Municipalities of Lambton Shores, Bluewater and South Huron
Grand Bend and Area Sanitary Sewage Servicing Master Plan

February 21, 2006

Municipality of Lambton Shores

Project No. 04-3796-2000

Submitted by

Dillon Consulting Limited

The Municipality of Lambton Shores

GRAND BEND AND AREA SANITARY SEWAGE SERVICING MASTER PLAN
NOTICE OF COMPLETION

The Grand Bend and Area Sanitary Sewage Master Plan was completed by Dillon Consulting Limited and followed Phases 1 and 2 of the "Municipal Class Environmental Assessment (EA)" (June 2000). The Study Area for the project consisted of a large area extending along the Lake Huron shoreline from the Ausable River Cut to Huron Road 84, in the municipalities of Lambton Shores, Bluewater and South Huron, including the hamlet of Dashwood. The goal of the Master Plan was to identify a long-term, environmentally and economically sustainable servicing scheme to meet the servicing needs of existing and future development over the next 20 years.

Phase 1 of the study concluded that malfunctioning septic systems in the Study Area, as well as discharges from the Grand Bend Sewage Treatment Facility (STF), are adversely affecting surface and groundwater, including Lake Huron, the area's most important natural and recreational asset. Septic system malfunction rates are expected to be high over the next 20 years. In addition, currently proposed and future growth must be serviced by municipal sanitary sewage services to comply with Provincial policies and legislation requiring environmental protection. Phase 2 identified and evaluated alternative solutions for addressing these problems. Based on Phases 1 and 2 and public and agency input, the preferred sanitary sewage servicing solution chosen by the three municipalities consists of the following components:

- provide municipal sanitary services to the entire Study Area, phased in over time
- expand and upgrade the Grand Bend STF to service the entire Study Area. A Mechanical Treatment Plant Upgrade was recommended as the preferred expansion and upgrading option
- accept and treat septage at the upgraded plant, but further assessment is required to determine the quantity of septage
- low pressure sanitary sewage collection system for almost all of the Study Area. For Dashwood, a conventional (gravity) collection system was selected.

The three municipalities will complete the servicing projects identified in the Master Plan over the next 20 years. The priority for improvements includes the following:

1. Expansion and upgrading of the Grand Bend STF to accommodate peak (summer) flows from Pinery Provincial Park and proposed Southbend Estates
2. Lambton Shores – servicing of Pinery Park and Southbend Estates
3. Lambton Shores – servicing of existing subdivisions, west of Southbend Estates
4. South Huron – servicing of South Huron from north of Grand Bend to Huron Road 83
5. Bluewater – servicing of the lakeshore (west side of Highway 21) from Huron Road 83 to 84
6. South Huron and Bluewater – servicing of Dashwood.

Further EA studies, following the requirements of the Municipal Class EA, are required before any of the projects included in the Master Plan can be constructed. The Master Plan Report will be available for public review from **February 27** to **March 29, 2006** at the following locations:

Bluewater Municipal Office	South Huron Municipal Office
14 Mill Avenue	322 Main Street South
Zurich, Ontario	Exeter, Ontario
Tel: (519) 236-4351	Tel: (519) 235-0310

Municipality of Lambton Shores Offices:

Town of Forest Sub Office	Village of Grand Bend Sub Office	Northville Complex
19 Ann Street	4 Ontario St.	9575 Port Franks Road
Forest, Ontario	Grand Bend, Ontario	Thedford, Ontario
Tel: (519) 786-2335	Tel: (519) 238-8461	Tel: (519) 243-1400

The Class EA document entitles any person who has significant concerns about the projects identified in the Master Plan to request the Ministry of Environment to change the status of the project from a Class EA to an individual EA by issuing a "Part II Order" under the Environmental Assessment Act. The procedure for requesting a Part II Order is:

- the person with concerns must discuss them with the Municipality first
- if the concern cannot be resolved, the person may submit a written request for a Part II Order to the Ministry of Environment at 135 St. Clair Avenue West, 12th Floor, Toronto, Ontario M4V 1P5 (Tel: 416-314-6790) by **March 29, 2006**. A copy of the request must be sent to the Municipality of Lambton Shores, 9575 Port Franks Road, R.R. 1, Thedford, Ontario, N0M 2N0 (Tel: 519-243-1400), Attention: Paul Turnbull, Director of Community Services.

DILLON
CONSULTING

February 21, 2006

Municipality of Lambton Shores
9575 Port Franks Road
R.R. 1
Thedford, Ontario
N0M 2N0

Attention: Mr. Paul Turnbull
Director of Community Services

Municipalities of Lambton Shores, Bluewater and South Huron
Grand Bend and Area Sanitary Sewage Servicing Master Plan

Dear Mr. Turnbull:

Enclosed is a copy of the Master Plan for this project. As noted in the Notice of Submission bound into the front of the report, the 30-day review period extends from **February 27** to **March 29, 2006.**

Also enclosed is a digital copy of the report that can be posted on your webpage.

It has been a pleasure working with you on this important project.

Yours sincerely,

DILLON CONSULTING LIMITED

Louis Tasfi, PhD., P.Eng.
Project Manager

SNS:plf
Encls.

Our File: 04-3796

cc: Janisse Zimmerman, Municipality of Bluewater
Larry Brown, Municipality of South Huron

Dillon Consulting
Limited

Municipalities of Lambton Shores, Bluewater and South Huron
Grand Bend and Area Sanitary Sewage Servicing
Master Plan

CONTENTS

LIST OF TABLES

LIST OF FIGURES

Follows Page

LIST OF APPENDICES

1 INTRODUCTION

1.1 Background and Purpose

Dillon Consulting Limited was retained by the Municipality of Lambton Shores in 2004 to prepare a Master Plan for long-term sanitary sewage servicing improvements to meet the needs of existing and future development in Grand Bend and the surrounding area in the Municipality of South Huron. Based on input received from the Municipalities of Bluewater and South Huron regarding septic system failures along the Lake Huron shoreline and future servicing needs in the Dashwood area, the Study Area for the Master Plan was subsequently enlarged to include the Lake Huron shoreline and Dashwood. The lake front, sandy beaches and picturesque setting of Grand Bend and the surrounding area in South Huron and Lake Huron have made this area one of Ontario's most popular summer resorts.

Following the requirements of the Municipal Class Environmental Assessment (EA) (2000) for the preparation of Master Plans, the plan is a comprehensive, long-range document outlining a long-term Service Area for the Grand Bend Sewage Treatment Facility (STF) and the sanitary sewage infrastructure improvements that are required over the next 20 years. The goal of the Master Plan is to identify a long-term, environmentally and economically sustainable servicing scheme for the next 20 years to meet the sanitary sewage servicing needs of existing and future development in the Study Area. The Master Plan's objectives are to:

- avoid potential impacts on human health
- minimize potential impacts on and enhance the natural environment, including ground and surface water, aquatic resources, terrestrial features and recreational areas. Lake Huron, the beaches and the Ausable River have significant natural and recreational value
- efficient use of services and cost effectiveness for municipalities and ratepayers, including reduced long-term (life cycle) costs for sewage servicing
- conform to Provincial, County and local municipal land use planning and servicing policies.

1.2 Study Area

As shown on **Figure 1**, the Study Area for the Master Plan consists of the following portions of the Municipalities of Lambton Shores, Bluewater, and South Huron:

- Lambton Shores - lands along both sides of Highway 21, from the Ausable River Cut to Grand Bend, including Pinery Provincial Park. The Lambton Shores portion of the Study Area also includes the Defore Subdivision on the north side of the Ausable River Cut

- South Huron- lands along both sides of Highway 21 from the Grand Bend boundary to the Bluewater boundary (Highway 83), lands along the south side of Huron Road 83 and the southern portion of the hamlet of Dashwood. The South Huron portion of the Study Area also includes the Grand Bend Sewage Treatment Facility (the "lagoons") on Mollard Line and existing and proposed tourist commercial, industrial and Airport commercial uses along Huron Road 81, south of Grand Bend

- Bluewater - lands along both sides of Highway 21 from Huron Road 83 to Huron Road 84, including the hamlet of St. Joseph. The Bluewater portion of the Study Area also includes lands along the north side of Huron Road 84 and the northern part of the hamlet of Dashwood.

1.3 Preferred Wastewater Servicing Solution and Service Area

The preferred sanitary sewage servicing solution for the Study Area was identified at the end of the Master Plan process and is shown on **Figures 12A** and **12B** in **Appendix A**. Subject to the completion of the Class EA process for particular projects, the recommended solution includes:

- the provision of municipal sanitary sewage services in the entire Study Area to be phased in over time

- an expansion and upgrading of the Grand Bend Sewage Treatment Facility (STF) to serve the entire Study Area. A Mechanical Treatment Plant Upgrade was recommended as the preferred expansion and upgrading option

- septage can be accepted and treated at the Upgraded Mechanical Treatment Plant. Further assessment is needed related to the quantity of septage generated in the Study Area that would require treatment at the Grand Bend STF. If additional capacity is required to treat septage, the addition of septage pre-treatment equipment and the upgrading of plant capacity would be phased-in over time

- a low pressure sanitary sewage collection system is the preferred option for servicing Lambton Shores, South Huron (along Highway 21 from Huron Road 81 to Huron Road 83) and Bluewater, along Highway 21

- a conventional (gravity) collection system is the preferred servicing option for Dashwood.

These servicing projects will be completed by the three municipalities over the next 20 years. The priority of improvements, as recommended by the Master Plan, includes the following:

1. Lambton Shores - the first priority for servicing the Study Area is the construction of an expansion and upgrading of the Grand Bend STF to accommodate peak (summer) flows from the Pinery Provincial Park and proposed Southbend Estates (highest priority wastewater improvement) and existing and future development in the Study Area

2. Lambton Shores - the construction of a forcemain from the Grand Bend STF to Southbend Estates and Pinery Park, the highest priority areas for servicing

3. Lambton Shores - future servicing of existing developed areas west of Southbend Estates, including Huron Woods, Southcott Pines and Merrywoods Subdivisions

4. South Huron - construction of a pumping station and forcemain to the Grand Bend STF to service South Huron north of Grand Bend to Huron Road 83. This area includes recreational and commercial uses along Highway 21 and the Oakwood Park Subdivision

5. Bluewater - servicing of the lakeshore, on the west side of Highway 21, from Huron Road 83 to St. Joseph

6. South Huron and Bluewater - servicing of Dashwood.

As explained in the next section, further environmental assessment studies, following the requirements of the Municipal Class EA (June 2000), are required before any of the projects included in the Master Plan can be constructed.

1.4 Class Environmental Assessment Process

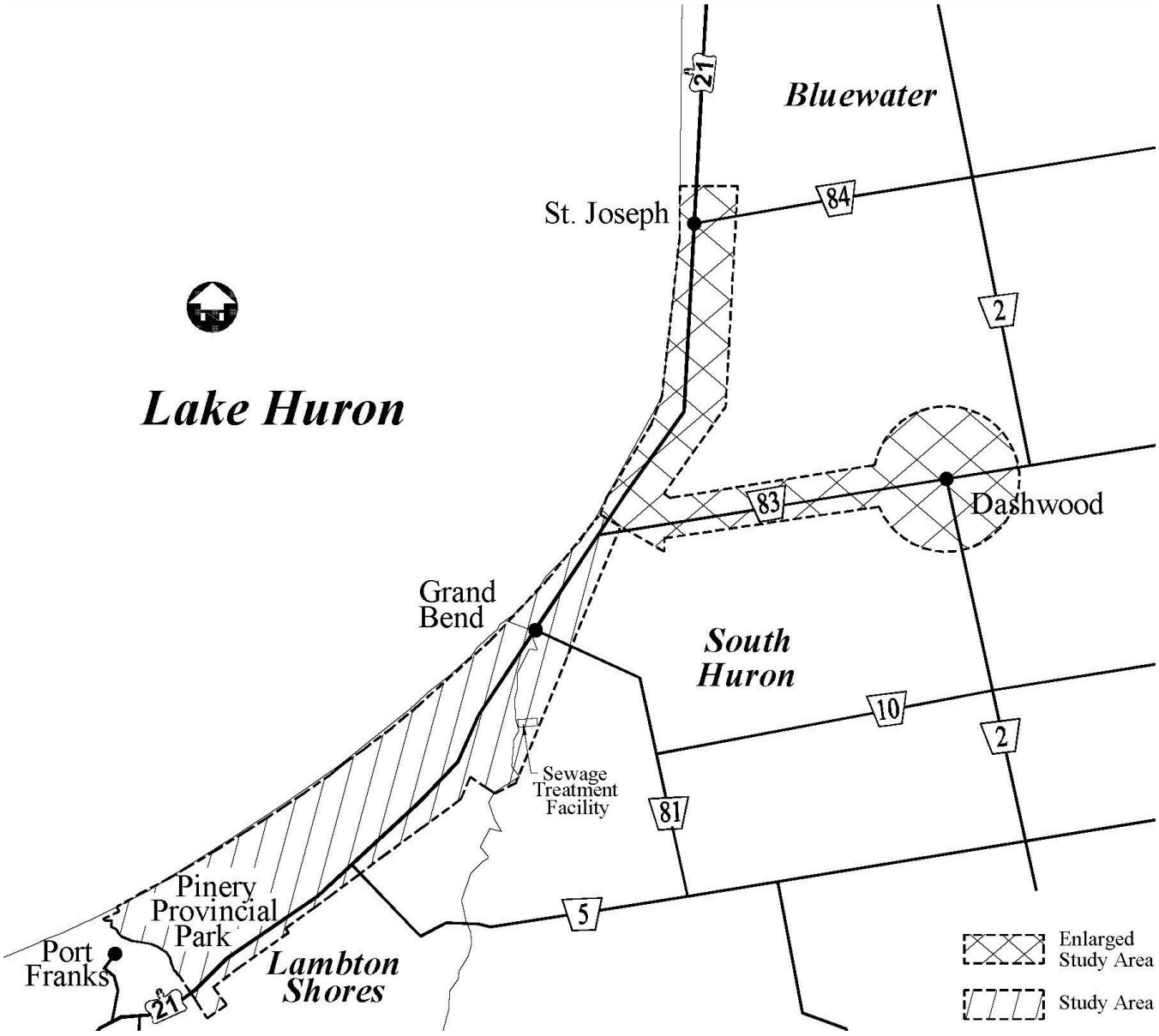
Municipal water and wastewater projects must meet the requirements of the Ontario *Environmental Assessment Act*. The Municipal Class Environmental Assessment (EA), approved under the *EA Act* in October 2000, applies to a group or "class" of municipal projects which occur frequently and have relatively minor and predictable environmental impacts. These projects are approved under the *EA Act*, as long as they are planned, designed and constructed according to the requirements of the Class EA document.

A Master Plan is a long range plan which examines the whole infrastructure system and recommends a series of projects to be implemented over an extended period of time. Integrating infrastructure needs with environmental planning principles, a Master Plan follows Phases 1 and 2 of the Class EA process. Phase 1 consists of "Problem or Opportunity Identification" and provides the justification of the need for future wastewater improvements. Phase 2, "Alternative Solutions", consists of the identification and evaluation of alternatives to solve the problems identified in Phase 1. At the end of Phase 2, preferred solutions are "put together" to form the recommended Master Plan.

The specific requirements of the Class EA document for a particular project depend on the type of project, its complexity and the significance of environmental impacts. Since a Master Plan covers Phases 1 and 2 of the Class EA process, projects which must follow all five phases of the Class EA process, such as the expansion or upgrading of an existing sewage treatment plant beyond its existing rated capacity, can proceed directly to Phase 3 and then Phase 4 of the Class EA process. Phase 3 consists of the identification, evaluation, and selection of the preferred design and Phase 4 consists of the documentation of Phases 1, 2 (including any required updates to this Master Plan) and 3 in an Environmental Study Report (ESR).

According to the project classifications included in the Class EA document, the wastewater projects included in this Master Plan could be a combination of the following Schedule "A", "B" and "C" projects:

- Schedule "A" projects are limited in scale and have minimal adverse environmental impacts. These projects are approved and may proceed to construction without following the Class EA process. An example of a Schedule "A" sewage project is the construction of an



Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 1: STUDY AREA

DILLON CONSULTING

Lambton Shores

MUNICIPALITY OF SOUTH HURON

MUNICIPALITY OF BLUEWATER
BAYFIELD - HAY - HENSALL - STANLEY - ZURICH
2001

extension to an existing sewage system following an existing road allowance or utility corridor

- Schedule "B" projects have the potential for some adverse impacts and are approved under the EA Act provided they follow Phases 1 and 2 of the Class EA process and are "screened". An example of a Schedule "B" project is the extension of an existing sewage system not located in an existing road allowance or utility corridor

- Schedule "C" projects have the potential for significant adverse environmental impacts. This type of project must follow all five phases of the Class EA process and require the preparation of an ESR. An example of a Schedule "C" wastewater project is the expansion or upgrading of an existing sewage treatment plant beyond its existing rated capacity.

Phases 3 and 4 of the Class EA must be completed prior to construction of any Schedule "C" projects.

2. EXISTING AND PROJECTED CONDITIONS

2.1 Introduction

This section of the report provides a summary of the Study Area's existing and projected conditions potentially affected by the wastewater improvements proposed by the Master Plan. Potentially affected conditions include engineering considerations, cultural resources, the natural and socio-economic environment and relevant Provincial, Lambton County and municipal land use planning and servicing policies. Section 2 also includes population projections and forecasted sanitary sewage quantities to the year 2026 for the Study Area.

The information included in Section 2 was used to:

- identify servicing needs and prepare the "Problem Statement" included in Section 3
- identify and evaluate the alternative solutions included in Section 5
- evaluate the impacts of recommended solutions on the full scope of the "environment", as documented in Section 6.

2.2 Engineering Considerations

2.2.1 Grand Bend Sewage Treatment System

The existing Grand Bend Area Sanitary Sewage Treatment Facility (STF) and collection system was designed and constructed during the late 1970s. The system became operational in 1980. The existing Service Area includes the following areas in Lambton Shores and South Huron:

- the urbanized portion of the former Village of Grand Bend. This area includes the downtown, densely developed older residential areas east of the Ausable River, newer, less densely developed residential areas (including the Green Forest Subdivision and the easterly one-third of Southcott Pines) and commercial and residential development on Ontario Street (Highway 21) and Huron Road 81

- uses included in the South Huron portion of the Service Area on Highway 21 and Huron Road 81 include Grand Cove Estates (a large modular home development), Oakwood Inn, Huron County Playhouse, Grand Bend Motorplex and the Pickling Onion Growers Plant.

The STF is located on Mollard Line, on Lot 6, Aux Sable Concession, in the Municipality of South Huron (formerly Stephen Township). As shown on **Figure 2**, the facility consists of four waste stabilization ponds (lagoons), without supplemental aeration, discharged on a seasonal basis to the Ausable River. The facility is owned by the Municipality of Lambton Shores and operated by OMI (Operations Management International) Inc. In the Lambton Shores portion of the Serviced Area, the sewage collection system is owned by the Municipality of Lambton Shores. The South Huron portion of the collection system is owned by the Municipality of South Huron.

According to the current Certificate of Approval (C of A) for the Grand Bend STF, the four lagoons have an approximate surface area of 22.7 hectares (56 acres) at a liquid depth of 1.52 m (5 ft). The total lagoon volume at a total depth of 1.83 m (6 ft), including a liquid depth of 1.52 m (5ft) with an additional 0.305 m (1 ft) of sludge depth at the bottom of the lagoons, is 398,500 m^3 (87.6 MIG). Inlet chambers enable distribution of pumped sewage to each lagoon. Interconnecting piping between adjacent lagoons and outlet structures allow series or parallel operation. An outlet pipe from each lagoon discharges directly to the Gill-Lovie Drain, which runs parallel to the treatment site's southerly property boundary. The Drain is a tributary to the Ausable River/Lake Huron.

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Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 2: GRAND BEND SEWAGE TREATMENT FACILITY EXISTING SITE PLAN

Lambton Shores

Municipality of South Huron

Municipality of Bluewater 2001

The lagoons are operated on a seasonal discharge basis. Wastewater is accumulated in the system with seasonal discharge occurring in the winter (December/January) and in the spring (April/May/June). Treated effluent is discharged directly to the Gill-Lovie Drain over a two to three week period.

The average rated daily flow capacity of the treatment system is 1,891 m^3/d (0.416 MIGD, with capacity shared by Lambton Shores and South Huron. Lambton Shores' allotted capacity is 1,497 m^3/d (about 80% of the total) and South Huron's allotted capacity is 394 m^3/d (20%). As shown on **Table 7** in Section 2.2.5 of this report, the facility is quickly reaching its capacity, particularly during the peak season. Current (2005) daily flows for the off-season (October to April) are 640 m^3/day. During the peak season (May to September), daily flows are 1,740 m^3/day.

The existing C of A for the Grand Bend STF, issued by the Ministry of Environment (MOE), includes no specific effluent quality criteria. The Ministry has the authority to add criteria, however, particularly in the case of an upgrade or expansion to the STF. Based on recent monitoring data, **Table 1** shows the characteristics of existing raw sewage and effluent discharged from the facility.

Table 1
Existing Raw Sewage and Effluent Quality (2002-2003)*

	Raw Sewage Average Concentration (mg/L)		Discharged Effluent Average Concentration (mg/L)	
	2002	2003	2002	2003
BOD_5	191	211	6.8	10.9
TSS	155	145	16.1	16.4
TKN	27	26	--	--
Ammonia NH_3	--	--	1.09	1.8
TP	4.4	4.5	0.31	0.76

*Source: Operations Management International (OMI) Canada Inc., Grand Bend Wastewater System 2002, and 2003 Annual Reports of Operations
-- (not measured)

The existing collection system in Grand Bend consists of a network of gravity pipes ranging in size from 200 mm in diameter to 450 mm, with private drain connections servicing individual residences and industry. The collection system has a series of pumping stations and sewage ultimately flows to the Main Pumping Station, located in the former Village of Grand Bend on Huron Road 81. Raw sewage is pumped to the treatment system from the Main Pumping Station through a 200 mm (8 in) diameter 3,200 m (10,500 ft) long forcemain. A separate pumping station and forcemain is used to convey raw sewage from the Huron Country Playhouse directly to the Grand Bend STF. Another forcemain is used to convey sewage from serviced uses on Huron Road 81, including the Grand Bend Motorplex and the Pickling Onion Growers Plant, directly to the lagoons.

2.2.2 Private Sanitary Sewage Disposal

The remainder of the Study Area is serviced by private subsurface sanitary sewage disposal systems (septic tank and tile bed systems). Jurisdiction under the *Building Code Act* for the approval, installation, inspection and repair of septic systems is different for each municipality in the Study Area:

- in Lambton Shores, it is administered by the County of Lambton
- in South Huron, it is administered by the Huron County Health Unit
- in Bluewater, it is administered by the Municipality of Bluewater.

Records documenting septic system failures and repairs in the Study Area are limited. Although permits are required for new and replacement systems, no permits are required for repairs to existing systems. The County of Lambton and the Huron County Health Unit do not maintain records outlining the reason for septic system replacement. The Municipality of Bluewater keeps records for the 'reason for work' for both new septic systems and repairs to existing systems. In the case of repairs, however, the 'reason for work' does not typically detail the cause of the failure. For these reasons, it is difficult to differentiate between septic system failures caused by poor soil conditions and/or failures due to other conditions (i.e., root blockage).

Dillon received the following input from officials of Lambton Shores, South Huron and Bluewater having jurisdiction over septic systems regarding septic system problems in the municipalities:

Lambton Shores -

- many tile bed systems have been replaced in the same area where the previous bed was located due to soil problems
- few lots have a contingency bed area required in the case of system failure
- septic system problems are likely to become more apparent as many cottages are converted from seasonal to year-round use.

South Huron -

- most dwellings, more than 25 years old, experience problems with their septic systems on a yearly basis
- homeowners with septic system problems are reluctant to divulge problems for fear of action by enforcement authorities. As a result, many problems go unreported.

Bluewater -

- some septic systems have old holding tanks that have deteriorated over time
- tree root blockage is another problem that is affecting the operation of septic systems.

During the public and agency consultation completed for the project, Dillon also received extensive input from the public about septic system failures throughout the Study Area, particularly in the Bluewater lakeshore area. Public input is summarized in Section 3 of this report.

Some recent developments, such as the Huron Woods and Deer Run Subdivisions, are serviced by septic systems. In these cases, the septic systems are fairly new. However, most of the septic systems in the Study Area are more than 25 years old. Conventional septic tank and tile bed systems have a service life of about 20 years. Based on the age of existing development, system failure rates are expected to be high over the next 20 years. Existing surface and groundwater quality problems caused by failing and dysfunctional septic systems are outlined in Section 2.4.1 of this report.

2.2.3 Water Supply and Distribution

The entire Study Area is serviced by municipal water, supplied by the Lake Huron Water Supply System's Grand Bend Water Treatment Plant. The plant is located on Highway 21, near Huron Road 83.

2.2.4 Population Projections

To project sanitary sewage quantities, Dillon prepared population projections to the year 2026 for the Lambton Shores, Bluewater and South Huron portions of the Study Area. An "Ultimate Population" (when all lands are developed) was also prepared.

a) Existing Serviced Population Estimate

As outlined in Section 2.2.1, the Grand Bend STF currently services the urbanized portion of the former Village of Grand Bend and a portion of South Huron along Highway 21 and Huron Road 81. As shown on **Table 2**, the STF currently services an estimated population of 1,930.

Table 2
Existing (2005) Serviced Population

Municipality	Residential Sewer Connections [1]	Estimated Serviced Population [2]
Lambton Shores	696	1,092, say 1,100
South Huron	365	825, say 830
Total	1061	**1930**

[1] Information provided by the Municipalities of Lambton Shores and South Huron, 2005

[2] Based on 1.57 persons per household (p.p.h.) for Lambton Shores and 2.26 p.p.h. for South Huron (2002 Ontario Municipal Directory)

b) Seasonal and Tourist Populations

Lambton Shores

In 1992, according to Dillon's "Grand Bend Area STF Class EA (October 1994), the former Village of Grand Bend had an almost equal split between year round (47%) and seasonal population (52%). According to Dillon's "North Bosanquet Sewage System Class EA" (February 1994), the North Bosanquet area (north of Klondike Road) also had an approximately equal split of year round and seasonal residential population (52% year round and 48% seasonal). However, based on the type of residential development which has occurred over the last ten years (expensive, year round or retirement type dwellings), the percentage year round population has likely increased.

According to November 2004 figures provided by the Municipal Property Assessment Corporation (MPAC) to Lambton Shores, approximately 74% of the residences in the entire Municipality of Lambton Shores are year round and 24% are seasonal. The percentage seasonal population in the lakeshore area is likely higher, however, due to the recreational value of this area.

The most current estimates of tourists (day visitors) in the Grand Bend area are included in "Economic Development Opportunities in the Village of Grand Bend" prepared by Emric Suiches in November 1983. According to the report, an average of 6,000 tourists visited Grand Bend per weekday in the summer in 1983. The study also estimated that there are from 5,000 to 10,000 tourists in the village on an average summer weekend day. This figure was predicted to grow by 2% per year.

South Huron

According to Dillon's 1994 "Grand Bend Area STF Class EA", all of the cottage developments in the South Huron portion of the Study Area (Oakwood, Maplegrove, Sunnyside and Kingsmere) are seasonal. Approximately one-third of these cottages are now used year round, according to an estimate prepared by the Municipality of South Huron (May 26, 2005). According to the Huron County Planning Department, year round use of recreational properties is expected to increase as the population ages (letter dated April 4, 2005 to Dillon). Grand Cove Estates and Dashwood are assumed to be year round residential.

Bluewater

Based on an analysis of mailing addresses provided by the Municipality of Bluewater for the distribution of the "Revised Project Initiation Notice" in April 2005, over 70% of the property owners in the Bluewater portion of the Study Area have out-of-town addresses, indicating they are seasonal dwellings. These figures are consistent with a "Rural Servicing Study" prepared by the Huron County Planning Department in 1992. According to the study, the population of the lakeshore portion of Hay Township (larger than the Study Area for this project) consisted of 78% seasonal residents and 22% year round residents.

According to a field survey completed by Dillon in the Spring of 2005, the percentage seasonal population varies from development to development, however. Some cottage developments appear to be entirely seasonal, while some subdivisions appear to be entirely year round.

Future Trends in Year Round Population

The year round percentage population in all three municipalities in the Study Area is expected to increase significantly over the next 20 years. The following factors are contributing to this trend:

- many of the new houses being built in all three municipalities are expensive, year round or retirement type dwellings
- the "baby boom" generation is aging and a large portion is expected to retire over the next 10 years
- the attractiveness of this area for retirement.

c) Existing (2005) Population Estimates in Unserviced Areas

Estimates of the existing population in the unserviced portion of the Study Area, by municipality, are shown on **Table 3**. The estimates were based on information provided by the three municipalities, base mapping and population estimates included in Class EA's prepared by Dillon for Bosanquet and Grand Bend in 1994.

Table 3
Existing (2005) Unserviced Population

Municipality	Residential Lots/Units	Estimated Unserviced Population[1]
Lambton Shores	1505	2,363, say 2,370
South Huron	474 (includes south half of Dashwood)	1,071, say 1,070
Bluewater	1,093 (includes north half of Dashwood)	1,738, say 1,740
Total	3072	**5180**

1 Based on 1.57 persons per household for Lambton Shores, 2.26 p.p.h. for South Huron and 1.59 p.p.h. for Bluewater (2002 Ontario Municipal Directory)

As shown on **Table 3**, the unserviced portion of the Study Area currently includes 3,072 residential lots/units with a total estimated population 5,180. Major existing developments by municipality include the following:

- residential developments in Lambton Shores include long established subdivisions such as Southcott Pines, Beach O'Pines, Pinedale, Van Dongen, Dalton, Walker Woods and Walden North. Newer developments include Huron Woods, Wee Lake Estates, Deer Run and Oak Forest Estates, for a total of 1,505 residential lots/units (2,370 people)

- the largest cottage development in the unserviced portion of South Huron is Oakwood Park with 135 lots, approximately. Other developments include Maplegrove, Sunnyside and Kingsmere Cottages and Birchbark Trailer Park. Including the south half of the hamlet of Dashwood, the unserviced portion of South Huron includes 474 residential lots/units with an estimated existing population of 1,070

- the Bluewater lakeshore includes over 20 seasonal and year-round cottage, trailer and subdivision developments. Larger developments include Turnbull's Grove, Highlands I, II and III, Poplar Beach I and II, Lakewood Gardens, Bayview North and South, Bayview Farms and Norman Heights. Including the north half of Dashwood, the Bluewater portion of the Study Area includes 1,093 residential lots/units with an estimated population of 1,740.

As mentioned, the north half of the hamlet of Dashwood is located in Bluewater, while the south half is located in South Huron. Based on the number of existing residential water connections (including the houses along both sides of Huron Road 83 from Highway 21 to Dashwood), Dashwood currently has approximately 220 residential lots. At 2.26 persons per household (South Huron's average person per household figure), the existing estimated population of Dashwood is around 500 people. According to the Huron County Planning Department's "Population Trends and Settlement Patterns", the 1991 population of Dashwood was 420.

The estimated existing population of the unserviced portion of the Study Area is 5,180, as shown on **Table 3**. As shown on **Table 4**, the Study Area has a total estimated existing population of 7,110.

Table 4
Total Existing (2005) Serviced and Unserviced Population

Municipality	Serviced Population	Unserviced Population	Total
Lambton Shores	1100	2370	3470
South Huron	830	1070	1900
Bluewater	0	1740	1740
Total	1930	5180	**7110**

d) Population Projections to 2026

The estimated 2005 populations shown on **Table 4** were used as the "starting point" for population projections to the year 2026.

A fairly high growth rate of 2% was used to project the existing population of the Lambton Shores portion of the Study Area. Previous Dillon studies (1994) projected that the population of Grand Bend and North Bosanquet would increase by 2.2% per year to the year 2021. Population projections prepared by the Lambton County Planning and Development Department in 1996 projected that Bosanquet's population would increase by 2.6% per year to 2021. Comparing the year 2001 projection with the actual 2001 Statistics Canada census population of the County, however, indicates that the County's projections were, overall, too high. Also, according to Ministry of Finance population projections (February 2005) for Lambton County to 2031, the population of Lambton County is expected to increase at a very slow rate of only 0.12% per year. In comparison, projected growth in the Greater Toronto Area (GTA), the fastest growing region in the Province, ranges from 1.5% per year for Durham Region, 1.7% per year for Halton and Peel and 2.3% per year for York Region.

A growth rate of 2% per year for Lambton Shores appears reasonable given the significant amount of development that has occurred in Lambton Shores over the last five years. During this time, development in Grand Bend and North Bosanquet was equivalent to a population growth rate of 1.95% per year. In addition, almost 1,000 lots are registered or Draft Plan approved in the Lambton Shores portion of the Study Area, indicating that this area has significant development potential.

According to the Ministry of Finance, "Ontario Population Projections, 2004 - 2031" (February 2005), the population of Huron County will increase at a moderate rate of 0.42% per year from 61,750 in 2004 to 69,170 in 2013. Compared to Lambton Shores, little development has recently occurred in the South Huron and Bluewater portions of the Study Area. In addition, according to the Huron County Planning Department, Dashwood has little development potential.

Sanitary sewage servicing may, however, encourage growth to occur in the South Huron and Bluewater portions of the Study Area at a slightly higher rate than projected by the Ministry of Finance. Based on this and the popularity of lakefront property, a slightly higher growth rate of 0.5% per year was used to project the population of the Huron County portion of the Study Area.

Applying these growth rates to the existing population of the Study Area results in the projections shown on **Table 5** for the year 2026. As shown, the population of the Study Area is projected to reach 9,300 by 2026.

Table 5
Population Projections to 2026

Year	Lambton Shores	South Huron	Bluewater	Total
2005 (estimated existing)	3470	1900	1740	7110
2006	3539	1910	1749	7198
2011	3908	1958	1793	7659
2016	4314	2007	1838	8159
2021	4764	2058	1884	8706
2026	5259	2110	1932	9,301, say **9,300**

e) Ultimate Population

Table 6 shows the "ultimate" population of the Study Area. "Ultimate" population includes the existing population, plus the population of all future development, including current development

applications and other lands designated/zoned for development in the local municipal Official Plans and Zoning By-laws.

Table 6
Ultimate Population

Municipality	Existing (2005) Population	Future Development		Ultimate Population
		Proposed and Designated/Zoned Lots/Units[1]	Estimated Population[2]	
Lambton Shores	3470	4292	6738	10208
South Huron	1900	595	1345	3245
Bluewater	1740	1236	1965	3705
Total	7110	6123	10048	17,158, say **17,160**

[1] Information provided by Lambton Shores' fax dated February 23, 2005, Huron County Plannning Department letter dated April 4, 2005 and Bluewater March 16, 2005 e-mail and review of Township of Stephen and Township of Hay Zoning By-laws

[2] Based on 1.57 p.p.h. for Lambton Shores, 2.26 p.p.h. for South Huron and 1.59 p.p.h. for Bluewater

2.2.5 Projected Sanitary Sewage Quantities

Table 7 shows existing and projected daily sewage flows for each municipality in the Study Area. To account for increased flow due to the seasonal and tourist population, the table includes flows for both the off-season (October to April) and the peak season (May to September). The table also shows projected flows for major uses in the Study Area, including those that are not currently serviced. Uses and areas currently not serviced include the Bluewater lakeshore, Dashwood, Pinery Provincial Park and Hayter's Turkey Processing Plant, just outside of Dashwood. Consideration has also be given to projected flows from these areas/uses.

Table 7
Existing and Projected Daily Sanitary Sewage Flow

	Current Flow (2005) (m^3/d)		Future Flow (2026) (m^3/d)	
Area	**Off-season**	**Peak Season**	**Off-season**	**Peak Season**
Lambton Shores	340	660	1000	1860
South Huron (not incl. Dashwood)	260	500	300	570
Bluewater (not incl. Dashwood)	--	--	260	890
Dashwood	--	--	290	370
Pinery Provincial Park	--	--	10	550
Huron Country Playhouse	0	220	0	220
POG Plant, Grand Bend Motorplex	40	360	40	360
Hayter's Turkey Products (Processing Plant)	--	--	120	140
Total Sewage Flow	**640**	**1740**	**2020**	**4960**

Notes: Off-season is the average of flows from the months of October to April
Peak Season is the maximum of the average monthly flow occurring in the months of May to September (typically occurring in the month of August)
-- not currently serviced

The total expected flow from all areas/uses considered in the Study Area is 4,960 m^3/d by 2026.

2.2.6 Provincial Highway, County Roads and Grand Bend Nature Trail

The Ministry of Transportation (MTO) has jurisdiction over Highway 21. MTO will not permit any sanitary sewer infrastructure in its right-of-way. In addition, the Ministry will not permit open cutting of the highway for sewer crossings.

Approvals from Huron and Lambton County will be required for any sewage infrastructure located along or crossing any of the area's County Roads. These include Lambton Road 5, Huron Road 81, Huron Road 83 and Huron Road 84.

The Grand Bend Nature Trail, part of a County-wide walking and biking trail, follows the north side of Highway 21 from the Ausable River Bridge in Grand Bend to the entrance of Pinery Park. The trail is over 9 km long and was constructed through the efforts of the Grand Bend Rotary Club.

2.3 Cultural Resources

The Study Area's rich history and cultural resources will be an important consideration in the future planning and design of infrastructure improvements.

Cultural resources is a collective term given to artifacts, buildings, features and landscapes which reflect past human activities. Resources can take the form of North American native camps, villages, lithic workshops and burial sites and historical buildings, structures and other features. Grand Bend and surrounding area is an area of high archaeological significance. Human occupation of this area covers a period of approximately 11,000 years consisting of four major periods:

- the Paleo-Indians (9500 to 8000 B.C.) were nomadic hunters of caribou and other big game
- as the climate became warmer, the Paleo-Indian period was replaced by the Archaic period (8000 to 1000 B.C.). The Archaic people lived in small groups on sandy soils next to rivers and streams and were hunters and gatherers. They moved on a seasonal basis
- the Woodland period extended from 1000 B.C. to 1650 A.D. This period is characterized by the introduction of pottery and the transition to village life and agriculture
- the Historic period extends from 1650 to the present and is marked by European settlements and displacement of the native peoples.

The Pinery Provincial Park and surrounding area in Lambton Shores, for example, has very high archaeological potential. According to a Stage 1 Archaeological Assessment prepared for the Ministry of Natural Resources in 2001, there are approximately 85 registered archaeological sites within and around Pinery Provincial Park. The age of the Pinery's sites covers almost 2,700 years, first by Native people from the Early Woodland period of 800 to 400 B.C. to European settlers in the 1870s. The most frequent type of site is from the Middle Woodland, Saugeen peoples. Other

sites represent the Late Woodland period (A.D. ~ 700 to 1550). No comprehensive cultural resources surveys have been prepared for the rest of the Study Area.

Bosanquet Township was originally named for Charles Bosanquet, a director of the Canada Company. In 1826, the company bought the township from the Crown, along with the rest of the "Huron Tract". Following the completion of the township survey in 1835, settlement began slowly. By 1841, the population of the township was only 148. Early settlements in Bosanquet included Brewster (Grand Bend), Ravenswood and Kinnaird, all centered around saw and grist mills. Major family groups included the Utter, Smith and Eastman families. The completion of the Grand Trunk Railway through the township in 1859, encouraged settlement and led to the founding of the towns of Forest and Thedford. By the 1870s, Grand Bend had became a tourist destination noted for its picturesque setting and healthy atmosphere.

In 1860, Dashwood was named Friedsburg after brothers Absolom and Noah who settled there in 1853 and built saw and grist mills. In 1871, the name was changed to Dashwood, likely after Dashwood House in London, England, the British headquarters of the Grand Trunk Railway.

St. Joseph was settled by a group of French Canadian settlers who moved to the area in the late 1700s. Narcisse M. Cantin, descended from a long line of shipbuilders, began planning a city at St. Joseph and a canal linking Lake Huron and Lake Erie. From 1900 to 1930 he tirelessly promoted the concept of a Great Lakes seaway system, but was unable to raise sufficient funds for the project.

2.4 Natural Features

2.4.1 Soils, Surface Water and Groundwater

Soils in the Study Area are shown on **Figure 3** and include sandy and clay soils.

As shown on **Figure 3**, more than half of the Study Area's soils consist of surficial sandy soils. Areas with sandy soils include almost all of the lands along Highway 21 south of Grand Bend, including Pinery Park, and a strip of sandy soils extending through the hamlet of Dashwood. The Lambton County Groundwater Study (2005) identified almost all of the Lambton Shores portion of the Study Area as highly susceptible to groundwater contamination from septic systems and other sources.

Septic systems in sandy soils generally work well, but too many systems in one area may adversely impact groundwater. Also, a large lot size is required to reduce the risk of groundwater impacts.

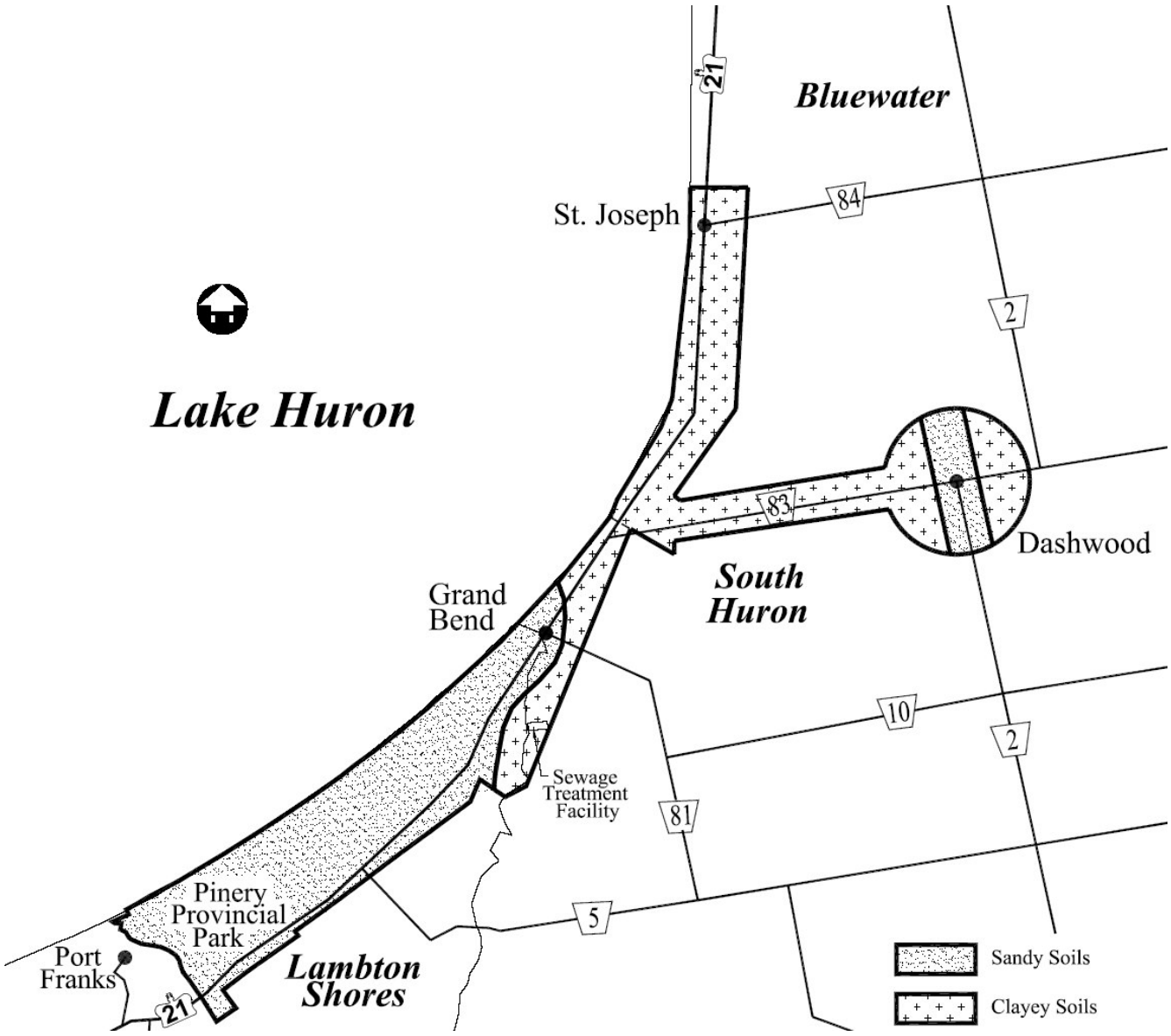
Dillon determined that an average lot size of less than 4,000 m^2 (1 acre) in a subdivision on sandy soils, such as Deer Run, results in unacceptable nutrient impacts (e.g. nitrates) on groundwater. Almost all of the lots in Lambton Shores are less than 1 acre. Based on this, it is highly likely that existing development is adversely affecting groundwater. In some areas, very rapid percolation times in sandy soils requires pre-treatment of septic tank effluent, using treatment units such as EcoFlow, Waterloo Biofilter, and FAST Canada.

Although generally suitable for septic systems, the permeable nature of sandy soils allows nitrates from the leaching beds to migrate with groundwater flow and discharge to Lake Huron and area watercourses. Dysfunctional septic systems cause more severe impacts, such as organic nitrogen, ammonia and general organic loading.

The rest of the Study Area, including lands in the vicinity of the sewage treatment facility and almost all of the lands north of Grand Bend along the lakeshore, has surficial clayey soils. In these soils, septic systems require large leaching beds and may require "raised" beds. Many lots in Bluewater are less than 2,000 m^2 and have leaching beds smaller than current standards. These lots do not have the required area to accommodate the installation of a properly sized tile bed.

Tile beds on clay soils are more prone to premature failure and "breakout" of septic effluent. This "breakout" has lead some homeowners along the lakeshore to illegally connect a leaching bed area to a surface water drain. A recent DNA study conducted for the Bluewater Shoreline Residents Association by GAP Enviro/Microbial Services concluded that *E. coli* bacteria from samples collected in the St. Joseph's Drain are closely related to the *E. coli* strains taken at St. Joseph beach. Multiple sources, including agriculture and domestic sewage are contributing to the problem.

Based on these types of problems, the Huron County Groundwater Study (2003) recommended that the County of Huron investigate the feasibility of a County-wide septic system inspection and pump out program to deal with inadequate system care and maintenance.



Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 3: SOILS IN THE STUDY AREA

DILLON CONSULTING

Lambton Shores

MUNICIPALITY OF SOUTH HURON

MUNICIPALITY OF BLUEWATER
BAYFIELD - HAY - HENSALL - STANLEY - ZURICH
2001

2.4.2 Aquatic Resources Overview

This section of the report describes the aquatic resources of the Study Area, based on a review of secondary sources. The aquatic resources in this area are managed by the Ausable Bayfield Conservation Authority (ABCA) under the guidance of its *Watershed Management Strategy* (June 1995). This section covers the following topics relating to the aquatic features of the Study Area:

- surrounding land use and fish habitat management issues
- watercourse classifications
- fish communities present in the Study Area
- aquatic species at risk
- water quality and benthic invertebrate monitoring.

Surrounding Land Use and Fish Habitat Management Issues

The Lower Parkhill, Gullies and Lower Ausable are the three sub-basins that divide the study area. Aquatic features include numerous gullies and streams that drain directly into Lake Huron, the Ausable River, Parkhill Creek and several wetland habitats.

Lower Ausable Sub-Basin

This sub-basin incorporates a land area of 200 km^2 and includes the Ausable River from its confluence with Adelaide Creek to its outlet at Port Franks. Agriculture is the dominant land use; however, 27% of the sub-basin is covered by forest and wetland, including the areas of Pinery Provincial Park. The fish community objective according to ABCA's *Fish Habitat Management Plan* (2001) for the main stem and warm water tributaries is a warm water system, with top predators (i.e., northern pike and walleye). For cold water tributaries, the fish community objective is for a cool to cold system with migratory and resident trout. In order to reach the water quality objectives associated with the ABCA's fish community objectives, the ABCA aims to encourage practises that reduce nutrient and sediment inputs in this sub-basin.

Lower Parkhill Sub-Basin

This sub-basin incorporates a land area of 310 km^2 and includes Parkhill Creek from below the Parkhill Creek Reservoir to the mouth. Agriculture is the dominant land use, while forest and wetland cover is approximately 14% of the sub-watershed, consisting of mostly riparian and headwater woodlots (ABCA, 2001). The fish community objective in the main stem and warm water

tributaries is a warm water system with top predators (largemouth bass and white crappie) and a warm water system with diverse forage communities, respectively. As with the Lower Ausable sub-basin, the ABCA aims to encourage practises that reduce nutrient and sediment inputs in the Parkhill Creek sub-basin (ABCA, 2001). One of the primary concerns identified in the management plan is the impact from the input of potential point source pollution, as is the case with sewage discharge into Parkhill Creek at Parkhill and two locations in Grand Bend (ABCA, 2001).

Gullies Sub-Basin

This sub-basin incorporates a land area of 310 km^2 and is comprised of numerous tributary systems flowing west into Lake Huron. Agriculture is the dominant land use, while forest and wetland cover comprises approximately 13% of the sub-watershed. However, the amount of forested area in the Grand Bend portion of the Study Area for this project is limited (ABCA, 2001). The fish community objective in the Gullies sub-basin is a mixture of cool to cold water systems with migratory salmonid populations and warm water systems with diverse forage communities.

***Watercourse Classification*s**

Most drains in the Study Area have been "draft" classified by the ABCA in conjunction with the federal Department of Fisheries and Oceans (DFO) and the Ministry of Natural Resources (MNR), based on field work conducted in 2001. Draft drain classifications for the Study Area were provided by ABCA and are described below in **Table 8**.

Table 8
Watercourse Classifications as Assigned by ABCA

Classification	Definition
A	Cold cool water with no trout/salmon present
C	Warm water fish habitat with no top predators present
D	Cold cool water fish habitat with trout/salmon present
E	Warm water fish habitat, top predators present, no channelization within 10 years
F	Intermittent
T	Tiled
U	Unclassified

Drains in the Study Area represent a mix of classifications. Most drains are classified as warmwater watercourses with no top predators or intermittent. One drain (the Schroeder Drain crossing Huron Road 83) is classified as a cold/cool water watercourse with no trout/salmon present. The Ausable River is classified as a warmwater watercourse with top predators.

Fish Communities

The *Fish Habitat Management Plan* (ABCA, 2001) summarized the fish species that have been collected in the Ausable River Basin. A complete list of confirmed fish species historically collected in this watershed can be found in **Table 9**. Fish species range from both habitat generalists to habitat specialists and can be found in both coldwater and warmwater systems.

Table 9
Confirmed Fish Species in the Ausable River Basin

Common Name	Scientific Name	Most Recently Collected
Bowfin	*Amia calva*	1947
Gizzard Shad	*Dorosoma cepedianum*	2000
Pink Salmon	*Oncorhynchus gorbuscha*	–
Coho Salmon	*Oncirhynchus kisutch*	--
Chinook Salmon	*Oncirhynchus tshawytscha*	–
Rainbow Trout	*Oncorhynchus mykiss*	1999
Brook Trout	*Salvelinus fontinalis*	1999
Central Mudminnow	*Unbra limi*	2000
Grass Pickerel	*Esox americanus vermiculatunm*	1947
Northern Pike	*Esox lucius*	2000
Muskellunge	*Esox masquinongy*	1947
Central Stone Roller	*Campostoma anomalum*	1999
Northern Redbelly Dace	*Phoxinus eos*	1999
Common Carp	*Cyprinus carpio*	1999
Brassy Minnow	*Hybognathus hankinsoni*	1999
Hornyhead Chub	*Nocmis biguttatus*	1999
River Chub	*Nocomis micropogon*	1974
Golden Shiner	*Notemigonus crysoleucas*	1982
Pugnose Shiner	*Notropis anogenus*	1982
Common Shiner	*Notropis cornutus*	2000
Ghost Shiner	*Notropis buchanani*	1982
Striped Shiner	*Notropis chrysoocephalus*	2000
Blackchin Shiner	*Notropis heterodon*	1982
Backnose Shiner	*Notropis heterolepis*	1982
Rosyface Shiner	*Notropis rubellus*	1999
Spottail Shiner	*Notropis hudsonius*	1982
Spotfin Shiner	*Cyprinella spiloptera*	1999
Sand Shiner	*Notropis stramineus*	1982
Redfin Shiner	*Lythrurus umbratilis*	1973
Mimic Shiner	*Notropis volucellus*	1982
Blacknose Dace	*Rhinichthys atratulus*	2000
Bluntnose Minnow	*Pimephales notatus*	2000
Fathead Minnow	*Pimephales promelas*	2000
Longnose Dace	*Rhynichthys cataractae*	1947
Creek Chub	*Semotilus atromaculatus*	2000
Quillback	*Carpiodes cyprinus*	1974
White Sucker	*Catostomus commersoni*	2000
Lake Chubsucker	*Erimyzon sucetta*	1982
Northern Hog Sucker	*Hypentelium nigricans*	2000

Common Name	Scientific Name	Most Recently Collected
River Redhorse	*Moxostoma carinatum*	1936
Golden Redhorse	*Moxostoma erythrurum*	1982
Shorthead Redhorse	*Moxostoma macrolepidotum*	1982
Greater Redhorse	*Moxostoma valenciennesi*	1982
Black Bullhead	*Ameiurus melas*	2000
Brown Bullhead	*Ameiurus nebulosus*	1982
Channel Catfish	*Ictalurus punctatus*	1947
Stonecat	*Notorus flavus*	2000
Tadpole Madtom	*Notorus gyrinus*	1982
Banded Killfish	*Fundulus diaphanus*	1929
Brook Stickleback	*Culaea inconstans*	2000
Trout-perch	*Percopsis omiscomaycus*	1982
Rock Bass	*Ambloplites rupestris*	2000
Green Sunfish	*Lepomis cyanellus*	2000
Pumpkinseed	*Lepomis gibbosus*	2000
Bluegill	*Lepomis macrochirus*	1999
Longear Sunfish	*Lepomis megalotis*	1969
Smallmouth Bass	*Micropterus dolomieui*	2000
Black Crappie	*Pomoxis nigromaculatus*	1982
Yellow Perch	*Perca flavescens*	1947
Pickerel/Walleye	*Stizostedion vitreum*	1947
Greenside Darter	*Etheostoma blennioides*	2000
Rainbow Darter	*Etheostoma caeruleum*	1982
Iowa Darter	*Etheostoma exile*	1982
Fantail Darter	*Etheostoma flabellare*	2000
Least Darter	*Etheostoma microperca*	2000
Johnny Darter	*Etheostoma nigrum*	2000
Logperch	*Percina caprodes*	1999
Blackside Darter	*Percina maculata*	2000
Mottled Sculpin	*Cottus bairdi*	1999

Aquatic Species at Risk

There are several aquatic species in the Ausable River watershed that have been identified by the Committee on the Status of Endangered Wildlife in Canada (COSEWIC) and the ABCA as Species at Risk under the Federal *Species at Risk Act*. Aquatic species at risk in the Ausable River watershed include fishes, reptiles, and mussels, as listed in **Table 10**.

Table 10
Aquatic Species at Risk in the Ausable River Watershed

Fishes		
Common Name	**Scientific Name**	**COSEWIC Status**
Pugnose Shiner	*Notropis anogenus*	Endangered
Black Redhorse	*Moxostoma duquesnei*	Threatened
Eastern Sand Darter	*Ammocrypta pellucida*	Threatened
Lake Chubsucker	*Erimyzon sucetta*	Threatened
River Redhorse	*Moxostoma carinatum*	Special Concern
Greenside Darter	*Etheostoma blennioides*	Special Concern
Bigmouth Buffalo	*Ictiobus cyprinellus*	Special Concern
Reptiles		
Eastern Spiny Softshell Turtle	*Apalone spinifera spinifera*	Threatened
Map Turtle	*Graptemys geographica*	Special Concern
Queen Snake	*Regina septemvittata*	Threatened
Mussels		
Northern Riffleshell	*Epioblasma torulosa*	Endangered
Wavy-Rayed Lampmussel	*Lampsilis fasciola*	Endangered
Kidneyshell	*Ptychobranchus fasciolaris*	Endangered
Snuffbox	*Epioblasma triquetra*	Endangered

In general, these species at risk, as well as other aquatic species in the Ausable River watershed, are declining due to the negative impacts of the water quality of the Ausable River, habitat loss and degradation in the watershed. Flow regime, toxic contaminants, thermal change and exotic species also adversely affect aquatic systems. A report written for the Ausable River Recovery Team entitled *Towards a Recovery Strategy for Species at Risk in the Ausable River: Synthesis of Background Information* (Nelson et al., 2003) identified the primary threats to water quality as turbidity, siltation and nutrient enrichment.

These water quality issues originated because of historical changes in land use from forested open space to agricultural, leading to increased runoff of nutrient enriched silt and sediment, loss of wetlands and a corresponding increase in surface and subsurface drainage. Nutrient enrichment has occurred from wastewater treatment facilities and septic systems. The ABCA report, *Clean Up Rural Beaches (CURB) Plan* (1989), which examined the relative contribution of contaminant sources to Lake Huron Beaches, estimated that the greatest contributors in the Lower Parkhill, Lower Ausable and Gullies sub-basins of phosphorus and bacteria were faulty septic systems. According to the authors of the Nelson et al. (2003) report, the CURB study may have underestimated the nutrient loading contribution of fertilizer and pesticide applications but highlighted the potential impacts of the release of septic waste into aquatic environments.

Water Quality and Benthic Invertebrate Monitoring

As indicated by the *Fish Habitat Management Plan* (ABCA, 2001), water quality monitoring should be evaluated annually. Inorganic phosphorus (P), nitrogen (N) and fecal contaminant concentrations have been monitored, and are used in subwatershed planning strategies. At twenty Provincial Water Quality Monitoring Stations (PWQMS) located in the Ausable River and Parkhill Creek jurisdictions, water quality monitoring has been ongoing since 1965 (Nelson et al., 2003). Typically, water quality parameters examined at the PWQMS are total phosphorus (TP), un-ionized ammonia, nitrate, turbidity, suspended solids (SS) and dissolved oxygen (DO).

Summary data exists for water quality indicators for the Lower Ausable and Parkhill Creek. For both of these sub-watersheds, the water quality indicators often fail to reach the Provincial Water Quality Objectives set by the Ontario Ministry of the Environment. The Parkhill Creek subwatershed had not shown any decrease in TP, nitrate or SS in the period from 1980 to 1995, while improvements in TP and SS were observed in the Lower Ausable sub-watershed, with no significant change in nitrates (Nelson et al., 2003). This report cites the contribution from wastewater treatment plants, livestock operations and private septic systems as being important to the overall contaminant loading that occurs in these sub-watersheds.

A benthic invertebrate monitoring program was established in the Ausable River and Parkhill Creek by the ABCA in 2000. Sampling of headwater areas began in 2000 and continued with sampling sites in the lower sections of the watershed the following year (Nelson et al., 2003). Sampling in the future will provide a means to track the health of the watershed over time and aid in the development

of long term strategies for improving the aquatic health of the Ausable River, Parkhill Creek and associated tributaries and headwaters.

The results of ABCA's benthic invertebrate community surveys suggested that headwater sites of the Ausable River were more degraded than the main channel (Nelson et al., 2003). Furthermore, this study hypothesized that the stream health at these more degraded headwater sites is likely being compromised by terrestrial activities and discharges from wastewater treatment plants, both of which can lead to eutrophication, and ultimately, degradation of the aquatic system downstream.

Summary

Any wastewater improvements proposed by the Master Plan should include provisions to protect and conserve aquatic resources and habitat. These provisions should contain measures to minimize deleterious effects on water quality. Furthermore, the plan should also consider the management objectives of the ABCA with respect to the protection of aquatic resources.

2.4.3 Terrestrial Features

The Study Area is entirely within the jurisdiction of the Ausable River Conservation Authority. The Authority is responsible for the management of renewable resources such as water, soil, vegetation and wildlife on a watershed basis.

The Study Area lies in two vegetation regions, including the Carolinian Zone/Southern Deciduous Forest Region in the south and the Mixed Deciduous Forest Region to the north, including a Boundary Zone (north of the Pinery Provincial Park) between the two regions. Remnant forests contain plants and animals from both regions. Although the Carolinian Life Zone constitutes less than 1% of Canada's land area, it includes more species of plants and animals than anywhere else in Canada. Many southern tree species, such as southern oak, hickory, tulip, sassafras, hop-tree, hackberry, magnolia and chinquapin oak, as well as several species of fish and herptofauna, are not found anywhere else in Canada.

Lambton County

A large portion of the Study Area, on the north side of Highway 21 to the Cut, is designated "Primary Natural Heritage Corridor" in the Lambton County Official Plan. "Significant Natural

Areas" designated on Map 2 of the Plan include the Pinery Provincial Park, the Old Ausable River Channel and Thedford Marsh Floodplain.

The Pinery Provincial Park, one of Ontario's largest campgrounds (2532 hectares) supports a diverse ecosystem. The park contains many vegetation communities, including oak savanna (occupies approximately 2/3 of the park), forests, open dune, wet meadow, river communities, some of which are provincially, nationally and in some cases globally rare. Oak savanna is a globally rare vegetation community and the park protects almost 50% of the oak savanna remaining in the world. Seven hundred and fifty-seven plant species are found in the park, as well as 325 bird and 60 butterfly species. The park is home to a long list of vulnerable, threatened and endangered bird, fish, insect, mammal, plant and reptile species.

The Old Ausable River Channel and surrounding "Primary Natural Heritage Corridor" is designated as an Environmentally Significant Area because of its unique ecological role, high water quality and isolation from pollution resulting from historical diversions of the river in 1976 and 1892. The channel has little flow, resulting in a system highly susceptible to increased pollution. Classified as a river vegetation community, the low lying back of the channel is lined with species characteristic of wetlands, while communities of grasses dominate higher areas. Freshwater springs are located underneath the river. A locally significant wetland is also located in this area. Several plant species of special concern are located along the channel.

The Thedford Marsh was an extensive marshy area with three poorly defined lakes, including Lake Smith, Lake George and Lake Burwell. For thousands of years, these inland lakes were part of the migratory flyway for birds, including many species of ducks, geese and tundra swans. Now used for the production of vegetables, Lakes George and Burwell were drained in 1875 by the Canada Company when it built the canal (referred to as the "Cut") from the Ausable River to Lake Huron at Port Franks. Lake Smith was drained in the 1950s, also for vegetable production. Corporate farms now produce tonnes of carrots, potatoes and onions in the marsh's rich organic soils. The Pickling Onion Growers Plant on Huron Road 81 processes onion silverskins in brine. During the Spring bird migration, area farmers allow the lands to remain flooded to provide habitat for migrating birds. Since the birds bring seeds from southern areas, the migration is largely responsible for the unique Carolinian environment of Pinery Park and the surrounding area.

Significant Natural Areas are protected by the Lambton County Official Plan and the Lambton Shores Official Plan. According to both plans, development and the creation of new lots will generally be directed away from Significant Natural Areas. For development proposals within or adjacent to Significant Natural Areas, an Environmental Evaluation is required to demonstrate that development will have no negative impacts on natural features or ecological functions. The County Official Plan also includes surface and groundwater protection policies. With respect to sanitary sewage servicing, the Plan "encourages the upgrading of sewage treatment where existing facilities are detrimental to water quality."

Huron County

The Huron County Official Plan was adopted by County Council 1998. The Plan's "Natural Environment Resource Map" designates a number of locally and Provincially significant "Natural Environment Areas", including woodlots and major watercourses in the South Huron and Bluewater portions of the Study Area. According to the Plan, all natural heritage features and areas of Provincial significance will be protected.

In April 2005, Bluewater adopted a new Official Plan which is currently before Huron County Council for approval. As shown on Schedule B, "Land Use Plan", most of the lake bank is designated as "Natural Environment". Larger woodlots, including one on Lake Road East and one south of St. Joseph are shown as "Significant Woodlands" in Appendix 2. The intent of the Official Plan is "to preserve and protect existing natural environment areas and promote the restoration... whenever possible." According to the Plan, "the community declared that a healthy environment is a priority and believes it is the responsibility of all residents to protect and maintain." The Plan includes a target of 22% for forest cover in all watersheds, compared to the existing 11.9% coverage in the "Gullies" watershed. Septic system maintenance is mentioned as a community stewardship initiative necessary for a healthy environment.

The South Huron Official Plan was approved by the County of Huron in 2003. Existing woodlots on the south side of Huron Road 83, part of a large wooded area extending through Concession XVII, are designated "Natural Environment". One of the Plan's goals is "to conserve, protect and re-establish Natural Environment areas and prevent further deterioration through wise management and use". The Plan includes a target natural environment coverage of 15% , compared to 10% in 2002. "Community Awareness, Education and Consultation" policies state that the Municipality will support education programs, such as proper maintenance of septic systems

2.5 Socio-Economic Environment

2.5.1 Existing Land Uses

Grand Bend is located in the northwest corner of Lambton County on the shore of Lake Huron. The lake front, sandy beaches and picturesque setting of Grand Bend and the surrounding area in South Huron and Bluewater in Huron County have made this area one of Ontario's most popular summer resorts. Descriptions of major existing land uses in the serviced and unserviced portions of the Study Area are provided in Section 2.2.1, "Grand Bend Sewage Treatment System", and Section 2.2.4 c), "Existing Population Estimate in Unserviced Area".

2.5.2 Official Plan Land Use Designations and Policies

County of Lambton Official Plan

The County's Official Plan came into effect on January 3, 1998. The Lambton Shores portion of the Study Area is designated as "Urban Centre", "Rural Settlement", "Primary Natural Corridor", "Rural/Agricultural" and "Thedford Marsh".

The urbanized portion of the former Village of Grand Bend is designated as "Urban Centre" on Map 1, "Growth Strategy". This area is the "Grand Bend Planning Area" in the Lambton Shores Official Plan and is approximately the same area that is currently serviced by the Grand Bend STF. According to the County Plan, the majority of growth will be directed to Urban Centres and Urban Settlements. Full municipal sewage and water services are the preferred form of servicing in Urban Centres and Rural Settlements. However, the "Approval Authority" will recognize a hierarchy of servicing and may consider the use of municipally owned and operated communal systems, partial municipal services and individual on-site private systems. Proposed development on communal, partial or individual services must be supported by studies on soil percolation rates and groundwater and watercourse impacts. Reserve areas for replacement septic systems are required for individual private sewage systems.

The north side of Highway 21, from the Pinery Provincial Park to the Grand Bend "Urban Centre", is designated "Rural Settlement". These lands include the unserviced portion of Southcott Pines, Beach O'Pines and Huron Woods. According to the County Plan, Rural Settlements have a limited number of public facilities and commercial uses. Development will occur within the boundaries of

existing designations. Where full municipal services are not practical or feasible, the Plan allows development on partial municipal services provided that development is "consistent with natural heritage goals and does not significantly increase the overall density of Rural Settlements".

A large portion of the Study Area, on the north side of Highway 21 to the Cut, is designated "Primary Natural Heritage Corridor". This area includes Pinery Provincial Park and mixed commercial and residential uses. Important goals of the County's Official Plan are to identify and protect the County's Natural Heritage Corridors, recognize and protect Significant Natural Areas and promote and protect the biodiversity of species found in the County's ecosystems. The Plan's policies for the Natural Heritage System are discussed in more detail in Section 2.4.3.

The south side of Highway 21 from the Grand Bend "Urban Centre" to the Cut is designated as "Rural/Agricultural" (between Highway 21 and Goosemarsh Line) and "Thedford Marsh" in the County Official Plan. According to the Plan, "this Plan will protect, maintain and improve prime agricultural areas for the long-term future of agriculture". Prime agricultural areas are considered to be lands predominated by Class 1, 2 and 3 soils according to the Canada Land Inventory and include specialty crop areas. The Thedford Marsh is a provincially significant specialty crop area with organic soils suitable for the production of vegetables.

According to the Plan's Growth Strategy, the "Rural Area" is characterized primarily by agriculture, natural areas and clusters of development. Private sewage disposal and water supply are permitted "given the limited amount of development anticipated". The Plan supports the extension of municipal rural piped water to rural areas "because of the historical lack of potable water". However, "this should not be construed to mean that scattered development is encouraged in the Rural/Agricultural Area".

Policies for water and sewer services are included in Section 7.8 of the County Plan. The goal of these policies is to encourage full municipal services for development in centres and settlements, minimize development on private services and encourage expansions and improvements to distribution, collection and treatment systems to accommodate new growth or alleviate environmental concerns. Relevant policies include:

- full municipal services, including communal sewage treatment systems, is the preferred method of servicing. Consistent with the Growth Strategy, the majority of growth will occur

on full municipal services with limited use of private services in Rural Areas and Rural Settlements where full municipal services are not available

- consistent with Provincial Policy and the requirements of MOE, no extension to an existing urban designation, as shown on Map 1 of the County Plan, will be approved unless an approved municipal or communal sewage treatment system with adequate uncommitted reserve capacity is available to service the development

- local municipalities are encouraged to work together in the provision of sanitary sewage services to development.

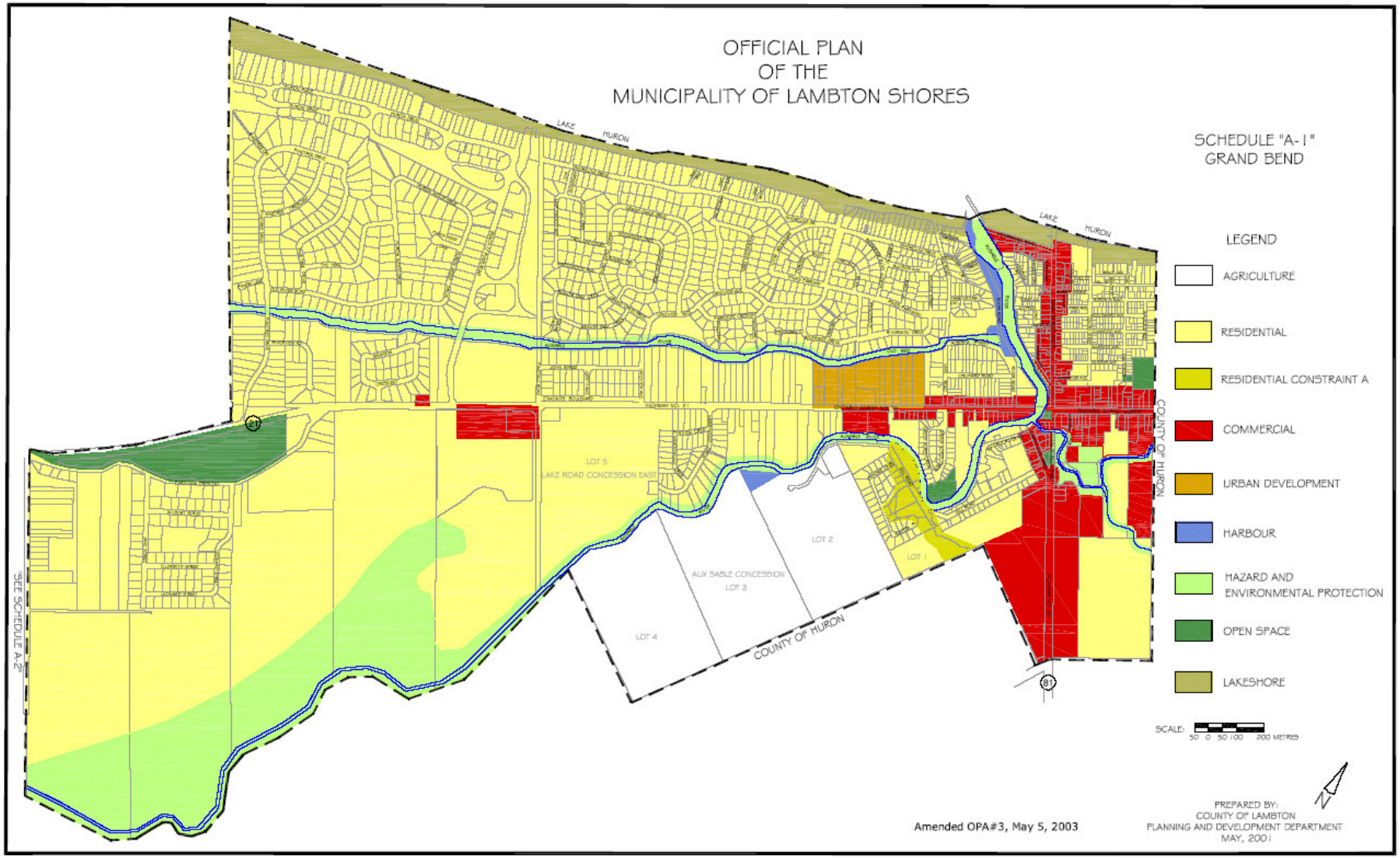
Municipality of Lambton Shores Official Plan

Lambton Shores Official Plan was approved by the County of Lambton in 2001. The Study Area for this project is located in three different planning areas, including Grand Bend, North Bosanquet and Northville.

Figure 4 shows the Plan's Schedule "A-1" for the Grand Bend Planning Area. As shown, most of this part of the Study Area is designated "Residential", with "Commercial" uses along Grand Bend's Main and Ontario Streets. "Primary" permitted uses in the "Residential" area are low density housing, not exceeding 20 units per hectare. Medium and high density uses are also permitted "where the scale and physical character... are compatible with the surrounding area and where municipal and community services are adequate". Other land use designations in this part of the Study Area include "Hazard and Environmental Protection" along the Ausable River and the Old Ausable Channel and "Lakeshore" along the beach. According to the Plan, the Old Channel is sensitive to water quality impacts because of its limited flow. In addition, it is bordered by extensive residential development.

Figure 5 shows Lambton Shore's Official Plan Schedule "A-2" for the North Bosanquet Area, south of Klondyke Road. This part of the Study Area is designated as follows:

- the Thedford Marsh (also referred to as the Bog) is designated "Agricultural Constraint". These lands are in the Thedford/Klondyke floodplain and have a high capability for vegetable farming. New residential development is not permitted in this area. According to the Plan, the bog lands consist of fragile organic soils which are subject to loss by erosion and



Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 4: MUNICIPALITY OF LAMBTON SHORES OFFICIAL PLAN SCHEDULE A-1

Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 5: MUNICIPALITY OF LAMBTON SHORES OFFICIAL PLAN SCHEDULE A-2

oxidation, potentially resulting in water quality problems

- the Pinery Park is designated "Open Space", while lands along the Ausable River are designated "Hazard and Environmental Protection". According to the Plan's policies for woodlot management, no clearing of woodlots will be permitted except for minor clearing as approved by Lambton County Council

- the existing trailer parks and other commercial uses along Highway 21 are designated "Mixed Commercial and Residential". Permitted uses in this area include "commercial uses catering to the tourist trade, the travelling public and the local market", single detached dwellings, campgrounds and trailer parks and small scale institutional uses. According to the Plan, campgrounds and trailer parks are intended to be used on a seasonal and not permanent basis

- the existing Subdivisions, including Dalton and Deer Run, are designated "Residential". All new residential development along Highway 21, including residential development in the "Mixed Commercial and Residential" area, shall include a vegetated buffer along the highway of at least 23 metres

- the remaining undeveloped lands along Highway 21 are designated "Agriculture". According to the Plan, non-agricultural uses will generally be discouraged in the Agricultural area and will be directed to appropriate settlement areas.

Schedule A-4 for the Northville Planning Area is shown on **Figure 6**. Oak Forest Estates and the Walker Woods Subdivision are designated "Residential". The Walden North and Defore Acres Subdivisions are designated "Residential Constraint A". The elevations of these Subdivisions are below the level of the Regulatory Flood. Any new development must conform to minimum floodproofing elevations. Lands along the Cut are designated as "Hazard and Environmental Protection".

The Lambton Shores Official Plan permits sewage treatment facilities in all land use designations subject to the following conditions:

- all facilities will be designed to be compatible with any surrounding residential areas

- justification must be provided for any facilities located on high capability agricultural land
- all facilities are prohibited in significant natural areas, unless they are authorized under an environmental assessment process.

Section 22 of the Official Plan includes policies for municipal services, including sanitary sewage services. The following policies are relevant to this Master Plan:

- all development within the sanitary sewer service area must be serviced by municipal sewers. Limited new development may occur on private septic systems provided it is located in an area where private services predominate and there are a limited number of undeveloped lots

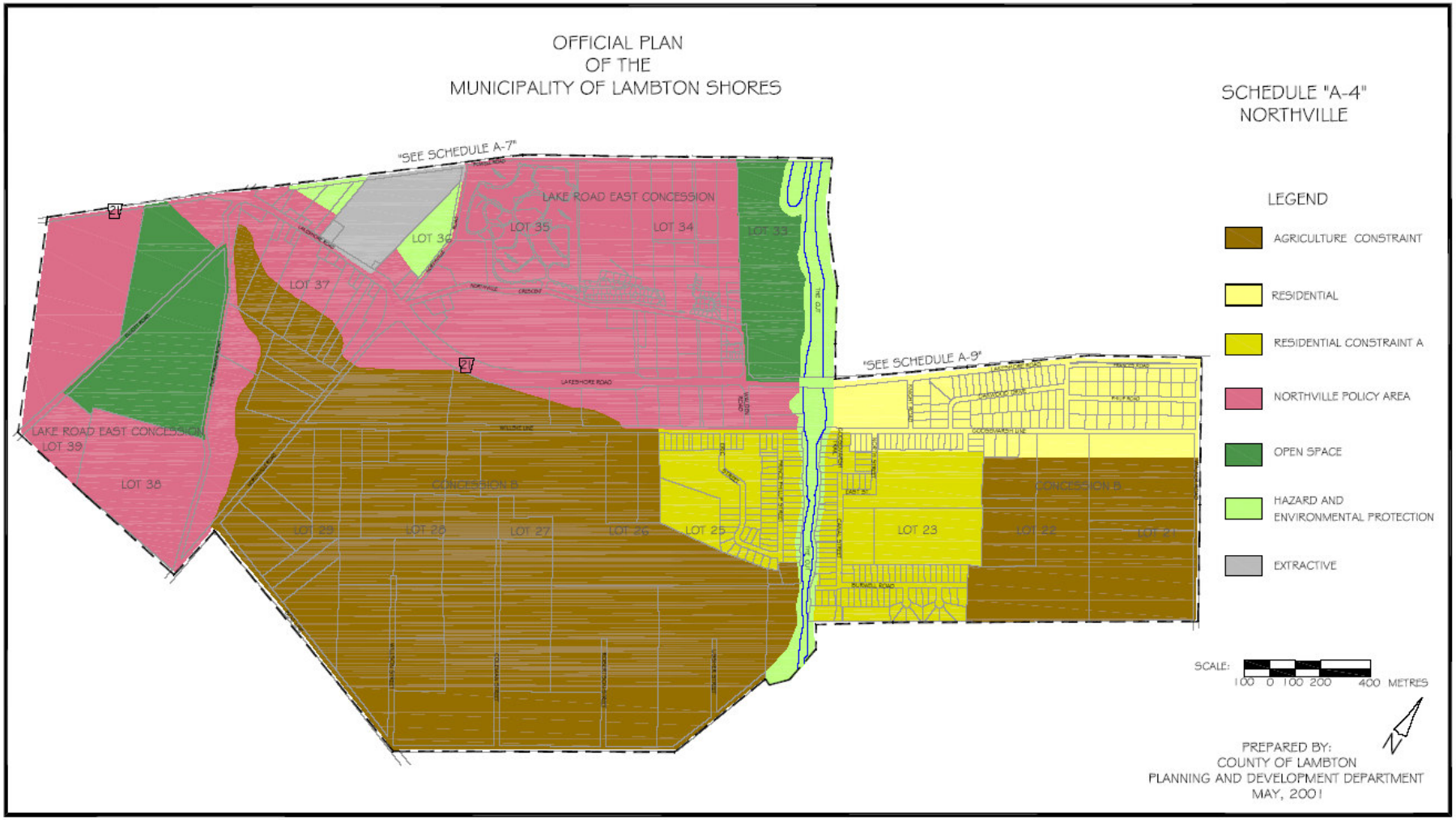
- the Municipality will make no commitment or approve any development that will cause the capacity of the sewage treatment plant to be exceeded

- new development outside the service area may be serviced by septic systems provided that the site meets the following criteria:

    - the lot area complies with Provincial requirements or its designated agent and is large enough for the type of development
    - a sewage system permit is obtained
    - development is supported by studies to address MOE's "Reasonable Use Guidelines", including soil percolation rates and impacts on ground and surface water
    - reserve areas for replacement septic systems are required.

To provide an odour buffer, new residential development or other sensitive land uses are not permitted within 100 metres of an existing sewage lagoon.

The "Transportation" policies of the Lambton Shores Official Plan state that the Ministry of Transportation (MTO) has jurisdiction over Highway 21, except in Grand Bend where the Municipality has jurisdiction over the "connecting link". Permission is required from MTO for any construction within the Highway 21 right-of-way.



Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 6: MUNICIPALITY OF LAMBTON SHORES OFFICIAL PLAN SCHEDULE A-4

County of Huron Official Plan

The County's Official Plan came into effect on March 1, 1999. The land use designations applying to the Study Area include "Agricultural" and "Settlement Areas".

All lands not designated as "Settlement Areas" in the County Plan are Agricultural. Consistent with the Provincial Policy Statement, one of the goals of the Plan is to protect *prime agricultural* land, including lands with Class 1, 2 and 3 soils according to the Canada Land Inventory and specialty crop areas. All of the agricultural land within the Study Area is *prime agricultural*, as shown on the Agricultural Resource Map in the Official Plan. Agriculture is given priority over other uses in agricultural areas and development is directed to urban areas, unless it complements and does not restrict agriculture.

"Settlement Areas" generally consist of the towns, villages and numerous hamlets shown on the Settlement Patterns Resources Map. These areas provide opportunities for new residential, commercial and industrial development. One of the goals outlined in Section 4.3 of the Plan is to encourage development within the County by providing an adequate supply of available serviced land. In addition, Section 7 states, "the availability of proper and affordable servicing will continue to be a critical issue."

Policies for water and sewer services are included in Section 7.3 of the County Plan. Development within the County is encouraged to occur on full municipal services. The Plan provides for an, "adequate land base and allows for continued growth within existing urban areas on full services to encourage the provision of employment and housing opportunities, while preventing fringe or sprawl development". Relevant policies include:

- expansion of urban areas will be based on a review of the policies of the local municipal plan, including the availability of public water and sewers
- development of urban areas where full services are not available will focus on lots large enough to support private or communal services
- development in all areas will occur in an environmentally sustainable and sound manner. Most future urban development will occur on full services within urban settlement areas.

Municipality of Bluewater Official Plan

The Bluewater Official Plan designates St. Joseph and the north half of Dashwood as "Hamlets" (Schedules "H" and "L") which "are rural in character and provide limited residential, commercial and social functions". According to the Plan, "minimal development pressure exists for these rural communities and should occur primarily by infilling on lots large enough to accommodate septic systems".

The existing cottage and residential developments along the lakeshore are designated "Lakeshore Residential". According to the Plan, significant development pressure exists in this area and the development of year-round residential uses and conversion of seasonal cottages to year-round use is increasing. The Plan states that the Zoning By-law will distinguish between non-permanent residential use (limited services) and permanent year-round residential use. Other relevant goals and policies for the "Lakeshore Residential" area include:

- one of the goals for this area is to "ensure clean drinking water and ravine and lake water for residents through the appropriate management of services and land use"

- most development will proceed by Plan of Subdivision. Infilling and small scale development may proceed by consent

- lot sizes will be sufficient to accommodate the proposed method of servicing over the long term. Where septic systems are proposed, developments will comply with Provincial groundwater protection criteria for nitrates and lots will contain a contingency tile bed area

- "for new developments, including the opening of new areas, the Municipality may require a study on the need for a piped sewage system and treatment facility"

- zoning for year-round residential use will apply to a development as a whole and individual lots in seasonal areas will not be zoned for year-round residential use. To be used year-round, each septic system must be capable of supporting year-round occupancy.

Turnbull's Grove Trailer Park is designated "Recreational". According to the Plan, trailer parks and campgrounds will be limited to seasonal and recreational occupancy and will not be used as year round dwellings. The Plan requires that sewage disposal be provided by "a communal sewage

system or a communal washroom facility" to the satisfaction of MOE or the Huron County Health Unit.

All of the lands on the east side of Highway 21 from Huron Road 83 to the hamlet of St. Joseph are designated "Agriculture". According to the Plan, almost 90% of the Municipality consists of prime agricultural land. To "promote and protect the long-term future of agriculture", the Plan requires that all non-farm development be located in settlement areas. The Plan also encourages "sustainable" agricultural practices that protect water quality, improve the health of the environment and reduce conflict and negative impacts on neighbouring land uses.

Municipality of South Huron Official Plan

The Official Plan designates the South Huron portion of the Study Area as follows:

- Grand Cove Estates "Residential Park" and the south half of Dashwood are designated "Urban". Full municipal services are required for Grand Cove Estates. The Plan categorizes Dashwood as a "Village" and states that "sewage service is not envisaged for the village in the immediate future, however, Council is receptive to reviewing applications for the private provision of this service"

- the Grand Bend Motorplex and surrounding area on Huron Road 83 are part of the "Grand Bend Airport Commercial Area". A wide range of commercial and recreational uses are permitted in this area, including airport facilities, aircraft related and highway commercial uses, motor vehicle racing facilities and camping areas. The Pickling Onion Growers Plant and the surrounding Grand Bend Airport Industrial Subdivision are designated "Industrial". Small-scale industrial uses are permitted in this area, including agricultural-related industrial and commercial establishments, automotive body shops, contractor shops and yards, service and repair shops, public and private garages, storage facilities and warehouses. Full municipal services are required in the Grand Bend Airport Commercial Area and Industrial Subdivision

- Oakwood Inn, the cottage developments along the lakeshore and Birchbark Trailer Park are designated "Recreational". This designation applies to recreational residences, camp and trailer grounds, golf courses, public and private parks and recreational commercial establishments. With respect to "recreational residences", the Plan states that many are being

converted for year-round use. "Such year-round use in areas zoned for seasonal use shall only be permitted where the existing sewage and water services are adequate to accommodate the increased use or upgraded services are provided. In no case shall year-round use be permitted that results in inadequate services and/or increased pressure on the Municipality to upgrade sewage, water and road standards."

- the existing commercial uses along Highway 21 are designated "Commercial". Section 3.6.9.1 of the Plan discourages further development of the lands along the east side of Highway 21 on Lake Road East Concession. The Lake Huron Water Supply System Water Treatment Plant at Highway 21 and Huron Road 83 is designated "Institutional"

- the Grand Bend STF site (Lot 6, Aux Sable Concession) is designated "Agriculture". Infrastructure and utilities, such as sewage treatment plants and sewers, are permitted in the "Agriculture" area. The Gill-Lovie Drain located on the STF site (and the receiving watercourse for the facility) is designated "Natural Environment (River, creek)" and is part of the "Klondyke Special Policy Area"

- the remainder of the Study Area is designated for "Agriculture". According to the Plan, "the fundamental principle of this Plan for rural areas is to promote and protect the long-term future of agriculture". Over 90% of the land in the Municipality is rated as Classes 1 and 2 Agricultural Soils according to the Canada Land Inventory for Agriculture.

Section 4.1.3.1 of the South Huron Official Plan includes "Water and Sewage Services Policies". Consistent with the Provincial Policy Statement, the Plan includes a hierarchy of servicing options. Full municipal services are the preferred form of servicing for urban areas, followed by communal services, where full municipal services are not available. New subdivisions require full services. In areas where full municipal or communal services are not available, on-site individual services may be considered provided they meet environmental and public health requirements. The Plan's "Servicing Table", shown on **Table 11**, includes the minimum sewer servicing standards for areas across the Municipality.

Table 11
South Huron Official Plan
Minimum Sewer Servicing Standards

Area	Sewer Servicing Required	
	Existing or Infill (Consent)	**New (except Plans of Subdivision)**
Grand Bend Special Area (north of Grand Bend)	Municipal Sewer (where available) or Individual On-Site Systems	Standard of Servicing to be determined by Sewage Strategy
Dashwood	Individual On-Site Systems	Standard of Servicing to be determined by Sewage Strategy
Existing Recreational Trailer & Mobile Home Parks	Communal or same as existing	Expansion of Park - Municipal or Communal with Responsibility Agreement
New Mobile Home Parks (Urban)	Not Applicable	Municipal
New Recreational Trailer Parks	Not Applicable	Municipal or Communal with Responsibility Agreement

As shown on **Table 11**, the Plan recommends that a Sewage Strategy (similar to this Master Plan) be prepared for certain areas, including the "Grand Bend Special Area" and Dashwood. The Plan also states that any development serviced by communal or individual systems must be supported by studies on percolation rates and impacts on groundwater and adjacent watercourses.

The Plan's "Road Infrastructure" policies state that any construction within the Highway 21 right-of-way requires a permit from MTO.

Township of Stephen Zoning By-law

The Grand Bend STF site is zoned "Disposal Zone (DS) Zone" on Key Map 57 to the Township of Stephen Zoning By-law (remains in force and effect until appealed by the Municipality of South Huron). Sewage treatment works are permitted in the DS Zone, subject to applicable regulations of MOE. Lands adjoining the Ausable River on the western edge of the site are zoned "Natural Environment (NE1) Zone" and "Klondyke Special Policy Area (SP1) Zone". All new buildings in

the SP1 Zone must conform to the ABCA's flood-proofing standards or be located at a higher elevation than the regional storm flood level of 180.7 metres.

2.5.3 Current Development Activity

Significant development is currently proposed in the Lambton Shores and South Huron portions of the Study Area:

Lambton Shores

According to Lambton Shores, almost 1,000 residential units are currently proposed in the Study Area, indicating that significant growth is expected to continue. These lots include 869 draft approved lots and 121 vacant registered lots in Plans of Subdivision. Major proposed developments include Southbend Estates with 400 single family lots, 186 multiple family units centred around a golf course, an extension of Grand Cove Estates (119 single detached dwellings) and a development proposed by Halicki Developments with 82 townhouse and semi-detached units.

Bluewater

According to the Municipality, there are no current development applications in the Study Area. However, as explained in Section 2.2.4 c), "Ultimate Population", the Bluewater lakeshore area includes over 1,200 vacant lots zoned residential. These lots are developable provided a building permit and a permit for a new septic system is issued by the Municipality.

South Huron

According to the Huron County Planning Department, the following developments are proposed in the South Huron portion of the Study Area:

- Oakwood Links Condominiums, 28 units
- Oakwood Links Retirement Community, including approximately 100 townhouse and apartment units and a retirement home
- Birchbark Trailer Park expansion, on Huron Road 83, from 100 sites to 150 sites.

2.6 Provincial Policies

This section of the Servicing Study provides an overview of Provincial land use planning and servicing policies which are relevant to the alternative servicing solutions evaluated in this report.

Strong Communities Act and Provincial Policy Statement

The *Strong Communities Act* is an amendment to the 1996 *Planning Act* and received Royal Assent in November 2004. The Province also issued a proposed new Provincial Policy Statement under the Act which came into effect on March 1, 2005. Based on the Province's key interest of wisely managing growth, the statement requires efficient development patterns to focus growth in settlement areas and direct growth away from significant or sensitive resources. Efficient development patterns optimize the use of land, resources and public investments in transportation, servicing and other infrastructure, resulting in strong, livable and healthy communities.

Section 1.5 of the Policy Statement includes policies for "Infrastructure". According to the policy, all planning authorities will provide infrastructure in a coordinated, efficient and cost-effective manner to co-ordinate projected growth. Section 1.5.2 states that "existing infrastructure... within settlement areas will be utilized to accommodate growth, wherever feasible, before developing new infrastructure". Policies applying to "Sewage and Water Systems"are included in Section 1.5.4. According to this section, expected population growth must make efficient use of existing municipal water and sewage services or, where such services are not available, private communal water and sewage services.

The Policy Statement is "Sewage and Water Services" policies include the following servicing hierarchy:

- municipal sewage and water services are the preferred form of servicing for settlement areas. Intensification and redevelopment in settlement areas on existing municipal services will be promoted

- private communal sewage and water services (defined as a sewage works serving six or more lots, not owned by a municipality, or non-municipal drinking water systems serving more than six lots) will only be used to service new development of six or more lots in areas where:

  - municipal services cannot be provided and
  - site conditions are suitable for the long-term provision of these services

- private non-communal services (septic systems and wells) will only be used to service new development of five or less lots where site conditions are suitable for the long-term provision of these services

- partial services (such as municipal water and individual on-site septic systems) will not be permitted except:
  - when required to address failed private systems in existing development
  - to allow for infilling and rounding out of existing development in settlement areas provided that development is within the reserve capacity of the applicable service and site conditions are suitable for the long term provision of the partial service.

The Provincial Policy Statement also includes policies for the protection of groundwater. Section 2.2 states that all municipalities will provide for a comprehensive, integrated and long-term approach for the protection, improvement or restoration of the quality and quantity of groundwater by:

- utilizing the watershed as the ecologically meaningful scale for planning
- addressing potential negative impacts
- identifying restrictions on development and site alteration to protect all municipal drinking water supplies and protect, improve or restore sensitive groundwater features and hydrologic functions
- maintaining linkages and related functions among surface and groundwater features, hydrologic functions and natural heritage features and areas
- promoting efficient and sustainable use of water resources, including practices for water conservation and sustaining water quality.

To protect, improve or restore sensitive surface and groundwater features, the Policy Statement also restricts development and site alteration in or near these features. Mitigative measures or alternative development approaches may be required.

Another important change in the *Strong Communities Act* is the requirement that all municipal planning decisions "be consistent with" the Provincial Policy Statement. This replaces the

requirement in the "old" *Planning Act* that planning decisions "have regard to" the policies. In this way, the Province appears to be moving toward a more prescriptive approach to land use planning.

MOE, Ontario Operation Clean Water Initiative

This MOE initiative, including the preparation of groundwater studies across Ontario, began in August 2001. The objectives of the groundwater studies are to develop a clear understanding of groundwater resources and develop strategies and action plans to protect groundwater as a safe supply of drinking water for current and future generations. Studies completed as part of Ontario's Clean Water Initiative have concluded that multiple lot development on septic systems adversely affects groundwater quality, no matter how well these systems are designed, constructed, operated and maintained.

Several important pieces of legislation related to the protection of surface and groundwater have subsequently been passed by the Ontario government, including the *Source Water Protection Act* and revisions to the Wells Regulation (O.Reg. 903). It is also anticipated that new regulations related to the *Source Water Protection Act* will impose further restrictions on the use of septic systems and other activities potentially impacting water quality.

3. PUBLIC AND AGENCY CONSULTATION

Public and agency consultation occurred throughout the Master Planning process and was incorporated, where possible, into the Problem Statement and identification and evaluation of alternative solutions. **Appendix B** includes all of the consultation materials referred to in this section.

3.1 Contact List

The Contact List for this project consisted of potentially interested/affected Provincial Ministries, Provincial interest groups, Lambton County and Huron County, local agencies such as the County Health Units and Ausable Bayfield Conservation Authority, First Nations, many local interest groups, ratepayers and cottagers' associations and local land developers. Updated throughout the project, the Contact List also includes individuals who replied to the Project Initiation Notices and attended the August 9, 2005 Public Information Centre. In total, over 500 public and agency contacts were included in the list.

3.2 Project Initiation Notices

3.2.1 Initial Notice

The initial Project Initiation Notice was mailed to the Contact List prepared for the original Study Area (Lambton Shores and a portion of South Huron) on November 9, 2004, accompanied by a form requesting comments by November 26. On November 8, a copy of the notice and comment form was mailed to 1,856 addresses with the postal code N0M 1T0 through Canada Post's Unaddressed Admail service. The notice also appeared in the November 10 and 17 editions of the Lakeshore Advance and the November 11 and 18 editions of the Forest Standard.

In reply, Dillon received 12 completed comment forms and letters from agencies and 150 'phone calls, completed comment forms, letters and e-mails from residents, for a total of 162 replies.

Agency Comments

- Ministry of Agriculture and Food stated that it is not opposed in principle to the project based on the understanding that the study will lead to the more effective and improved provision of sanitary services in the Study Area, thereby preserving agricultural land

- Ministry of Culture is interested in potential impacts on cultural heritage resources

- Ministry of Transportation stated that sanitary sewers will not be permitted within the Highway 21 right-of-way. The Ministry will consider sanitary sewer crossings of the highway, but will not permit open cutting of the highway. Encroachment permits are required prior to construction of any facilities within MTO's right-of-way

- Municipality of Bluewater requested that the north part of Dashwood and properties along Highway 21, from Huron Road 83 to Huron Road 84, be included in the Study Area

- Municipality of South Huron requested general information on the scope of the project

- Hay Communications Cooperative Ltd. stated that the proposed project may impact its telephone plant and facilities.

Other agencies requesting to be kept informed included Pinery Provincial Park, the local M.P.P., the Joint Water Services Board of the Lake Huron Primary Water Supply System and the Ausable Bayfield Conservation Authority.

Local Interest Groups and Ratepayers Associations

Several requested to be kept informed about the project, including the Beach O'Pines Association, Grand Bend Women's Institute, International Order of Alhambra, Southcott Pines Association and the McIlwraith Field Naturalists.

Public Comments

Approximately 150 replies were received from the public in reply to the initial Project Initiation Notice. Of these, the majority (about 115) simply requested to be kept informed. Approximately 30 included comments summarized as follows:

- less than 10 people stated that they are in favour of municipal sanitary sewage servicing in the Study Area based on concerns regarding the water quality of the lake. One person stated that he believes the existing Grand Bend STF is inadequate

- approximately 15 people stated that they are opposed to municipal servicing, mostly based on cost concerns. Several people noted that their existing septic systems are working well, they live in new Subdivisions with new septic systems or they had recently installed a new septic system or a "bio filter" system

- several people asked for more information on the extent of the Study Area, the purpose of the study and the phasing of servicing extensions

- two local businesses (Oakwood Inn and the developers of Grand Cove Estates) stated that they had plans for future development in the area.

3.2.2 Revised Project Initiation Notice

A Revised Project Initiation Notice, advising of the enlargement of the Study Area to include Dashwood and the Bluewater lakeshore to St. Joseph was issued in April 2005. The notice was

accompanied by a comment form stating that "we are interested in any problems you are having with your septic tank and tile bed system. Comments were requested by April 15 ".

The notice and comment form were distributed as follows:

- Dillon mailed a copy of the notice and comment form to the revised Contact List on April 4, 2005. The revised list included approximately 700 residents and ratepayer groups in the Municipality of Bluewater

- Dillon arranged for the Notice and comment form to be delivered through the Canada Post Unaddressed Admail Service on April 4 to 193 addresses in Dashwood

- the notice appeared in the April 6 edition of the Lakeshore Advance, the April 7 edition of the Forest Standard and the April 13 edition of the Exeter Times Advocate.

In total, Dillon received 300 completed comment forms, including 11 from agencies, 11 from local interest groups, cottages associations and developers and 268 from individuals and businesses. The Contact List was subsequently revised to include Bluewater residents who replied to the notice.

Agency Comments

- Fisheries and Oceans Canada advised Dillon that it does not have to be involved in the planning stages of the project
- the Ministry of Municipal Affairs and Housing stated that the preferred wastewater solution should consider the new Provincial Policy Statement, involve the Counties and incorporate the policies of the local municipal and County Official Plans
- MTO stated that it is interested in any alternatives potentially affecting Highway 21
- Hydro One requested to be notified if the project affects any of its facilities.

MNR, the Huron County Planners, Ausable Bayfield Conservation Authority, Lake Huron Primary Water Supply System and Southern First Nations Secretariat requested to be kept informed, but made no comments.

Local Interest Groups and Ratepayers Associations and Developers

Requests to be kept informed were received from the Greater Grand Bend Community Association, Lambton Wildlife Inc., Poplar Beach Property Owners Association, Southcott Pines Park Association, Sunnyside Cottage Association, Jennison Construction Ltd., Oakwood Resort, PEIL (consultants for the Southbend development) and Rice Construction. Comments were received from:

- Merrywood Inc. requested that lands adjacent to Merrywood Meadows Phase II (designated for Future Development) be included in the long-term service area
- Peter Warner Holdings Inc. requested that Part Lot 5, LRE Conc. in Bluewater be included in the long-term service area since it is suitable for "future commercial/recreational uses on a larger scale"
- Turnbull's Grove Inc., a mobile home park with 175 sites in Bluewater, is interested in connecting to the sewage system "when the time comes".

Public Comments - Lambton Shores

Approximately 50 of the comment forms were from Lambton Shores residents who had already replied to the initial November 2004 Project Initiation Notice. Twenty-two of the forms received from Lambton Shores residents included comments:

- eight residents (some in Southcott Pines, Huron Woods and Deer Run) stated that they had no septic system problems and expressed no opinions either in favour or opposition to municipal servicing

- six residents (some from Huron Woods and Deer Run) stated they had no septic system problems and are opposed to servicing based mostly on cost concerns. One person stated that the Municipality should inspect septic systems and force owners to maintain them

- three residents (two from Southcott Pines) stated they have septic problems and are in favour of servicing based on rapid growth in the area and the impact of septic systems on Lake Huron.

Other comments, questions and concerns noted on the comment forms were the impacts of factory farms and the existing Grand Bend lagoons on Lake Huron and the source of funding for future

servicing improvements. Smits Produce on Goosemarsh Line expressed concerns about the location of any sewers and the timing of construction.

Dashwood

Only 15 completed comment forms were received in reply to the 193 notices and comment forms sent to Dashwood residents. Thirteen of the forms included comments, as follows:

- six residents stated that they are opposed to servicing Dashwood. According to these residents, sewers are not needed because many septic systems have been recently replaced, Dashwood has sandy soils and the community is small. Other concerns included the cost of sewers

- four residents stated they had no septic system problems but did not give an opinion for or against sewers

- only two residents stated they are in favour of servicing Dashwood. One person said that it is "a step in the right direction". Another stated that he is concerned "there is too much sewage in the ground"

- the Hayter turkey processing plant enquired about alternatives for wastewater treatment.

Bluewater Lakeshore

Over 200 completed comment forms were received from Bluewater residents. Approximately half included comments:

- about 40 people said they have no problems with their septic systems because the systems are new, regularly maintained or pumped out or they rarely use their cottage. Two residents said they had installed on-site tertiary treatment systems (Waterloo Bio-Filter, Whitewater System). Some residents stated that their neighbours have problems with their septic systems

- an equal number of residents (about 40) stated they have problems with their septic systems. About 30 of these said they are in favour of municipal servicing based on problems with existing septic systems or environmental concerns. Problems include system back-ups, toilets won't flush and "constant drainage problems" caused by clay soils. In some cases,

residents use holding tanks and pump out their septic system twice a year. Environmental concerns include the location of some septic systems on the beach at St. Joseph and deteriorating water quality caused by faulty septic systems and hog operations. A few residents said that they support sewers because they would like to install dishwashers or laundry machines, build a new cottage or build on vacant parcels of land

- seven people said they are opposed to sewers because their existing systems function well or have recently been replaced. Other reasons were the high cost of sewers and increased taxes

- five people stated that they have no problems with their septic systems but are in favour of servicing, mostly for environmental reasons

- one resident said that he was more concerned about farm drainage than any problems caused by septic systems.

3.3 Public Information Centre

A Public Information Centre (PIC) was held on August 9, 2005 at the Grand Bend Public School and consisted of an informal drop-in session from 3:00 to 5:00 p.m. Dillon staff and Municipal Council members and staff were available to explain the displays, record comments and answer questions. A copy of the displays and a comment form asking for comments by August 31, 2005 were handed out to all attendees. A formal presentation was given by Dillon staff at 7:00 p.m. A question and answer period followed the presentation.

Approximately 125 people attended the PIC. Timelines for construction and costs per household for the proposed sanitary sewage treatment facilities and the possibility of treating agricultural wastes dominated the discussions during the informal afternoon session. Many questions were asked following the formal presentation in the evening, including the following:

- could the trunk sewer run along the beach to avoid Highway 21? A location away from the beach is preferred based on environmental considerations and ease of maintenance

- ownership/operation of the expanded Sewage Treatment Facility? Dillon staff explained that Lambton Shores will likely be the lead municipality, as designated on the MOE Certificate of Approval. A secondary servicing agreement will be entered into with the two other municipalities

- does everyone need to connect to the sewers at the same time? Dillon staff replied that pressure sewers offer the most flexibility for staging/phasing, but eventually all households will be required to connect

- in the event of a power failure, grinder pumps would not work but the holding tank housing the grinder pump will provide some storage. The River Road area in Grand Bend is an example of an area currently serviced by pressure sewers

- in reply to questions about improvements in water quality, Dillon staff stated that full servicing would improve surface and water quality and may reduce the number of days that the beach is closed

- government funding is a "possibility"

- is it possible to have an effluent quality of "zero"? Dillon staff replied that it is possible, but would be very expensive

- can Zurich be included in the Service Area? This can be reviewed, but to be practical, limits have to be placed on the extent of the proposed Service Area

- a wetland will be used to treat sludge. With respect to providing facilities to treat septage, Dillon staff replied that there are already areas in both Counties that can treat septage. Also, this service could provide some revenue

- when asked about the percentage of septic systems which are malfunctioning, Dillon staff replied that it is not known because most people do not report problems to the municipality

- some economies of scale, including a lower cost per unit, will result from servicing Bluewater

- in response to a question about what will happen to the lagoons if they are not upgraded, Dillon staff stated that when the capacity runs out, no new development will be permitted. Also, the system could become obsolete, potentially resulting in effluent quality concerns.

Overall, most people appeared to support the proposed servicing of the Study Area, as indicated by the applause at the end of the presentation. This support is based on concerns regarding the number of septic systems in the Study Area and their suspected adverse impact on Lake Huron's water quality. Some concerns were expressed about overall capital costs, costs per household and the likely requirement that all households connect to the system once constructed. There were also some concerns about the use of pressure sewers since gravity sewers are more common in Southwestern Ontario.

3.3.1 Completed Comment Forms

Dillon received four replies from agencies and ratepayer associations and 12 replies from members of the public. Overall, the response was positive.

Agency and Ratepayer Association Replies

By letter dated August 12, 2005, Dillon mailed a copy of the PIC displays and a comment form to the agency portion of the project Contact List. This portion of the list includes Provincial Ministries, Provincial interest groups, municipalities, local agencies, First Nations, utilities, local interest groups, ratepayers associations and developers. Dillon received replies from the following:

- the Ministry of Natural Resources requested that it be kept informed
- the Manager of Public Works for Lambton County stated that the County is interested in the ability of the Grand Bend Sewage Treatment Facility to treat leachate from the Grand Bend Landfill located at 9898 Lakeshore Road
- the Ausable Bayfield Conservation Authority stated that it has no major concerns and agrees with the recommended solutions
- the Southcott Pines Park Association stated that it appreciated the presentation but had three concerns: construction timelines too vague; no mention of impacts of large hog farms; and costs per household were not provided.

Public Replies

Dillon received completed comment cards and e-mails from 12 residents following the PIC. Of these, only four included major concerns or requests for more specific information, especially costs. Eight residents indicated support for the proposed servicing improvements.

Concerns included the following:

- a resident of the Norman Heights Subdivision stated that more specific information should have been provided on costs per household and the timing of construction in Bluewater, if connection will be mandatory.

- a resident on Lakeshore Road in Grand Bend stated that his septic system on a 2 acre lot is adequate to meet his current and future needs. He also stated that the cost of improvements to handle peak flows and service Southbend and the Pinery Park should be paid by local businesses, developers and the Province, not by residents who do not need servicing. Other concerns included sewage back-up's caused by malfunctioning pressure systems (with Exeter used as an example)

- a resident in Southcott Pines stated that he is concerned about the cost per household of the proposed improvements and that there is no data to indicate how much pollution in Lake Huron is caused by agriculture versus domestic sewage and asked "is anything being done to curb agricultural effluent?". He also stated that his septic system was installed in 1995 and it is regularly maintained

- another Southcott Pines resident stated that he is very opposed to the sewage system, mostly based on costs to property owners. He said that most of the Lake Huron pollution problems are likely caused by area farms.

Dillon received the following comments in support of the proposed servicing scheme:

- a Bluewater cottage owner stated that he fully supports servicing as soon as possible, since most systems are at least 50 years old. This resident also said that the servicing plan should not be stopped by the "cannot afford it group - they said the same thing about the water and the gas!"

- a resident of Highlands 3 stated that she and her neighbours "are totally supportive of this project" and asked "when do you start?" Similarily, a resident of Grand Bend asked "when is the solution going to start - do it right the first time!"

- another Bluewater cottage owner said that he is in favour of the proposed sewage system, as are four of his neighbours

- a Grand Bend resident stated that the long-term time frame for the project (up to 20 years) is unacceptable based on concerns about the quality of effluent from the lagoons. Other comments included "our beaches are being destroyed (by) sewage and manure contamination" and "the recent beach closures due to high e-coli levels are negatively impacting our image as a tourist destination and the value of lakefront property"

- a resident of Gill Road in Grand Bend said that she has been waiting for sewers for many years

- a resident of Harbour Park Court in Grand Bend said that "this is a good and sound proposal and (we) fully support it". He also owns property in Bluewater and supports servicing the lakeshore

- a resident of Southcott Pines stated that he thinks that servicing of the subdivision is long overdue. He stated that the servicing of older developments should be a higher priority than new development.

3.4 Public and Agency Review of Master Plan

The Master Plan, along with a Notice of Completion, will be placed on the "public record" for the 30-day public and agency review period. If no Part II Order Requests are received, the projects included in the Master Plan may proceed through the rest of the required Class EA process.

Any input received during the 30-day review period will be incorporated into the future phases of the Class EA planning, design and construction process by the three municipalities.

4. PHASE 1, "PROBLEM/OPPORTUNITY IDENTIFICATION"

4.1 Introduction

Phase 1 of the Master Plan process consists of Problem/Opportunity Identification and provides the justification of the need for future infrastructure upgrades and expansions. The Problem Statement included in this section of the Master Plan covers the existing, interim and long-term sanitary sewage servicing needs of the Study Area. The statement is based on the analysis of existing and projected conditions included in Section 2 and public and agency consultation documented in Section 3 of this report.

4.2 Summary of Problems and Opportunities

The lake front, sandy beaches and picturesque setting of Grand Bend and the surrounding area have made this area one of Ontario's most popular summer resorts. In recent years, it has also become a popular place for retirement.

The existing Grand Bend STF and collection system serves an estimated existing population of 1,930 (about 30% of the Study Area's total population of 7,110) in the urbanized portion of the former Village of Grand Bend and part of South Huron on Highway 21 and Huron Road 83. The average rated daily flow capacity of the Grand Bend STF is 1,891 m^3/d. The facility is quickly reaching its capacity, especially during the peak season when daily flows are 1,740 m^3/d. The existing C of A for the facility issued by the MOE includes no specific effluent quality criteria. However, any upgrade or expansion to the STF will have to comply to effluent quality criteria set by MOE.

The remainder of the Study Area, with an estimated existing population of over 5,000 people (about 70% of the existing population), is serviced by septic tank and tile bed systems. With the exception of some new developments (Huron Woods and Deer Run Subdivisions), most of the septic systems in the Study Area are more than 25 years old. Based on the age of existing development and input received from officials from the three municipalities, system failure rates are expected to be high over the next 20 years. In reply to the Revised Project Initiation Notice (April 2005), about 40 residents along the Bluewater lakeshore stated they had problems with their septic systems.

All of the Study Area is serviced by municipal water supply systems.

The Study Area has a total estimated existing population of 7,110, including year round and seasonal residents. In addition, an estimated 5,000 to 10,000 tourists visit Grand Bend on an average summer weekend day. Currently, Lambton Shores' population is approximately 50% year round and 50% seasonal, the population of the South Huron portion of the Study Area is about one-third year round and two-thirds seasonal and the population of the Bluewater Lakeshore is about 30% year round and 70% seasonal. Dashwood's population is estimated to be 100% year round. Year round population in all three municipalities is expected to increase substantially over the next 20 years, based on the type of recent and proposed residential development, the large number of "baby boomers" who are expected to retire and the attractiveness of this area for retirement. Based on these trends, year round sanitary sewage servicing solutions are required for the Study Area.

The population of the Study Area is projected to increase to 9,300 by the year 2026. The "ultimate" population (when all lands designated/zoned for development are developed) of the Study Area is estimated to be over 17,000 people. Significant development is currently proposed in the Study Area, including almost 1,000 residential units in the Lambton Shores portion. The Bluewater lakeshore includes over 1,200 vacant lots zoned for residential uses.

Based on the year 2026 projected population, projected sanitary sewage flows are 2,202 m^3/d for the off-season and 4,960 m^3/d for the peak season.

Half of the Study Area consists of sandy soils (generally south of Grand Bend), while the other half (north of Grand Bend) consists of clay soils. Although septic systems in sandy soils generally work well, too many systems in one area may adversely impact groundwater. Tile beds on clay soils are more prone to premature failure and "breakout" of septic effluent, leading some homeowners along the lakeshore to illegally connect leaching beds to surface water drains. Dysfunctional systems may also cause more severe impacts, such as organic nitrogen, ammonia and general organic loading. Recent studies show that *E. coli* contamination of the beach and subsequent beach closures are caused by multiple sources, including agriculture and domestic sewage.

The Lambton County (2005) and Huron County (2003) Groundwater Studies were both completed under MOE's Ontario's Operation Clean Water Initiative. According to the Lambton County Study, soils in the Lambton Shores portion of the Study Area are highly susceptible to groundwater contamination from septic systems. The Huron County Groundwater Study recommended that the

County investigate the feasibility of a County-wide septic system inspection program to deal with inadequate care and maintenance. The Provincial Policy Statement passed under the *Planning Act* (March 2005) requires all municipalities to restrict development to improve or restore "vulnerable" ground and surface water. The recently passed *Source Water Protection Act* will impose further restrictions on septic systems and other activities potentially adversely impacting water quality.

Aquatic resources in the Study Area are managed by the Ausable Bayfield Conservation Authority (ABCA) under the Authority's Watershed Management Strategy. Water quality indicators for the Lower Ausable and Parkhill Creek fail to reach Provincial water quality objectives for total phosphorus, nitrates, suspended solids and bacteria. In addition, aquatic species in the Ausable River are declining due to negative impacts on river water quality. Effluent from wastewater treatment systems and septic systems are a significant source of nutrient enrichment, phosphorus and bacteria.

Future improvements must also be planned and designed to avoid adverse impacts on the Study Area's rich cultural resources, sensitive terrestrial and aquatic features and existing and future land uses. Another important consideration for the planning and design of future improvements is MTO's jurisdiction over Highway 21 throughout the Study Area. MTO will not permit any sanitary sewage infrastructure in the Highway 21 right-of-way.

Provincial, County and local municipal land use and servicing policies all require full municipal services for development in "settlement areas" and discourage partial services (such as municipal water and septic systems). According to the servicing hierarchy included in the Provincial Policy Statement, septic systems may be used for five lots or less if full or communal services are not available, the system complies with all regulations and protects human health and the environment, site conditions are suitable over the long-term and servicing is based on integrated servicing/land use considerations.

4.3 Problem Statement

The Grand Bend STF is quickly reaching its capacity, especially during the peak season. Committed, currently proposed and future growth in the Study Area must be serviced by municipal sanitary sewage services to comply with Provincial policies and legislation requiring environmental protection. More than 70% of the Study Area's total existing population of 7,110 is serviced by septic systems. Malfunctioning septic systems, as well as discharges from the Grand Bend STF, are

adversely affecting surface and groundwater, including Lake Huron and the Ausable River, the Study Area's most important natural and recreational assets. Septic system failure rates are expected to be high over the next 20 years. Based on these considerations, existing and future development in the Study Area requires short and long-term municipal sanitary sewage servicing improvements.

5. PHASE 2, "ALTERNATIVE SOLUTIONS"

5.1 Introduction

Phase 2 of the Master Plan process consists of the identification and evaluation of alternatives which could potentially solve the problems identified in Phase 1. At the end of Phase 2, preferred solutions were chosen by the three municipalities and "put together" to form the sanitary sewage servicing Master Plan. Public and agency consultation, as summarized in Section 3, occurred throughout Phase 2.

Activities completed during Phase 2 included:

- an inventory of existing and projected conditions in the Study Area, as documented in Section 2
- the development of a long list of alternative sanitary sewage treatment alternatives, alternatives for the handling of septage and alternative sewage collection system alternatives
- the identification of design criteria for future improvements, including projected sewage flows and treated discharge effluent criteria
- identification of preferred alternatives for treatment, septage and collection
- an impact assessment of the recommended servicing solution, as included in Section 6.

5.2 Long-List of Sanitary Sewage Treatment Alternatives

The long-list of alternative sewage treatment alternatives developed by Dillon includes:

- Alternative 1 - Do Nothing

- Alternative 2 - On-Site Tertiary Treatment For Individual Septic Systems ("Effluent Polishing")

- Alternative 3 - Discharge to an Adjacent Existing Sewage Treatment Facility:
  - 3A - Discharge to Thedford Lagoons
  - 3B - Discharge to Zurich Lagoons

- Alternative 4- New Municipal Sewage Treatment Plant(s):
  - 4A - Stand-Alone Municipal Sewage Treatment Plant for South Huron (including Dashwood)
  - 4B - Stand-Alone Municipal Sewage Treatment Plant for Bluewater
  - 4C - Stand-Alone Municipal Sewage Treatment Plant for Bluewater and South Huron

- Alternative 5 - Expansion and Upgrading of Grand Bend STF:
  - 5A - Service Entire Study Area
  - 5B - Service Unserviced Portion of Lambton Shores
  - 5C - Service Unserviced Portion of Lambton Shores AND Bluewater
  - 5D - Service Unserviced Portion of Lambton Shores AND South Huron.

5.3 Evaluation of Long-List of Sanitary Sewage Treatment Alternatives

This section of the report evaluates the advantages and disadvantages of the long-list of treatment alternatives based on broad considerations such as the ability to service the Study Area, practicality, acceptability to approving agencies, conformity to County, local and Provincial planning and servicing policies and order of magnitude costs.

5.3.1 Alternative 1 - Do Nothing

Alternative 1 consists of doing nothing and continuing to service existing and limited future development in the unserviced portion of the Study Area with septic systems over the long term. An advantage of this alternative is that the municipalities will not be responsible for the costs of servicing development. Upkeep and replacement of septic systems is the responsibility of the homeowner on an as needed basis.

This alternative was not considered feasible for several reasons:

- it does not meet the goal of the Master Plan for a long term environmentally sustainable servicing scheme

- it does not meet Lambton Shore's commitment to provide sanitary sewage servicing for the planned Southbend development and Pinery Provincial Park

- it does not address existing/expected future widespread septic system failures in Bluewater. Most lots throughout the Study Area are too small to accommodate new systems and the required contingency area. In addition, failure rates are expected to increase as residences are converted from seasonal to year round use

- this alternative does not address the existing/potential environmental impacts of failed systems. Even new, well designed conventional septic tank / leaching bed systems "nitrify" nitrogen in the wastewater to nitrate. Nitrates are not readily biodegraded in the environment and are carried along the groundwater flowpath with eventual discharge to surface water, including the Ausable River, its tributaries and eventually to Lake Huron. "Dilution" either in the groundwater environment or in surface water is the only assured means of attenuating nitrate impacts. Dysfunctional septic systems cause more severe impacts, such as organic nitrogen and ammonia, as well as general organic loading. Given the relative permeable nature of the soils in the Lambton Shores portion of the Study Area, impacted groundwater moves relatively fast

- since Provincial, County and local municipal land use planning and servicing policies require full municipal services for new development, Alternative 1 allows development by infilling only. This may be feasible for Dashwood where limited development is expected to occur, but many of the lots in Dashwood are too small to accommodate a new septic system. Alternative 1 is not feasible for Lambton Shores where significant growth is expected, South Huron where moderate growth is projected or in Bluewater due to the growth potential of the lakeshore.

Although some newer subdivisions and existing developments with larger lots and favourable soil conditions may remain on septic systems for now, without posing any significant problems, Alternative 1 is not a feasible long term servicing solution.

If this alternative is selected as the preferred alternative, all three municipalities should consider instituting a comprehensive monitoring program of groundwater and surface water quality to quantify environmental impacts.

5.3.2 Alternative 2 - On-Site Tertiary Treatment for Individual Septic Systems ("Effluent Polishing")

On-site wastewater disposal systems involve a combination of a wastewater stabilization/treatment unit (such as a septic tank) and a subsurface disposal system (such as a leaching bed). The typical septic tank/leaching bed system treats wastewater within the septic tank and leaching bed and depends on a certain "residence" time before the wastewater reaches the water table. Some systems may also use proprietary treatment units to treat wastewater before it gets to the subsurface disposal system.

Certain on-site tertiary treatment systems were considered for Alternative 2, including systems manufactured by Ecoflow-Ontario (a division of Premier Tech), Waterloo Biofilter Systems Inc., and Bio-Microbics Inc. The Building Materials Evaluation Commission (BMEC), a regulatory agency under the Ontario *Building Code Act*, have approved systems developed by each of these manufacturers. These systems are described in more detail in **Appendix C**. The technologies include attached growth and biofilter technology. All technologies are comprised of the septic system upstream of the treatment unit, the treatment unit itself and a sub-surface disposal system. Sub-surface disposal systems generally consist of area beds and shallow buried trenches, both of which have minimum areas and lengths specified by the Ontario *Building Code Act*.

These systems receive flow from the septic tank. Aerobic bacteria in the system nitrify ammonia to nitrates. The flow may be recirculated back to the septic tank, where nitrates are denitrified to nitrogen gas. The overall nitrate reduction from these systems varies depending on the portion of flow that is recirculated to the septic tank. Capital costs range from $10,000 to $20,000 (installed), including the septic tank and disposal bed. Operating costs range from $200 to $350 per year. All systems have minimal moving parts, thereby increasing reliability and keeping operating costs to a minimum.

All systems have been reported to meet the following tertiary effluent quality:

BOD < 10 mg/L	TSS < 10 mg/L	Nitrate < 5 mg/L

These systems do not remove phosphorus (unless a chemical system is added). Further evaluation of lot size and soil conditions, on a lot specific basis, is required to determine if the treatment system can remove nitrates to the required concentration.

These systems produce better quality effluent than septic systems alone, reduce the nitrate load to groundwater initially, are stand alone and can be implemented by home owners when septic systems and tile beds fail. In some existing subdivisions in Lambton Shores with favourable soil conditions, this alternative may be a technically feasible option. In South Huron and Bluewater, the suitability of the soil to hydraulically handle the flow may limit the feasibility of this option.

In addition, if the lot size is too small to install a new tertiary treatment system, including an area bed and distribution piping, this is not a feasible servicing alternative.

An advantage of these systems is that they can be phased in as septic systems fail, but only in cases where the system is technically feasible. The disadvantages of these systems are:

- high capital cost for homeowners and on-going yearly maintenance costs
- operating attention and maintenance is required to maintain performance and systems may fail from misuse or lack of maintenance. Effluent quality is not controlled or monitored, so the homeowner may not be aware that the system is not working
- systems may be neglected or misused when home ownership changes. As a result, the systems may not be able to produce reliable nitrification and the overall nitrogen load to groundwater may increase over time. In this way, future environmental regulations to protect groundwater quality will not be met
- the systems do not usually provide disinfection of effluent.

Based on these disadvantages, Alternative 2 was rejected and not considered further as a possible long term wastewater treatment solution.

5.3.3 Alternative 3 - Discharge to Adjacent Existing Sewage System

This alternative consists of the construction of a transfer pipe to convey sewage to the existing Thedford Sewage Treatment Facility (STF) (Alternative 3A) or to the **Zurich STF (Alternative 3B) for treatment. As explained earlier, Provincial policies encourage the use of existing infrastructure before the development of new.**

The Thedford STF consists of two facultative lagoon cells and the effluent is discharged from one of the lagoons each year. In 2002 and 2003, the average daily sewage flow to this treatment facility exceeded its rated capacity. The sewage received in these years was retained and treated in the system by increasing the liquid depth in the lagoons in excess of the 5 feet liquid depth specified in the facility's C of A. Based on this, Alternative 3A was rejected since it has insufficient capacity to handle the volume of sanitary sewage potentially generated by the Study Area.

The Zurich STF consists of two facultative lagoon cells that are operated on a seasonal fill and discharge basis. This plant conducts phosphorus removal using batch treatment with alum, as required. An Environmental Study Report (ESR), prepared under the Municipal Class EA in October 2002, provided for the upgrading of the STF. According to the ESR, the sewage lagoon system had been operating at or over its design capacity. Between 2001 and 2003 the average daily flow represented between 84 to 90% of the rated capacity of the facility. The preferred upgrading alternative identified in the ESR involves removing accumulated sludge from the lagoons, upgrading the lagoons with aeration and installing an Intermittent Sand Filter. According to the 2004 MOE Inspection report on the Zurich STF, the Municipality of Bluewater is currently working to implement the recommendations of the ESR.

Based on these considerations, Alternative 3B was rejected since the Zurich STF has insufficient capacity for the sanitary sewage generated by the Study Area. In addition, the October 2002 ESR has already established a servicing area for the upgraded facility, which does not extend into any portion of the Study Area for the Grand Bend and Area Master Plan.

5.3.4 Alternative 4 - New Municipal Sewage Treatment Plants

Alternative 4 consists of stand-alone new sewage treatment plants to provide full municipal services for South Huron, including Dashwood (Alternative 4A), Bluewater (Alternative 4B) and Bluewater and South Huron (Alternative 4C). All three options can be phased in over time.

All three alternatives are capable of providing full municipal services to the Study Area, as encouraged by Provincial policies. However, stand alone plants have some significant disadvantages, including high capital, operating and maintenance costs. In addition, a new facility requires property acquisition potentially causing adverse impacts on cultural resources, natural features and existing and future land uses. Another consideration is Provincial policy encouraging the use of existing infrastructure. MOE policy encourages centralized plants, as opposed to multiple plants.

The most significant disadvantage of Alternatives 4A, 4B and 4C is the difficulty of siting a new sewage treatment plant due to the lack of suitable discharge points. A new sewage treatment plant must provide effluent quality consistent with MOE guidelines. Potential receiving waters for effluent discharged by new sewage treatment plants serving South Huron or Bluewater include Lake Huron and local watercourses.

The waters of Lake Huron can provide sufficient dilution for treated sewage. The outfall of a new sewage treatment facility could be located to provide significant dispersion of treated sewage away from the beach. However, a lengthy outfall pipe (approximately 2 kilometres) would be required. The estimated effluent quality required for discharge to Lake Huron is:

- Biochemical Oxygen Demand (BOD) - 10 mg/L
- Total Suspended Solids (TSS) - 10 mg/L
- Total Phosphorous (TP) - 0.5 mg/L
- Ammonia - Summer: 2 mg/L; Winter: 4 mg/L
- Chlorine - 0.0 mg/L
- Coliform count - 100 mg/100mL.

Lake Huron is the Study Area's most important natural and socio-economic asset and is one of Southwestern Ontario's leading tourist attractions. Based on this, the public will have a negative

perception of discharging treated sewage to the lake. For these reasons, Lake Huron was rejected as a possible discharge point.

It may be impossible to find a suitable receiving stream in South Huron and Bluewater, since most of the streams are too small. Similar very stringent effluent criteria will be required for discharge to a local watercourse.

Based on these considerations, Alternatives 4A, 4B and 4C were rejected as possible sanitary sewage treatment solutions.

5.3.5 Alternative 5 - Expansion and Upgrading of Grand Bend STF

Alternative 5 consists of the expansion and upgrading of the existing Grand Bend STF with the following alternative service areas:

- 5A - services entire Study Area
- 5B - services unserviced portion of Lambton Shores
- 5C - services unserviced portion of Lambton Shores and Bluewater
- 5D - services unserviced portion of Lambton Shores and South Huron.

All four alternatives can be phased in, allowing priority areas to be serviced first. With Alternatives 5B, 5C and 5D, the remaining unserviced areas would continue to be serviced by septic systems (Alternative 1), or where technically feasible on a lot-by-lot basis, by-site tertiary treatment systems (Alternative 2). Both Alternatives 1 and 2 were rejected as long term sanitary sewage treatment solutions. Alternative 3, Discharge to an Adjacent Existing Sewage System, and Alternative 4, New Municipal Sewage Treatment Plants, have also been rejected. As a result, ***the only remaining feasible alternative is Alternative 5A, the expansion and upgrading of the Grand Bend STF to service the entire Study Area***. A significant advantage of Alternative 5A is that it conforms to the servicing hierarchy included in the Provincial Policy Statement.

5.4 Design Criteria for Sanitary Sewage Servicing Solutions

Alternative 5A, Expansion and Upgrading of the Grand Bend STF, has been identified as a feasible long-term servicing solution. Feasible solutions must be capable of meeting the 20 year (2026)

design horizon of 4,960 m^3/day to service a projected population of 9,300 and MOE's effluent quality parameters.

The existing outfall of the Grand Bend STF is the Gill-Lovie Drain, a tributary of the Ausable River/Lake Huron. If the existing Grand Bend STF is upgraded or replaced with a new facility, the current outfall may prove to be the best to use, subject to more detailed engineering studies completed during subsequent phases of the Class EA process. Effluent quality limits, to minimize the impacts of contaminants on receiving water quality, will become more stringent due to the increased capacity of the STF. Proposed effluent quality parameters are shown on **Table 12**. The proposed parameters require review and approval by MOE during subsequent phases of the Class EA process.

Table 12
Proposed Effluent Quality Parameters for Ausable River*

Parameter	Design Concentration	Compliance Criteria
BOD (mg/L)	5	10
TSS (mg/L)	5	10
Ammonia		
Summer (mg/L)	1	2
Winter (mg/L)	2	4
TP (mg/L)	0.3	0.5
E. Coli (count/100 mL)	100	150

* to be confirmed by the Ministry of the Environment

5.5 Grand Bend STF Expansion and Upgrading Options

According to the Lambton Shores Sanitary Sewage System Index recently completed by the Municipality, the existing four facultative lagoon cells are not expandable (i.e., cannot add more cells) because the facultative lagoon treatment process cannot meet current regulatory receiving watercourse effluent criteria. Based on this, Dillon identified and evaluated two other options for expanding and upgrading the Grand Bend STF, including:

- Option 1 - Lagoon Upgrade (New Hamburg Process)
- Option 2 - Mechanical Treatment Plant Upgrade.

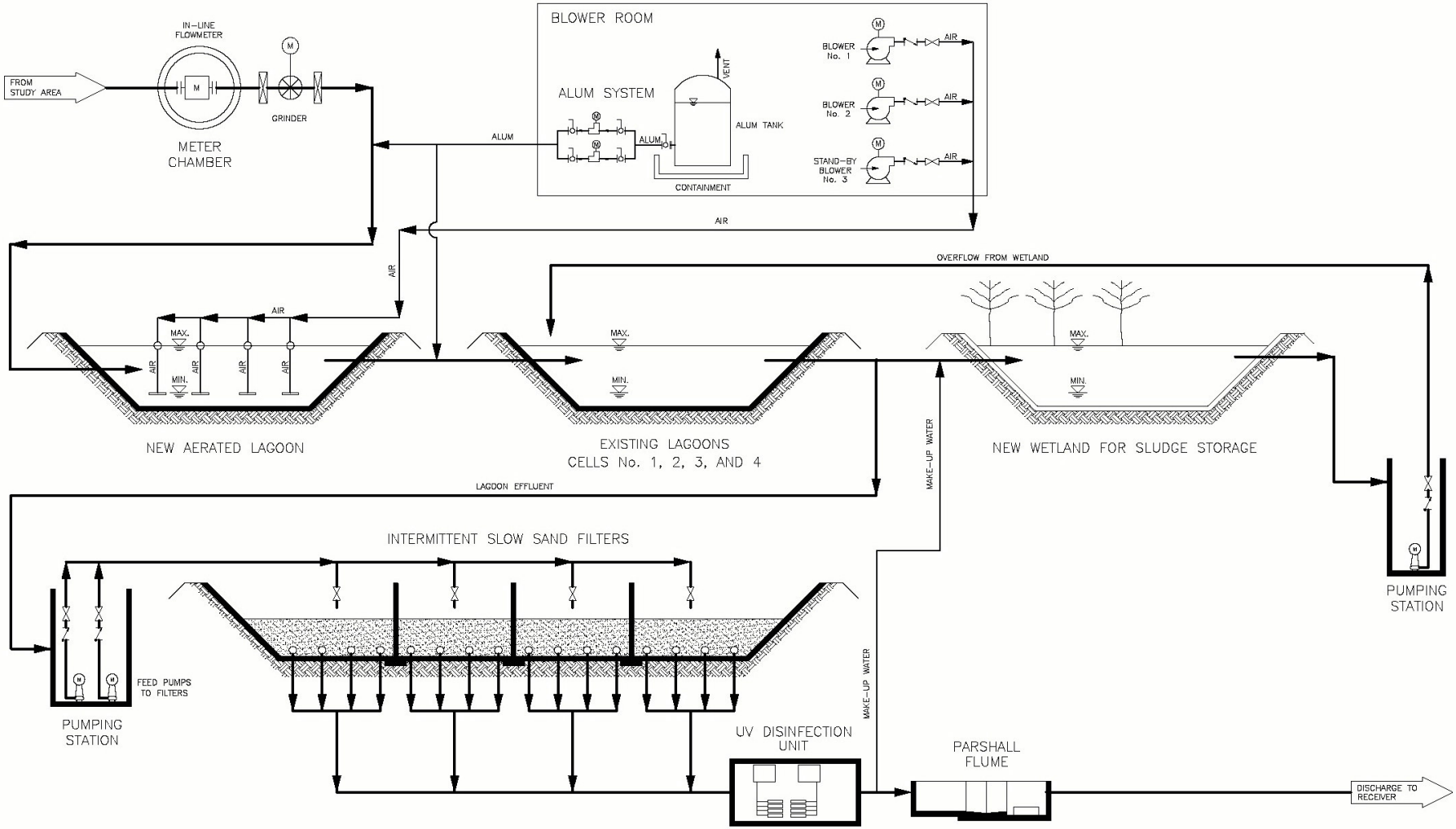
With Option 1, the existing lagoon upgrade alternative would be converted to a New Hamburg process with the following components:

- grinder
- aerated lagoon
- facultative lagoons
- slow sand filter
- UV disinfection
- wetland.

The four existing lagoon cells act as the facultative lagoons with the New Hamburg process. The remainder of the treatment components are new and would augment the existing lagoon cells. Additional land is required for these additional treatment components. Expansion to the south of the site is constrained by the location of the floodplain and the Gill-Lovie Drain. Expansion to the northeast is constrained by the location of a residence. The only feasible alternative for expansion is to the northwest of the site, also requiring some property acquisition.

With Option 1, influent wastewater to the upgraded lagoon treatment plant would initially be processed with a grinder pump that would grind up large particles into smaller particles. The wastewater would then be transferred to an aerated lagoon. In the aerated lagoon, oxygen is provided to remove BOD and provide nitrification (converts ammonia to nitrite and then nitrate). A blower would aerate the aerated lagoon via fine bubble diffusers. The blower would provide uninterrupted aeration and prevent odour formation in the aerated lagoon. Alum would be added upstream of the aerated lagoon to remove phosphorous. The wastewater would then be transferred to the existing lagoon cells (facultative lagoons), where wastewater is further clarified and some seasonal storage is provided. The clarified wastewater would then pass through the slow sand filter to further treat the wastewater. Before the treated wastewater is discharged to the Ausable River, it is disinfected by a UV system which removes microbial contaminants.

Sludge settles in the facultative lagoons where it is stabilized. This waste sludge would be periodically dredged from the lagoons and transferred to a wetland for further treatment. The wetland not only provides sludge storage but also provides further treatment of the sludge.
The New Hamburg upgrade for the Grand Bend Sewage Treatment Facility is outlined as a process flow diagram in **Figure 7**. The layout of the proposed New Hamburg System is ill-ustrated in



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Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 7: LAGOON UPGRADE (NEW HAMBURG PROCESS) OPTION PROCESS FLOW DIAGRAM

Lambton Shores

Municipality of South Huron

Municipality of Bluewater — Bayfield - Hay - Hensall - Stanley - Zurich 2001

Figure 8. The sizing and configuration of equipment would be further determined during subsequent phases of the Class EA process

Option 2, Mechanical Treatment Plant Upgrade, would convert the existing lagoon system to a mechanical treatment system with the following components:

- headworks processes
- biological treatment
- tertiary filtration
- UV disinfection
- waste sludge stabilization lagoon
- wetland.

The upgrading of the existing treatment system to a mechanical treatment plant involves abandoning one of the existing lagoon cells (Lagoon Cell No. 4 as shown on **Figure 2**) and using this area for the location of the Mechanical Treatment Plant. One of the existing lagoon cells (Lagoon Cell No. 3 as shown on **Figure 2**) would be split so that a portion of the lagoon (approximately 3/4) could be converted into a waste sludge stabilization lagoon and the remainder converted into a wetland. The other two existing lagoon cells (Lagoon Cells Nos. 1 and 2) would be modified into wetlands. A mechanical treatment system upgrade does not require any site expansion or additional land acquisition.

With Option 2, the headworks processes would include a mechanical screen and grit removal equipment to remove large solids and grit from the influent wastewater. The wastewater would receive biological treatment following the headworks processes. Biological treatment involves the oxidation of dissolved and particulate biodegradable constituents (removes organic material) and provides nitrification (converts ammonia to nitrite and then nitrate). The type of biological treatment depends on the type of Mechanical Treatment System selected during subsequent phases of the Class EA process. Some typical mechanical wastewater treatment systems include:

- Sequencing Batch Reactor System
- Oxidation Ditch System (Orbal™ System)
- Conventional Activated Sludge Plant.

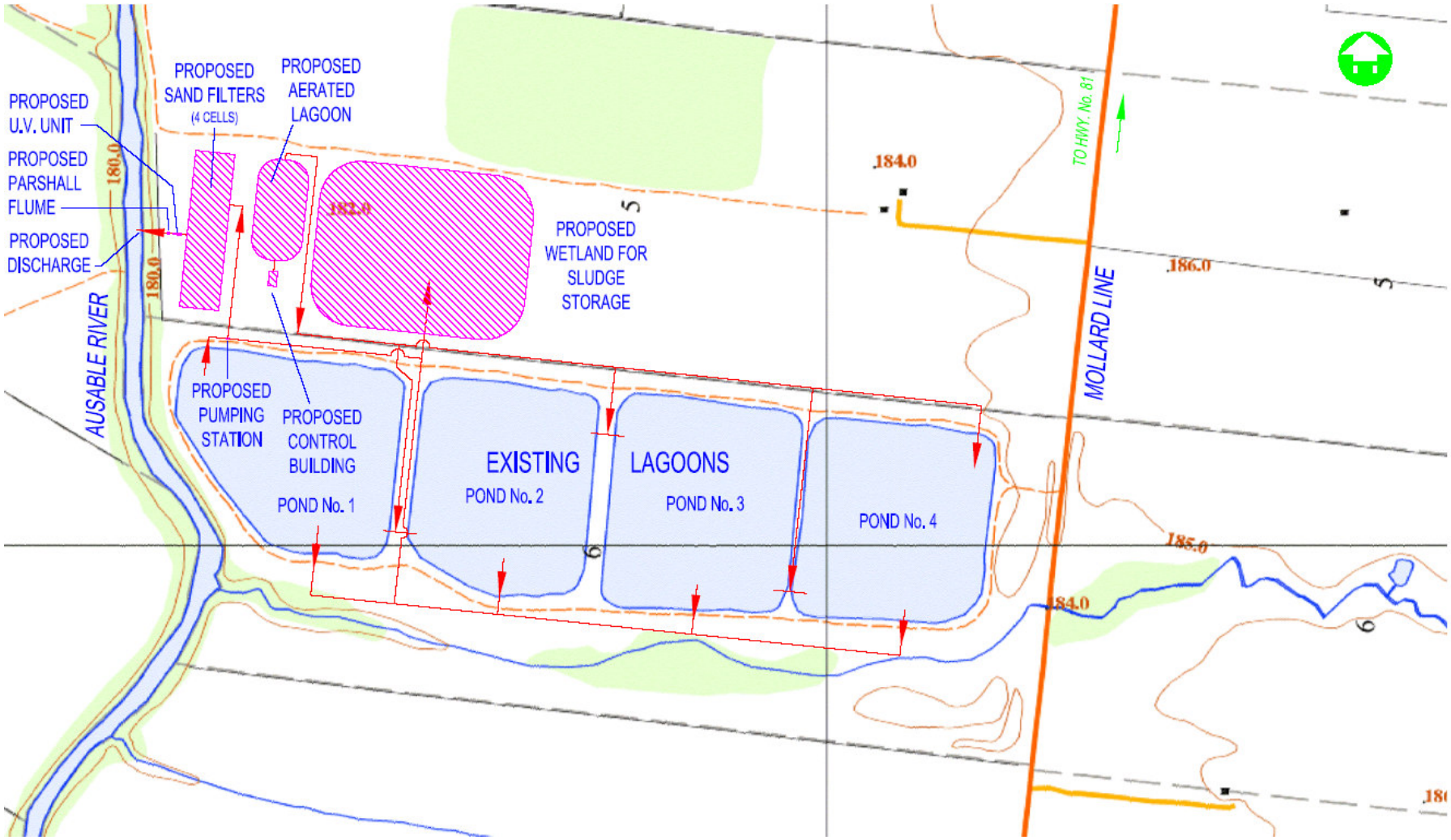
Following biological treatment, the wastewater would receive tertiary filtration, to further treat the effluent to ensure that effluent quality guidelines for Total Suspended Solids and Total Phosphorous are not exceeded. Tertiary filtration could be accomplished using one of a variety of different commercially available filtration technologies. The preferred tertiary filtration system would be selected during subsequent phases of the Class EA process. Before the treated wastewater is discharged to the Gill-Lovie Drain (or new outfall), it is disinfected by a UV system which removes microbial contaminants.

Sludge is generated in the mechanical treatment process and the sludge would be wasted and stored in the waste sludge stabilization lagoon. A blower would aerate this stabilization lagoon via fine bubble diffusers. Stabilized sludge would be periodically dredged from this lagoon and transferred to one of the wetland cells. The wetland not only provides sludge storage but also provides further treatment of the sludge.

Various Mechanical Treatment Systems were considered and found to be generally similar in the level of performance and the magnitude of capital and operating and maintenance costs. To allow for comparison of the mechanical treatment system and the lagoon upgrade alternative, the Orbal™ Oxidation Ditch System was developed as a potential mechanical treatment system. As mentioned, further assessment of various mechanical treatment and tertiary filtration systems is still required in subsequent phases of the Class EA process.

For illustration purposes, the Orbal™ Oxidation Ditch System is outlined as a process flow diagram in **Figure 9**. The layout of the Orbal™ Oxidation Ditch System is illustrated in **Figure 10**. Other mechanical treatment systems would have similar land requirements as the Orbal system. The selection, sizing, and configuration of equipment would be further determined during subsequent phases of the Class EA process.

Table 13 is a comparative evaluation of the capital and annual operating and maintenance costs of Options 1 and 2. The capital costs shown on **Table 13** for Option 2 are typical for various mechanical treatment systems, such as conventional activated sludge plant, a sequencing batch reactor system and the Orbal™ Oxidation Ditch System.



Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 8: LAGOON UPGRADE (NEW HAMBURG PROCESS) OPTION LAYOUT

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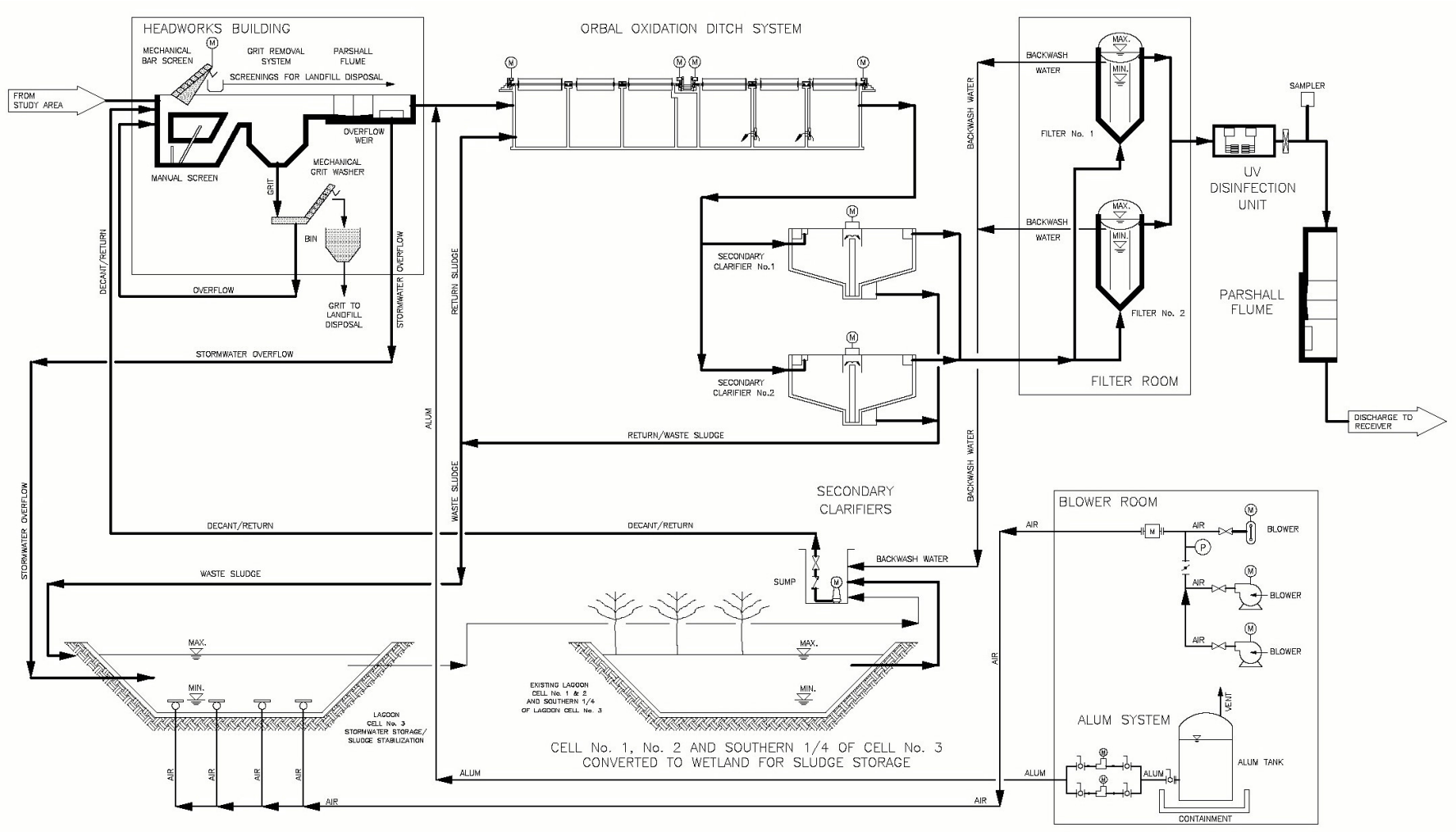
Lambton Shores

MUNICIPALITY OF SOUTH HURON

MUNICIPALITY OF BLUEWATER
BAYFIELD - HAY - HENSALL - STANLEY - ZURICH
2001



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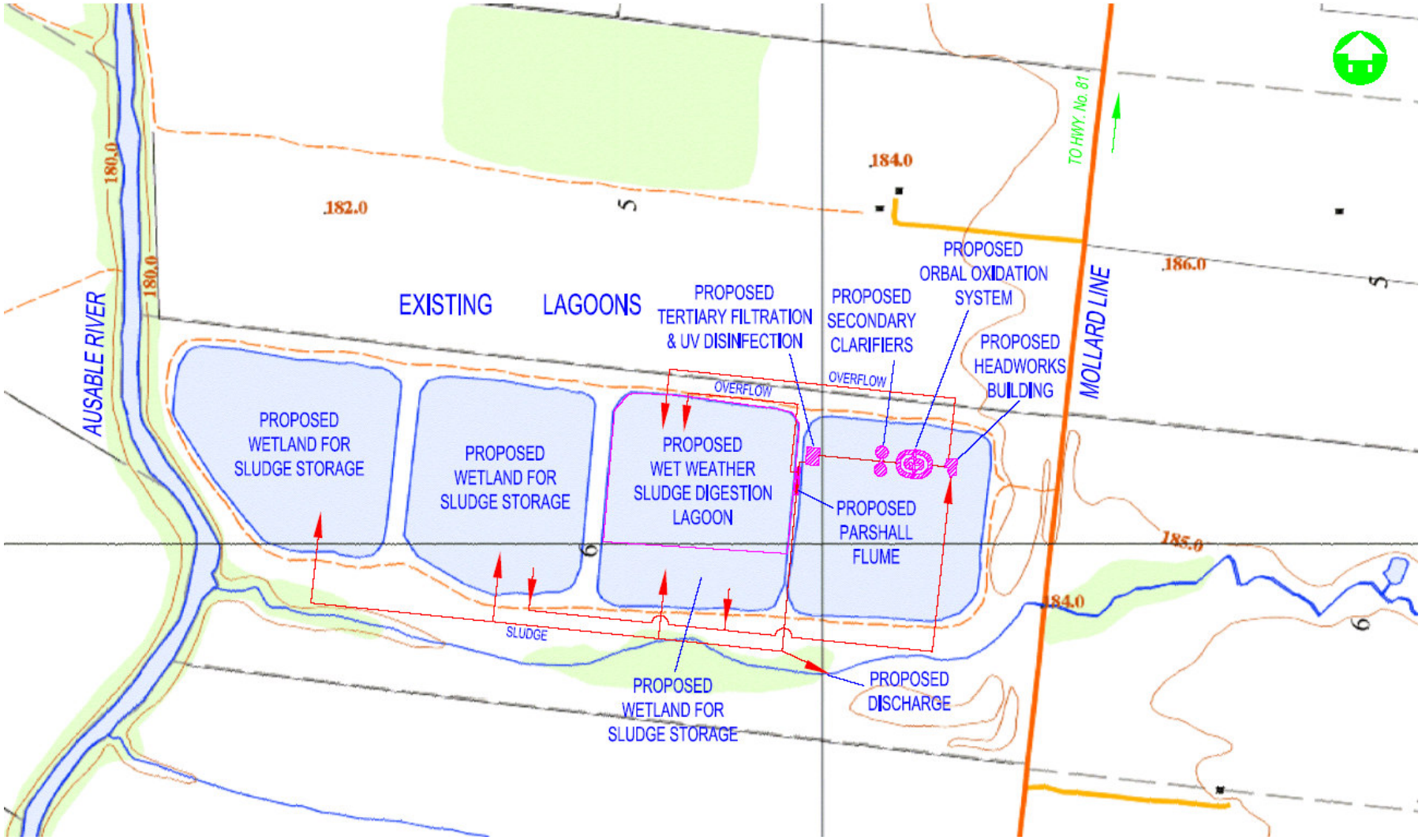
Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 9: MECHANICAL TREATMENT PLANT OPTION PROCESS FLOW DIAGRAM

Lambton Shores

MUNICIPALITY OF SOUTH HURON

MUNICIPALITY OF BLUEWATER
BAYFIELD - HAY - HENSALL - STANLEY - ZURICH
2001



Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 10: MECHANICAL TREATMENT PLANT OPTION PROCESS LAYOUT

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Lambton Shores

MUNICIPALITY OF SOUTH HURON

MUNICIPALITY OF BLUEWATER
BAYFIELD - HAY - HENSALL - STANLEY - ZURICH
2001

Table 13
Cost of Grand Bend Sewage Treatment Plant Upgrade Alternatives

Treatment Upgrade Option	Capital Cost (Direct and Indirect Costs)	Annual Operating and Maintenance Costs
1. Lagoon Updgrade (New Hamburg Process)	$ 10,700,000*	$ 186,000 / yr
2. Mechanical Treatment Upgrade**	$ 12,400,000	$ 341,000 / yr

* This cost does NOT include the cost of acquiring additional land
**The cost of typical Mechanical Treatment Systems were considered

Table 14 shows the advantages and disadvantages of Options 1 and 2 in terms of performance, reliability and costs.

Table 14
Comparison of Grand Bend Sewage Treatment Plant Upgrade/Expansion Alternatives

Expansion/Upgrade Option	Advantages	Disadvantages
Option 1 Lagoon Upgrade (New Hamburg Process)	• lower capital costs • lower operating and maintenance costs • less operational control required	• requires additional land which may add a substantial cost • additional land acquisition results in more potential for environmental impacts than Option 2 • this alternative is only practical if the fraction of year round to seasonal population remains similar (if this fraction changes significantly the treatment system would have to be further upgraded) • process has to be augmented or replaced in the future which may be prohibitive since additional land would once again be required • does not allow the treatment of septage

Expansion/Upgrade Option	Advantages	Disadvantages
Option 2 Mechanical Treatment Plant Upgrade	• easy to upgrade/expand in the future due to its modular design • high effluent quality control • no additional land required, resulting in fewer environmental impacts than Option 1 • allows the treatment of septage	• higher capital costs • higher operating and maintenance costs • more operational control required

Based on the comparative evaluation of the advantages and disadvantages of Options 1 and 2, the lagoon upgrade alternative is not recommended and a mechanical treatment plant (Option 2) is the preferred expansion and upgrading option. Option 2 provides a high level of effluent quality and can easily be upgraded in the future. Beyond the design horizon (20 years), the plant will have to be upgraded. This would be difficult with Option 1, since the process components of the New Hamburg process cannot be easily expanded. Also, if the percentage of year round population increases significantly, as is expected, the lagoon system may not have sufficient capacity to handle the flow potentially generated by the Study Area.

5.6 Alternatives for the Treatment of Septage

As part of the Master Plan, Dillon investigated the potential of the upgraded Grand Bend STF to treat septage.

Septage is material pumped out of a septic tank. Septage is much more concentrated than sewage and is considered high-strength wastewater. From a contaminant standpoint, 1 m^3 of septage is equivalent to approximately 30 m^3 of sewage. For this reason, septage must be blended with sewage before treatment to avoid upsetting the treatment process. The treatment of septage would only be possible with a Mechanical Treatment Plant Upgrade due to the higher treatment system efficiency of a mechanical plant.

Dillon identified and evaluated three alternatives for septage treatment:

- Alternative 1 - No Increase in Plant Design (2026) Capacity
- Alternative 2 - Increase Plant Capacity Beyond Plant Design (2026) Capacity and do not provide Septage Pre-Treatment
- Alternative 3 - Increase Plant Capacity Beyond Plant Design (2026) Capacity and provide Septage Pre-Treatment.

These three alternatives were considered over the following time horizons:

- Near Future - Summer
- Near Future - Winter
- Future - Winter
- Future - Summer.

These four time horizons were used to determine the quantity of septage that could be received during each time horizon. Efforts were made to distinguish between summer and winter flows due to the variation in sewage flows between the peak season and off-season. Near Future is defined as 1-5 years from present when the Treatment Plant has been upgraded with a Mechanical Treatment System and the Pinery Provincial Park and Southbend Estates are being serviced in addition to current servicing. Future is defined as the time when the upgraded Mechanical Treatment Plant reaches its design capacity (2026).

All three alternatives involve the construction of a Septage Receiving Station at the Upgraded Mechanical Treatment Plant to accept septage and ensure that the septage is properly blended with the influent sewage. The Septage Recieving Station may or may not include pre-treatment of septage. **Figure 11** illustrates the process flow for a septage receiving station both with and without septage pre-treatment using lime stabilization.

Table 15 shows the number of loads of septage that could be accepted by the upgraded Grand Bend Mechanical Treatment Plant for each of the three septage treatment alternatives over the four time horizons. A single load is equivalent to about 19 m^3 (5000 gal (US)) or the assumed volume of septage that could be hauled by each septage hauler vehicle. This volume is equivalent to the volume of septage from approximately four to five septic tanks. To determine a baseline in terms of the number of loads of septage generated by the Study Area, it may be assumed that each septic

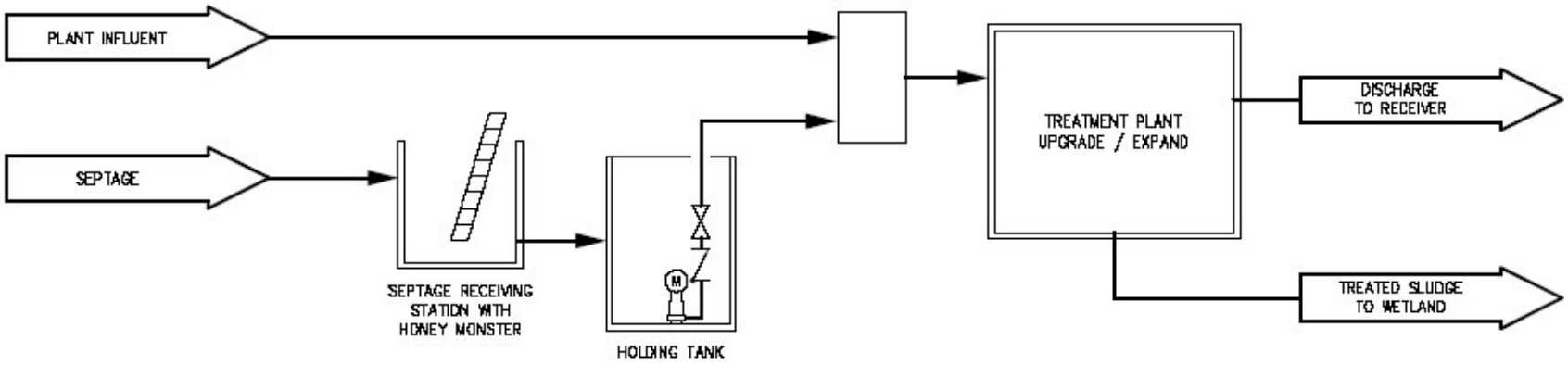
tank would be pumped out once every two years. This is equivalent to an average of 1.3 loads of septage generated per day in the Study Area.

The costs associated with each septage treatment alternative are also shown on **Table 15**. These costs are in addition to the costs associated with the Mechanical Treatment Plant Upgrade, previously outlined in **Table 13**.

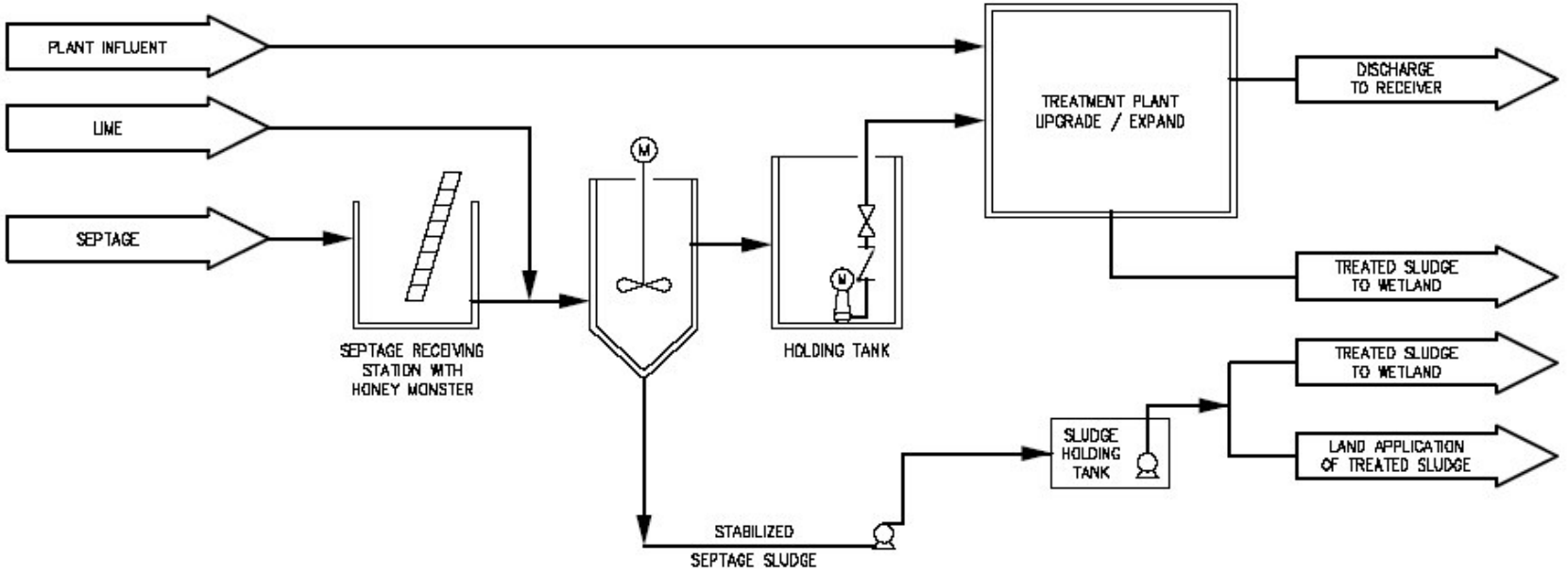
Table 15
Comparison of Septage Treatment Alternatives

	Alternative 1 **No increase in plant design capacity**	***Alternative 2*** **Increase plant capacity, no septage pre-treatment**	***Alternative 3*** **Increase plant capacity and provide septage pre-treatment**
No. of Loads* of Septage per Day:			
• Near Future - Peak Season	1.2	4.8	5.0
• Near Future - Off-Season	2.4	5.8	8.9
• Future - Peak Season	0	3.4	0.5
• Future - Off-Season	1.7	5.0	6.6
Plant Design Capacity (m^3/d)	4 588	10 000	4 800
Additional Capital Cost to increase Plant Capacity ($)	$ 35,000	$7,690,000	$ 350,000
Additional Cost for Septage Handling Equipment ($)	$ 840,000	$ 900,000	$ 900,000
Additional Cost for Septage Pre-Treatment Equipment ($)	–	–	$ 270,000
Additional Operating and Maintenance Costs to Treat Septage ($)	$ 55,000 /yr	$ 120,000 /yr	$ 160,000 /yr

* One septage load is equivalent to 19 m^3 or 5 000 gal (US) (or the volume of about 4-5 septic tanks)
Off-season: October to April
Peak Season: May to September



Septage Receiving Station



Septage Receiving Station with Septage Pre-Treatment (Lime Stabilization)

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Grand Bend and Area Sanitary Sewage Servicing Master Plan

FIGURE 11: SEPTAGE TREATMENT

Lambton Shores

Municipality of South Huron

Municipality of Bluewater 2001

As shown on **Table 15**, the number of septage loads that can be accepted by the upgraded Mechanical Sewage Treatment Plant varies seasonally, as well as between the near future (one to five years) and the future (2026).

Based on the comparison of the three septage treatment alternatives, it is evident that Alternative 2 which involves increasing the treatment plant capacity without providing septage pretreatment has a substantial cost. Alternative 2 is not capable of accepting significantly higher volumes of septage, in comparison to the other alternatives considered. Based on these disadvantages Alternative 2 is rejected. Alternative 1, which consists of accepting septage without increasing plant capacity, does not add a substantial cost to the treatment system since the treatment plant design capacity is not increased. As a result, this alternative would provide limited septage treatment capacity. By increasing the plant capacity slightly and providing septage treatment (Alternative 3), quantities of septage loads similar to Alternative 2 may be accepted at a reduced capital cost. Alternative 3 is preferable as it can be phased in over time, depending on the Study Area's need for septage treatment.

Alternative 1 is recommended as the preferred septage treatment alternative since it does not involve an increase in the Upgraded Mechanical Treatment Plant design capacity. This alternative does not include any additional treatment plant capacity or any provision for septage pretreatment. The need for septage treatment must be further assessed to determine the quantity of septage generated requiring treatment at the Upgraded Mechanical Treatment Plant. However, if a significant need is established for septage treatment, in excess of the capacity of the existing plant, then it is recommended that Alternative 3 be adopted. Alternative 3 involves the addition of septage pre-treatment equipment and the upgrading of treatment plant capacity, both of which could be phased in over time to meet the demand for septage treatment in the Study Area.

5.7 Options for Sanitary Sewage Collection System

Dillon identified and evaluated the following sanitary sewage collection system options:

- Option 1 - Conventional (Gravity) System. With a conventional system, sewage is collected and transported by gravity flow through buried piping. Sewers are installed at a specified grade and sized to handle peak flow

- Option 2 - Vacuum Collection System. With this option, a vacuum source enables the collection and transport of sewage through small-diameter mains
- Option 3 - Low Pressure System. This system consists of a number of pumping stations interconnected with pressure mains and submersible grinder pump stations capable of generating a wide range of operating heads
- Option 4 - Septic Tank Effluent Pump System. With this system, raw sewage is conveyed from the household to a septic tank where solids settle out. A pump is used to convey effluent into a pressurized collection system with small diameter piping.

5.7.1 Evaluation of Collection Alternatives

Due to the size and moderately varying topography of the Study Area, Dillon evaluated the four options for two separate areas. The first area included the unserviced portions of Lambton Shores, Bluewater (Highway 21 only) and South Huron (along Highway 21 from Huron Road 81 to 83). The second area included Dashwood.

Table 16 outlines the advantages and disadvantages of each collection system option for the first area, including unserviced portions of Lambton Shores, Bluewater and South Huron.

Table 16
Comparison of Collection System Options for Lambton Shores, Bluewater (Hwy. 21 only) and South Huron (Hwy. 21 from Huron Road 81 to 83)

Type of Collection System	Advantages	Disadvantages
1. Conventional (gravity)	- lower operating and maintenance costs - consumes no power, except for large pumping stations	- in Lambton Shores - slope requirements to maintain gravity flow may require deep excavations - height of water table may prohibit this - several conventional pumping stations required due to undulating terrain leading to high construction costs - does not easily accommodate seasonal fluctuations in flow (ie., low flow causes increased maintenance and costs) - large lots with deep setbacks to houses requires deep sewers
2. Vacuum	- lower capital cost - non-invasive construction - shallow piping network	- not suitable for undulating terrain - requires full time operator leading to high maintenance cost
3. Low Pressure	- lower capital cost - can accommodate very long runs of forcemains before another pump is needed to increase pressure - can accommodate low flows - non-invasive construction - suitable for all types of terrains	- higher operating and maintenance costs than conventional systems
4. Septic Tank Effluent Pump	- allows developments with septic systems to be phased in municipal system	- well suited to areas with low to moderate density - solids in septic tank still must be cleaned out every 3 years (same as conventional septic systems)

Based on the advantages and disadvantages shown on **Table 16**, a low pressure system is recommended for Lambton Shores, Bluewater (Hwy. 21 only) and South Huron (Hwy. 21 from Huron Road 81 to 83). This type of system is suitable for long forcemain runs with undulating

terrains and can accommodate low flows associated with the off-season. A low pressure system also has a lower capital costs and requires less invasive construction than other types of collection systems.

Table 17 outlines the advantages and disadvantages associated with each type of collection system for Dashwood.

Table 17
Comparison of Collection System Options for Dashwood

Type of Collection System	Advantages	Disadvantages
1. Conventional (gravity)	- lower operating and maintenance costs - consumes no power, except for large pumping stations - simplicity of the design for generally flat terrain	- higher initial cost of construction
2. Vacuum	- lower capital cost - non-invasive construction - shallow piping network	- not suitable for undulating terrain - requires full time operator leading to high maintenance cost
3. Low Pressure	- lower capital cost - can accommodate very long runs of forcemains before another pump needed to increase pressure - can accommodate low flows - non-invasive construction - suitable for all types of terrains	- higher operating and maintenance costs than conventional systems
4. Septic Tank Effluent Pump	- allows developments with septic systems to still be phased-in	- well suited to areas with low to moderate density - solids in the septic tank must still be cleaned out every 3 years (same as conventional septic systems) - some homeowners in Study Area have tertiary treatment units installed

A conventional (gravity) collection system is the preferred option for Dashwood due to the generally flat terrain in the hamlet. Also, since Dashwood has a year-round, permanent population, there are no seasonal variations in sewage flows.

Figures 12A and 12B in **Appendix A**, illustrates the overall collection system layout for the Study Area. **Table 18** summarizes the capital and operating costs of the recommended collection system.

Table 18
Capital, Operating and Maintenance Costs for Recommended Collection System, Forcemains and Pumping Stations

Recommended Collection System	Capital Cost (Direct and Indirect Costs)	Annual Operating and Maintenance Costs
Low Pressure System: • Bluewater (excluding Dashwood) • South Huron (excluding Dashwood) • Lambton Shores	$ 9,400,000 $ 5,460,000 $20,600,000	$ 625,500 / yr (for entire service area serviced by low pressure sewers)
Conventional System: • Dashwood	$ 3,670,000	$ 3,400 / yr

6. SANITARY SEWAGE SERVICING MASTER PLAN

6.1 Description of Recommended Servicing Scheme

Based on the findings of this Master Plan, the recommended sanitary sewage servicing solution for the Study Area is shown on **Figures 12A and 12B** and includes:

- the provision of municipal sanitary sewage services for the entire Study Area to be phased in over time

- an expansion and upgrading of the Grand Bend Sewage Treatment Facility (STF) to serve the entire Study Area. A Mechanical Treatment Plant Upgrade is recommended as the preferred expansion and upgrading option

- septage can be accepted and treated at the Upgraded Mechanical Treatment Plant. Further assessment is needed to identify the quantity of septage generated in the Study Area requiring treatment at the Grand Bend STF. If additional capacity is required to treat septage, septage pre-treatment equipment and the upgrading of plant capacity could be phased in over time

- a low pressure sanitary sewage collection system is the preferred option for servicing Lambton Shores, South Huron (along Highway 21 from Huron Road 81 to Huron Road 83) and Bluewater, along Highway 21

- a conventional (gravity) collection system is the preferred servicing option for Dashwood.

Further assessment of the recommended treatment, collection and sludge and septage management options is required during the subsequent Class EA process to identify a preferred design for the improvements and mitigate potential environmental impacts.

6.2 Phasing of Improvements

The sanitary sewage servicing projects will be completed by the three municipalities over the next 20 years. The priority of improvements, as recommended by the Master Plan, includes the following:

1. Lambton Shores - the first priority for servicing the Study Area is the expansion and upgrading of the Grand Bend STF to accommodate peak (Summer) flows from the Pinery Provincial Park and proposed Southbend Estates (highest priority wastewater improvement) and existing and future development in the Study Area. The plant's capacity will be expanded from 1,891 m^3/d to 4,960 m^3/d

2. Lambton Shores - the construction of a forcemain from the Grand Bend STF to Southbend Estates and Pinery Park, the highest priority areas for servicing

3. Lambton Shores - future servicing of existing developed areas west of Southbend Estates, including Huron Woods, Southcott Pines and Merrywoods Subdivisions

4. South Huron - construction of a pumping station and forcemain to the Grand Bend STF to service South Huron north of Grand Bend to Huron Road 83. This area includes recreational and commercial uses along Highway 21 and the Oakwood Park Subdivision

5. Bluewater - servicing of the lakeshore, on the west side of Highway 21, from Huron Road 83 to St. Joseph at Huron Road 84

6. South Huron and Bluewater - servicing of Dashwood.

6.3 Impact Assessment of Recommended Servicing Scheme

Table 19 is an impact assessment of the recommended servicing scheme. The assessment covers potential impacts on cultural resources, natural features and existing and future land uses and includes measures to mitigate adverse impacts. Further assessment of the site specific impacts of the sanitary sewage projects included in the recommended scheme is required by the Municipal Class EA during the subsequent planning, design and approvals process for the projects.

Table 19
Impacts/Benefits of Preferred Servicing Scheme

Environmental Feature	Impacts	Mitigating Measures
Cultural Resources		
Impacts on lands with moderate and high archaeological potential and other heritage features	Potential disturbance caused by construction of: - expansion of Grand Bend STF - collection system and pumping stations in Study Area	Impacts avoided/mitigated by completion of Archaeological Assessments of any undisturbed lands affected by new construction. Ministry of Culture approval of assessments and "clearance" required prior to construction

Environmental Feature	Impacts	Mitigating Measures
Natural Features		
Impacts on Terrestrial Features	Potential loss/adverse impacts on woodlots, wetlands and other features caused by construction of: - expansion of Grand Bend STF - collection system and pumping stations in Study Area	New construction can be sited/routed to avoid loss/adverse impacts on significant features. Impacts during construction mitigated by: - significant areas designated as "off limits" during construction - tree protection plans, including barrier for tree protection - standard erosion and sedimentation control measures
Benefits for Ausable River/Lake Huron and other area subwatersheds	Municipal sanitary sewage treatment significantly reduces nutrient impacts (nitrates) from existing septic systems and sewage discharges from malfunctioning systems, resulting in long-term ground and surface water improvements	Monitoring of surface and groundwater quality can be undertaken to verify improvements
Watercourse Crossings and Impacts on Water Quality	Potential turbidity and sedimentation impacts caused by construction of sanitary sewers in the vicinity of watercourses and possible improvements to the Grand Bend STF outfall to the Ausable River	Facilities can be sited/routed to avoid watercourse crossings. Water quality impacts minimized by using trenchless technologies at watercourse crossings and following standard watercourse protection measures during construction

Environmental Feature	Impacts	Mitigating Measures
Impacts on Fish Habitat	Potential Harmful Alteration, Disruption and Destruction (HADD) of fish habitat and turbidity and sedimentation impacts caused by: - changes to outfall of Grand Bend STF - construction of sanitary sewers at watercourse crossings	HADD's at outfall likely require Authorization under the *Fisheries Act*. Any loss of fish habitat compensated by Fish Habitat Compensation Works. Potential HADD's caused by construction of sewers at watercourse crossings can be avoided by trenchless technology. Other impacts minimized by following standard watercourse and fisheries protection measures during construction
Impacts on Existing and Future Land Uses		
Impacts on Private Property	Private property potentially required for sewage pumping stations. Sewers have minimal impacts as long as these facilities can be located in or along road allowances	Siting of pumping stations and routing of sewers during subsequent Class EA's will minimize private property requirements
Sanitary Sewage Servicing for Existing Uses	Provides a long-term sanitary sewage servicing solution: - avoids need to repair/replace existing septic systems. In some cases, replacement may be impossible due to small lot sizes, making many lots unusable - eliminates public nuisance and potential health problems caused by malfunctioning systems	Not required, but cost savings of repair/replacement of septic systems likely offset by sanitary sewage connection charges

Environmental Feature	Impacts	Mitigating Measures
Construction Impacts on Existing Uses adjacent to Construction	Short-term noise, vibrations, dust impacts. Temporary property access disruptions	Mitigated by standard noise attenuation and dust control measures. Access disruptions will be minimized
Capital and Operating Costs for Existing and Future Property Owners	To be determined during subsequent Class EA's and engineering studies	Costs to homeowners cannot be avoided. Costs to future home owners will form part of a development levy
Future Development in the Study Area	Allows future development to proceed on full municipal services, in conformity with Provincial, County and Municipal land use planning and servicing policies	Not required

In summary, the proposed servicing scheme provides a long-term and "beyond" sanitary sewage servicing solution. Although the servicing scheme involves costs for property owners and will have some short-term construction impacts, it has significant benefits, including:

- significant reduction in nutrient impacts (nitrates) from existing septic systems and sewage discharges from malfunctioning systems, thereby helping to improve ground and surface water in all affected subwatersheds. This will help improve water quality in Lake Huron and the Ausable River, the Study Area's most important natural and recreational assets. These improvements are also expected to reduce the number of beach closures during the summer months

- elimination of the potential public nuisance and health problems caused by malfunctioning septic systems. Until the Study Area is entirely serviced, Dillon recommends that the municipalities monitor surface and groundwater quality to determine the impacts of existing septic systems

- elimination of the need for property owners to repair/replace existing systems. In some cases, replacement may be impossible due to small lot sizes, making many lots unusable.

As shown on **Table 19**, the potential site specific impacts of the improvements on cultural resources, aquatic resources, terrestrial features and existing and future land uses can all be dealt with as part of the subsequent planning, design and approvals process, including the Municipal Class EA process.

6.4 Estimated Capital and Operating Costs and Funding

Estimated capital and operating costs are shown on **Table 20**.

Table 20
Estimated Capital and Operating Costs

Sanitary Sewage Servicing Improvements	Costs
Total Capital Cost of Expansion and Upgrading of Grand Bend Sewage Treatment Facility, Septage Treatment (Alternative I), Sewage Collection System, Pumping Stations and Forcemains	$52.5 Million (approx. $39.2 Million for sewage collection system, pumping stations and forcemains)
Operating Cost	$1.03 million/year

6.5 Future Planning, Design and Construction Phases

This section explains the classification of the projects recommended by the Master Plan under the Municipal Class EA.

The expansion and upgrading of the Grand Bend STF to a Mechanical Sewage Treatment Plant has been identified as the first priority for sanitary sewage servicing improvements in the Study Area. This project is classified as a Schedule "C" project under the Municipal Class EA. Schedule "C" projects are the most complex and have the potential for significant environmental impacts. This type of project is subject to the full Class EA process and requires extensive public and agency participation and the preparation of an Environmental Study Report (ESR). Phases 1 and 2 of the Class EA process are already covered by the Master Plan. Subsequent phases include:

- Phase 3 consists of the identification, evaluation and selection of a preferred design option for the expansion and upgrading of the Grand Bend STF, including options for sludge and

septage management. This phase also involves the preparation of a site specific inventory of the "environment" potentially affected by the design options, a comparative evaluation of the impacts of these options and the selection of preferred options. A Pre-design of the preferred options is prepared, along with a detailed impact assessment, including measures to mitigate any adverse impacts. Public and agency consultation occurs throughout Phase 3

- Phase 4 consists of the documentation of Phases 1, 2 (including any required updates to this Master Plan) and 3 in an ESR. The ESR is placed on the public record for a 30-day review period. During this period, any individual may request the Minister of the Environment to change the status of the project from a Class EA to an individual EA by issuing a Part II Order under the EA Act. The project may not proceed to construction until all Part II Order requests have been resolved

The construction of the forcemain from the Grand Bend STF to Southbend Estates and Pinery Provincial Park (identified as the second priority improvement) is classified as a Schedule "B" project since portions of the forcemain will likely be located outside of an existing road allowance or utility corridor. Other future collection system construction projects, such as those in South Huron and Bluewater, may also be classified as Schedule "B" projects if portions of the sewers are located outside of an existing road allowance or utility corridor. A Schedule "B" project is approved provided Phases 1 and 2 of the Class EA process have been completed and the project is "screened". Phases 1 and 2 are covered by this Master Plan. Based on the objective of avoiding or minimizing adverse environmental impacts, the screening process involves:

- identification and evaluation of design options and the development of a recommended design
- preparation of an inventory of the site specific "environment" potentially affected by the project
- public and agency consultation
- assessment of the impacts of the recommended design, including measures to mitigate adverse impacts
- documentation of the screening process in a Project File. Similar to an ESR, the Project File is placed on the "public record' for a 30 day review period.

Some of the future collection system projects may be classified as Schedule "A" projects, provided all collection facilities are located in an existing road allowance or utility corridor. A Schedule "A" project is pre-approved under the Class EA.

As required by the Municipal Class EA document, all projects must be designed and constructed as outlined in this Master Plan and subsequent Class EA's. In addition, all mitigation measures identified in an environmental assessment must be incorporated into the Contract documents for the construction of the facilities. Failure to do so is a contravention of the *Environmental Assessment Act*.

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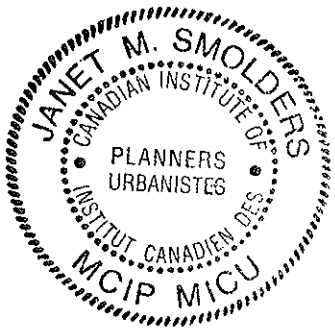
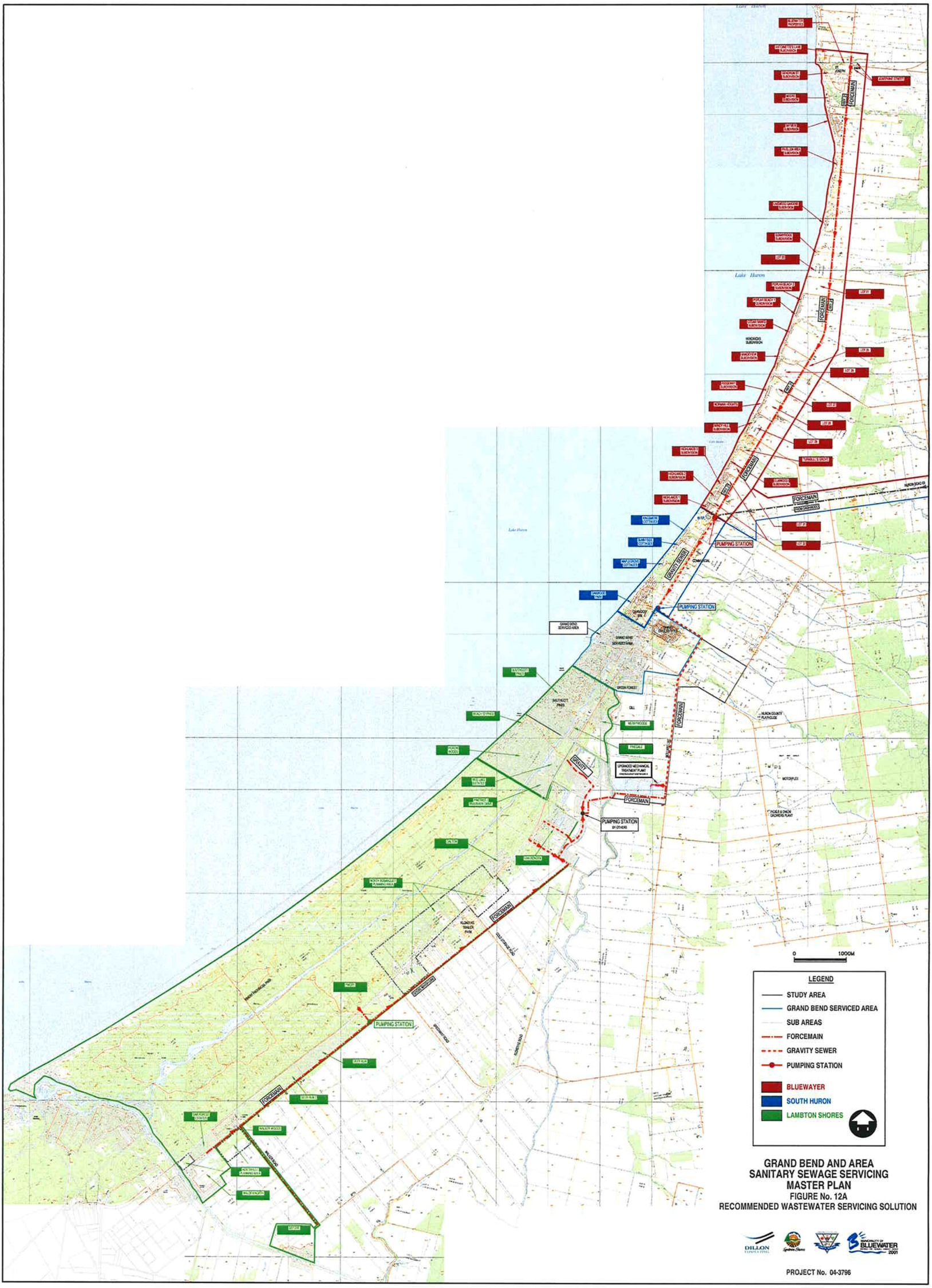


APPENDIX A
FIGURES 12A AND 12B



GRAND BEND AND AREA SANITARY SEWAGE SERVICING MASTER PLAN

FIGURE No. 12A

RECOMMENDED WASTEWATER SERVICING SOLUTION

DILLON CONSULTING

MUNICIPALITY OF BLUEWATER 2001

PROJECT No. 04-3796

TOWNSHIP OF HAY

VILLAGE OF DASHWOOD

LIMIT OF REG. PLANS

WILLERT STREET

CALFAS STREET

ELEANOR ST.

LOUISE STREET

MAULDON ST.

LOTS 23 & 24

EASEMENT

PUMPING STATION

HELEN STREET

RINKER STREET

ALLOWANCE BETWEEN LOTS 23 & 24

FREDERICK STREET

LANE

PHILIP STREET

HWY. Nº 83

FORCEMAIN (TO HWY. 21)

SANITARY SEWER

FORCEMAIN FROM HAYTER'S TURKEY PRODUCTS PROCESSING PLANT

ROLAND STREET

FRIED STREET

CHURCH ST

MILTON STREET

ANN STREET

EMILA LANE

WILLIAM STREET

BOSTON STREET

COUNTY ROAD Nº 2

TOWNSHIP OF STEPHEN

LEGEND

- SANITARY SEWER
- FUTURE SANITARY SEWER
- FORCEMAIN
- MANHOLE
- FUTURE MANHOLE

NOTE:
ALL SANITARY SEWERS TO BE 200mm Ø UNLESS OTHERWISE NOTED.

GRAND BEND AND AREA SANITARY SEWAGE SERVICING MASTER PLAN

FIGURE No. 12B

RECOMMENDED WASTEWATER SERVICING SOLUTION

PROJECT No. 04-3796

APPENDIX B
PUBLIC AND AGENCY CONSULTATION

APPENDIX C
SCREENING OF LONG LIST OF ON-SITE TERTIARY TREATMENT SYSTEMS

Appendix C: Screening of Long List of On-Site Tertiary Treatment Systems

Table C-1 EcoFlo	
Factors	**Treatment Specifications**
EcoFlo Treatment System	
Design Criteria	Model ST-500 or STB-500 (1and 2 bedroom): 1 500 L/d (peak daily design flow rate) Model ST-650 or STB-650 (3 and 4 bedroom): 2 200 L/d (peak daily design flow rate) Note: There are two configurations: ST having an open bottom and STB with a submersible collecting bottom
Treatment Capacity (L/d)	For residential units capacity ranges up to 2 200 L/d
Treatment Performance for Nitrate (mg/L)	22% Nitrate reduction level on basic system 50% Nitrate reduction level on basic system with recirculation 89% Nitrate reduction level on basic system with uplift composite peat filter
Treatment Performance for BOD, TSS and TP (mg/L)	BOD: <10mg/L, 95% removal TSS: < 10 mg/L, 90% removal TP: no removal Fecal coliforms: < 25 000/100 mL, 99% removal
System Reliability	Provided excessive flows don't occur, excessive chemicals not dumped down the drain, etc. (according to manufacturer)
Potential for Odour Formation	Potential odour issue if vent stack not properly connected to house/septic tank or improper installation causing unit malfunction If odour detected, EcoFlo installs a carbon filter until cause is determined Remediation is easy in 99% of cases
Maintenance Requirement	Requires cleaning effluent filter, raking peat All maintenance done by a trained technician certified by the manufacturer (Premier Tech Environmental) No maintenance required by owner
Frequency for Media Replacement	once every 8 years peat must be replaced
Monitoring Requirement	Area Bed: Conduct sampling and testing in accordance with the requirements of the OBC - once during first 12 months - thereafter every 48-month period Shallow Buried Trench: every 12 months
Order of Magnitude Capital Cost	$10 000-15 000 Installed (incl. an 8-year annual maintenance contract which has a value of $1 200 and a septic tank)

Table C-1 EcoFlo	
Factors	**Treatment Specifications**
Order of Magnitude Operating Costs	If no pump, $0 for first 8 years (incl. in capital cost above) except for regular pumping costs associated with cleaning out septic tank If pump is installed the cost of operating a 0.4 hp effluent pump must be considered Annual maintenance contract of $1 200 for next 8 years including peat change-out
Acceptance by MOE and Heath Units	Ontario Building Code Approval of EcoFlo Biofiltration Treatment Unit for meeting secondary effluent quality criteria (based on MOE letter dated Feb. 9, 1998) Building Material Evaluation Commission (BMEC) Approval of EcoFlo ST-650 Biofilter System for tertiary level treatment- April, 1999 MOE acceptance based on approved C of A's Health Unit acceptance based on Building Materials Evaluation Commission (BMEC) approval
Number of Installations and Service Life	Ontario: close to 5,000 Started in 1988 in Ontario, first installed in 1994 Service life is approximately 8 years, replace peat, good for another 8 years, etc. Total Lifespan approx. 30 years
EcoFlo Sub-surface Discharge	
Type Sub-surface Discharge System based on Soil Type	Sand: -shallow buried trench for percolation times of 125 min/cm or less Clay: - to avoid a mound, put bottom on EcoFlo and pipe to an absorption system below grade (EcoFlo no longer on top of absorption system) -shallow buried trench for percolation times of 125 min/cm or less -raised absorption system

Table C-1 EcoFlo	
Factors	**Treatment Specifications**
Design Criteria for Sub-surface System (based on BMEC Approval)	**Absorption System:** Stone layer of 200 mm (minimum) over 250 mm (minimum) of sand (with percolation time of 6-10 min/com) Provided that the underlying native soil has a percolation time of less than 6 min/cm, the water table shall be a minimum of 600 mm below the bottom of the stone layer required **Stone Layer** - $Q \leq 3\ 000$ L/d: the loading on the surface of the stone layer should not exceed 75L/m^2 per day - $Q > 3\ 000$ L/d: the loading on the surface of the stone layer should not exceed 50 L/m^2 per day - minimum area of crushed stone is 27 m^2 **Sand Layer** The sand layer shall have a minimum area that is the greater of: - the area of the stone layer required, and - A = QT/850 where A = the area of contact, m^2 Q = the total daily design flow, L and T = the lesser of 50 and the percolation time of the underlying soil, min/cm In a raised absorption system, the sand layer shall extend at least 15 m beyond the perimeter of the system, in any direction which the effluent entering the soil will move horizontally **Shallow Buried Trench:** - Length of distribution pipe (L) shall not be less than 30 m when constructed as a shallow buried trench
Bed Size (m/d) based on soil type (analysis utilized hydraulic load calculations for determining area)	1 min/cm to 20 min/cm = 400 m^2 20 min/cm to 50 min/cm = 600 m^2 50 min/cm to 125 min/cm = 850 m^2
Minimum Lot Area required for Treatment System per Soil Category (sum of disposal system and treatment unit area)	1 min/cm to 20 min/cm = 425 m^2 20 min/cm to 50 min/cm = 625 m^2 50 min/cm to 125 min/cm = 875 m^2
Does the system meet MOE reasonable use policy requirements?	Yes, if a solution is devised to treat nitrates (recycle, etc.) Yes, if based on travel through absorption bed
Life Expectancy of Sub-surface System	Indefinite, if system working effectively to reduce nutrients. Only treated water is discharged so life expectancy is "indefinitely"
Acceptance of Sub-surface System by MOE and Health Unit	MOE developed sizing calculations Health Unit relies on MOE/Building Code evaluation

Table C-1 EcoFlo	
Factors	**Treatment Specifications**
Maximum Observed Life of Sub-surface system	First installed system in 1994

Table C-1 EcoFlo	
Factors	**Treatment Specifications**
EcoFlo Risk Assessment	
Potential for Treatment System Failure	An EcoFlo could malfunction due to misuse by owner Moving parts limited to tray and pumps, therefore cause for failure is easily identified and can be easily fixed
Remedial Step to Correct Equipment Failure	Pump out peat and replace If system was installed incorrectly, dig up and replace
Overall Impact of Equipment Failure on System Performance	If equipment fails, system performance will likely halt until equipment is remediated
Potential for Sub-surface System failure	Provided system is working properly, sub-surface system should last indefinitely If owner misuses systems (dumping chemicals down drain, etc.), sub-surface system could temporarily fail or in the worst case permanently fail
Remedial step to correct system failure without contingency for sub-surface system replacement	Attempt to remediate by fixing source of problem Dig up area bed and replace with new media
Remedial step to correct system failure with contingency for sub-surface system replacement	Attempt to remediate by fixing source of problem Dig up area bed and replace with new media Add new area bed or new shallow pressure trench and divert flow to this system. May have to install bottom on system to allow for diversion of flow if system was previously sitting on top of the area bed

Table C-2: Waterloo Biofilter	
Factors	**Treatment Specifications**
Waterloo Biofilter Treatment System	
Design criteria	Model # 11 - 1100 L/d (2 bedroom) system Model # 16 - 1600 L/d (3 bedroom) system Typical domestic wastewater: - 500 L/m^2/day or 50 cm/day for a 0.9 m deep bed Treatment improves if 50-66% of the effluent is recirculated to the septic system (must account for this additional flow in the design) For residential sewage Maximum Loading rate 750 L daily design flow per m^3 of biofilter medium (specified by OBC)
Treatment Capacity (L/d)	For residential units capacity ranges from 1 100 to 10 000 L/d
Treatment Performance for Nitrate (mg/L)	20 - 50% TN removal typical 25-30 % TN removal being average When 50% of effluent returned to the septic tank, the TN removal increases to 50 - 60% Nitrate: < 5 mg/L
Treatment Performance for BOD, TSS and TP (mg/L)	BOD < 10 mg/L, 90 -95 % removal TSS < 10 mg/L, 90 -95 % removal TP: no removal but an upflow chemical filter can be added as a module to remove P
System Reliability	System is reliable, provided: - owner should not use excessive disinfectant, bleach or fats during cooking -nozzles can become plugged
Potential for Odour Formation	Optional ventilation system Passive air vents through enclosure Activated carbon filter can be used Odour control necessary, if septic tank is unhealthy Odour problems can occur if water supply is from black shale or limestone containing iron sulphide
Maintenance Requirement	Persons authorized by manufacturer are required to service and maintain Biofilter Annual maintenance Owner not permitted to maintain Biofilter
Frequency for Media Replacement	Big System: replace 5% foam/year All foam should be replaced over 20 years On-site system: after 10 years, clean, replace and top up foam (approximately 25% of foam)

Table C-2: Waterloo Biofilter	
Factors	**Treatment Specifications**
Monitoring Requirement	Area Bed: Conduct sampling and testing in accordance with the requirements of the OBC - once during first 12 months - thereafter every 48-month period Shallow Buried Trench: every 12 months
Order of Magnitude Capital Cost	- 1 100 L/d (2 bedroom) and 1 600 L/d (3 bedroom) systems typically cost from $15 000 to $20 000 fully installed - this capital cost estimate incl. the septic tank, effluent filter, Biofilter, pumps, disposal bed, etc.
Order of Magnitude Operating Costs	$100 - $300 per year for maintenance agreement Electrical consumption have been report to be 451 kWh per year ($45.10 @ $0.10 per kWh)
Acceptance by MOE and Health Units	Ontario Building Code Approval of Waterloo Biofilter for meeting secondary effluent quality criteria (based on MOE letter dated June 26, 1996 and March 12, 1996) Building Material Evaluation Commission (BMEC) Approval of Waterloo Biofilter Area Bed System for tertiary level treatment- April, 1999 Health Units accept provided technology is approved under the BMEC. After BMEC approval, Health Unit checks distances, T times, etc. MOE has accepted system as per C of A applications
Number of Installations and Service Life	Number of systems in Ontario is greater than 1 300 Max observed service life is 8 years

Table C-2: Waterloo Biofilter	
Factors	**Treatment Specifications**
Waterloo Biofilter Sub-surface Discharge	
Type of Sub-surface Discharge System based on Soil Type	See Below
Design Criteria for Sub-surface System (based on BMEC Approval)	**Absorption System:** Stone layer of 200 mm (minimum) over 250 mm (minimum) of sand (with percolation time of 6-10 min/com) Provided that the underlying native soil has a percolation time of less than 6 min/cm, the water table shall be a minimum of 600 mm below the bottom of the stone layer required **Stone Layer** - $Q \leq 3\,000$ L/d: the loading on the surface of the stone layer should not exceed 75L/m^2 per day - $Q > 3\,000$ L/d: the loading on the surface of the stone layer should not exceed 50 L/m^2 per day **Sand Layer** The sand layer shall have a minimum area that is the greater of: - the area of the stone layer required, and - A = QT/850 where A = the area of contact, m^2 Q = the total daily design flow, L and T = the lesser of 50 and the percolation time of the underlying soil, min/cm In a raised absorption system, the sand layer shall extend at least 15 m beyond the perimeter of the system and distribution pipes, in any direction which the effluent entering the soil will move horizontally
Bed size (m/d) based on Soil Type. (Analysis used hydraulic load calculations for determining area)	1 min/cm to 20 min/cm = 400 m^2 20 min/cm to 50 min/cm = 600 m^2 50 min/cm to 125 min/cm = 850 m^2
Minimum Lot Area required for Treatment System per Soil Category (sum of disposal system and treatment unit area)	1 min/cm to 20 min/cm = 416 m^2 20 min/cm to 50 min/cm = 616 m^2 50 min/cm to 125 min/cm = 866 m^2
Does the system meet MOE reasonable use policy requirements?	Can usually obtain 10 - 15 mg/L TN or 75-80% removal of TN (including both Biofilter and Septic Tank operations) Achieved by recycling flows 20-30 times the design flow/day back to septic tank If removal through disposal system is included, may meet reasonable use
Life Expectancy of Sub-surface System	Waterloo Biofilter - predict that 90% of systems will last 20 years 5% will last 5 years

Table C-2: Waterloo Biofilter	
Factors	**Treatment Specifications**
Acceptance of Sub-surface System by MOE and Health Unit	MOE developed sizing calculations Health Unit relies on MOE/Building Code evaluation
Maximum Observed Life of Sub-surface System	Bed: 8 years Shallow Buried Trench: 6 years
Waterloo Biofilter Risk Assessment	
Potential for Treatment System Failure	Mostly related to use of disinfectant in a household (or other chemicals)
Remedial Step to Correct Equipment Failure	Remove source of chemicals, fats, etc. Pump failure, replace pump
Overall Impact of Equipment Failure on System Performance	Equipment failure does not affect bed because system stops putting water through bed Backed up sewage into yard is a possibility but this is a "quick fix"
Potential for Sub-surface System Failure	Bed fails based on excessive flows (ponding in bed)
Remedial Step to Correct System Failure without Contingency for Sub-surface System Replacement	Remove bed and put new bed in soil underneath, Bed should be fine provided it was not disturbed Remediate bed Shallow buried (pressurized) trenches, no options if remediation efforts fail
Remedial Step to Correct System Failure with contingency for Sub-surface System Replacement	Remove bed and put new ed in soil underneath, Bed should be fine provided it was not disturbed Remediate bed Shallow buried (pressurized) trenches, remediate or replace in another location

Table C-3: FAST Canada	
Factors	**Treatment Specifications**
FAST Treatment System	
Design Criteria	Fixed film, aerated system using combo of attached and suspended growth Pre-engineered, therefore flows are calculated and system is specified based on flow MicroFAST 0.5 flow range: 1 300 to 1 900 L/d MicroFAST 0.75 flow range: 1 900 to 2 850 L/d MicroFAST 0.9 flow range: 1 900 to 3 400 L/d MicroFAST 1.5 flow range: 2 850 to 5 700 L/d
Treatment Capacity (L/d)	For residential units capacity ranges from 1 900 to 10 000 L/d
Treatment Performance for Nitrate (mg/L)	TN: <10 mg/L, >70% reduction TKN: < 10 mg/L Nitrate: < 5 mg/L
Treatment Performance for BOD, TSS and TP (mg/L)	BOD: < 10 mg/L TSS: < 10 mg/L P: no removal
System Reliability	Smith & Loveless System Certifications: - U.S. Coast Guard - Canadian Great Lakes - UK Department of Trade - National Sanitation Foundation (NSF) International Standard 40, Class I - International Maritime Organization (IMO) 2 year warranty available, will soon be upgraded to 5 years If chemicals dumped, or other misuse by owner, warranty may be void If treatment system fails, can pump out solids and will remediate itself. Can also easily replace media if necessary No pumps required, system on grade
Potential for Odour Formation	Chemicals flushed into system in sufficient quantity, could kill off bacteria and cause odour If blower fails, no oxygen, anaerobic, could result in odour
Maintenance Requirement	Area Bed: Conduct sampling and testing in accordance with the requirements of the OBC - once during first 12 months - thereafter every 48-month period Shallow Buried Trench: every 12 months

Table C-3: FAST Canada	
Factors	**Treatment Specifications**
Frequency for Media Replacement	PVC media, does not corrode Never have to replace
Monitoring Requirement	Yearly for shallow buried trench
Order of Magnitude Capital Cost	$11 000 to $13 000 for 1 900 L/d (MicroFAST 0.5) system installed $12 000 to $14 000 for 2400 L/d (MicroFAST 0.75) system installed -these capital cost estimates also include the cost of a two (2) year inspection plan
Order of Magnitude Operating Costs	Electricity: 1/3 hp blower (for MicroFAST 0.5, 0.75 and 0.9 systems) No chemicals $185 - $200 per year for maintenance is typical after 2nd year
Acceptance by MOE and Heath Units	Building Material Evaluation Commission (BMEC) Approval of Bio-Microbic Area Bed System (models MicroFAST 0.25, 0.75, 0.9, and 1.5) for tertiary level treatment - November, 2004 Approved for a Northern Ontario Lodge >10,000 L/d for a C of A by MOE Prior to BMEC Approval the systems had been approved in certain areas: Ottawa, Lucan, Lambton County
Number of Installations and Service Life	130 residential units installed in Ontario (in 2004 and 2005) Service life of system 25 years More installations in U.S. where max. observed life is 30 years

Table C-3: FAST Canada	
Factors	**Treatment Specifications**
FAST Sub-surface Discharge	
Sub-surface System based on Soil Type	**Shallow Buried Trench (Clay):** majority of systems employ shallow buried trench follow Building Code specifications shallow buried trench for percolation times 125 min/cm or less Other disposal systems provided at owner's request
Design criteria for sub-surface system (based on BMEC Approval)	**Adsorption System:** Stone layer of 200 mm (minimum) over 250 mm (minimum) of sand The water table, rock, or soil with a T time of 6 or less or greater than 50 min/cm: shall be a minimum of 600 mm below the bottom of the stone layer required **Stone** - Q <3 000L/d: the area shall be such that the loading on the stone layer does not exceed 75 L/m^2 per day - Q >3 000L/d: the area shall be such that the loading on the stone layer does not 50 L/m^2 per day **Sand** Area of sand layer: A = QT/850 where A = the area of contact, m^2 Q = the total daily design flow, L and T = the lesser of 50 and the percolation time of the underlying soil, min/cm When the sand layer is installed in or on soil having a T time of greater than 15 min/cm, the sand layer shall extend at least 15 m beyond the perimeter of the system or distribution pipes if utilized, in any direction which the effluent entering the soil will move horizontally **Shallow Buried Trench:** - Length of distribution pipe (L) shall not be less than 30 m when constructed as a shallow buried trench
Bed Size (m/d) based on Soil Type. (analysis utilized hydraulic load calculations for determining area)	1 min/cm to 20 min/cm = 400 m^2 20 min/cm to 50 min/cm = 600 m^2 50 min/cm to 125 min/cm = 850 m^2
Minimum Lot Area required for Treatment System per soil category (sum of disposal system and treatment unit area)	1 min/cm to 20 min/cm = 416 m^2 20 min/cm to 50 min/cm = 616 m^2 50 min/cm to 125 min/cm = 866 m^2

Table C-3: FAST Canada	
Factors	**Treatment Specifications**
Does the system meet MOE reasonable use policy requirements?	Yes, see TN removals above
Life Expectancy of Sub-surface System	30 years, will not plug (or can be remediated), System is made out of plastic
Acceptance of Sub-surface System by MOE and Health Unit	MOE developed sizing calculations Health Unit relies on MOE/Building Code evaluation
Maximum Observed Life of Sub-surface System	At least 2 years, 30 years (potentially) in States
FAST Risk Assessment	
Potential for Treatment System Failure	Chemicals, paint, etc. discharged by owner could cause death of system Problem with blower results in no oxygen, therefore anaerobic Power outage, no air
Remedial Step to Correct Equipment Failure	Pump out solids Could easily replace media
Overall Impact of Equipment Failure on System Performance	If shallow buried trench used, will no longer meet tertiary effluent requirements and could plug Can remediate buildup in trench when system is operating properly, as high DO levels allow for remediation of bed
Potential for Sub-surface System Failure	If system fails, shallow buried trench could plug If hydraulic overloading, could have breakthrough
Remedial Step to Correct System Failure without Contingency for Sub-surface System Replacement	Remediate shallow buried trench by ensuring system working properly. High DO levels will allow bed to remediate If conventional bed, can be remediated
Remedial Step to Correct System Failure with Contingency for Sub-surface System Replacement	Remediate using existing system with high DO levels inherent in treatment Install new shallow buried trench disposal system