



REPORT TO: Regional Chair and Members of the Committee of the Whole

SUBJECT: Wainfleet Township - Lakeshore Area
Water and Wastewater Servicing
Final Report on Alternatives

RECOMMENDATION(S)

That Wainfleet Township Council endorse the following:

- Following completion of the tasks outlined below, staff report back to Wainfleet Township and Niagara Region Councils with a recommended option, cost and funding strategy for the project;
- Based on the public health, safety and environmental conditions in the Lakeshore Area of Wainfleet Township, Wainfleet Township Council confirm, in principle, their commitment to the municipal water and wastewater central servicing systems, as determined by the Environmental Assessment (EA) process, and endorsed by the Minister of the Environment of Ontario, with a number of conditions outlined herein.
- Wainfleet Township formally requests Niagara Region to act on its behalf as project manager for the Lakeshore Area water and wastewater servicing project to proceed with the next steps as outlined below:
 - Prepare background and pre-design information; develop and issue an RFP/draft contract document for a design/build type project for central water and wastewater servicing systems options; and prepare a preliminary design for the municipal systems; and
 - Prepare a final project cost estimate and cost allocation between the Niagara Region, Wainfleet Township and benefiting landowners.
- Wainfleet Township continue with the timely development of a Secondary Plan for the Lakeshore Area that will provide direction for the future of the community.
- In order to fully explore municipal water and wastewater central systems options (such as small bore pressure and gravity wastewater systems, and the provision of fire flows) and the potential to reduce costs, Regional staff apply for an administrative amendment, if required.

- Wainfleet Township conduct an appropriate review of other local municipalities and their connection policies and fees in support of the municipal water and wastewater central servicing systems.

That subject to Wainfleet Township's approval, Regional Council endorse the following:

- Following completion of the tasks outlined below, staff report back to Niagara Regional Council and Wainfleet Township Council with a recommended option, cost and funding strategy for the project
- Based on the public health, safety and environmental conditions in the Lakeshore Area of Wainfleet Township, Niagara Region endorse in principle the municipal water and wastewater central servicing systems, as determined by the EA process and endorsed by the Minister of the Environment of Ontario, with a number of conditions outlined herein.
- Subject to Wainfleet Township's formal request, Niagara Region act on Wainfleet's behalf as project manager for the Lakeshore Area water and wastewater servicing project; that Niagara Region proceed with the next steps as outlined below at an estimated cost to the Region of \$1,500,000:
 - Report back to Committee and Council on the joint Regional/Township process and structure to be used to review and select the preferred option through the RFP/draft contract process;
 - Prepare background and pre-design information, develop and issue an RFP/draft contract document for a design/build type project for central water and wastewater servicing systems options; and prepare a preliminary design for the municipal systems; and
 - Prepare a final project cost estimate and cost allocation between the Niagara Region, Wainfleet Township and benefiting landowners.
- Niagara Region encourage and support Wainfleet Township in the timely finalization of its Secondary Plan for the Lakeshore Area.
- Regional staff continue to assist Wainfleet Township in applying for grants or other funding from senior levels of government or other organizations.
- Additional costs for the option of providing fire flow supply be identified separately in contractor proposals for future consideration, prior to construction.

In order to fully explore municipal water and wastewater central systems options (such as small bore pressure and gravity wastewater systems and the provision of fire flows) and the potential to reduce costs, Regional staff apply for an administrative amendment, if required.

EXECUTIVE SUMMARY

The Wainfleet Lakeshore Community is an urban area in a rural setting comprised of approximately 670 permanent and 450 seasonal residences. There are two distinct issues that must be addressed: drinking water contamination and environmental degradation.

The density of development, poor septic system maintenance and local soil conditions have led to significant environmental deterioration and contamination of the groundwater. An area-wide Boil Water Advisory was put in place on April 10, 2006.

An Environmental Assessment was completed for the area. The Minister of the Environment endorsed the preferred alternative, which is to build municipal water and wastewater central systems, and sited a number of conditions that must be met prior to construction. As a result of the EA, this is the only servicing alternative available to the Township and the Region.

Under the Municipal Act, both the Region and Township have the ability and authority to build the necessary systems and to recover costs, some of which could come from development charges.

FINANCIAL IMPLICATIONS

Prior project funding is in place to cover the \$1,500,000 commitment to proceed with the next steps recommended in this report.

Costs of the entire Wainfleet servicing project are currently estimated at approximately \$72 million. These costs are comprised of about \$33 million that could be borne by Regional water and wastewater ratepayers and \$39 million by Wainfleet Township. These estimates are based on conceptual designs for the Environment Minister-endorsed, municipal water and wastewater central systems and professional input from engineering consultants.

Due to the need to minimize both costs and impacts to ratepayers, it is proposed that the central servicing be approved, in principle, subject to final approval of actual costs, and that work proceed in order to confirm:

- Exact costs through an RFP/draft contact process, including the extent to which costs may be reduced.
- The opportunities for cost sharing and cost allocation between existing and future ratepayers, and
- Funding sources from other levels of government that could be applied to reduce the impact on Niagara.

No additional funds are required at this time. Final funding requirements and allocations will be identified in the final report (see Table 7), subject to Regional Council and Wainfleet Council approvals of the recommended option.

PURPOSE

The purpose of the report is to recommend to Council the next steps in developing the most appropriate and cost effective central municipal solution for the Lakeshore Area of Wainfleet Township. This will address current public health and safety risks and environmental threats that confront Wainfleet's Lakeshore Area residents as a result of their water and wastewater systems. In doing so, this report summarizes pertinent facts and issues presented in numerous technical studies and staff reports conducted between 2001 and 2007, at a current cost of over \$1.5 million, excluding staff time/costs

The report also brings Council up-to-date on recent activities, including the results of the Technical Review Workshop undertaken in April 2007 and the Public Open House held in August 2007.

BACKGROUND

Significant problems with contaminated wells and aging/failing septic tank systems have been identified in residences located along the Lake Erie shoreline of Wainfleet Township. Studies conducted by Niagara Region Public Health (2001), Niagara Region Public Works (2002 and 2005) and the Ministry of the Environment (2003) all concluded that a sizeable number of private wells are contaminated with water-borne bacteria and that failing septic tank systems are contributing to the deterioration of local water quality in Lake Erie.

Regional studies concluded that inadequate and failing private septic tank systems are having a detrimental impact on groundwater supplies and on Lake Erie itself. Overall, soil conditions and fractured bedrock are not suitable for the effective management of septic effluent. In many cases, even properly constructed septic systems are not environmentally sustainable in this area. In order to ensure that the community was fully aware of the potential for a serious outbreak of waterborne illness, the Medical Officer of Health issued a Boil Water Advisory (BWA) for the Lakeshore Area on April 10, 2006. The BWA will remain in effect until a permanent solution is implemented.

From a land use perspective, development along the Lake Erie shore has occurred without an understanding of the cumulative and long-term effects of individual, random development actions. The Lakeshore Area remains the only area of significant population concentration within the Region yet to resolve a contamination issue of this nature.

The degree of contamination in the Lakeshore Area is considerable. Overall, the fractured bedrock aquifer is close to the surface and prevailing shallow soils provide little or no attenuation for effluent discharged from septic tank systems. These factors have combined

to create a situation destined to result in groundwater contamination. Given that the bedrock also serves as the primary water supply aquifer for most residences, high levels of bacterial contamination in local wells are inevitable and result in a public health and safety issue.

From a land use perspective, most development has taken place over an 80-year period without the benefit of effective planning controls. In the vast majority of cases, the predominance of small lots, inadequate soils and high development density precludes the possibility of replacing outdated and failing septic systems with properly designed and functioning systems that would meet today's standards, safeguard public health and safety and protect the environment.

REPORT

The report is set out under the following main headings:

- 1.0 Report Summary
- 2.0 Rules and Regulations, Roles and Responsibilities
- 3.0 Health Risks and Environmental Concerns
- 4.0 On-Site Sewage Disposal and Environmental Sustainability
- 5.0 Environmental Assessment Process and Alternatives Considered
- 6.0 Third Review Of Technical Alternatives
- 7.0 Planning Considerations
- 8.0 Public Health and Safety Considerations
- 9.0 Project Financing
- 10.0 Timelines and Next Steps
- 11.0 Conclusion

1.0 REPORT SUMMARY

Introduction

Studies conducted in Wainfleet between 2001 and 2005 have shown that a serious and systemic environmental and public health risk exists along the Lake Erie shoreline. Many private wells are contaminated with water borne bacteria as a result of failing septic systems, small lot sizes, and shallow soil over bedrock, allowing for infiltration of septic tank effluent into the groundwater.

Public Health

The province transferred governance of private sewage systems from the Environmental Protection Act to the Ontario Building Code in 1998 and responsibility for program administration was delegated to local municipalities. Public Health provides this service under agreement to the Township of Wainfleet and recovers its costs on a “fee for service” basis.

Based on technical study findings and consultation with a panel of national experts, the Region’s Medical Officer of Health issued a Boil Water Advisory to all residents of the Lakeshore Area in April 2006. This Advisory will remain in effect until further notice from the Public Health Department.

Key Study Findings

It has been suggested that Wainfleet’s problems could be resolved by having the Public Health Department inspect all private systems and enforce remediation of all deficiencies. This position does not recognize the complexity of the problem and the fact that:

- Sewage discharge from septic systems quickly infiltrates into the fractured bedrock that serves as a drinking water supply aquifer for the community, due to thin soil cover.
- It could take generations for the water table to clear itself, even if a new sewage collection system were to be installed immediately to prevent further contamination.
- 54 percent of the tested private wells are contaminated with coliform bacteria and 28 percent with E. coli, including some of those with “in-house” treatment devices. This signifies that the health risk from contaminated well water can not be eliminated through the use of household water treatment systems.
- There are currently about 1,320 lots in the community, including residential, commercial, municipal and vacant properties. Of the 1,267 single detached residential lots, about 60 percent can not satisfy Ontario Building Code requirements with either a conventional septic system or a private alternative sewage treatment system. In addition, due to local soil conditions, almost 90 percent of these properties are not environmentally sustainable; that is, on-site private systems will continue to have a detrimental impact on the environment.

Class Environmental Assessment

The Class Environmental Assessment (EA) process was initiated in June 2003 and after an extensive review, the Minister of the Environment endorsed the Wainfleet Servicing EA in September 2006. The approval expires in five years. The Minister-endorsed EA servicing solution is:

- **Wastewater:** extend municipal wastewater trunk system from Port Colborne and construct a local sewage collection system, and
- **Water:** extend municipal water supply from the existing system in Port Colborne and construct a local distribution system

For the purposes of this report, the above defines the municipal water and wastewater central servicing system.

Confirmation of EA Solution

The Class EA preferred solution was reviewed and confirmed in two separate technical workshops. The first workshop (the Value Analysis Workshop) was held in February 2005 and the second (the Technical Review workshop) in April 2007, following Council's direction to further evaluate alternative technologies.

An Expression of Interest was advertised in advance of both workshops soliciting alternative equipment, design concepts and costing information from suppliers and contractors.

The value analysis teams included Regional and Township staff, politicians, Wainfleet Public Advisory Committee members, engineering specialists, and contractors. The workshops reviewed all submissions and reached the following conclusions:

- On-site septic systems work for less than half the lots in the study area.
- The use of holding tanks is not considered viable since the Ontario Building Code dictates that tanks are only permitted where no other option is available.
- Individual water treatment devices will not eliminate the health risk.
- On-site systems have a greater life cycle cost than the Class EA recommended option of centralized systems, ultimately being more expensive for owners.
- Localized packaged treatment plants are more expensive to own, operate and maintain than connecting to the existing facilities in Port Colborne.
- The use of small bore gravity sewers or small bore low pressure sewers have the potential to reduce costs.
- The preferred option is a centralized water transmission/distribution system and wastewater collection/conveyance system connected to existing Regional treatment facilities in Port Colborne (as endorsed by the Environment Minister in the Class EA).

Planning/Development

- Regional Policy Plan allows water and sewer services to be extended outside urban area boundaries to correct health problems, as determined by the Medical Officer of Health.
- The Township is currently reviewing its Official Plan and Secondary Plan for the Lakeshore Area. Decisions on future growth and development are subject to these planning processes, both of which are open to public input under the Planning Act.
- Water and sewer pipe sizes and capacity will be designed accordingly, after these planning decisions have been made.

Project Costs

- Project development costs to date are approximately \$1.5 million.
- The Environment Minister-endorsed Class EA project is estimated to cost approximately \$72 million (\$22 million water and \$50 million sewer).

Cost Allocation (Who Pays and How Much)

- Funding from the provincial or federal governments would make the project significantly more affordable for residents. Funding opportunities will be pursued.
- To date, the Township has been unsuccessful in three attempts to obtain provincial and/or federal funding for this project.
- One factor that has likely negatively affected the success of previous funding applications is the high project cost relative to the low number of properties to be serviced. Other influencing considerations may have included the following: many of the properties are foreign owned, some are also operated as businesses, public investment in infrastructure may result in private gains, and cottages are fundamentally not primary residences.
- An example of a possible cost allocation, based on the existing two-tier relationship set out in the Municipal Act is shown below (excluding private lateral connection costs).

Capital Cost Sharing Between Region and Township	Wainfleet Twsp./ Property Owners	RMON	Total
• Municipal Wastewater System: Minister-endorsed option - conventional piped wastewater to Port Colborne	\$29 M.	\$21 M.	\$50 M.
• Municipal Water System: Minister-endorsed option - piped water from Pt. Colborne	\$10 M.	\$12 M.	\$22 M.
Total:	\$39 M.	\$33 M.	\$72 M.

Communication

An extensive communication program is in place and, to date, has gone well beyond the requirements of the Class EA. The program included community meetings, workshops, media releases, newsletters and websites designed to increase public awareness of the health and safety and environmental issues.

Legal

There are several Ontario statutes that speak to the responsibilities of the Township, Niagara Region, the Medical Officer of Health and the province in these circumstances. For example:

- Although the Township is responsible under the Ontario Building Code to regulate private sewage systems, Niagara Public Health provides that service under contract;
- Under the Municipal Act, although Niagara Region has exclusive jurisdiction over water production, treatment and storage, the Region and the Township otherwise share jurisdiction with respect to water and sewage works;
- The Health Protection and Promotion Act grants the Medical Officer of Health broad authority to address a health hazard; and
- The Ontario Water Resources Act permits the provincial authority to direct a municipality to establish water works or sewage works when deemed necessary in the public interest.

That said, Niagara Region and the Township jointly have the ability and legislative authority to establish municipal water and sewage works in the Lakeshore area. In addition, each municipality is obliged to make a fully informed decision as to how best to respond to this situation.

Conclusion

The level of effort over the past six years has been considerable. All relevant facts are before us. The preferred solution was confirmed on four separate occasions: namely, the completion of the draft EA document, the result of the Value Analysis Exercise, the outcome of the Technical Alternatives Review Workshop and the decision of the Minister of the Environment to endorse the project.

2.0 RULES and REGULATIONS, ROLES and RESPONSIBILITIES

The Wainfleet Lakeshore community is an unplanned residential area in a rural setting that developed randomly over the past 80 years. As a result of the development density, its area is significantly more urban than rural in character. Structures are generally small, densely packed and occupy undersized lots. There are approximately 1,120 detached residences of which roughly 60 per cent are permanent and 40 per cent are seasonal. In addition, there are about 130 dwellings situated on 20 multiple lots.

The permanent population is estimated at 2,000 to 2,500 residents. Anecdotally, occupancy peaks at 10,000 or more on a seasonal basis. The Lakeshore Area is the last significant urbanized concentration in Niagara Region to remain unserved by a municipal water and wastewater system.

Since April 2006, the Lakeshore Area has been under a Boil Water Advisory. This is the consequence of serious groundwater contamination resulting in a significant public health and safety concern. The Medical Officer of Health has determined that current conditions represent a substantive and unacceptable health risk. As determined by numerous technical and scientific studies, local groundwater contamination is caused by inadequate

and/or unsuitable soils for septic systems, poorly maintained septic systems and building lots that are simply too small for individual systems.

As mentioned, there is a variety of Ontario legislation relevant to these circumstances including:

- The Health Protection And Promotion Act
- The Environmental Protection Act
- The Ontario Water Resources Act
- The Municipal Act
- The Planning Act
- The Clean Water Act
- The Safe Drinking Water Act
- The Building Code Act

There is no single piece of legislation that governs the issues of safe drinking water and groundwater contamination. Instead, various Acts regulate the actions of several levels of government, including Ministries.

Is "do-nothing" an option?

Technically speaking, "do-nothing" is always an option. However, in this case, it is not the staff-recommended option. In fact, this option was considered and rejected in the Environmental Assessment carried out for the project. Considerable provincial legislation makes it clear that where a problem exists, and public health and safety is at risk due to the lack of adequate sewer and water facilities, the Ministry of the Environment (MOE) can require municipalities to take action.

Maintaining status quo on the Boil Water Advisory may mitigate some responsibility to protect residents, but it does not provide a solution to the corroborated groundwater contamination. If the MOE deems the groundwater contamination to be unacceptable, the Ministry could impose an order to take action under sections of both the Environmental Protection Act and the Ontario Water Resources Act.

Unlike the Medical Officer of Health or the MOE, the Township and the Region's Public Works Department are not obligated to respond to a private water contamination problem although, ironically, they have the ability and authority to rectify one by installing municipal water and sewage services. However, both the Township and Region are legally obligated to consider the issue.

The policy decision to 'do-nothing' can only be taken after careful consideration of the relevant criteria, particularly those related to health, social and financial issues. Even then, a properly informed decision to take no further action would not likely prevent either

municipality from being named as a defendant in a legal action should, for example, a person become sick after consuming tainted water.

Is "deferral" an option?

Similar to the "do-nothing option", deferral is always an option, albeit not a staff recommended one. If this is Council's preferred option, then it should be taken with great care to reduce liability. Since servicing is discretionary, Council must take this policy decision in good faith, after political, social and economic factors, are fully considered, as per the "do-nothing" approach.

Who should do something?

Under the Municipal Act, both the upper and lower tier municipalities have jurisdiction for water and wastewater systems. In keeping with past practice and legislation, Niagara Region is responsible for plants, major pumping stations, trunk mains and forcemains. Costs for any expansion or upgrade to these systems have historically been shared by the "Regional community" at large.

Wainfleet, as a local area municipality, is responsible for administration of the Ontario Building Code (OBC), along with ancillary codes (e.g. The Plumbing Code). The Township has chosen to contract the Public Health Department to enforce the OBC on its behalf. As noted previously, MOE also has jurisdiction over these matters and could conceivably order the Township and/or the Region to remedy this situation.

What are the trends in legislation?

The recently proclaimed (July 2007) Clean Water Act introduces several new duties, obligations and powers for municipalities. The Act's legislative and regulatory framework endorses a proactive and preventative approach to assuring drinking water quality. Although the new regulations will take time to unfold, it is clear that the Act's overall intent is to protect Ontario's drinking water sources within relatively short timelines.

Can individual systems be inspected and the legislation enforced?

Individual water and wastewater systems can be inspected, as is currently done. Public Health or the MOE can enforce relevant legislation. However, this could prove to be a futile and costly effort. For the majority of lots in this tightly developed area, lot sizes, system age and condition, and local soils simply render individual septic systems unsuitable, and underline the need for a central solution.

Can only one system be built at this time?

A water system definitely needs to be built to eliminate current public health and safety risks by providing safe drinking water to all residents. However, a sewer system is also required to reduce the hazards from contaminated groundwater and surface water, as well as effectively addressing environmental degradation caused by the defective septic

systems. Cost efficiencies can be realized by constructing both systems concurrently at a savings estimated at about \$6 million.

3.0 HEALTH & SAFETY RISKS and ENVIRONMENTAL CONCERNS

3.1 Initial Investigation: The Long Beach Sanitary Survey

In June 2001, Wainfleet Township requested that the Public Health Department conduct a sanitary survey in the Long Beach area. The study focused on observed environmental and potential public health and safety concerns associated with functionally inoperative, on-site sewage systems.

The survey concluded that 246 of the 286 lots surveyed (86 per cent) demonstrated visible or suspected evidence of sewage disposal malfunction. Most septic systems were ineffective in managing their level of usage and caused excessive effluent loading. This significant number of malfunctioning systems is a compelling statistic and indicator of general septic system failure in the Lakeshore Area.

Septic systems were determined to be malfunctioning as a result of improper design and connections, insufficient tile bed area, unsuitable soil conditions, limited land area, high water table, shallow bedrock, poor siting (e.g. septic tanks under buildings), construction of ancillary buildings, deficient maintenance and aging components.

The majority of the lots were too small to accommodate repairs or replacement, except for holding tanks. The 2001 report noted that holding tanks, which require regular and frequent pump-outs with treatment at a sewage treatment facility, are not a viable, long-term solution to address existing public health and environmental concerns. Consequently, recognizing that holding tanks are not permitted under the OBC as a viable, permanent community-wide alternative, Public Health concluded that a municipal central sewer system was required.

Some of the residences in this study area (220) have access to a private drinking water supply, subject to monitoring by the MOE. However, all other residents not connected to this system were notified by the Public Health Department of potential health and safety risks and the need for frequent testing and proper utilization of water treatment devices.

3.2 Further Scientific Investigations: Water Well Testing and Septic System Surveys

Following the 2001 Long Beach Sanitary Survey, concerns were raised about potable groundwater quality, environmental degradation, and the effectiveness of water and wastewater systems in neighbouring Lakeshore communities in Wainfleet. Subsequently, the Township solicited the assistance of Regional Public Works to gather additional information regarding physical and sanitary conditions in nearby hamlets.

From June 2002 to August 2005, Regional Public Works engaged MacViro Consultants to undertake a three-phased program to assess groundwater quality (i.e. the source of drinking water) and the condition of additional septic systems across the Lakeshore Area, outside of Long Beach. The consultant also examined local geology, hydrogeology and land use.

MacViro's three water quality studies were completed independently. The Phase I Study (June 2002), focussed on the communities of Belleview Beach, Morgan's Point, and Camelot Beach. This included 128 residences, spanning the Lakeshore Area from the Wainfleet/Port Colborne Townline Road in the east to Station Road in the west.

The Phase II Study (March 2005) was conducted to fill perceived data gaps. This spatially-distributed, random sampling program tested 107 wells from permanent residences across the entire Lakeshore Area.

The Phase III Study (August 2005) was carried out to account for seasonal residents in the Lakeshore community. Using the same random sampling approach previously employed, 45 residences were surveyed, sampled and tested in an accredited laboratory. MacViro's three drinking water quality and septic systems surveys included voluntary inspections and testing of 280 permanent and seasonal residences. Findings of these unbiased and statistically random surveys are presented in Table 1.

Table 1

Summary of Results of Water Well and Septic System Surveys				
Survey Parameters	2002 Survey (Permanent Residents)	2005 Survey (Permanent Residents)	2005 Survey (Seasonal Residents)	Total Samples
Number of Residents Contacted	160	505	389	1054
Number of Residences Surveyed ¹ .	128	107	45	280
E. coli Exceedences	39 (30%)	27 (25%)	11 (24%)	77 (28%)
Total Coliform Exceedences	66 (52%)	59 (55%)	27 (60%)	152 (54%)
Septic Tanks >20 Years Old ² .	45 (41%)	44 (41%)	25 (56%)	114 (43%)
Building Code Non-Compliance	49 (44%)	52 (49%)	15 (33%)	116 (44%)
Inadequately Maintained Systems	41 (37%)	24 (22%)	20 (44%)	85 (32%)

¹. 160 samples involved in laboratory testing

². 111 residences involved in household questionnaire

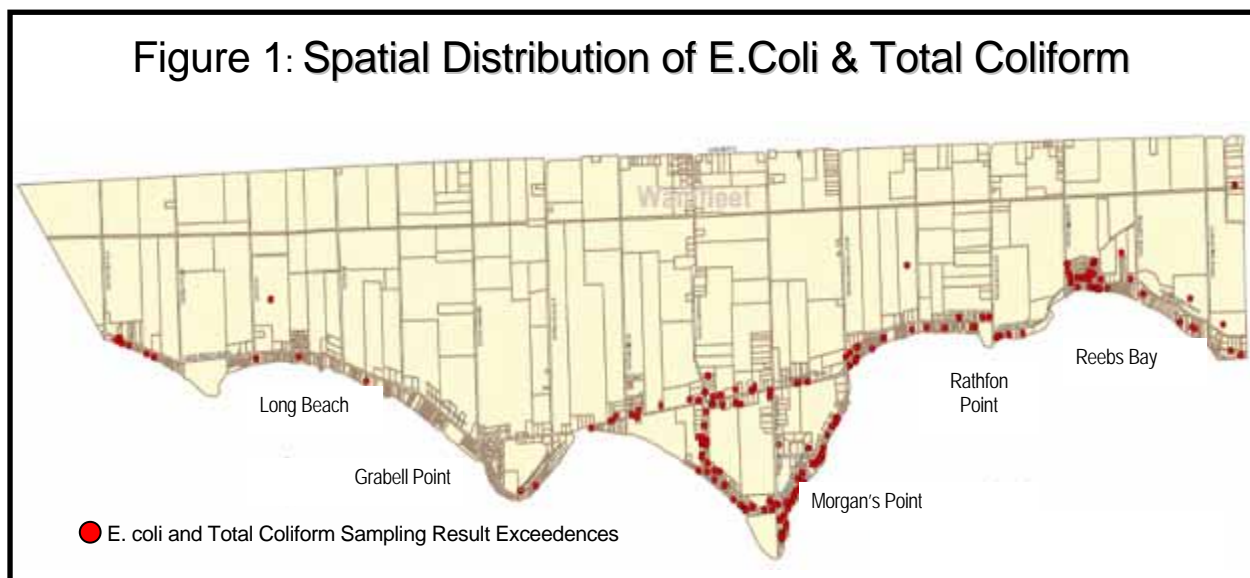
3.3 Findings of Scientific Investigations

Although some variability was observed across the three surveys, the main points of note are summarized as follows:

- Significant bacterial contamination of water wells was proven. Water quality results from laboratory tests showed that 28 per cent of all dwellings sampled reported E.Coli in the groundwater
- More that half the wells tested had total coliform exceedences in the groundwater (52 to 60 per cent)
- 41 - 55 per cent of the septic systems on sampled properties were older than 20 years
- 33 - 49 per cent of the septic systems on sampled properties did not meet current requirements for setbacks between wells, property lines and septic systems
- 57 per cent of the sampled lots were considered to be too small for repairs or replacement of on-site septic systems and can only accommodate holding tanks

3.4 Distribution of Contaminated Well Samples

The spatial distribution of contaminated water wells across the Lakeshore Area is illustrated on Figure 1. Concentrations of contaminated wells can be seen in the vicinity of Reeb's Bay, Rathfon Point, Morgan's Point, Lakeshore Road, Grabell Point and on the western extremity of the Township.



It is evident that the problem is community-wide. The sampling program included voluntary inspections and laboratory testing of 280 permanent and seasonal residences. These surveys identified a pattern of well contamination fully extending along the Lake Erie shoreline from the Township's western to eastern boundaries.

3.5 Local Geology

MacViro's examination of local geology revealed the existence of bedrock at shallow depths with a thin overburden soil cover. Hydrogeologically, a significant portion of the

study area was defined as sensitive due to the presence of the fractured bedrock aquifer close to the surface. The “aquifer” is the underground geological formation that acts as the source for drinking water drawn by local wells.

The very thin overburden provides little or no attenuation to septic effluent discharged from individual septic systems into the groundwater aquifer. In addition, many individual lots are too small to allow for sufficient dilution of septic effluent.

The fractured bedrock serves as the drinking water supply aquifer for the Lakeshore community. Geological, hydrogeological and land use information (e.g. lot size and septic systems) all point to significant potential for contamination of the drinking water supply from local septic tank effluent. Septic tank effluent is made up of liquid human waste containing bacteria and other pathogens that, over decades, has significantly contaminated the Lakeshore community’s drinking water source.

3.6 Who Drinks the Water?

During the MacViro surveys, information regarding treatment systems was obtained by interviewing permanent and seasonal residents and, where possible, by visual observation. Various water treatment systems were observed, including a combination of disinfection, distillation and water softening systems. Some residences visited had no treatment system in place.

Residents interviewed were asked if they drank water from the household source. In the 2005 surveys, 62 per cent of the permanent residents verified that one or more family members consumed on-site well water, as did 36 per cent of the seasonal residents. The consultants inspected on-site water treatment systems used by residents consuming well water. Particularly, they examined their ability to remove microbiological parameters (e.g. coliform or E. coli bacteria). Their findings included the following:

- 24 per cent of the permanent population sampled are exposed to health and safety risks related to their drinking water source and the lack of adequate treatment
- 80 per cent of seasonal residences on sampled properties have either no treatment system in place, or rely on treatment systems that are incapable of removing or deactivating microbiological parameters.

In addition to reporting exceedences in total coliforms (a health related parameter used to indicate the presence of harmful bacteria), 28 per cent of the wells surveyed reported exceedences in E. coli. This form of bacteria has severe pathogenic effects on human health.

Overall, the water quality survey program identified a significant impact on local water supplies from malfunctioning, private sewage disposal systems. The surveys also confirmed potentially serious human health and safety risks facing residents in the concentrated urban areas along the Lakeshore. This was reported in PWA 07-2003 and PHD 07-2003.

Immediately following completion of these studies, Public Health staff visited individual residences where water sampling results identified the presence of contaminants. Staff provided occupants with a public health interpretation of the analytical laboratory results. Public Health also publicly notified residents to boil well water before consumption or use an alternative water supply, unless tests consistently returned bacteria-free results.

Advertisements were regularly placed in the local newspaper, warning residents that a significant number of wells in the community are contaminated. These public notices advised residents to regularly submit samples for bacteriological analysis. Property owners were also notified by letter, fact sheets, paid newspaper ads, media coverage and website information.

4.0 ON-SITE SEWAGE DISPOSAL and ENVIRONMENTAL SUSTAINABILITY

4.1 On-site Sewage Disposal Study

While the previously-mentioned surveys identified deficiencies in private sewage treatment facilities across the Lakeshore Area, they did not include reviewing the feasibility of upgrading or replacing individual septic systems in accordance with prescribed provincial standards. In early 2005, Regional Public Works engaged the services of AMEC Earth and Environmental to undertake a desk-top analysis of private septic disposal systems for all lots within the approximately 16-kilometre Lakeshore study area.

In Ontario, septic systems for residential lots, like those typical of the Lakeshore Area, must be designed in accordance with the Ontario Building Code (OBC). In Wainfleet, the OBC is administered by the Public Health Department, on behalf of the Township. OBC approval is primarily contingent on the size of the lot with no consideration given to the impacts of sewage discharge on the environment (e.g. groundwater).

Although most systems were installed decades ago without the benefit of current OBC requirements, all septic systems must be replaced over time. Recognizing this, AMEC undertook a feasibility study to determine the minimum on-site sewage design requirements for lots in each soil zone in the Lakeshore Area. In judging the effectiveness of all individual on-site sewage disposal systems, the following criteria were considered:

- System ability to meet OBC regulations for set-backs from property lines and structures
- System ability to satisfy the current code for septic tank size and leaching tile length
- Soil suitability for leaching tiles and ability to provide sufficient distance above local bedrock, low permeable soil, or groundwater
- Whether a sewage breakout from the ground surface could be expected

4.2 Compliance with OBC

Using these criteria, the consultant assessed whether OBC standards could be satisfied on every residential lot (excluding multiple and commercial properties that are covered by different regulations). Supporting material included Assessment Roll information, Regional digital mapping and water table and bedrock data derived from borehole logs.

Properties were categorized according to their ability to meet the minimum lot size for a standard house using a conventional septic tank and leaching tile system. Where minimum OBC lot sizes could not be met, AMEC assessed the opportunity for an alternative treatment system (e.g. biofilter system). Results of the assessment, showing the number of lots that satisfy OBC requirements, are summarized in Table 2. Details on the assumptions used for this assessment are provided in Appendix 4.

Table 2

Ability to Satisfy Ontario Building Code (including lots with a house and vacant lots)		Lots	
		(#)	(%)
Lots meeting OBC with <u>conventional</u> septic tank systems:	- Lots with houses	294	23%
	- Vacant Lots	37	3%
Lots meeting OBC with <u>alternative</u> systems:	- Lots with houses	149	12%
	- Vacant Lots	37	3%
Lots <u>not meeting</u> OBC for on-site servicing:	- Lots with houses	677	53%
	- Vacant Lots	73	6%
Total (excludes multiple residential/commercial (25) lots or municipal (28) lots)		1267	100%

Table 2 depicts the number of lots in the Lakeshore Area that have existing residences or are vacant. Multiple residential and commercial lots (25) and municipally-owned lots (28), such as road allowances and remnant parcels, are not included.

In the Lakeshore Area, only 23 per cent of the lots have sufficient area to satisfy OBC requirements for a conventional septic system. Most of these are found in the sand dune area at the east end of the Lakeshore (see Figure 2). There are also 149 (12 per cent) smaller scattered lots that could only be serviced by private, OBC-approved alternative treatment systems (e.g. bioreactors, organic filters, etc.) and not by conventional septic systems.

The most striking conclusion of the “On-site Sewage Disposal Study” is that 677 lots with houses (53 per cent) are too small to satisfy OBC standards, including alternative systems. Servicing such lots could only be accommodated by holding tanks, which would require household sewage to be taken outside the Lakeshore Area for treatment and disposal.

4.3 Is OBC Compliance Enough to Protect the Environment?

The foregoing section dealt with the OBC approval requirements and their relationship to the size of individual lots. The second part of the AMEC study examined the

consequences of many sewage systems discharging to the local environment, specifically the long-term impacts of septic systems on groundwater.

Under the OBC, the design and review of any sewage disposal system for a single house does not take into account the effect of sewage on the environment. In fact, OBC design requirements are unrelated to environmental concerns beyond the first one and a half metres below the surface. This is largely because OBC standards were primarily designed for new development on large lots.

Simply speaking, the OBC only considers groundwater conditions near the surface and the ability to put liquid waste into the ground without surface “breakouts”. Environmental impairment related to discharge limits for such parameters as E. coli, coliform bacteria, harmful micro-organisms, nitrates and phosphorus are not addressed.

However, given the unique geological setting of the Lakeshore Area, it is important to know if sewage disposal from septic systems is cumulatively generating more effluent than the soils and groundwater can assimilate. If so, this situation would be considered unsustainable over time.

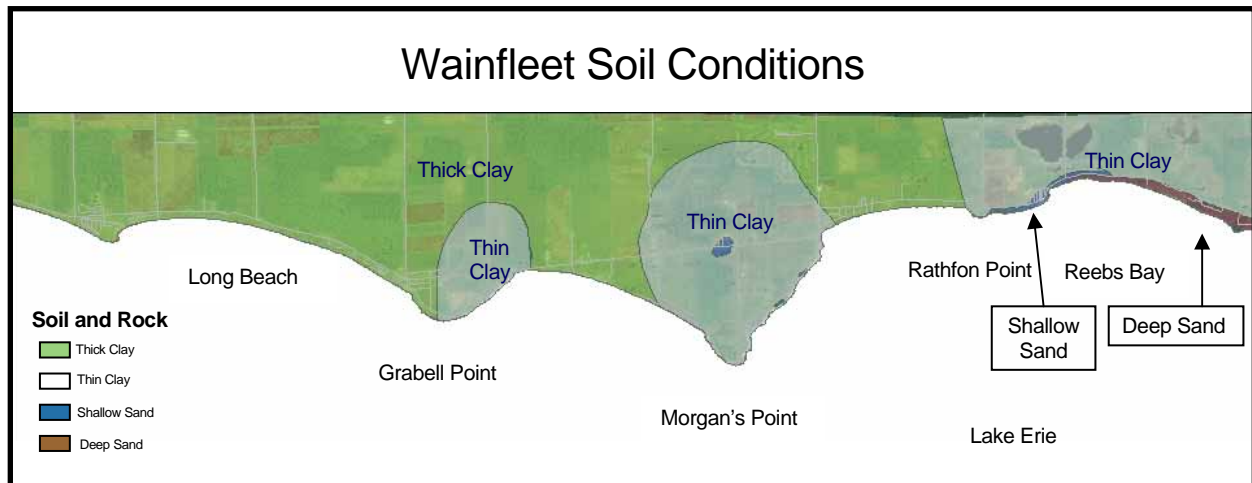
The Lakeshore Area has extensive areas of shallow bedrock. Within the bedrock, a series of cracks and voids act as conduits for the fast transfer of groundwater from one area to another. Therefore, without a sufficiently thick layer of low permeability soil over the bedrock to retard flow, effluent will travel through the shallow bedrock and rapidly reach the groundwater. In many parts of the Lakeshore Area there is insufficient time for the natural treatment of septic effluent through the assimilation process.

Typically, groundwater underlying a thick layer of clay is less likely to be contaminated as it is more difficult for sewage leachate to penetrate this relatively impermeable barrier. On the other hand, thin clay and shallow bedrock cannot effectively protect a groundwater aquifer as leachate will rapidly travel through cracks in the bedrock. Similarly, a thin layer of sand offers little protection as leachate can easily infiltrate this medium.

4.4 The Lakeshore’s Physiographic Areas

Using information on the soil, rock and groundwater conditions, AMEC determined whether residences in each physiographic area are generating more effluent than local soils and groundwater can assimilate without producing unacceptable groundwater contamination. The term “physiographic” refers to the physical terrain features of the Lakeshore Area, particularly below the surface. The physical conditions that determine the effectiveness of on-site sewage disposal are shown on Figure 2.

Figure 2



Recognizing some variability in the physical setting, four distinct areas were identified within the Lakeshore Area. The prevailing local soil and rock conditions encompass the following four categories:

- Deep sand dunes - These areas are composed of deep sand with groundwater depths that do not restrict disposal system design. These are found predominantly in the extreme eastern end of the Lakeshore Area, along the lake, east of Quarry Road to the Township boundary.
- Shallow sand overlying bedrock - These sand areas are not thick enough for conventional below-ground disposal systems to be installed without modification. Shallow groundwater levels place restrictions on disposal systems. Such areas are found in the eastern part of the study area, along the lake between Rathfon and Quarry Roads, and in pockets along the eastern side of Morgan's Point.
- Deep clay deposits - These are areas of low permeability clay soil of sufficient thickness to protect the groundwater. Such areas cover most of the western and central parts of the Lakeshore Area, excluding Grabell Point and Morgan's Point.
- Thin clay (aquitar) overlying shallow bedrock - These areas are characterized by a thin clay layer that does not protect the groundwater from contaminants. Such areas include most of Grabell Point and all of Morgan's Point.

In addition to the above soil conditions, there are areas with a high water table, especially at the base of the sand deposits.

4.5 Summary of Environmental Sustainability Study Findings

To assess current sub-surface conditions, AMEC adopted the same modelling procedure developed by MOE to determine a new lot's suitability for the installation of a septic system. The environmental sustainability analysis considered the total septic system effluent generated by lots across the Lakeshore Area and the amount of contaminants

discharged into the groundwater. Details on the consultant's approach and methodology are provided in Appendix 5.

Based on technical data related to local soil and rock categories, areas considered environmentally acceptable (i.e. where groundwater contamination would be within acceptable limits) were determined. Findings of this phase of the AMEC study are as follows:

- 556 (49 per cent) residential lots are located in environmentally acceptable areas. These tend to be deep clays. Some of these lots still may not meet OBC requirements.
- 564 (51 per cent) lots are in areas where there is a great likelihood that unacceptable groundwater contamination is currently taking place. Some properties, but not all, may meet OBC requirements. Installation of new septic tank systems in such areas would further exacerbate the situation.

In conclusion, considering both the ability of lots to satisfy OBC standards (i.e. as described in Section 4.3) and their cumulative, sustained negative environmental effects, the AMEC study determined that:

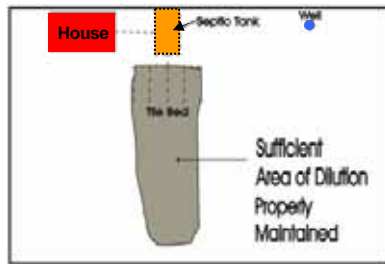
- Only 148 (13 per cent) of the single residential lots meet OBC servicing requirements and are located in environmentally acceptable areas
- 973 (87 per cent) of the single residential lots are deficient. These properties either do not meet OBC on-site servicing requirements, or are located in environmentally unacceptable areas, or both.

These findings demonstrate that even lots that could satisfy OBC requirements are situated in areas where contamination is likely to be at an already unacceptable level. Even the replacement and upgrading of private on-site sewage treatment systems in accordance with OBC standards will not improve the quality of well water drawn from the local aquifer, nor allow the aquifer to be naturally rejuvenated.

Overall, community contamination issues are wide-spread. Contaminant sludge has progressively accumulated in the aquifer over time. An illustration of how contamination from defective septic systems can impact adjacent properties and contaminate the groundwater is provided in the Figure 3.

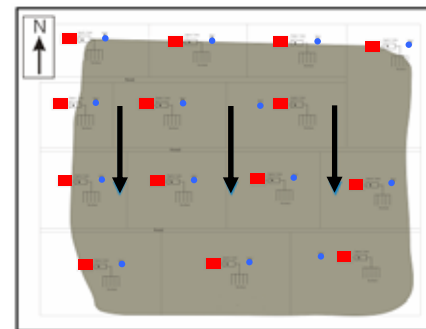
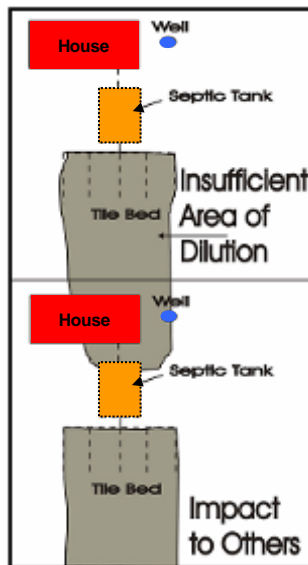
Figure 3
Lot Size, Soils and Maintenance Impacts

Ideal Lot Size Wainfleet Situation Possible Future Scenarios



Lots must be large enough to:

- Provide sufficient separation distance between septic system and water well
- Accommodate a properly functioning tile bed.



For clean drinking water, both dissolved plume and sludge need to be removed.

4.6 Can the Groundwater Recover?

As noted, local groundwater is the primary potable water source for most Lakeshore Area residents. The question of the amount of time required for natural resuscitation of the aquifer is relevant to any decision on the long-term use of private wells and the rationale for providing a piped potable water supply.

MacViro consultants were asked to provide an estimate of the residence time of local contaminated groundwater in the Lakeshore Area. Using published scientific data (geological and hydrogeological) and borehole information collected during field investigations, the respective flushing times of dissolved contaminants in different typical soil and rock types were estimated.

The technical answer to this question of aquifer restoration is complex. However, succinctly, the consultant estimated subsurface contaminant travel times based on groundwater velocity, distance and the porosity of different soil and rock materials. Based on this assessment, flushing times for dissolved contaminants were determined to conservatively range from about 10 to 40 years in sand, 25 to 130 years in fractured rock, 1,500 to 7,500 years in silt, and even longer for clay. It should be noted that these estimates do not account for additional contamination related to the bio-accumulation of sludge that would act as a breeding ground for additional bacteria.

Simply stated, it would take hundreds of years for parts of the Lakeshore Area's local aquifer to return to safe background conditions, even if the use of septic systems ceased today. Technical details related to this assessment are provided in Appendix 6.

4.7 Lake Erie Shoreline Water Quality

The primary focus of the Wainfleet Servicing project is driven by the public health and safety risks and environmental issues faced by Lakeshore Area residents related to contaminated drinking water and polluted surface water runoff. The project's objective is not specifically to clean up Lake Erie.

In October 2003, the Ministry of the Environment (MOE) released a report addressing localized environmental problems in the nearshore of Lake Erie, including the Wainfleet shoreline. Concerns about malfunctioning septic systems that could potentially contaminate surface drainage to the Lake were examined, as well as contaminant levels on local beaches.

The provincial study provided extensive technical data on water quality characteristics and identified excessive algae fouling close to the shore caused by high levels of nutrients, particularly phosphorus. The source of phosphorus, a significant factor contributing to nutrient loading, was not identified. However, the provincial study concluded that the establishment of sanitary services along the shoreline would serve to limit future nutrient discharge from groundwater impacted by failing septic systems.

5.0 ENVIRONMENTAL APPROVAL PROCESS and ALTERNATIVES CONSIDERED

5.1 The Provincial Approval Process

In Ontario, most municipal infrastructure projects must follow the prescribed provincial process set out in the Environmental Assessment Act. The Environmental Assessment (EA) process focuses on identifying, in an objective and scientific manner, the best environmental solution for a problem. In doing so, the assessment must be based on a broad definition of the environment that considers public health and safety, natural environment, social/cultural, economic/financial, legal/jurisdictional and technical impacts of any proposed project.

The EA process also imposes high standards of community outreach, input and communication. In addition, the process and the "preferred alternative" must meet stringent approval requirements imposed by the Minister of the Environment. These provincial legislative requirements must be met before any system is built in Wainfleet.

The Environmental Assessment process provides a formal method for evaluating a proposed undertaking. The main steps include: describing the problem, identifying and evaluating alternative solutions, determining environmental impacts, describing how these impacts can be eliminated or mitigated and selecting a preferred solution. Explicit provisions for notifying and consulting the public, informing agencies, documenting the process and securing provincial approval are set out in the Act.

Simply speaking, the EA process requires evaluation criteria to be objectively developed with public input prior to considering any technological solutions. Following this, a brainstorming session is held with technical experts to consider a broad range of alternative solutions. Finally, all reasonable alternatives are evaluated and the recommended solution is presented to the affected community. As such, the mandatory EA process integrates the elements of objectivity, transparency, inclusiveness, technical expertise and public openness. It is the primary mechanism to resolve complicated and contentious infrastructure issues across the province.

With the adoption of PWA 7-2003 in January 2003, Regional Council formally initiated the Wainfleet Class EA process. After an extensive 31-month period, a Notice of Completion was issued on July 18, 2005, signifying submission of the required documentation to the Minister of Environment. During that period, extensive public consultation was carried out with Lakeshore Area residents, including the establishment of a Public Advisory Committee. Appendix 10 illustrates the project timeline.

The Wainfleet Water and Sewer Servicing EA document describes how a range of alternatives were considered as possible solutions to Wainfleet's public health and safety and environmental problems. In brief, these included:

- Constructing local water and wastewater piping systems and connecting them to Regional water and wastewater treatment plants in Port Colborne
- Establishing new central systems in the Wainfleet area
- Improving/replacing existing on-site systems (including septic systems and alternative on-site technologies)
- Promoting water conservation and demand management practices and
- Introducing alternative on-site technologies

The steps followed in the EA process and how a decision on selecting a preferred water and wastewater solution was reached are summarized in the Appendix 11.

5.2 The Preferred Water and Wastewater Solutions

The preferred water servicing solution identified in the EA process involves extending a new municipal water supply from the Region's Port Colborne water treatment plant and constructing a local distribution system in the Lakeshore Area. Similarly, the preferred wastewater servicing solution includes extending the Regional trunk system from the Seaway wastewater treatment plant in Port Colborne and constructing a new local sewage collection system.

5.3 Additional Review of Alternative Technologies: The Value Analysis Exercise

Some residents have continued to assert that technological alternatives to a central piped water and sewer system were not fully considered in the Wainfleet Class EA process. This assertion is incorrect.

In October 2004, prior to the submission of the EA documentation to the Minister of the Environment, staff began a process to re-assess alternative servicing solutions by way of a Value Analysis Exercise (VAE). The VAE followed a “value engineering” approach similar to others conducted for similar, large scale infrastructure projects elsewhere in the Region.

“Value engineering” is an approach that uses a variety of technical expertise to achieve the best design solution. The process explores all options and ideas for consideration and development, follows a prescribed methodology and is conducted by an accredited value engineering professional.

Regional staff undertook an enhanced value engineering approach for the Wainfleet servicing project. Whereas a value engineering team is traditionally comprised of design engineers, facility operators, and contractors, the Wainfleet project team was expanded to include MOE representatives, Public Health staff, Township staff, local politicians, Wainfleet Public Advisory Committee members and interested community observers.

This wide range of expertise was deliberately selected, as Public Works staff felt that a more broadly-representative project team would be better equipped to identify and analyse all feasible design alternatives, from both a technical and non-technical perspective, and to review the EA preferred alternative for the Lakeshore Area.

The VAE had two phases: a formal request for technical information from system proprietors, followed by the multi-disciplinary workshop. Technical information requests were sent to more than 60 water and wastewater technology vendors asking for up-to-date data on proprietary systems that vendors claimed could address the Lakeshore Area’s servicing needs.

In general, these were grouped into three water and wastewater categories: individual or private on-site systems, cluster systems and centralized systems. This technical information allowed experts to fully address claims made by each vendor and determine their applicability to the Lakeshore Area’s specific physical conditions.

Over a seven-day period in February 2005, workshop participants evaluated over 170 servicing ideas and creative possibilities. The VAE team identified numerous design, construction and operational ideas that could lower costs without reducing the functional adequacy and reliability of the systems. Details of the VAE workshop were provided in PWP 67-2004 and PWA 101-2005. Examples of some of the water and wastewater alternatives examined are listed in Table 3 below:

Table 3

Examples of Servicing Solutions Considered in the VA Workshop	
• Solar aquatic systems	• Expanding the private water system
• Water consumption fixtures and appliances	• Low pressure, steady flow water system
• Chemically assisted filtration systems	• Localized treatment facilities
• UV disinfection	• Sewage lagoons
• Reverse osmosis	• Biological treatment systems
• Sand/media filters	• Effluent disinfection processes
• Wetlands	• On-site private treatment alternative
• Vacuum collection systems	• Bioreactor systems
• Low pressure sewers	• Home-based treatment systems

During the workshop, the VAE Team evaluated and eliminated most of these servicing alternatives based on the following:

- Inability to satisfy OBC, MOE, or Public Health Department requirements
- System ineffectiveness regarding local geology, hydrogeology and land use
- Limited or no performance history in Ontario
- Potential for adverse water quality outside municipal control
- Substantially greater life cycle costs and higher annual than equivalent costs for the modified baseline system.

Based on the conclusions reached at the workshop, the VAE Team recommended that the EA preferred alternative, including consideration of the small-bore options, be carried forward as the most cost-effective and technically appropriate servicing solutions. The VAE Team recommended that these options should be further evaluated as part of the detailed design process. The VAE Team's "constructability" refinements have the potential to add value, trim capital costs and reduce life cycle costs.

The VAE brought together the best available experts to review and examine a wide range of options and identify the best servicing solution for the Lakeshore Area. Experts presented scientific evidence confirming the seriousness of the Lakeshore's public health and safety situation and introduced technical information underscoring the need to address environmental contamination risks.

During the VAE Workshop, Wainfleet Public Advisory Committee (PAC) members and politicians developed a first-hand understanding of local conditions, the results of additional technical studies and the rationale for the elimination of various alternative technologies. The PAC participated in an open and unbiased workshop. Members expressed support for a process that confirmed the need for community-wide services,

ensured that options were properly and fairly defined, and identified the most appropriate solution.

In the opinion of the VAE Team, no community-wide solution, other than the piped municipal systems proposed in the draft EA, could effectively address the pressing public health and safety and environmental concerns faced by Lakeshore residents. The VAE Team also identified potential technical refinements and cost savings to the EA-proposed solution, including shallow insulated water pipes, smaller pipe diameters, rock trenching, shallow burial with insulation, chemical injection, storage tanks, booster stations and prefabricated pumping stations.

The VAE workshop conclusions, including confirmation of the municipal piped water and sewer solutions, were reported in the EA document that was submitted to the Minister of the Environment in July 2005.

5.4 EA Approval by the Minister

On September 25, 2006, the Minister of the Environment, having carefully considered a variety of issues raised by the public, rendered a decision to allow the Wainfleet Servicing project to proceed. This decision was made following a thorough 14-month Ministry review of the legislative requirements, technical documentation and public input.

Regarding issues and concerns raised by area residents, the Minister of the Environment noted that she is satisfied with the work done to date by the Region and Township, which allowed her to approve the project. In her correspondence, the Minister noted that:

- “I am satisfied that the extent of the severity of the problem has been adequately demonstrated through these studies and reviews, and that the project is warranted to address environmental and health and safety problems associated with the failure and malfunctioning of the existing septic systems...”
- “I am satisfied that the Region and Township considered a reasonable range of solutions, including innovative technologies...”
- “I am satisfied that the results of the Value Analysis are reasonable, effective and impartial...”
- “I am satisfied that no significant concerns have been identified that undermine the effectiveness of the proposed project.”

5.5 Conditions of EA Approval

The Environment Minister’s decision to allow the preferred solution to be implemented is conditional upon the Region and Township satisfying a number of prescribed conditions and other permits. Such conditions are typically required in similar undertakings. Prior to proceeding with construction of the Minister-endorsed water and wastewater system, the following must be completed and results presented to affected property owners:

- An Archaeological Assessment

- A Cost Evaluation and Sharing Plan (including, but not limited to, detailed cost estimates, cost-sharing scenarios and contingency measures)
- A Social Impact Assessment
- A Natural Resource Impact Assessment on the system right-of-way
- Public consultation to advise Lakeshore residents on progress on the above studies, prior to commencement of construction.

All of the above studies must be completed before construction can commence. However, to gain an understanding of prevailing socio-economic circumstances in the Lakeshore Area, a Social Impact Assessment is currently underway.

5.6 Significance of EA Approval

The significance of receiving Ministerial approval for this project cannot be underestimated. Notwithstanding other matters, the approval signifies that the MOE's technical staff and the Minister, herself, are confident that the project is the best environmental solution for the Lakeshore Area. The approval also recognizes that potential negative environmental effects can be eliminated or effectively mitigated.

The approval represents a culmination point in the process which, subject to refinements identified by the above mentioned studies, will allow the confirmed public health and safety risk and environmental issues to be resolved. Details on the Minister's approval were provided in PWA 181-2006.

The EA process is broadly recognized as the most effective mechanism to identify the best infrastructural solution for difficult and complex environmental issues, like those currently faced by Lakeshore Area residents. The Minister's approval represents a valuable outcome to a process that, conservatively, has lasted seven years. Under the Environmental Assessment Act, this approval will expire in September 2011.

6.0 THIRD REVIEW OF TECHNICAL ALTERNATIVES

In the fall of 2006, prior to the Minister's EA approval, overtures by equipment suppliers were made to staff and Regional Council regarding possible private sector involvement in various aspects of the Wainfleet Servicing project. This included design, construction, project management, financing, ownership and operation. In response, Regional Council directed staff to conduct an additional assessment of alternative approaches to ensure that current innovative technologies and project delivery mechanisms were assessed.

With the adoption of PWA 172-2006 and PWA 181-2006, Public Works staff initiated a two-step process to ascertain the interest of technology vendors, engineering groups and business consortia and assembled an expert panel to undertake a third technical review of possible options. The objective was to further review alternatives and identify refinements

to the Environment Minister-endorsed solution that could reduce design, construction and operating costs.

6.1 Requests for Expressions of Interest

In late November 2006, Expressions of Interest (EOI) solicitations were made to the industry regarding alternative technologies, innovative concepts and project delivery approaches. Twenty-two responses were received asking for technical information and eight bona fide EOI submissions were subsequently obtained. This was reported in PWA 46-2007.

These submissions formed the basis for the assessment carried out by the Technical Review Team. This information supplemented material previously received from industry representatives as part of the Value Analysis Exercise (VAE) conducted in February, 2005. Where different technological information or new data was provided (i.e. different from the previous Value Analysis Exercise and the EA process), submitters were contacted regarding presentations at the Technical Review Workshop scheduled for April 2007. Six presenters requested an audience before the Technical Review Team.

6.2 Technical Review Workshop

Participants at the Technical Review Workshop represented three groups: background information presenters, community representatives and members of the Technical Review Team. The Team was primarily comprised of technical experts and Regional/Township staff, supplemented by other expertise.

More than 50 people attended the Technical Review Workshop. This included professionals from six different firms that had not previously been involved in the Wainfleet Servicing project. Representatives from four consultants that were previously engaged in the EA process were retained to provide continuity and background information. Other attendees included Regional councillors, Township aldermen, staff, MOE representatives, area residents, representatives of the opposition group named the “Wainfleet Water and Sewer Committee” and the media. Details on the Technical Review Workshop are summarized in PWP 35-2007.

The evaluation of alternatives followed a Functional Performance Specification methodology. This approach included an evaluation of each alternative technology in terms of its “value”, which was defined as its ability to satisfy the community’s needs versus the project’s costs. The alternatives considered are listed in Table 4.

Table 4

Servicing Alternatives Considered in Technical Review Workshop
Potable Water Systems
<ul style="list-style-type: none"> • Municipal Piped Water Systems: <ul style="list-style-type: none"> – Connected to the Port Colborne Water Treatment Plant (WTP)

<ul style="list-style-type: none"> - Connected to the Port Colborne WTP with fire flows - Connected to a new local water treatment plant
<ul style="list-style-type: none"> • On-site Private Systems: <ul style="list-style-type: none"> - With on-site wells - With on site cisterns
<p>Wastewater Collection Systems</p>
<ul style="list-style-type: none"> • Conventional Piped Wastewater Systems: <ul style="list-style-type: none"> - Connected to the Seaway Wastewater Treatment Plant (WWTP) - Connected to a new local wastewater treatment plant
<ul style="list-style-type: none"> • Small Bore Gravity System: <ul style="list-style-type: none"> - Connected to the Seaway WWTP - Connected to a new local wastewater treatment plant
<ul style="list-style-type: none"> • Small Bore Pressure Systems: <ul style="list-style-type: none"> - Connected to the Seaway WWTP - Connected to a new local wastewater treatment plant
<ul style="list-style-type: none"> • On-site Private Systems: <ul style="list-style-type: none"> - Traditional septic treatment (including tank and septic bed) - Alternative septic treatment
<ul style="list-style-type: none"> • Holding Tanks with Trucking to the Seaway Wastewater Treatment Plant (WWTP)
<ul style="list-style-type: none"> • On-site treatment with cluster collection and systems and sub-surface discharge

6.3 Conclusions of the Technical Review Team

The Technical Review Team concluded that the “best value” solution for providing safe drinking water service to Lakeshore Area residents involves the distribution of potable water from the Port Colborne WTP to Lakeshore properties. Similarly, the “best value” solution for wastewater services involves the collection of sewage from Lakeshore Area properties and conveyance to the Seaway WWTP for treatment. This validates the preferred solution that was identified in the EA process and endorsed by the Minister of Environment.

The Technical Review Team recommended that serious consideration be given to small bore gravity and small bore pressure system options for wastewater collection within the Lakeshore Area, and treatment at the Regional WWTP. Although these systems were determined to offer a lower level of satisfaction (i.e. due to pump-out and maintenance requirements), Team members concluded that they offer potential initial capital cost advantages over conventional systems and should be considered in the detailed design phase of the project.

7.0 PLANNING CONSIDERATIONS

At various public meetings held over the course of the Wainfleet Servicing process, residents have expressed concern regarding their desire to maintain the “rural cottage-like ambience” of the Lakeshore Area. Many see the provision of municipal services as a significant threat to preserving the community’s character. However, in reality, the Lakeshore community essentially reflects the characteristics of an urbanized residential area within a rural setting. The area could more appropriately be viewed as a de facto hamlet of upwards of some 2,500 permanent residents, with a population anecdotally exceeding 10,000 residents during seasonal peak periods.

To determine the potential, long-term community impact of the proposed servicing scheme, it is important to understand the land use controls that are currently in place. The Regional Policy Plan designates most of the Lakeshore servicing area as “Rural”. The predominant land use permitted in the area is agriculture. However, limited non-farm uses, such as low intensity recreational, small scale commercial, local-serving institutional and rural residential uses are permitted.

The Regional Policy Plan states that municipal water and sewer lines will not be permitted in “Rural” areas, except where they are required to correct a public health and safety problem, as determined by the Medical Officer of Health. Given the current level of groundwater contamination throughout the Lakeshore Area and the Boil Water Advisory, the provision of municipal water and wastewater services would be permitted by exception.

The Wainfleet Township Official Plan also designates much of the study area as “Rural” along with areas of “Estate Residential” and “Lakeshore Residential”. The Township Official Plan recognizes agriculture as the predominant land use, along with residential and small-scale ancillary uses that serve the community.

With the assistance of the Regional Planning Department, the Township is currently updating its Official Plan and preparing a Secondary Plan for the Lakeshore Area. The Secondary Plan will determine the type, location, scale, form and character of any future development along the lake. Plan preparation will be carried out with the involvement of a citizen-based Planning Advisory Committee. Public input into the process will be ensured in accordance with Planning Act requirements.

Currently, preliminary water and wastewater servicing concepts are based on the existing need to address public health and safety risks, environmental contamination issues, service established lots and satisfy MOE design standards. Regional Public Works has not developed a detailed design for the proposed water and wastewater infrastructure.

Concerns related to future development and preservation of community character fall within the realm of land use planning. Servicing decisions will be shaped by the Township’s Secondary Plan process for the Lakeshore Area, which is currently underway. Preparation of a detailed design for future services will fully consider the results of the Secondary Planning process.

8.0 PUBLIC HEALTH and SAFETY CONSIDERATIONS

On April 10, 2006, the Region's Medical Officer of Health issued a Boil Water Advisory (BWA) to all residents in Wainfleet's Lakeshore Area. This advisory was implemented based on an extensive review of the above-mentioned studies, consideration of all other relevant information and in response to an undeniably, significant public health and safety risk.

The decision was confirmed by a specially convened expert panel with representation from across Canada, and in discussions with the Chief Medical Officer of Health for the Province of Ontario. The BWA for the Lakeshore Area will remain in effect until the Medical Officer of Health is satisfied that the threat to the local drinking water supply has been appropriately addressed. Details on the rationale for the Boil Water Advisory and the process followed were reported in PHD 37-2006.

8.1 Enforcement Strategies

Public Health staff currently responds to all complaints regarding deficient or malfunctioning private sewage systems. Where defects are identified, homeowners are ordered to repair or replace their systems. The Department also receives requests for comments on rezoning, severances, and minor variance applications. It also undertakes inspections at the time of property transfer, mortgage renewal and proposed building additions. Where defective systems are identified, remediation is required prior to approval.

In recent years, requests for additions have often been rejected because of limited lot size and over-development. Most of the 115 holding tanks currently approved for use in the Lakeshore community were installed to replace defective septic systems, where lot limitations precluded the installation of a viable alternative.

It has been suggested that Wainfleet's sewage problems could be resolved, if the Public Health Department inspected all private systems and ordered remediation of systems with demonstrable defects. Unfortunately, this is not possible since almost 90 per cent of the properties cannot meet OBC standards and/or operate without environmental concerns.

8.2 Detection of Failing Septic Systems

Failing septic systems are not simply those with discernable break-outs or evidence of surface ponding. Septic systems are also considered defective if they do not properly treat effluent discharge and/or directly contaminate groundwater. This is a significant issue in Wainfleet.

Many defective systems cannot easily be identified by visual inspection. In many cases, residents may not be contaminating their own wells, but are impacting neighbouring wells downstream due to inadequate soils and/or poor maintenance. Previously referenced

studies reported that sewage plumes can extend significantly beyond property boundaries. This has resulted in systemic groundwater contamination due to the cumulative impact of many defective septic systems. Numerous Lakeshore lots are grossly undersized and cannot accommodate traditional or alternative private sewage systems.

8.3 Cost Recovery Mechanisms and Budget Implications

In 1998, the Province transferred governance of private sewage systems from the Environmental Protection Act to the Ontario Building Code (OBC). Consequently, responsibility for program administration was delegated to local municipalities. In Wainfleet, as in eight other Niagara municipalities, the Regional Public Health Department delivers this service under contract. The program operates on a “fee for service” basis and is not funded from the local or Regional tax base.

Currently, there is no cost recovery mechanism for complaint responses or conducting sanitary surveys. Consequently, no budgetary provision is in place to accommodate an expensive door-to-door “blitz” of the Lakeshore Area. Public Health has qualified staff capable of conducting such sanitary surveys. However, they cannot be re-assigned from existing programs as this would result in a concomitant failure to meet other mandatory program requirements. Consequently, such action would contravene Ministry of Health and Long-Term Care requirements.

8.4 Burden of Proof Requirement

Significant proof is required to order private remediation in cases where sewage systems are deemed defective due to lack of overburden, proximity to fractured bedrock, negligent maintenance, etc. In situations of large scale contamination, such as the Lakeshore Area, appeals are likely to ensue, involving significant Regional and Township costs and staff commitment. Therefore, enforcement strategies targeted at individual properties are not a solution to a community problem.

8.5 Holding Tank Limitations

As previously stated, many existing lots are grossly undersized and/or situated on unsuitable soils. Consequently, they cannot effectively accommodate even an approved alternative private sewage system. Extensive use of holding tanks is not an option. In accordance with the OBC, Public Health advises that holding tanks are only permitted where no viable, alternative option is available. No additions, alterations or renovations are permitted for properties serviced by holding tanks. Significant use of holding tanks can lead to odour issues and can stigmatize a community.

Experience has shown that homeowners and business operators in Wainfleet, and elsewhere, have adopted a variety of irresponsible practices, including puncturing holding tanks, pumping sewage to drainage ditches, or installing by-pass valves that divert “grey” water. Effective policing of holding tanks requires regular tank inspections and monitoring of pump-out receipts.

In addition, holding tank waste and septage can distort a treatment plant's process. Furthermore, in some communities, it has been found that the use of holding tanks leads to the rise of unlicensed haulers who undercut legitimate contractors and dispose of waste indiscriminately.

8.6 Cost of Enforcement

It is difficult to provide definitive enforcement costs since estimates depend upon the level of compliance. As noted earlier, nearly 90 per cent of the properties can neither meet OBC requirements nor satisfy environmental concerns. Therefore, in the absence of a community solution, individual holding tanks would be the only alternative for such homeowners. As noted, this is not an acceptable alternative on a grand scale, or where other alternatives exist.

Public Health estimated the costs of an effective and proactive enforcement strategy that includes a one-time inspection enforcement program and annual policing. Steps in the inspection and enforcement program include: assessment of all properties in the Lakeshore Area, property owner consultation, deficiency identification, provision of notice, issuance of legal orders, charge laying, preparing evidence, court attendance, etc. In addition, holding tank policing would be required annually.

Based on these assumptions, one-time enforcement costs are estimated to be approximately \$2.5 million. Annual costs for tank policing including maintenance monitoring of pump-out records are estimated to be about \$300,000. Assumptions for these estimates are summarized in Appendix 3.

As previously mentioned, currently there is no recovery mechanism for such enforcement costs. This is not a cost-shared program. If such enforcement strategies were to be introduced, Regional options could include absorbing the full cost, billing Wainfleet Township, or requesting the Township to impose an annual fee on affected property owners.

Adopting an aggressive enforcement strategy as an interim measure, until municipal sewers and water are installed, would burden many homeowners faced with two significant financial outlays. First, some property owners would be required to pay for replacing defective/undersized systems with an OBC-approved system (\$15,000 - \$20,000) or holding tank (\$5,000). Later, they would be required to pay again after municipal services were ultimately installed.

8.7 Support for a Long-Term Municipal Solution

Public Health believes that the provision of municipal water and sewers is the most effective and cost-efficient solution to Wainfleet's serious contamination problem. This conclusion considers the pervasive septic tank system failure and resulting contamination of drinking water supplies prevalent throughout the Lakeshore Area.

Public Health takes this position, recognizing the economic and logistical barriers to effective enforcement discussed above. It should be stressed that Public Health's

conclusion was endorsed by a Canada-wide panel of medical experts, including national and provincial representatives.

9.0 PROJECT FINANCING

9.1 Initial Capital Costs

Local System Costs

The initial capital costs of services are shown on Table 6. These estimates reflect the costs for the Environment Minister-endorsed system and modified versions (e.g. small bore pressure and small bore gravity systems) that potentially could be considered. The conceptual cost envelope for the Minister-endorsed system is \$50 million for wastewater and \$22 million for drinking water, for a total of \$72 million.

Table 6

Examples of Estimated Initial Capital Costs of Municipal Central System Options*	Local System	Regional System	Total
Wastewater			
Conventional Municipal System	\$29 Million	\$21 Million	\$50 Million
Small Bore Pressure Municipal System	\$18 Million	\$14 Million	\$32 Million
Small Bore Gravity Municipal System	\$25 Million	\$18 Million	\$43 Million
Water			
Municipal System	\$10 Million	\$12 Million	\$22 Million

* The above include services to property lines but not the cost of private laterals to each house.

Wainfleet Township and benefiting property owner costs shown below include local water distribution and wastewater collection system costs, which are a lower tier municipal responsibility under the Regional Act. Other wastewater options in terms of “central systems” (i.e. small bore pressure and gravity systems) were also included. Conceptual cost estimates include 10% for engineering and a 15% contingency.

Niagara System Costs

Historically, costs of building service lines from local municipalities to Regional water and wastewater plants, as well as required plant upgrades or expansions, have been Niagara Region’s responsibility, in accordance with the Regional mandate. Applied to the Lakeshore Area, the same cost allocation could result in the following Regional costs:

- Wastewater costs include \$4 million for the Seaway WWTP (budgeted for as part of a larger plant upgrade and expansion project already approved and under design) and \$17 million for the trunk sewer line and sewage pumping stations. The total Regional wastewater cost is estimated to be \$21 million.

- There are no water treatment plant costs since no expansion is required. Approximately \$12 million is required for the trunk watermain.

Private On-Site Systems

Although private on-site wastewater systems were costed, they are not considered to be a viable option because they are either legally or environmentally deficient on nearly 90 per cent of the lots. Costs of dismantling or abandoning existing, on-site systems (e.g. private wells and septic tanks) are excluded in the above figures, since no policy decision has yet been made. The initial capital costs of on-site private systems are detailed in Appendix 7.

9.2 Lifecycle Costs

Initial capital costs for on-site wastewater systems are considerably lower than municipal systems. However, this can be misleading. In order to undertake a fair and equitable lifecycle cost comparison between various options, a reasonable and realistic life expectancy must be established against which all options are compared.

A 75-year baseline was used for the central system and 30-year baseline for on-site systems. This concept is illustrated in Figure 3. The figure illustrates that initial capital costs are in the same order of magnitude when compared equally on a 75-year basis. Figure 3 considers only the capital (or construction) costs, albeit on the same 75-year life cycle basis as the central system. Costs include that part of the Seaway wastewater treatment plant capacity upgrade related to the Wainfleet service area.

Figure 3

Initial Capital Cost and Life Expectancy

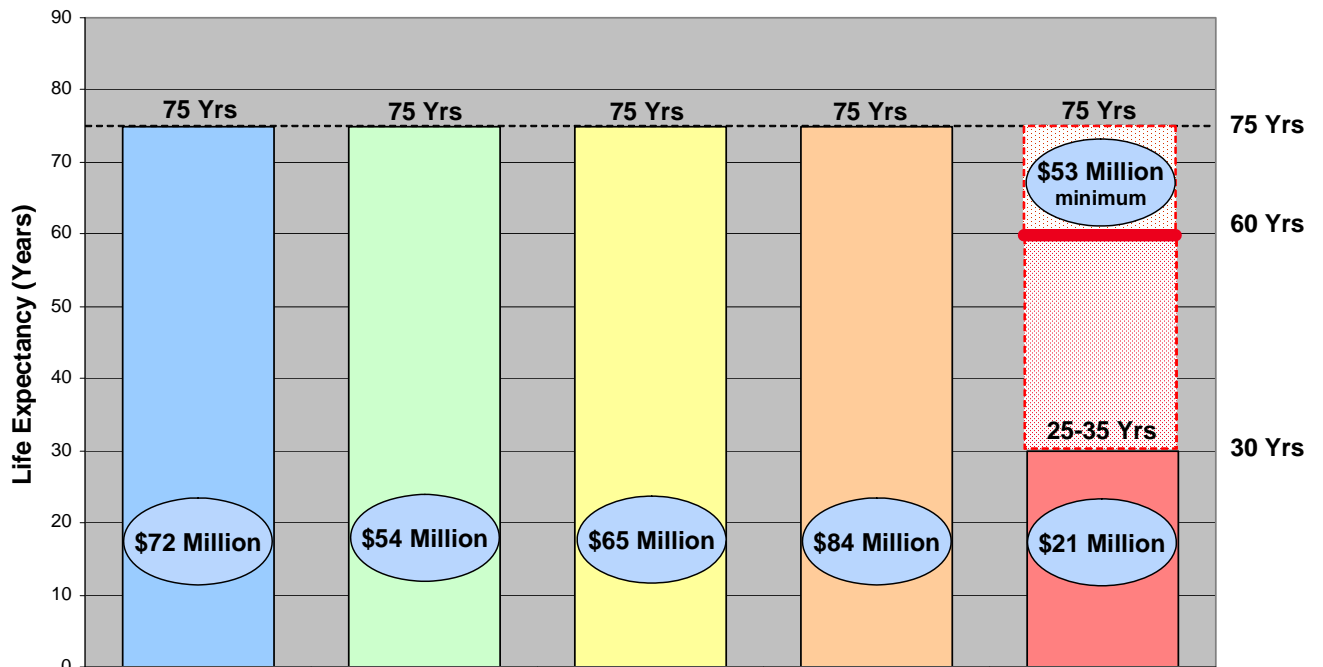
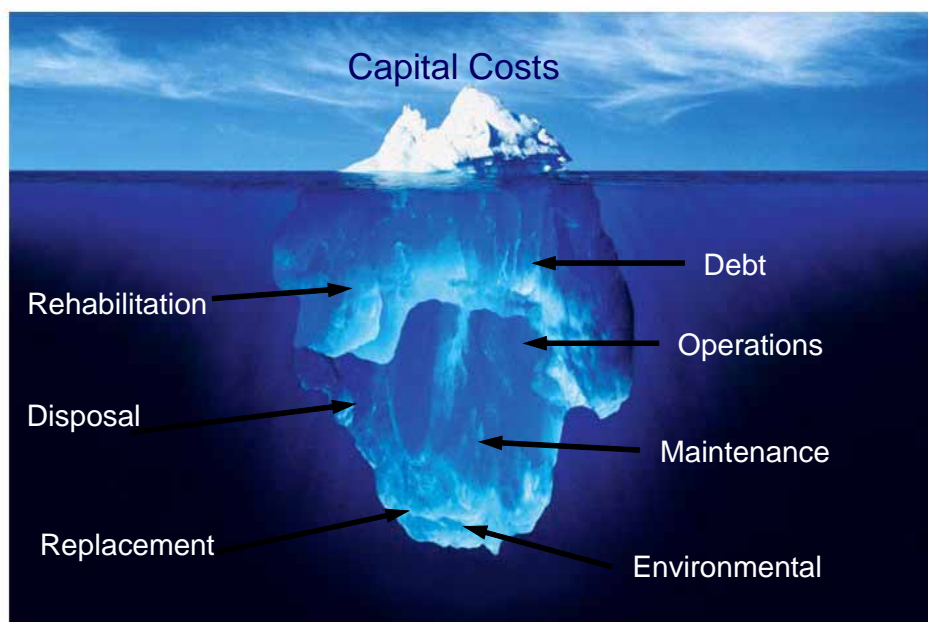


Figure 3 does not tell the whole story. Today, it is common and prudent practice to consider total lifecycle costs when considering the feasibility of projects and technologies.

As shown in Figure 4 (following page), initial capital costs are only "the tip of the iceberg". A multitude of other costs must also be considered, including debt repayment, operations, maintenance, rehabilitation, environmental, disposal and, ultimately, replacement costs. Details of this are shown in Appendices 7, 8 and 9.

In both a relative and proportional sense, private on-site systems are approximately 50 per cent more expensive on a lifecycle basis than a central system. Again, these costs are not absolute but relative, as they are intended to represent a proportional relationship and not firm number.

Figure 4



9.3 Other Cost Considerations

Other issues that need to be considered and resolved as part of the cost allocation policies, are addressed below:

- Should cost assessments and business/rental property connection fees be different for residential properties?

Municipal water purveyors generally treat industrial, commercial and institutional properties in a variety of ways in terms of connecting to a water or sewer system. Generally speaking, connection fees are based mostly on size of connection and not on type of client. Cost assessments, however, could be done on a different basis. This would be subject to the Township's by-law.

- Should seasonal residents be treated differently than permanent residents?

This would be subject to the Township's by-law.

- Should farm operations be treated differently from other users?

This would be subject to the Township's by-law.

- How will vacant lots be treated?

When developing the Township's cost assessment and connection fee by-law, consideration could be given to requirements that are consistent with those applied to currently developed lots in Niagara.

- How will private lanes/roads be serviced?

The Township may need to facilitate access agreements or other methods for accessing private property.

9.4 Cost-Sharing Options (Who Pays What?)

Unfortunately, Wainfleet Township has unsuccessfully applied on three separate occasions to obtain project funding from provincial and federal governments under COMRIF (Canada/Ontario Municipal Rural Infrastructure Fund). Based on these results, all financial analyses in this report do not include funding from senior levels of government. The Region has yet to qualify for this type of funding (i.e. COMRIF), but has previously secured funding under other funding programs (e.g. the Millennium Partnerships program).

There are various cost sharing options open for the Region and Township to consider. For example, in accordance with past practice, the Region could assume responsibility for the water and wastewater trunk lines and all related ancillary works connecting to the Lakeshore service area. This could include all required plant expansions and upgrades.

Under the Regional Act, local municipalities own, operate and maintain the local water distribution and wastewater collection systems. Therefore, a logical option would be for the Township to assume responsibility for the construction, operations and maintenance costs of proposed local system components.

There are many other options to be explored, including further cost recovery from benefiting property owners who would be responsible for connecting to the system proper. The Township and Region should examine the broad range of cost-sharing opportunities based on related best management practices adopted by other municipalities to address similar servicing issues.

These and other options will be explored as part of the recommendation to: “prepare a final project cost estimate and cost allocation between the Niagara Region, Wainfleet Township and benefiting landowners”.

9.5 Cost Assessment and Allocation Options

The actions for cost assessment are fairly limited. Some options would include:

- Fixed charge per lot regardless of area or frontage
- Unit charge per area or size
- Fixed charge per residence on the lot
- Frontage fee (with special calculation for corner lots)
- Charges based on the assessment value of each property

In reality, cost allocation options are directly linked to the Township and Region’s approach to executing the project.

There are three cost allocation options available under the Municipal Act for undertaking and recovering costs from benefiting property owners, including:

- **Local Improvement Charges:** Cost assessment is based on frontage. The disadvantage is that this will not result in an equal charge per lot. However, charges reflect the proportional amount of infrastructure installed in front of the property.
- **Special Services:** Water and wastewater systems are defined as special services. Special services charges can be levied by by-law at a separate tax rate on the assessed value of each property. The disadvantage is that this will not result in an equal charge per lot, since charges are based on assessment values.
- **Fees:** Fees need not be based on frontage (like a local improvement charge) or on assessed value (like a special service charge) and, therefore, can be applied as a common charge across all lots.

9.6 Cost Payment Options

The Region's portion of the works could be recovered from all ratepayers according to current practice for all local municipalities. An appropriate portion of these costs could also

be recovered from development charges. Wainfleet Township's portion of the works could be recovered in a number of ways. This ultimately depends on how the Township initially decides to proceed with the project. Some examples are provided below:

- Adding monthly payment to taxes
- Increasing fixed component of rates
- Billing annually
- Deferring repayment until property ownership changes (servicing costs registered on title)
- Personal funding (owner's choice) including:
 - Upfront cash payment
 - Reverse mortgage
 - Personal loan/mortgage

The Region and Township may also assist residents in considering the following options:

- Arranging low interest rate financing
- Securing long-term debentures to reduce annual payments
- Assessing development charges for infill lots for future development
- Providing partial homeowner grants under the Municipal Act
- Developing a contractors list for private connections to assist homeowners.

Other options may be identified as part of the next step, which is the development of appropriate and detailed cost-recovery policies and by-laws.

10.0 TIMELINES and NEXT STEPS

Table 7 provides an implementation schedule for key follow-up actions.

Table 7

Actions	Estimated Timeline
Wainfleet Council Session	October 9, '07
Committee of The Whole Meeting	October 11, '07
Regional Council Session	October 18, '07
MOE Mandatory Studies:	
• Social Impact Assessment	4 th Quarter, '07
• Natural Resources Impact Assessment	3 rd Quarter '08

• Archaeological Assessment	3 rd Quarter '08
• Cost Evaluation and Sharing Plan	4 th Quarter '08
RFP/Draft Contract/Preliminary Design Process	
• Start	4 th Quarter '07
• Finish	4 th Quarter '08
Final Report to Councils for ratification	1 st Quarter '09
Public Consultation (Meeting to report on studies and recommended option)	2 nd Quarter '09
Detailed Design and Construction	TBD

11.0 CONCLUSION

The Wainfleet servicing project is very complex. Authority governing the protection of public health and safety and the environment is spread over several provincial legislative Acts and jurisdictions. No single authority (e.g. MOE, the Township or the Region) has sole responsibility for the implementation of regulations related to these Acts and their enforcement.

However, although no organization has complete legal jurisdiction, both the Region and Township have a duty of care to ensure that appropriate steps are taken to ensure that the Lakeshore Area's public health and safety risks and environmental degradation are responsibly addressed in a timely manner.

One of the difficulties in this complex project is that participants in the public debate have been drawn into the details and technical minutiae of the issues. This has often resulted in a clouded understanding of the "big picture". Nevertheless, the following facts are known with certainty:

- The local drinking water is contaminated by fecal bacteria and other pathogens, and poses a serious public health and safety risk;
- The environment is threatened by the progressive accumulation of bacterial contamination that has built up over time, and continues to occur;
- The MOE could order the Township and/or Region to take appropriate action to remediate this situation;
- The Environment Minister-endorsed central solution is the only infrastructure alternative legally available that can be built by the Township and the Region;
- The Region and Township have the authority under the Municipal Act to construct the solution endorsed by the Minister of the Environment and to recover costs from benefiting property owners.

The decision to “do nothing” remains an option from a purely technical perspective. However, this would not be supported by the Public Health Department and was not borne out by the EA process.

Regardless, any such decision should only be taken with the full benefit of a comprehensive risk management strategy and not simply on the grounds of legislative, liability, financial or jurisdictional dictates.

Submitted by:



Kenneth J. Brothers, P.Eng.
Commissioner of Public Works

John Bergsma
Commissioner of Corporate Services

R.C. Williams, MD, DPH, FRCPC
Medical Officer of Health

David J. Farley, MCIP, RPP
Director of Planning Services

Approved by:

Mike Trojan
Chief Administrative Officer

This report was prepared by Leo Gohier P.Eng., Acting Director, Water and Wastewater Services and Bob Steele, MA, MCIP, RPP, Environmental Coordinator, in collaboration with Ken Brothers, P.Eng., Betty Matthews-Malone, P. Eng., Bjorn Christensen, Bill Hunter, Gord Lockyer, David Farley, John Murphy, Denise Papaiz, Michael Kyne and Chris McQueen.

Appendices

- Appendix 1: Frequently Asked Questions
- Appendix 2: Minutes of Wainfleet Open House
- Appendix 3: Enforcement Cost Assumptions
- Appendix 4: On-site Sewage Disposal Study Assumptions
- Appendix 5: Summary of Environmental Sustainability Assumptions
- Appendix 6: Residence Time of Contaminated Groundwater
- Appendix 7: Life Cycle Costs for Private System Maintenance and Replacement
- Appendix 8: Life Cycle Costs for Water and Wastewater Alternatives
- Appendix 9: Life Cycle Costs and Average Expected Life of Alternatives
- Appendix 10: Wainfleet EA Process - Project Timeline
- Appendix 11: Summary of EA Approval Process

Appendix 1

Frequently Asked Questions

Why is there a big pipe?

- There is no big pipe. The MOE-approved servicing concept was developed for approximately 1300 lots. No detailed design has yet been completed. The Township's Secondary Plan will determine the ultimate population of the Lakeshore community and, correspondingly the size of the pipe.

Does Groundwater contamination come from agriculture, golf courses or landfills?

- No. The volume of bacterial contamination released from septic systems is overwhelming compared to any potential contaminants coming from other sources (agriculture, landfills, etc.). Typically, bacteria transported from outside the area will not survive.

Why was individual septic testing not done?

- Septic discharges into groundwater indicate an improperly functioning septic system. The volume of septic effluent and concentration of small lots led to the conclusion that the aquifer is being contaminated by failing septic systems, making individual testing unnecessary.

Why not just fix individual systems?

- Most lots are too small to support septic systems. In addition, local soil and rock conditions are not suitable for septic beds to function properly and many existing septic systems are failing. Therefore, a central solution is required.

What is the current status of the project?

- The Minister of the Environment has endorsed the project. Township and Regional Councils have not made a decision on whether to proceed. A report recommending the next steps is expected to be submitted in October, 2007.

Why can't holding tanks be used?

- The use of holding tanks is not a viable solution to a widespread issue of this nature. Experience has shown that, in many cases, the on-going expense of pumping results in illegal bypasses. Equally, the resources required to police holding tanks are beyond those available to the Township or the Public Health Department. If policing costs were passed on to the homeowner, the financial impact of a holding tank is ultimately more expensive than municipal services

How long will it take for the aquifer to flush itself if the sewage problem is addressed today?

- It is impossible to determine this with any reasonable accuracy. Our experts estimated that this will take between ten and thousands of years.

Why should Lakeshore residents be responsible for fixing lake pollution and not others?

- There are two primary focuses of the servicing project - the public health and environmental issues directly faced by Lakeshore Area residents related to contaminated drinking water and polluted surface water ponding on-site from failing. Our objective is not to clean up Lake Erie.

Why do I have to pay for the sins of the past?

- Our focus is on the present and the future. The current public health and environmental risks demand a central solution to a community wide contamination issue.

Appendix 2

WAINFEET PUBLIC OPEN HOUSE – August 11, 2007

As reported to Council in PWP 51-2007, on Saturday, August 11 2007, a Public Open House was held in Wainfleet from 9:00 am to 12:30 pm. The purpose of the Open House was to discuss the water and sewer servicing strategies endorsed by the Minister of the Environment; provide the most up-to-date information on public health and safety and environmental conditions; review project costs and cost allocation options; and present the next steps.

The Public Open House focused on the servicing aspects of the Lakeshore Area. Public health related issues were not discussed as the intent of the Open House was to present and discuss servicing strategies designed to resolve a clearly defined problem. Over 200 residents were in attendance.

The Open House was organized around two sessions. The first, from 9-11am, involved presentations and discussion at information stations of prominent project themes, including: the mandatory provincial EA process: Minister-endorsed water and wastewater systems; water quality testing results; OBC compliance: environmental sustainability issues; consideration of alternative technologies; capital and life cycle costs; cost allocation; payment options and project affordability. Regional staff and technical experts were available to answer questions at each of the information stations.

During the subsequent question and answer session that lasted from 11:00 am to 12:30 pm, residents asked questions and expressed their concerns. A copy of the minutes of the Public Open House is provided on the following page.

THE REGIONAL MUNICIPALITY OF NIAGARA
PUBLIC MEETING
WAINFLEET WATER AND SEWER SERVICING PROJECT

AUGUST 11, 2007

Minutes of a Public Meeting respecting the Wainfleet Water and Sewer Servicing Project that took place at the Port Colborne Brethren In Christ Church, 10641 Highway 3 in Wainfleet, Ontario, on Saturday, August 11, 2007, commencing at 9:00 a.m.

ATTENDANCE

Regional
Councillors: Councillors Baty, Greenwood, Henderson, Rigby.

Municipal
Aldermen: Alderman Warketin, Kramer and Hessels

Staff: Messrs. Gohier, Acting Director, Water & Wastewater Services; Steele, Environmental Coordinator; Baker, Associate Director, Water and Wastewater Engineering; Nicholls, Information and Public Outreach Assistant; Ms. Papaiz, Communications Strategist; Ms. Lambe, Business Partner, Strategic Communications; Ms. Gilroy, Regional Clerk; Ms. Pilon, Deputy Clerk.

Consultants: Messrs. Mullin, Hydromantis Ltd.; Stephenson, Hydromantis Ltd.; McGlone, Amec; Dr. Muin Husain, Genivar; Ms. Cumming, Cumming+Cumming + Company, Moderator.

Others: Mr. Kormos, MPP

PUBLIC INFORMATION SESSION

1. Public Information Session

The Public Works Department hosted a public information session prior to the question and answer period that began at 9:00 a.m. to provide the residents and senior staff the opportunity to discuss the water and sewer servicing alternatives reviewed to date; project costs; cost allocation; and the next steps.

The Niagara Region will also be conducting a telephone survey of Lakeshore residents.

The information garnered from the telephone survey and from the comments and questions asked at the public meeting will be included in the Niagara Region's report that is to be presented to the Planning and Public Works Committee on September 19, 2007.

WELCOME AND INTRODUCTIONS

2. Welcome and Introductions

Ms. Cumming introduced herself as the meeting's Moderator; and Mr. Gohier, Acting Director, Water & Wastewater Services who would be answering questions from the participants.

Ms. Cumming provided those in attendance with an overview of the process that would be followed during the question and answer period (11a.m. to noon), with everyone being given the opportunity to ask their questions or comment at two microphones set up at either side of the room.

QUESTION AND ANSWER PERIOD

3. Question and Answer Period

The following are the *questions and comments* from those in attendance and the **comments** from staff in response to the question or comments:

Andrew Watts, asked why we are here today? As he was surprised of the fact that Public Health officials were not in attendance since this is a Public Health issue and why are we talking costs at this point?

We are here today to provide you with honest and open information and dialogue on the Wainfleet Water and Sewer Servicing Project, being as it is a Public Works infrastructure issue and Public Health did not want to take away from that, when they have done their job.

The Public Health issue has not been explained to us and either has the environmental issue.

Public Work is serious about getting public input, as more information is required and there could be personal liability at play. Public Health is based on scientific data, that revealed that a number of wells in the area have serious contamination issues that could attribute the health issues.

Meeting respecting the Boil Water Advisory, noted that no one in Wainfleet has been ill from drinking the water, based on science.

Mr. Christensen, Harbourview, asked why the Niagara Region is testing untreated water.

Mr. Christensen, noted that the residents are not on board with the preferred alternative and asked why did it take so long to put the Boil Water Advisory into affect?

Mr. Gohier noted that he will follow up with Public Health and the answer will be communicated in a future report.

Mr. Don Davis, Marketing Manager, Light World Water Corporation, advised those in attendance that colloidal water, keeps out e-coli and builds the immune system and asked what is the price of the pipe? and why not an on site alternative?

\$68 million for the whole project depending on the option that is chosen.

Local solutions were evaluated as per the information boards around the room, however, local solutions should not be implemented from a technical, legal and environmental perspective.

Eugene Canby, asked why we can't treat on site? There are several good systems out there, a new system would cost approximately \$25K installed, there are composting toilets, holding tanks, what's the difference between putting the sewage in the Port Colborne Plant or trucking it in to the plant? Why can't we look at these alternatives? Who is going to guarantee that the solution will be \$65 million and no more? If it goes over budget, who pays for it?

The alternatives were evaluated not once but three times by different experts in the field, they were all deemed not feasible as a preferred system for the area. These alternatives also during their life cycle become more expensive from an environmental impact perspective, they may work for the treatment of wastewater, however, they do not protect the ground/drinking water.

The Niagara Region has projects that run over and under budget, our track record is very good for overall project management. These are not the final numbers, there are some unknowns with this project. There may be an opportunity to protect the homeowners by fixing the contribution, which would transfer any cost overruns to the Niagara Region or future development charges.

Nancy Giles, asked that the Niagara Region listen to the residents of Wainfleet, noting that there are thirty Regional Councillors, so make your concerns known, tell them what you think about a decision that will affect all our lives. Ms. Giles commented on one of her neighbours who installed a holding tank for approximately \$5K, they are frugal with their water, so there is only a need to pump the tank once in the spring and once in the fall at a cost \$200.00 per year. We are looking at a huge cost and increased property taxes. We should be looking at holding tanks as a viable alternative.

Holding tanks were evaluated, the costs associated with them and staff did take into account the seasonal residents.

Sherry Main, the Ministry of the Environment approved the Environmental Assessment (EA), however, the municipal and Regional Councils have not approved it, what is the status of the EA at this point?

The EA does not require the approval of the municipal and Regional Councils, they do not have a say in the EA process. The Ministry of the Environment are satisfied with the process being implemented in Niagara Region at this time.

What came out of the EA process is a legally defined process that resulted in the selection of the best option.

One condition of the EA, was a cost sharing solution, what is it?

Staff did not want to define a cost sharing solution until we had this public meeting and had the opportunity to discuss the complexity of the issue. Staff are responsible for making a recommendation to Regional Council, however, staff required the resident's input in order to see what they feel is fair, fair to everyone.

Where did the \$20K figure come from in the survey?

The figure was a reference point, staff had two options, we could leave it out of the survey or ask how the residents feel about \$20K.

If you can't afford it?

What's key about the \$20K, is that staff have not defined how to collect it, we have total project costs, do we look at it as per individual lot? How does the resident pay for it?

The Niagara Region has attempted to obtain infrastructure funding several times and has been unsuccessful, what happens if funding is not available?

Niagara Region has tried to secure infrastructure funding on three separate occasions, we feel that we may be successful the next time, therefore, we will continue to try.

There is a report being written for the September 19, 2007 Planning and Public Works Committee, which will include the comments and discussion from this meeting as well as a recommendation.

At the first meeting we heard a figure of \$3K per household, that went up to \$5K then \$7K, now it's \$20K, what is the cost?

Will anything be done about the contaminated flows from the Casey drain, that empty into the lake where people swim?

Mr. Gohier noted that he is unaware of the situation surrounding the Casey drain and he will look into it further.

Dave Robinson, the Boil Water Advisory is based on test results from May, which were presented to Council in November and then the advisory followed the following year, it should have been issued earlier!

Mr. Robinson noted that he is against the preferred solution, as is 90% of the residents, as it does not make sense and asked whether this could be forced on us? He also wanted to know the position of the Mayor on this issue.

Mr. Gohier noted that staff is aware that there are individuals who are against the preferred solution, staff have tried to explain that it is not that simple, there are environmental concerns as well as Public Health and legal concerns, as some of the systems in question are impacting their neighbours' drinking water. Niagara Region has done all of the science, we have spent \$1.5 million and have concluded that on site solutions end up costing the resident more.

The government is liable and is required to act when they are made aware of a problem, Niagara Region's job is to give the residents, municipal and Regional Councils the facts so they are informed.

Jackie, asked whether Niagara Region has a ten year plan for the area? If so, what is it? What is the Grow South plan?

Niagara Region has a long term capital budget and a Master Plan that details where development is planned and what that development will require, which is updated every five years.

Is Wainfleet in it?

The update will include Wainfleet, as this project will be included.

The plans for a municipality are prepared at the municipal level and they are required to comply with the Regional Official Plan, which would be a Planning & Development Department question. Mr. Gohier noted that the answer would be communicated in a future report.

Lee Bott asked how much of this situation is a health issue? And how much of it is a development issue?

This will be detailed in the report.

She noted that she cannot honestly believe that the Provincial government would let them all die.

Comparing Wainfleet's situation with Walkerton is incorrect, as Walkerton was on municipal water, when they had the contamination and if we accept municipal water we are opening ourselves up to being another Walkerton. The residents in Wainfleet are not stupid, we do what we want to do, we have good water, we are not sick, we take care of our water and when there is a problem with our water system we fix it. The City of Port Colborne water is not good and she won't drink it!

When staff compared Wainfleet to Walkerton, it was only respecting the E. coli and the coliform in the water, as these contaminants affect public health.

Mr. Gohier stressed the fact that staff have not spoken to developers, they have not estimated costs based on tremendous growth and that no major development has been included in the project.

Betty Konc asked whether Niagara Region was going to pay attention to the stakeholders of the Lakeshore Area and to what they want. As they are telling us that they do not approve of the pipeline. Are our issues going to be paid attention to?

Mr. Gohier noted that the comments of the residents will be clearly reported in the report, that they do not want the preferred solution. There is however, a commitment that has to be satisfied by the Niagara Region to deal with the legal and environmental issues.

The Niagara Region is committed to deal with this situation through the EA process. Regional Council will have all of the options in front of them when they are deciding on the best solution for Wainfleet.

Staff is doing their best and will recommend the best option to solve the water and sewer servicing issue in Wainfleet.

What happens if the EA expires?

There are a number of options for Niagara Region to choose from, if the EA expires, we would have to begin the process again. Mr. Gohier noted that if the Niagara Region was to begin the EA process again, they would come to the same conclusions as we have in front of us now.

If we could convince Councillors that the on site solution is the best way to go, they could recommend it?

If the Niagara Region decides to do nothing, then the residents of Wainfleet are on their own to do whatever they wish to resolve their water and sewer servicing issues.

If the pipeline is suppose to fix and repair what is wrong, will it entirely fix the aquifer?

Mr. Gohier could not claim that it would because you could do everything according to best practices and it doesn't always work.

Public Works approached this project, as two projects, the drinking water system needs to be repaired and the wastewater issue should be rectified.

We do understand that Regional staff is attempting to correct what is wrong with the Lakeshore Area, we are saying that Niagara Region is not listening to us!

Could we use a mediation process to resolve this?

Mr. Gohier could not comment on a mediation process, public involvement is part of the EA and the public has and remains involved and he is not sure how a mediation process would work in this situation.

This is not a lake driven project, it is a drinking water project, with a focus on the present and the future, not the past. Water quality of the lake is not in consideration, we are dealing with drinking water only. It's not about the lake and it never was about the lake.

Regional Councillors must start listening to residents, we have the solution, and we are willing to pay for our solution to fix our properties.

Wayne Redshaw, asked who drafted the question for the telephone survey?

The questions were drafted by a company experienced in preparing surveys, they asked what Niagara Region needed to know and prepared the questions accordingly. The questions were unbiased and were prepared scientifically.

The question respecting income should not have been asked.

Mr. Redshaw noted that he has ultra-violet light system and he has a perfect well and won't be decommissioning it, if and when municipal water is available.

Mr. Redshaw also noted that the experts that evaluated the sixty eight alternatives, were paid and put up in accommodations. During the evaluations these experts kept going back to the pipe.

Mr. Redshaw advised those in attendance that if we are going to be forced to take the preferred solution, we should get fire hydrants, something to protect us.

Lester Shoalts, noted that he is surprised that there are so many against the big pipe solution, as it is the only way we can fix the problem. You can use alternative methods, in some cases they will work and in others they won't. He noted that most of the residents are against the big pipe solution due to dollars and cents.

The explanation given by the Niagara Region to begin with, has been the problem from the start, it should have been explained as follows: if the big pipe solution is implemented it would be considered a local improvement, with the costs being amortized over 20-25 years, it would not be a personal debt, it would be a debt on the property itself. This solution is not being suggested to make money, it is being suggested to fix the environment and give us safe drinking water and a place for our sewage.

Mr. Shoalts noted that if it costs each household \$30-40K, the day it is approved, the property values of our homes would double. There are lots in Wainfleet that cannot be sold, with this system in place, your property is now saleable. We have to understand that this must be done and you should not be afraid of the costs.

Another gentleman noted that staff had done an amazing job with all of the information that was on display at today's meeting, however, he has lived in various areas of Niagara Region and has always drunk bottled water, the water in Niagara Region is not good. He asked whether Wainfleet was the tip of the iceberg, are there other areas of Niagara Region with the same issues that have just not come to light yet?

From a legal perspective we have to deal with a problem when we are made aware of it, it is a concentrated problem, the government response is that it is a Ministry of the Environment responsibility.

Bruce Miner, asked where the representatives are from the Ministry of the Environment, the Ministry of Health and Long Term Care and the Building Codes? When will they be in front of us?

Niagara Region follows the Ministry of the Environment rules and regulations, the Ministry of the Environment is the body that enforces them.

This is a drinking water problem caused by septic systems, it is not development driven. Development is not a consideration.

We want to see the representatives from the Ministry of the Environment, the Ministry of Health and Long Term Care and the Building Codes.

As to the costs, the \$70 million capital budget, the capital costs are just a fraction of the costs, as the entire costs will be \$300 million plus with the operational costs included, is there any intention to bring the full burden of the costs in front of the people?

Mr. Gohier noted that the costs have been reported. They are displayed on the information boards and in the handouts provided.

Helen Hoskins, congratulated staff for conducting this public meeting in this location as they have the best septic system.

Ms. Hoskins noted that if anyone was to ask the member of the Public Advisory Committee, whether staff listened to them, they would have to say no. The cost of the system began at \$18 million it has now gone in excess of \$65 million. It seems to be that whenever she receives information, she has to ask if it is correct, as she has lost her trust in the information, as it keeps changing.

At one of the meetings, a real estate specialist was brought in and she advised the residents that their properties would only increase by 3%.

Ms. Hoskins noted that she is having a hard time justifying cost, when it works out to \$225 per month for 20 years, that is without the extra taxes, the cost needs to be reasonable. She would rather fix and repair her own home at her expense.

Ms. Hoskins questioned the distribution of the flyers and the information respecting this public meeting.

Ms. Hoskins asked about phasing, what are the phases and the boundaries of the phases?

Ms. Hoskins made those in attendance aware of the proposed transfer of the SuperBuild Millennium funds being transferred to another project since the funds for the Wainfleet project would not be spent by the March 31, 2008 deadline and the \$9 million Port Colborne asked for, for the hook up of Wainfleet to their system, is that included in the costs?

Mr. Gohier noted that he seemed to recall that the consultant reported that the property values would go up 20%, he will check the report.

Staff have been giving the residents the plain truth, as there is nothing to hide.

As far as the distribution of the flyers and the information respecting this meeting, it was done well.

Phasing will be an option, we could implement a water system and then a wastewater system, or we could go geographically.

The \$9 million for the hook up, these costs for expansion or upgrades are borne by all residents of Niagara Region.

Mr. B. Fraser of Sun Mar, manufacturers of composting toilet systems, noted that there is nothing better for the environment and they could service the entire community for a cost of \$1-2 million.

Mr. Fraser noted that he had submitted information to the Public Works Department, but there was never any follow up or further investigation on the Region's part into this system.

Toilets are part of the solution, life cycle costs are documented.

Celeste Rimac asked why Public Health is not here. And who was the brilliant strategist who scheduled two hours for socializing and one hour for questions, as it is not good enough.

This meeting is dealing with infrastructure.

Cathy from Lakeshore Area asked if the big pipe solution goes through, could all of Niagara Region pay for it? And if the Niagara Region approves this, do they pay for it?

There are different options being presented to Regional Council.

If we cap the resident's contribution then someone else has to pay for the balance.

She noted that the media in attendance should ensure that the rest of Niagara Region is made aware of the possibility of them having to pay for the Wainfleet Water and Sewer Servicing system.

Gord, Maplewood, noted that he has a small son and they don't drink the water and that this is all a result of a Wainfleet planning problem, the residents are thinking that Niagara Region has something going on, development will happen either way.

He encouraged everyone to get the facts and make a decision, as if we don't make a decision; they will make one for us.

Marilyn from Lakeshore Area asked about an area in Wainfleet where sewage has been put for years, this pipe is not the answer. The wells in the area have been adequate; however, the ground water has been depleted severely. The statement that trucking water in to the area would cause more environmental destruction to the area than the pipeline would, is questionable.

I understand that if it is usually the case that an area is not considered for a water and sewer line, until they are part of the urban boundary, a pipeline is not recommended.

If you are going to put in a system, then you should be putting in a system for all of Wainfleet, not just for some.

There are suds in the ditches and she has asked the Mayor to clean the ditches.

Just because ground water levels are dropping, is not the reason for E. coli in the water, they are not related.

Andrew Watts asked about strict environmental restrictions being the reason for on site solutions not being acceptable, is it acceptable that Niagara Region has six million litres of wastewater leaking in the environment on an annual basis.

Leaks of this type don't harm the environment, it's not a good thing. There are over 300 CSO points in the Niagara Region and we are addressing them in partnership with the municipalities, it is diluted sewage and there has been no point in time when the Ministry of the Environment has charged anyone for this, as it is not critical.

If you have a proper system for wastewater, there are things that the building code don't take into account, from an environmental perspective it is contaminating the water system, the systems in place are not working, you have done everything right, it is more of a moral issue that could become a legal issue.

A resident spoke, who just moved to Wainfleet ten days ago, he moved to Wainfleet to a home with a cistern and a holding tank under his control, he does not like municipal water and wants to be independent.

A 49 year resident of Maplewood noted that she has had a Culligan system put in place due to poor test results, she reiterated that the residents of Wainfleet are not stupid, they don't want to be ill, they take care of their water and she for one could not afford the added expense of the pipeline and would loose her home if it was put into place.

We understand that the affordability aspect of the preferred solution, however, there are avenues that could be taken, residents could establish a lien on their properties, staff are looking at all the options available.

Copies of the additional comments and questions have been attached for information purposes.

CLOSING COMMENTS

4. Closing Comments

Mr. Gohier and Ms. Cumming thanked everyone for coming to the meeting.

Councillor Henderson, Mayor of Wainfleet thanked everyone for making their opinions heard, as it was important to have the meeting at this time, to ensure that we heard from the seasonal residents.

Councillor Henderson thanked staff for making the arrangements for the meeting.

ADJOURNMENT

The Public Meeting respecting the Wainfleet Water and Sewer Servicing Project
adjourned at 12:40 p.m.

Janet Pilon
Deputy Clerk

Appendix 3: Private System Enforcement Cost Assumptions

- All properties in the subject area would be assessed.
- Assume 1,200 properties each requiring pumping and cleaning of the septic tank so that it could be inspected:
 - Pump=\$190
 - Clean out is filled with clean water and re-pump= \$300
 - Inspection (no confined space entry) 4 hours @ \$36/hr and mark up of 1.75 = \$252
 - Locate bed. Assume digging required Backhoe=\$300
 - Inspector for 6 hours=\$378
 - Restoration=\$200
 - Total 1,200 x \$1,620 =\$1,944,000
- Where deficiencies were identified, (estimated 924 properties, or 76%) the property owners would be provided with written notice to correct the deficiencies within a specified time frame.
 - 924 x \$50= 45,700
- At least half (0.5) of the properties where such notification was given would not be in compliance requiring the issuance of a legal Order.
 - 924 x 0.5 x \$200= \$92,400
- One in four (0.25) of those served with an Order would not comply and would require charges to be laid.
 - 924 x 0.5 x 0.25 x \$1,000 = \$115,000
- Possible court appearances @ \$5,000 +924 x 0.5 x 0.25 x 0.5 x \$5000=\$290,000

Cost For Initial Stage =\$2,487,100

- Holding tank policing would require two inspections/annum including examination of the tank, review of pump-out receipts, conformation of data with the sewage hauler, cross-referencing with the sewage treatment plant, where appropriate.
- Assume 600 tanks x 2 inspections x 4hrs for inspector (as above) = \$302,400.

Policing Cost Per Year = \$302,400

Appendix 4

On-site Sewage Disposal Study Assumptions

METHODOLOGY

The first stage of this work has been taken from previous AMEC reports. It consisted of a Desk-top Study that identified the physiographic parameters in a portion of Wainfleet that extends significantly north of the area under consideration for servicing. This was done by means of a review of available maps, reports and published data. Subsequently, a series of site visits took place as part of a Ground Truth Exercise that included hand-auger holes. This fieldwork refined the limits and descriptions produced by the desk study. The study area was then divided into areas that have significance both in relation to on-site sewage disposal and also in relation to area pollution. These physiographic areas are shown on Fig 2.

The second stage was to determine minimum on-site sewage disposal design requirements and hence lot size for each of the significant areas. A three bedroom house was taken as the standard for estimating the sewage flows for each property, with modifications made when the necessity became apparent from aerial photographs. For each set of physiographic constraints, the "conventional" sewage disposal system that met the legal minimum requirements as set out in the Ontario Building Code was determined. Also calculated were the minimum requirements for a more sophisticated sewage treatment and disposal system.

Each lot was examined using a set of aerial photographs provided by the Region. The areas available for sewage disposal were measured. Taking into account the local physiographic conditions, it was then determined whether the individual lots could be serviced using septic tanks and tile or (alternatively) using a more sophisticated system.

Individual Lot Compliance with Ontario Building Code OBC

The Region provided AMEC with a series of coloured aerial photographs that cover the whole of the study area in question. Marked on the photographs were the property boundaries and the ARN. Each property was located on the appropriate photograph and the distances between the house and each of the property lines was measured. Many of these measurements were difficult to make as the house outlines were often partially obscured by trees or shadow.

The requirements of a disposal system for the appropriate soil type (as described elsewhere) were then compared with the boundary distances to determine if a disposal system could fit on the lot. For example a lot in the deep sand conditions would require a setback from the structure of five metres and from the property boundary of three metres. Consequently, there was no space for any disposal area if the distance between the house and the boundary was eight metres or less. This was very often the case for the side boundary measurements. Where the distance was more than eight metres it was determined whether a system could be constructed.

The same procedure was applied to the other physiographic areas.

For clay areas, the lots were compared with the minimum space requirements for both a conventional raised bed system and for an alternative system that would take less space. A

larger area is needed in clay soils which do not accept effluent as easily as sand. This is largely due to the fact that a 15 metre mantle is needed around the tile. Therefore, no lot less than 30 metres wide could even be considered for a regular above ground disposal system with 20 metres being the minimum for an alternative system.

If a driveway or garden shed would have reduced the area to less than the minimum required, then it was assumed that the shed or driveway would be moved to provide the required space.

Summary of Ontario Building Code (OBC) Assessment

The quantity of sewage produced by a residence is dependant mainly on the number of people living in the residence (i.e. the number of bedrooms). Therefore, the sewage generation is dependent on the house size, not the lot size. On the other hand, the ability of the soil and groundwater to accept sewage effluent is dependant on both the type of soil and the lot size but not the house size. Therefore if the lot is too small for the house, the soil will not accept the volume of effluent generated, the individual sewage disposal system fails and sewage effluent breaks out to the ground surface.

There is a section of the Ontario Building Code which provides the requirements for an on-site sewage disposal system in the same way that the OBC provides the requirements for the size of the joists that support a living room floor. The OBC specifies the sewage disposal system in relation to the size of the house, the type of soil, the depth of groundwater, setbacks from property lines, buildings etc.

The lots in the study area have been individually examined to determine whether each of them could contain a system which would comply with the OBC. Those that could not would need to install a holding tank and have the sewage hauled away. Costs for both of these alternatives have been calculated. In addition to the existing residential lots, the requirements and estimated costs have been calculated for lots on which more than one residence was present, and for commercial lots.

Of the 1120 occupied residential lots in the study area, 443 could be made compliant with the Ontario Building Code and 677 could not.

There are 25 lots with either multiple residences or commercial usage which could not be made compliant with the OBC. Of these, approval to construct a sewage disposal system would have to come from the MOE, as the sewage generation would be too large to be dealt with under the OBC.

There are about 147 vacant lots in the study area of which about half will not receive sewage disposal permits under the present policies. They can therefore not be built upon. The other half will require on-site disposal systems.

Minimum Sewage Disposal System Sizes

1. General Comments

When determining whether a lot has sufficient room to accommodate the minimum sewage disposal system certain assumptions have been made. The assumptions are:

- A) That the soil and groundwater conditions are uniform across the area that would be affected by the sewage disposal system.
- B) That any well on the property (or on adjacent properties) is in a location where it meets the required clearances from the disposal system on the property.
- C) That there are no small streams, slopes or other physical site features that are not evident on the photographs but would restrict the disposal area.
- D) The septic tank and dosing chamber, or whatever primary treatment is required, can be accommodated on the lot without impinging on the disposal area.

Obviously, these assumptions may not be valid for all lots.

In addition to the above, it is standard practice when evaluating a new lot to allow for a "spare area" that is equal to the disposal area. No spare area allowance has been made in this analysis.

2. Deep Dry Sand

The sands that were encountered in the area under investigation consisted of dune sands and beach sands. In both cases they were quite clean granular materials with very little in the way of fines. The dune sands were of uniform composition with rounded grains and based on previous work in the vicinity had a percolation time that varied between one minute and five minutes. Only one significant area of beach sand was observed but what there was also had rounded grains (although due to wave action rather than wind) and very little in the way of fines. The estimated T time range was one minute to ten minutes.

Both of these sands would make excellent materials in which to construct conventional below ground disposal systems. In fact, if these sands have a problem, it is that they can have too low a T time.

The "dry" portion of the area description means that there must be a minimum of 0.9 m of unsaturated soil below the base of the leaching tile trench. With a minimum leaching tile trench depth of 0.6 m, the long-term water table would need to be at least 1.5 m below ground surface. This figure does not allow for any groundwater mounding below the tile area, as the mounding effect should be very small for materials with such a small "T time".

Allowing 1,600 L/day sewage flow for a standard three-bedroom house and a T time of five minutes, the length of tile required in a standard septic tank and tile system would be.

Sewage generated in litres X T time of soil in minutes/ 200 = $(1600 \times 5)/200 = 40$ minutes

Coincidentally, this is the minimum length of tile permissible for a leaching tile system. The tile could be placed in any configuration that had tile lengths of 30 m or less and allows for 3 m clearance from property lines and 5 m clearance from the house.

It would be possible to reduce the size of the disposal area by using a filter bed or an alternative system. However, in an area with such a fast T time, the use of a different system would not make a great deal of difference in the sewage disposal area that is required.

3. Shallow Dry Sand

This soil area category would typically occur at the edges of a sand dune where the surface soil is dune sand, but where there was either a high water table and/or relatively thin layer of the sand itself. It has been difficult to accurately define shallow for the purposes of this work. This is because a very shallow (approximately 0.2 m layer) of sand over clay would not change the necessity for a raised bed and mantle and therefore the minimum lot size would not vary significantly from that required for a clay lot with no sand overlay. For the purposes of this study, shallow dry sand will consist of an unsaturated sand layer with a thickness between 1.5 m and 0.9 m.

The reasoning behind this definition is that minor ground build up (of up to 0.6 m) would be required for a disposal system to ensure the 0.9 m separation between the bottom of the tile trench and the clay or water table. The base of the trench would not be above the original ground surface and hence a mantle would not be required. Nevertheless, all setbacks would need to be increased by twice the height of the surface build up and so the area required for the sewage disposal would need to increase. Assuming a 0.6 m build up, each setback would increase by 1.2 m. In addition, with the changes in ground surface, a minor allowance should be made to ensure that there is enough room to provide adequate site drainage. An arbitrary 1 m has been allowed on both sides and at the rear of the lot.

The effective result of these changes is an increase in disposal area and hence minimum lot area. In the case of shallow dry sand, a lot has been considered compliant if the 40 m of tile could be placed in any configuration that had tile lengths of 30 m or less and a setback of 5.2 m from property lines and 6.2 m clearance from the house.

4. Thick Aquitard

The majority of the Wainfleet area falls into this category. Conventional in-ground leaching tile systems are not permitted by the building code in areas where the T time is greater than 50 (or 125 for a shallow buried trench). Past experience by AMEC suggest that the heavy Wainfleet clay has a T time greater than 125 and thus a raised tile system is required. A raised system requires a 15 m wide mantle (generally a sand layer placed on the ground surface) in any direction in which the effluent could flow. As most of this area is relatively flat, an argument could be made that a mantle would be required in all four directions. However this is an extreme position and in keeping with the philosophy of this report, a mantle in two directions has been assumed with clay berms being constructed to prevent flow in the other two directions. Because there is a ground build up and because the soil has a high T time, an allowance for a drainage swale has been made on both sides and at the rear of the lot. If this situation were being considered for the creation of a new lot, 100% spare area would be needed in case problems were encountered with the disposal area. No spare area has been allowed in this analysis.

Considering an imported soil with a T time of 10 minutes, a tile length of $1600 \times 10 / 200 = 80$ m would be required, (approximately 8 lengths of 10m for an area of 11.2 m x 10 m). Allowing 3.5m for the clay berms on two adjacent sides and 15 m for the mantle on the other two sides, a raised disposal area of 29.7 m by 28.5 m would be required (approximately 30 m by 30 m). In addition, some allowance would need to be made for drainage swales. The raised disposal area would have a contact area of about 21.2 m by 20 m or 424 m^2 with a loading rate of 3.8 L/m^2 , which is very close to the 4 L/m^2 maximum allowable in the Code.

For an alternative system, the equivalent to the “tile area” would be determined by the formula

- Sewage generated in litres X T time in minutes (max 50) / 850
- Area = $1600 \times 50 / 850 = 94\text{m}^2$ (approximately 10 m by 10 m).

Allowance should be made for a 15 m mantle on one side, 3.5 m berms on the other three and some allowance for drainage swales. Therefore, the lot is considered compliant for an alternative system if a disposal area of 30 m by 20 m or 600 m^2 can be accommodated. This produces a contact area of 300 m^2 with a dosage of 5.3 L/m^2 .

5. Thin Aquitard

For compliance with the Code, the Thin Aquitard condition has the same requirements as the Thick Aquitard condition and therefore the disposal area requirements previously referenced would also apply. The difference between these two conditions was relevant when the environmental analysis was being considered.

Appendix 5

Summary of Environmental Sustainability Assumptions

BACKGROUND

Every on-site sewage disposal system contributes to groundwater contamination to some extent. As it would be very difficult to examine all the possible contaminants, one is generally chosen for examination on the basis that it is the most likely contaminant to produce unacceptable concentrations. This is called the critical contaminant. The contaminant that is normally considered as critical for sewage effluent contamination of groundwater is nitrate although in some cases, close to water bodies, phosphates are used.

A normal, well-maintained, sewage disposal system consisting of a septic tank and tile system produces about 40 parts per million (ppm) of nitrates in its effluent. Obviously, the 1600 L/day effluent production will not occur every single day from all the houses in an area and a smaller figure of 1000 L/day/residence is used for environmental calculations. Within normally considered limits, this figure is independent of the size of the lot. In some circumstances it may be more appropriate to consider biological contamination such as E. coli, but the general assumption is that if the other design criteria are met, then biological contamination will not be a problem.

Depending on the soil/rock/groundwater conditions, the amount of this effluent that will reach the groundwater will vary from all of it to virtually none of it.

INFLUENCE OF PHYSIOGRAPHIC CONDITIONS

In Wainfleet, there are large areas of shallow bedrock. In the bedrock are a series of cracks and voids, which act as conduits for the fast transfer of groundwater from one area to another. Therefore unless there is a sufficient thickness of low permeability soil over the bedrock, the effluent travels down to the shallow bedrock from where it rapidly reaches the groundwater.

In deep clays, or shallow sands overlying deep clays, the low permeability of the clay allows it to act as an aquitard that prevents the effluent from traveling down to the groundwater. Therefore, unless there is any surface breakout, the effluent does not cause significant contamination of the groundwater.

In the deep sand, the effluent travels vertically downward in a virtually unchanged condition until it reaches either an impermeable layer or the water table. In some cases where there is the deep sand condition, there is a perched water table where the precipitation (and hence the effluent), having passed down through the sand, reaches a soil layer with a lower permeability which slows its vertical travel.

At this stage, it starts to travel sideways until it emerges in ditches, into the beach sands or forms swamps. However where there is less than 3 m of aquitard, the environmental analyses will assume that the effluent reaches the shallow bedrock.

ENVIRONMENTAL PROTECTION ACT – POLICY D-5-4

There are two main forms of aquifer protection that are considered acceptable by the MOE. One is to have sufficient thickness of low permeability soil (aquitard) over the groundwater aquifer so that very little effluent can reach it by travelling down from the ground surface. The second is to ensure that there is sufficient land area associated with a disposal system that the

rain and snowmelt that travels down into the soil is sufficient to dilute the contaminant in the effluent to acceptable levels. Depending on the type of project the acceptable concentration of the critical contaminant (nitrates) in the aquifer could rise as high as the Drinking Water Limit of 10 ppm.

There are two main classifications of soil conditions for the environmental analyses. These are areas with a thickness of 3 m or greater of aquitard. Under these conditions it is assumed that very little of the effluent reaches the bedrock and hence the groundwater, which is therefore considered to be protected from unacceptable contamination.

Normally if the analysis was being performed to determine whether the area was acceptable for a new development, a more conservative (i.e. greater) thickness of aquitard would be used. This is not because 3 m of solid clay would not provide sufficient aquifer protection, but because the permeability of clay is greatly increased by any fissuring system that it may contain and hence a conservative approach is taken.

However, this document is not a conservative analysis. Consequently any lot in a thick aquitard area will be considered as acceptable from an environmental perspective regardless of whether it is considered as compliant to the OBC.

SPECIFIC AREA RESULTS

There are three thin aquitard areas. As they are separated by thick aquitard areas, each will be dealt with separately. For sewage generation, the number of houses multiplied by 1,000 L/day will be taken at an assumed nitrate concentration of 40ppm. The east and west boundaries of the catchment areas are those shown on our Figure 2, with the north and south boundaries being the study limits, as described previously. Setting these limits allows an approximate calculation to be made of the precipitation infiltration that will dilute the effluent.

A water surplus of 0.3 m/year and an infiltration rate of, for instance, 60% can be combined to produce an infiltration volume of $0.18 \text{ m}^3/\text{m}^2/\text{year}$. Therefore a simple mass balance calculation indicates that when the effluent is diluted by infiltrated precipitation, the average nitrate concentration is 15.3ppm, 10.7ppm and 10.6ppm for areas D1, D2 and D3 respectively.

On the basis of this calculation, none of the thin aquitard (shallow bedrock) areas meet the test for environmental acceptability. However, this should not be taken to mean that all the wells in these areas would always indicate such high results when tested for nitrates. There would be local density variations in the housing.

The groundwater flows that are not directly related to local infiltration would cause local increases in the dilution and hence local reductions in the nitrate concentration. Possibly the most significant fact is that not all the houses are full time residences and hence would not contribute a full years sewage into the groundwater. Nevertheless, at these rates, the contamination of the groundwater would likely be at an unacceptable level.

Although not part of these analyses, if this much nitrate contamination is indicated, then there would certainly be some bacterial contamination of the groundwater which would make it unsafe to drink without some form of treatment.

Appendix 6

Residence Time of Contaminated Groundwater in Wainfleet

The residence time of contaminated groundwater in Wainfleet was estimated by applying the Darcy's equation and conceptual understanding of the local geology obtained from previous studies (MacViro Consultant Inc. 2006 and AMEC 2006). The residence time can be estimated by the average linear groundwater velocity:

Average Linear Groundwater Velocity (\bar{V}) = $\frac{Ki}{\phi}$, where K is hydraulic conductivity, *i* is hydraulic gradient and ϕ is effective porosity.

The conceptual understanding indicates that the subsurface geology mainly consists of silt, sand and fractured rock (limestone). A value for the hydraulic conductivity and the effective porosity was estimated for each soil/rock type using existing field reports and scientific literatures (MacViro Consultant Inc. 2006; Fetter 2001; Freeze and Cherry 1979). The horizontal hydraulic gradient was estimated as 8.53×10^{-3} (MacViro Consultant Inc. 2006). Based on these parameters, the average linear velocity of contaminated groundwater and travel times for distances of 200 m and 1,000 m were estimated as shown in the table below.

Rock Type (subsurface geology)	Hydraulic Conductivity (m/sec)	Effective Porosity	\bar{V} (m/year)	Travel (years)	
				200 (m)	1,000 (m)
Sand	2.23×10^{-5}	0.25	24.0	8.5	41.8
Silt	1.00×10^{-7}	0.20	0.135	1,490	7,440
Fractured Rock	1.44×10^{-6}	0.05	7.75	26	129

It should be mentioned that 200 m to 1,000 m is based on the distance between the lots and the lake. Based on this assessment, the flushing time of the dissolved phase contamination will take between 8.5 to 1,490 years. Please note that the pure phase (sludge) and other processes such as biodegradation were not accounted for in the calculation.

These estimates of residence time of contaminants based on the field measured parameters and scientific literature review suggests that it will take a considerable amount of time for the aquifer to return to background condition if use of the septic system ceased today.

Appendix 7

Life Cycle Costs for Private System Maintenance and Replacement

The following summarizes the assumptions adopted by AMEC Earth and Environmental Inc. in the Life Cycle Cost Analysis prepared to determine the cost of private on-site sewage disposal and the provision of a potable water supply. The basic assumptions are presented below and costs are shown on the table provided on the following page.

- The analysis period is 75 years.
- The discount rate is 6.5%.
- The inflation rate is 2.5%.
- The typical effective working life of a disposal system or a holding tank is 30 years.
- The typical effective working life of a drilled well is 40 years.
- Water requirements are at a rate that is 25% less than the rate used for the piped water supply calculations. This works out to 75% of 325 L/person/day and an occupancy of 2.4 persons/house or 585 L/house/day.
- Sewage generation rates for holding tank calculations are the same as the water supply requirements at 585 L/house/day. This is considerably less than the “long term” figure of 1000 L/house/day that is recommended by the MOE for environmental calculations.
- The OBC “standard house” generation of 1600 litres/day has been used when calculating the minimum on-site sewage disposal system for a lot.
- A summer only Residence is used for 6 months of the year.
- A permanent Residence is used for 12 months of the year.
- The residences are 50% permanent and 50% summer only.
- Cost of trucked water is \$5.00 /1000L.
- Cost to haul sewage is \$18.5 /1000L.

Life Cycle Costs for Private System Maintenance and Replacement

Type of System	Capital Cost	Yearly Cost	Present Value of Yearly Costs	Total Present Value
Sewage				
Holding Tank Permanent Residence		\$4,173	\$99,109	\$99,109
Holding Tank Summer Residence		\$2,294	\$54,483	\$54,483
New Conventional Sewage System	\$20,000	\$725	\$17,219	\$37,219
Existing Conventional Sewage System		\$725	\$17,219	\$17,219
New Alternative Sewage System	\$20,000	\$1,017	\$24,154	\$44,154
Existing Alternative Sewage System		\$1,017	\$24,154	\$24,154
Multiple Residence Sewage Systems	\$300,000	\$25,000	\$593,750	\$893,750
Water				
Well Water Supply new house	\$6,000	\$600	\$14,250	\$20,250
Well Water Supply existing house		\$600	\$14,250	\$14,250
Water purchase new permanent house	\$6,000	\$1,345	\$31,944	\$37,944
Water purchase existing Perm. house		\$1,345	\$31,944	\$31,944
Water purchase new Summer house	\$6,000	\$813	\$19,309	\$25,309
Water purchase existing summer house		\$813	\$19,309	\$19,309
Multiple Residence Water Supply	\$19,500	\$7,600	\$180,500	\$200,000
Other				
Loss on Un-developable Lot	\$60,000			\$60,000
Inspection Costs – Sewage	\$2,487,100	\$302,400	\$7,182,000	\$9,669,100
Inspection Costs – Water		\$458,344		\$10,885,670

Appendix 8

Life Cycle Costs for Water and Wastewater Alternatives

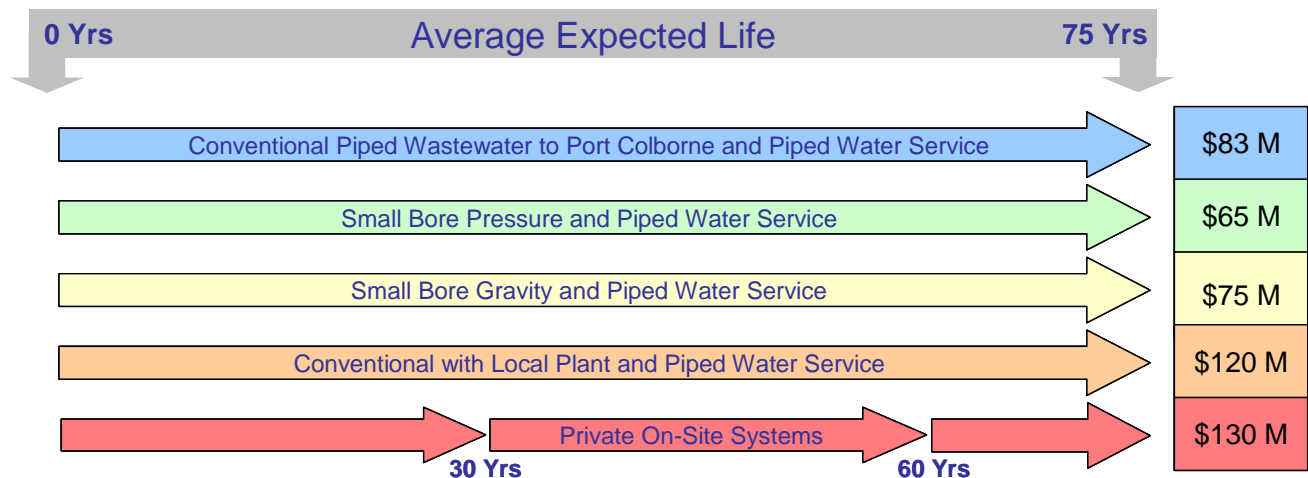
Alternative	Servicing Alternative Cost (\$ Million)			
	Conventional, with treatment at Pt. Colborne	Low Bore Pressure	Low Bore Gravity	Conventional, with local treatment
Water & Wastewater Servicing Cost	\$54.04 M.	\$39.86 M.	\$48.22 M.	\$62.64 M.
Engineering	\$7.51 M.	\$5.38.M	\$6.63 M.	\$10.61 M.
Contingency	\$6.77 M.	\$5.35 M.	\$6.19 M.	\$10.65 M.
Annual Maintenance	N/A	N/A	N/A	N/A
MOH Inspection	N/A	N/A	N/A	N/A
Total Capital Cost	\$68.32 M.	\$50.59 M.	\$61.04 M.	\$83.90 M.
O & M Cost	\$0.88 M.	\$0.87 M.	\$0.85 M.	\$2.18 M.
PV of O & M	\$14.77M.	\$14.60 M.	\$14.27 M.	\$36.59 M.
Life Cycle	\$83.09 M.	\$65.19 M.	\$75.31 M.	\$120.49 M.

Appendix 9

Life Cycle Costs and Average Expected Life of Alternatives

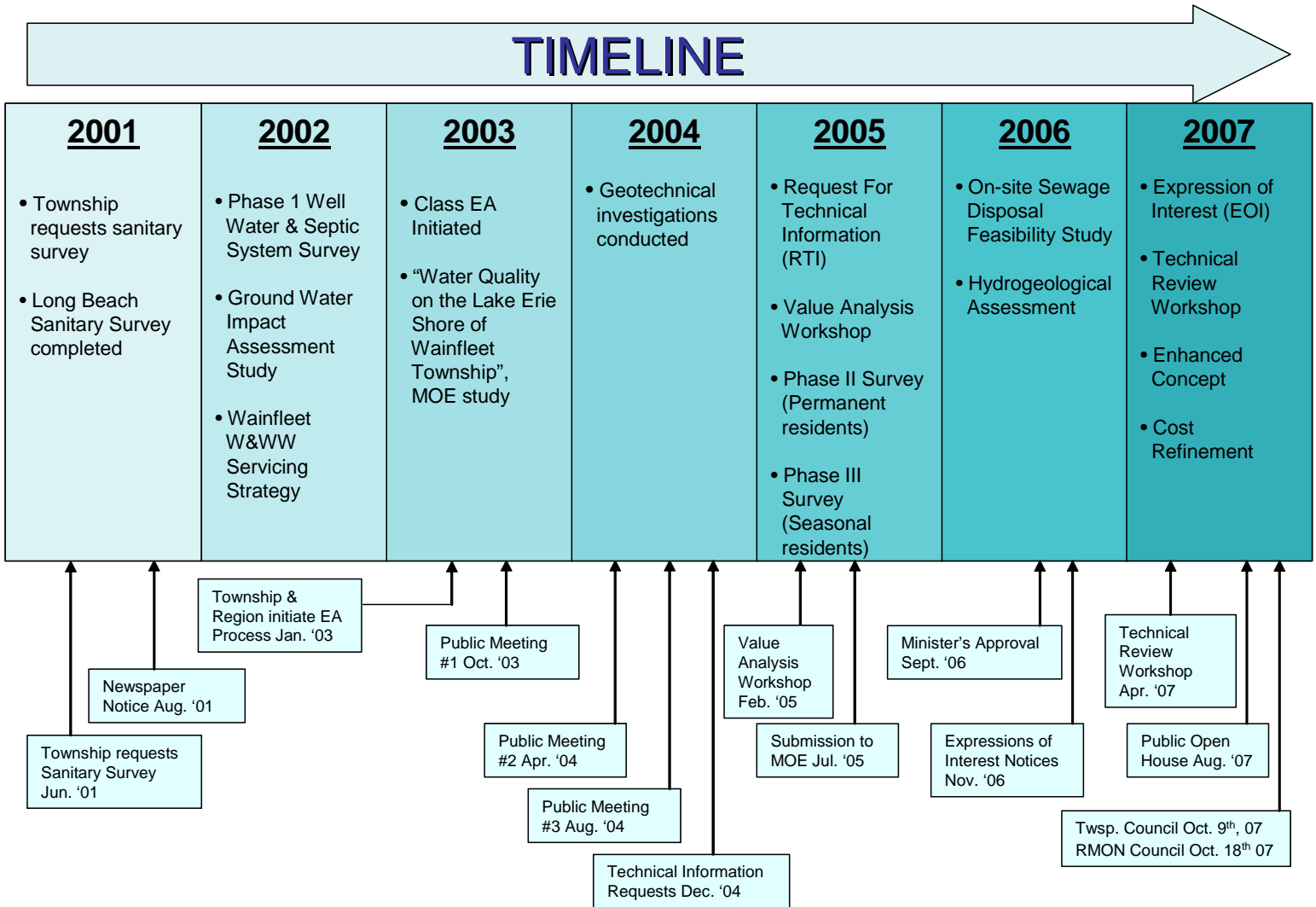
Life Cycle Costs – Water and Wastewater

Conventional Piped Wastewater to Port Colborne and Piped Water Service	Small Bore Pressure and Piped Water Service	Small Bore Gravity and Piped Water Service	Conventional with local plant and Piped Water Service	Private On-Site Systems
\$83 M	\$65 M	\$75 M	\$120 M	\$130 M



Includes consideration of: capital, engineering, annual maintenance, operations, policing and enforcement costs

Appendix 10 Wainfleet EA Process – Project Timeline



Appendix 11

Summary of EA Approval Process

