RURAL WASTEWATER:
OPPORTUNITIES FOR BETTER MANAGEMENT
OF
ON-SITE SEPTIC SYSTEMS

PREPARED BY
ROSAIRE MACNEIL
FOR

CLEAN ANNAPOLIS RIVER PROJECT
FEBRUARY 2002

Table of Contents

Acknowledgements

In the course of conducting research for the *Rural Wastewater: Opportunities for Better Management of On-Site Septic Systems* report, numerous people provided support and information. Funding was provided by Environment Canada for the research and writing of the report; further funding was provided by the Shell Canada Environment Fund to assist with publishing and distribution of fact sheets that will be available to citizens, resource users and decision makers in the region.

Thanks are extended to the Project Committee members for their expert help; they include Kelly MacDonald, B.A., MES, Environment Canada; Barry Gillis, P. Eng., Nova Scotia Department of Environment and Labour; Roger Sturtevant, Executive Director, Annapolis District Planning Commission; and the Executive Director of Clean Annapolis River Project, Stephen Hawboldt, who provided guidance as well as support.

The contribution of information from the Nova Scotia Department of Environment and Labour liaison person Janet MacKinnon, B.Sc., CPHI(C), is gratefully acknowledged. Grant Cooke of Service Nova Scotia and Municipal Relations (Municipal Services Division) was very informative and helpful.

The assistance of the Centre of Geographical Sciences staff, Annapolis County Planning Services staff and Kings County Department of Community Development Services personnel is gratefully acknowledged.

Thank you to Mike Cleaves and Theresa Ruggles-Nickerson for ongoing technical and office support.

About Clean Annapolis River Project

The Clean Annapolis River Project (CARP) is a charitable, community-based, non-governmental organization incorporated in 1990 to work with the community and organizations to promote awareness about, and to foster the conservation, restoration and sustainable use of the freshwater and marine ecosystems of the Annapolis River Watershed. CARP's vision statement asserts …"the Annapolis River Watershed will provide habitat capable of supporting a healthy ecosystem, recreational opportunities and a working landscape that supports and is enhanced by the sustainable use of the watershed's resources."

CARP was created when two unrelated events converged—the rejection of the Annapolis River system as a candidate for designation as a heritage river, and its selection by the scientific community as a demonstration site for an innovative environmental management initiative. This led directly to an invitation for CARP to participate in the Atlantic Coastal Action Program, a federal Green Plan program delivered by Environment Canada.

Constructive, positive problem-solving are characteristics of CARP's approach to environmental concerns. The group is interested in a pro-active response to genuine community and scientific issues; solutions that recognize the economic and societal strengths and limitations of all stakeholders are encouraged.

The organization is administered by a Board of Directors elected annually by the membership. The Board is presently composed of 15 volunteers drawn from many occupations and all geographic sectors of the watershed. The Board sets the policy and operating parameters for the society. For each of the dozens of projects that have been initiated by CARP, specialized project teams have been formed. These project teams, composed of non-technical and technical volunteers who have an interest in a particular issue, are charged with the final design, implementation and evaluation of the project.

In carrying out its mandate, CARP employs a four-pronged approach composed of action projects, public awareness programs, problem-definition efforts, and environmental planning initiatives. Projects are grouped into these four broad and interrelated classifications.

Clean Water Issues

Clean Water/Health

The ultimate goal of addressing malfunctioning on-site septic systems is to prevent wastewater from entering ground- and surface waters. The presence of coliforms (bacteria indicating the possible presence of disease-causing microorganisms) in water can often be traced to pollution from inadequately treated sewage.

The impacts of polluted water can be devastating for communities, both rural and urban. There are dramatic consequences of non-potable water supplies as was evident in the Walkerton Tragedy of 2000. Recently, in Garland, Nova Scotia, contaminated well water was partly a result of malfunctioning on-site septic systems. Foodstuffs contaminated by irrigation water have also been documented in Canada.

Up to November 30, 2001, there were 96 boil-water advisories issued in Nova Scotia by the Nova Scotia Department of Environment and Labour (NSDEL). It would be interesting to evaluate what economic impact the boil orders have had on the affected communities. The proliferation of homes and businesses using bottled water may indicate a mistrust of potable water from both private and public water sources.

Clean Water/Shellfish Harvesting Industry

Some other consequences of polluted waters are no less significant. Nova Scotia has approximately 7600 kilometres of marine shoreline. As of December 2000, approximately 3103.6 square kilometres of nearshore area was classified for the harvesting of molluscan bivalve shellfish. Of this total, 68.9% was approved for shellfish harvesting, 30.8% was closed and 0.3% was classified as approved under conditional management plans. The economic value lost as a result of shellfishery closures (due to contamination) is estimated in the millions of dollars annually in Nova Scotia. This is especially important in areas such as the Annapolis Basin where the soft-shelled clam industry once flourished.

A resource-valuation study of a shellfish harvesting area of southern New Brunswick shows that the estimated $4 million dollar industry is still impacted by residential and treatment-plant sewage. It also spoke to the lack of management plans for this important resource industry.

Since 1988-89, the traditional soft-shelled clam harvesting area of Chezzetcook Inlet in Nova Scotia has been closed due to fecal coliform pollution. Sixty families depended upon the fishery for income. Malfunctioning, poorly constructed sewage disposal fields were identified as the source of pollution. Studies and reports conducted since then have failed to resolve the social and environment issues stemming from the environmental

degradation and loss of employment. To date, the fishery is still closed; however, harvesting for personal consumption continues.

Clean Water/Tourism & Recreation

The tourist industry is an important part of Nova Scotia's economy. Ecotourism is at the heart of Nova Scotia's tourism industry. We are "Canada's Ocean Playground", with thousands of kilometres of ocean shoreline. Beaches, lakes and rivers play an important part in this "paradise" of ours. Contamination of our natural assets is anathema when trying to attract tourists and their dollars to our province to enjoy what should be a healthful *and* aesthetic experience.

There have been beach closures due to high coliform counts, as well as a decline in the once-profitable recreational salmon fishing industry because of the degradation of their traditional spawning areas. A decline in recreational water use by boaters and swimmers in contaminated areas represents a significant loss of income for communities in the short "seasonal" run; an area that develops a reputation for polluted waters will also experience a long-term decline in activity and economic growth.

In the case of Milo, Second and Doctors Lakes in Yarmouth County, the Department of Health officially closed the lakes for swimming in 1988 due to high coliform counts recorded after a build-up of residential properties around the lakes over a number of years. After a central sewer system was constructed, the polluted waters improved yearly and the lakes were officially opened for swimming by summer 1991. Public use of the lakes has increased steadily since then; boating and swimming programs are again the norm, contributing to a healthy local environment and economy.

The ultimate issue, though, is the protection of the health of Nova Scotians. A failure to ensure an adequately clean water supply could ultimately create a disastrous scenario involving sickness, perhaps deaths and a collapse of public faith in our ability to provide this essential and basic service.

Preface

Approximately 45% of Nova Scotians have their home wastewater treated by their own on-site septic systems. The Centre for Water Resources Studies (CWRS) estimates that fully one-third of the on-site septic systems in Nova Scotia are inadequate or degraded and contributes to pollution of ground- and surface waters. Evidence indicates that this holds true for the Annapolis Watershed area. Moreover, several surveys have determined that most homeowners do not monitor or maintain their on-site septic systems on a regular basis.

Standards in design and installation for septic systems have improved; steps have been taken by the provincial government to correct on-site problems. However, barriers—legislative, regulatory, and economic—remain in the pursuit of an environmentally acceptable, effective management approach to rural on-site wastewater. These barriers will be described and possible strategies to overcome them will be offered. There are other issues as well—technical and scientific—which are relevant to any discussion of wastewater management but they will not be dealt with in-depth in this report.

Nova Scotia has yet to implement a comprehensive management strategy; however, to address the issue of inadequate wastewater treatment at the on-site level, the Nova Scotia Department of Environment and Labour is currently exploring management strategies for decentralized wastewater treatment as part of their long-awaited wastewater strategy for Nova Scotia. Several strategies and tools that could help in the establishment and improvement of on-site septic system management plans will be described in this report.

Properly functioning on-site septic systems are a very effective means of treating wastewater in rural Nova Scotia; they are also very cost-effective. Nova Scotia has considerable rural areas where most wastewater treatment is decentralized, making the issue of creating wastewater management plans particularly significant. The scope of this report will focus on decentralized (on-site) septic systems with an emphasis on the experiences in the Annapolis Watershed area.

Summary and Recommendations

Summary

Advancements have been made in addressing the problems of non-point pollution such as that from on-site septic systems. However, three categories of barriers currently discourage the establishment or enhancement of management plans to control on-site septic systems, and they include: legislation, regulations, and economic resources. For instance, the legislated authority of municipalities to create (by by-law) Wastewater Management Districts has been under-utilized. In addition, the authority of municipalities to require on-site septic system maintenance has not yet been exercised.

The following points are considered key factors limiting progress in the establishment of management plans for on-site septic systems:

> although the Environment Act gives the province power to resolve important environmental problems such as pollution stemming from sources such as on-site septic systems, solutions have not been far-reaching enough;
>
> there has been no consistent funding attached to the legislated means of controlling on-site septic systems;
>
> the provincial government is currently producing a management strategy plan (to date, focus on this issue has been inadequate);
>
> the implied involvement of several government units—municipal as well as provincial bodies such as the Nova Scotia Department of Environment and Labour—may prove a hindrance in management cooperation within the private as well as government sector; and,
>
> there has been no singular impetus from the private sector to administer wastewater treatment, possibly due to the desire of government to be involved in this area.

There may be room for non-governmental bodies to ensure that on-site septic systems are managed—the creation of a co-operative, a not-for-profit society, or a "condominium" management model are creative approaches to rural wastewater management that could help lessen pollution from malfunctioning systems and also ensure that new systems are properly designed, installed, inspected and maintained. The management of on-site septic systems by the non-government sector warrants further examination.

The Centre for Water Resources Studies is available to the public and to government as an information and research resource regarding wastewater treatment and technology. Government departments, such as the Nova Scotia Department of Environment and

Labour, have a critically important role to play, part of which involves public education respecting homeowner responsibilities for on-site septic systems.

Funding to deal with rural wastewater has eroded in a time of government cutback. The loss of resources (human and financial) contributes to a diminished provincial capacity to focus on pollution from non-point sources, such as on-site septic systems.

Recommendations

There is an urgent need to address the issue of managing on-site septic systems in the province of Nova Scotia. A readjustment in the current focus on the sole use of expensive central infrastructure and government control to manage on-site septic system problems might be accomplished in several ways:

A study of provincial and municipal legislation respecting the control of wastewater treatment should be conducted to define the areas of authority that are untested or vague. More recent developments in provincial and municipal legislation and regulations respecting on-site wastewater treatment should be re-examined in the light of existing successes and problems.

Wastewater Management Districts (WWMDs) have an important role to play in the management of on-site septic systems. The reason why they are not regarded as a viable option in more communities needs to be determined. If sufficient financial resources are not available to support WWMDs, alternative approaches should be considered to assist WWMD establishment.

Growth management is an important element of the wastewater management problem. High density development, low density "sprawl," and by-laws authorizing zoning and lot sizes—all affect a community's capacity to manage its wastewater. These should be studied further in their relation to on-site septic system management.

Dedicated economic resources to address on-site wastewater management must be more firmly secured. Without the dedicated financial and human resources in place to monitor and enforce regulations, the legislation enabling these regulations is without influence.

Alternative models for the management of on-site wastewater treatment should be studied further. Although to date no private entity has managed on-site septic systems in Nova Scotia, it is an idea worthy of consideration. Extant organizations such as the Co-operatives Branch of the Nova Scotia Economic Development department, for example, already provide a ready framework for establishing a service model such as a co-

operative. Other entities could be considered, given further inquiry into their feasibility under the present legislative regime.

The underlying goal of providing clean potable water for Nova Scotians must not be forgotten. A clear public message should emphasize the responsibility the public and homeowners have in protecting their own drinking water supply from contamination by untreated wastewater. It is recommended that a homeowner survey be undertaken to determine attitudes and perceptions of homeowners regarding their on-site septic systems. The survey questionnaire could also serve to inform on-site septic system owners of the link between the maintenance of on-site systems and the protection of drinking water supplies.

Water conservation is not only a critical issue in itself; it also impacts on the efficacy of any wastewater treatment. A study contrasting the effects of intense water conservation efforts in town such as New Glasgow versus towns with no water conservation program could be conducted. The positive dollars-and-cents results of regulating water conservation (shown in the few studies that have been conducted in Nova Scotia) could be emphasized and reinforced.

1.0 Legislation and Regulation: Introduction

Decentralized wastewater treatment (the on-site septic system) provides a cost-effective, environmentally-sound means for non-urban communities to ensure their environmental and public health. On-site septic system design and installation is directly controlled by the Environment Act and the regulations that stem from it. This enabling legislation points the way toward implementation of the regulations to be enforced. Public resolve also comes into play; responsibility rests with all of us to contribute our interest and input into government legislation and enforcement to ensure that the mandates they are entrusted with implementing are realized.

In order to understand the current approach to on-site wastewater treatment, the following enabling legislation, regulations, and codes will be addressed:

The Environment Act
- On-Site Sewage Disposal Systems Regulations
- On-Site Sewage Disposal Technical Guidelines

The Municipal Government Act
- Nova Scotia Building Code/National Plumbing Code
- Planning and Development

Barriers to the establishment of on-site septic system management plans will be discussed as will strategies toward achieving the goal of developing such management plans. Several approaches toward implementing or enhancing management plans are described in *Section 5.0: Management Plans and Strategies*.

1.1 The Environment Act: Barriers

The chief piece of legislation overseeing the management of on-site septic systems in Nova Scotia is the Environment Act. The Minister of the Environment, through this Act, has wide-ranging powers…"to protect the environment and to use tools such as economic instruments to achieve environmental quality objectives."[1]

The Legislative Review Committee Report (2000), produced as a result of the Environment Act Legislative Review Process, cites several criticisms of the Environment Act. The Committee (an independent, non-governmental body) found the written Act to be essentially innovative and progressive as environmental legislation but that it remained ineffective due to:

an absence of accountability for lack of action and enforcement under the Act;
a lack of will to implement the Act;
the absence of "time-bound" objectives; and
a lack of a clear sense of common direction.

[1] Legislative Review Committee Report ©Crown copyright, Province of Nova Scotia, 2000. ISBN: 0-88871-636-2.

Without clear leadership and clear focus, the Legislative Review Committee felt that definite policy and programs were unlikely to emerge, especially in areas of contentious issues. The Committee also felt that current levels of training also contributed to a hesitation in the implementation of the Act. The Nova Scotia Department of Environment and Labour (NSDEL), the government agency responsible for enforcing the Environment Act, is seen by the Committee to be indicative of a generally "risk-adverse" culture within the public service. This is an issue not confined to the Nova Scotia experience…"Limited or unclear authority can prevent an agency from establishing a successful management program, which is a vital factor in ensuring that decentralized systems do not fail in the future."[2]

It was the Legislative Review Committee's opinion that a lack of purpose at the highest levels of government can translate into ineffective actions or non-action at the regulatory levels of enforcement. The mandate of the NSDEL is clearly to protect our environment and our health; yet a lack of resources, both in finances and in personnel, may adversely affect the implementation of this mandate. Effective enforcement is only possible given adequate resources. To date, there has been no response to the Committee Report by the Nova Scotia Department of Environment and Labour.

1.2 The Environment Act: Options

The issuing of the Legislative Review Committee Report in itself could represent initial progress toward the establishment of programs such as one providing for management of on-site septic systems. The Committee received input from many individuals and organizations within the province; if a heightened awareness of the issues results, ideas may be put forward toward organizing solutions to legislative, managerial and enforcement issues outlined in the Committee's Report. A forum for the contribution of ideas from the public is a positive step toward encouraging governmental accountability. Suggestions and recommendations put forward by the Legislative Review Committee may contribute towards improving the legislation that is now interpreted and enforced by the Nova Scotia Department of Environment and Labour.

It was mentioned in the Legislative Review Committee Report that the NSDEL "does not maintain an enforcement and compliance policy and, therefore, has no means of communicating to the public or the regulated community, their priorities for enforcement or their approach to this task." The Committee strongly recommended that such a policy be put into place in order that the NSDEL's legitimate powers of inspection and enforcement are instituted to ensure environmental protection. A greater accountability to the public may result.

A government response to the Legislative Review Committee Report may help to clarify problems identified within the Report; a formal acknowledgement of the Report by the NSDEL may provide a clear focus for problem-solving. The Nova Scotia Department of Environment and Labour stated upon the release of the Legislative Review Committee

[2] U.S. Environmental Protection Agency. Office of Water. "Response to Congress on Use of Decentralized Wastewater Treatment Systems." (EPA 832-R-97-001b). Washington, D.C. April 1997.

Report (October, 2000) that it would respond within six months; as mentioned, no response has yet been heard.

In 2001, a document was issued by the Nova Scotia Department of Environment and Labour outlining the province's concerns about pollution from malfunctioning and degraded on-site septic systems and the effect it had on our health and economy. It was stated that producing the discussion paper was…"the first step towards developing a sewage management strategy for the Province of Nova Scotia."[3] Workshops were held by the NSDEL around the province upon release of this document; members of the private sector in the wastewater industry as well as the public were invited to attend. The results of this consultation process will be used by NSDEL towards developing a management strategy.

Although to date no management strategy has been proposed, the consultation process and issuing of the discussion paper was a positive step taken by the Nova Scotia Department of Environment and Labour towards solving the problems of malfunctioning and degraded on-site septic systems. As individual homeowners are responsible for the maintenance of their on-site septic systems, a continuation of the consultation process would constitute an educational process for them.

1.3 On-Site Sewage Disposal Systems Regulations/On-Site Sewage Disposal Technical Guidelines: Barriers

Contained within the Environment Act and empowered by it is the section, On-Site Sewage Disposal Systems Regulations. Provisions are laid out in these regulations for the installation of on-site septic systems, maintenance and operation of these systems and the working relationship between the (NSDEL) engineers and inspectors, and the private sector engineers and installers. These latest regulations were first issued in 1997; there have been periodic amendments since then.

The recent change initiated by the Nova Scotia Department of Environment and Labour in 1999 resulting in the design and selection processes shifting to the private sector has not been without problems. Site evaluations, designs, inspections and final approvals were all formerly under the control of the NSDEL; the process, though more time-consuming, may have been less complicated by the involvement of only one government agency.

With the advent of new regulations and guidelines, the introduction of the private sector and specially-trained inspectors within the NSDEL may have created some uncertainty in the area of enforcement and responsibility. Levels of experience and training are not equivalent among those in the private and public sectors involved in rural wastewater management. Under performance-based regulations and guidelines, judgement becomes more of a critical factor in system design and selection approvals; experience, high-quality training, and education, therefore, become a more crucial factor.

[3] Nova Scotia. Department of Environment and Labour. "We All Have a Part to Play". 2001.

The Nova Scotia Department of Environment and Labour's role is that of enforcement; the private sector designers and installers now have more latitude in the selection and installation procedures. The NSDEL's goal is to audit 40% of on-site systems being installed (J. MacKinnon, personal communication). According to an NSDEL spokesman, errors may slip by even if 100% auditing is practised (B. Gillis, personal communication). If errors are missed in the auditing process, malfunctions resulting in disposal bed breakthrough or system backup may take some time to appear.

Under Section 113 of the Environment Act, an inspector…."has and may exercise in any part of the Province all the powers, authorities and immunities of a peace officer as defined in the *Criminal Code* (Canada)."[4] This gives inspectors within the Nova Scotia Department of Environment and Labour a very strong authority to enforce any regulations stemming from provincial legislation. It would also apply to the inspection of on-site septic systems and the laying of charges and issuing of any fines. It would also require they have a search warrant to enter private property (to conduct a dye test, for example) without the owner's permission. Enforcement and guidance policy is a vital part of any department's function; if not exercised consistently and with authority, it renders legislation ineffectual.

An associated document, the On-Site Sewage Disposal Technical Guidelines, contains the very specific engineering parameters to be followed by engineers and installers in developing and approving on-site septic systems congruent with the existing "Regulations." The NSDEL engineers and inspectors are also bound to follow the specific rules contained within this document. The Legislative Review Committee Report refers to incorrect data contained within the "Technical Guidelines"; there are also numerous typographical errors that may lead to confusion when interpreting instructions.

As well as some flawed data in Selection Tables contained within the "Technical Guidelines", the imposing of "Technical Guideline" specifications on designed systems supported by calculations by a design Engineer has led to conflicts between the NSDEL enforcement body and some private engineers (G. Adams, personal communication). In *Appendix I: Summary of Submissions* in The Legislative Review Committee Report mention is made…"that there was strong opposition to non-engineers doing engineering work, in direct conflict with the Engineering Act." The Committee Report also suggests removing or correcting any clause in the "Regulations" that refers to a Qualified Person II (QPII) not working under the supervision and direction of a Professional Engineer (QPI).

QPIIs are those certified individuals carrying liability insurance who may select systems from the On-Site Sewage Disposal Technical Guidelines, but they cannot design systems. Professional Engineers are designated QPIs and may select a system from the "Technical Guidelines" or design a septic system if site conditions cannot be supported by the information contained in the "Technical Guidelines."

[4] Nova Scotia. *Environment Act*, S.N.S. 1998, c. 18, S. 113

Anecdotal evidence suggesting that some over-large on-site systems are being approved by the NSDEL may be due to several factors, including that of liability. An over-cautious approach to system selection and design (due to a high safety factor) may be another. A spokesman for NSDEL asserts that…"guidelines for QPIIs will result in systems a bit larger than what would have resulted had pure numbers been used in equations, however, there was no other way to make the guidelines work for QPIIs and not have clear engineering work done by them" (B. Gillis, personal communication).

Larger systems mean greater costs; the resulting increased cost may be discouraging homeowners from upgrading their failing systems. Concerns over liability in the case of failing on-site systems may have some bearing on this tendency toward conservative system design, selection, and approval. The pervasive issue of liability for the NSDEL as well as private sector engineers and installers will be further commented on in *Section 3.1: Economic Barriers.*

Traditionally, regulations and codes governing the design and installation of individual wastewater treatment systems have been prescriptive. The regulations and codes were based on empirical relationships and arbitrary standards that emphasized hydraulic function rather than treatment that met the demands for environmental protection and public health. Currently, on-site septic systems in Nova Scotia are selected and designed according to equations involving flows, soils, and gradients, as well as factors directly affecting environment and health, such as clearance requirements and loading rate restrictions. Although the specialized information contained within the "Technical Guidelines" is generally suitable for most on-site septic system cases, there are other factors to consider when selecting or designing for on-site septic systems.

While the "Technical Guidelines" were designed to best accommodate the soil types and geologic features found in Nova Scotia, there are alternative on-site septic systems available not described within the "Technical Guidelines" that may be appropriate for some site situations.[5] Again, the issue of liability may also discourage latitude in the choice of alternate and innovative systems.

1.4 On-Site Sewage Disposal Systems Regulations/On-Site Sewage Disposal Technical Guidelines: Options

It is recommended by the Legislative Review Committee that incorrect technical information in the "Technical Guidelines" be corrected. Typographical errors contained within the document should also be corrected to lessen confusion.

An acceptance of more alternative designs could result in less-costly on-site septic systems being installed where performance is the key factor. Only ongoing monitoring of an installed on-site septic system can determine this. Unless there is effluent breakthrough or wastewater backup into a dwelling, it is assumed that an on-site septic

[5] Waller, D.H., "Options for On-Site Wastewater Systems in Nova Scotia." Centre for Water Resources Studies, Dalhousie University. CWRS Internal Report 01-04, July, 2001. (Online) Available: http://www.dal.ca/~cwrs/cwrs/onsite/options.b1.pdf [March 2002]

system is functioning properly. Without periodic testing, it is very difficult to measure the exact nature of the treated wastewater that is filtering through the disposal bed.

At the time of final approval of an on-site septic system, it has been suggested by experts in the industry that an operating permit be issued which would be renewable once testing showed satisfactory results.[6] Such a stipulation could be incorporated into the On-Site Sewage Disposal Systems Regulations should ongoing inspection and maintenance become part of a full regulatory plan.

Systems installed now under the On-Site Sewage Disposal Systems Regulations and On-Site Sewage Disposal Technical Guidelines are not monitored once the approval process is complete. Although the auditing process is minimal, compliance with NSDEL inspection and approval is mandatory for the private sector during the course of selection, design, and installation—further inspection and monitoring is not. An organized method of ongoing inspection and maintenance could be incorporated into an on-site septic system management plan, whether private or public.

Hydraulic overloading of an on-site septic system is one of the factors affecting its performance; it can result in effluent flooding the disposal field, contaminating soil and possibly ground- and surface waters. One solution to this problem could be the inclusion of simple water conservation devices within the home; this would result in less wastewater being flushed into the tank. All else being equal, a septic system of reduced size (and reduced cost) may then be sufficient to accommodate the maximum of flow cited in the "Technical Guidelines."[7] These devices could be mandated within both the "Regulations" and "Technical Guidelines".

Storm runoff from buildings and lot surfaces can also affect the performance of an on-site septic system if the system is poorly situated so that the runoff floods the disposal field. A saturated field will not readily absorb effluent leaving the septic tank; flooding and contamination could possibly result. Although runoff "interceptors" are mentioned in the "Technical Guidelines", there is no provision to mandate such devices within the On-Site Sewage Disposal Systems Regulations or the On-Site Sewage Disposal Technical Guidelines. This issue will also be mentioned under *N.S. Building Code/National Plumbing Code: Barriers, Section 2.3.*

1.5 Legislation and Regulation Summary

Although improvements have been made in the current regulatory approach to managing on-site septic systems, there are still barriers to be addressed:

[6] Otis, Richard J. and D.L. Anderson. "Coming of Age: Performance Management for Onsite Systems", The Third Annual Texas Onsite Wastewater Treatment Research Conference, Austin, Texas. 1995.
[7] Nova Scotia. Department of Environment and Labour. "On-Site Sewage Disposal Technical Guidelines (2001)". Halifax, N.S., 2001.

Barriers	Options
lack of enforcement and compliance policies within NSDEL	enforcement and compliance policy should be developed by NSDEL
no government response to recommendations presented in Legislative Review Committee Report of October 2000.	NSDEL response to the Legislative Review Committee Report recommended by October 2002
no provincial wastewater management strategy produced to date	table wastewater management strategy in legislature during Fall Session 2002
unclear regulatory environment created a difficult transition to private sector	examination of results due to changes made in private sector should be conducted
weak inspection and auditing procedures	tightening of inspection/auditing procedures
not enough latitude for QPIs in design of on-site septic systems	review alternate/innovative on-site septic systems for inclusion in "Technical Guidelines" document
no operating permits are issued post-installation; no ongoing inspection and maintenance of on-site septic systems	consider issuance of operating permits at time of Final Approval—issue of ongoing maintenance must be addressed
water conservation not mandated within On-Site Sewage Disposal System Regulations or "Technical Guidelines"	consider revising "Regulations" and "Technical Guidelines" to require use of water conservation devices

The Table above outlines several ways and means of overcoming identified barriers to the management of on-site septic systems. The focus has been on the Environment Act that in turn enables the On-Site Sewage Disposal Systems Regulations and On-Site Sewage Disposal Technical Guidelines. There are many factors affecting the current regulatory system. Following is an examination of the Municipal Government Act and the Codes and by-laws that are empowered by it.

2.0 Municipal Government Act: Barriers

As used in this report, a *municipality* is defined as any city, town or other region that has its own government. Although this report deals mainly with rural areas, as this is where most on-site septic systems are located, any legislation relating to municipalities also affects urban and town areas.

Service Nova Scotia and Municipal Relations is the provincial department responsible for overseeing the enforcement of the Municipal Government Act. On April 1, 1999, a new Municipal Government Act came into force, extending certain powers to the municipalities in Nova Scotia. Included is a provision giving municipalities some control over the maintenance of on-site septic systems:

> "A municipality may, by by-law, require owners of private on-site sewage disposal systems to have the systems pumped, emptied, cleaned, checked and maintained in accordance with the standards set out in the by-law."[8]

To date, no municipality has chosen to enact such a by-law. The municipalities may not have been anxious to have this section of the Act placed within their jurisdiction. Perhaps they were aware that to enforce such a by-law would most likely involve administering regulations and guidelines enforced by the Nova Scotia Department of Environment and Labour; personnel and finances are clearly not in place to do so at this time. The NSDEL has fewer personnel involved in on-site sewage disposal than in years past (G. Cooke, personal communication). Additional responsibilities created by municipalities seeking to upgrade on-site septic systems could place a great strain on resources in both municipal and provincial sectors.

Since 1982, municipalities have also had the authority to establish Wastewater Management Districts (WWMDs). Problems encountered in the establishment and maintenance of WWMDs may include community resistance, under funding, technical malfunctions and the complexities of multi-government department involvement. Wastewater Management Districts will be discussed further in *Section 5.1*.

Although municipalities within Nova Scotia have been given the choice to manage and maintain on-site septic systems, there has been no direct or indirect funding attached to these terms. To date, the Province has not contributed toward the establishment of on-site septic system management outside the municipal governmental framework.

Municipalities have no residual power; the provincial acts and statutes encompass the authority in determining all aspects of governance within the municipalities. The municipalities may enact by-laws but provincial legislation defines the parameters of those by-laws.

2.1 Municipal Government Act: Options

Municipal governments can exercise considerable influence in areas where water conservation is an issue; this will be discussed in the sections that follow. The control of non-point pollution sources such as malfunctioning on-site septic systems is also within their governance.

Although to date no funding from the province has been appended to the sections within the Municipal Government Act allowing municipalities to administer some control of on-sites (Section 336, Section 342), the authority to do so exists. If the municipalities wish to act upon this and establish either WWMDs or independent wastewater treatment utilities, the will and the resources must be found to do so.

Inter-governmental cooperation would be an essential component of any government-controlled entities, such as WWMDs. An independent utility would require some

[8]Nova Scotia. *Municipal Government Act*, S.N.S. 1998, c. 18, S. 336.

communication with government departments, such as the NSDEL, to ensure that regulations concerning wastewater disposal are followed.

Inequity among municipal units is an issue that may have to be addressed; funding from the wealthier municipalities could perhaps be used to initiate and fund programs. The current controversy over the Equalization Plan, designed to supplement the economic resources of the poorer municipalities, would indicate that this may not be a viable option.

2.2 Nova Scotia Building Code/National Plumbing Code: Introduction

The Nova Scotia Building Code is a code adopted through legislation by the provincial government from the National Building Code of Canada. Through Service Nova Scotia and Municipal Relations, the Building Code and the Plumbing Code are administered by municipally-appointed Building Inspectors and Plumbing Inspectors.

The National Plumbing Code is referenced within the National Building Code under Part 7, becoming part of the Code adopted by the Province of Nova Scotia. The Plumbing Code regulates the design and installation of plumbing systems in buildings in this province.

Any amendments to the National Plumbing Code must go through the same lengthy process that amendments to the National Building Code do. Even if changes are agreed upon by all parties, it would typically take five years or more for these changes to become law and thus enforceable. Volunteer representatives from various sectors of the construction industry, architects, engineers, manufacturers, building owners, etc., make up standing committees that decide on the technical content of the Codes. Anyone may suggest changes to the Codes.

Both the Nova Scotia Building Code and the Plumbing Code are limited when addressing water conservation issues; they provide minimum requirements only for health, life safety and structural sufficiency in buildings; it is unclear whether water conservation is an issue for the Code (T. Ross, personal communication).

2.3 Nova Scotia Building Code/National Plumbing Code: Barriers

Hydraulic overload is cited as one of the reasons on-site septic systems can fail.[9] Improper design, the damaging of a disposal bed or a failure to regulate the amount of water flowing into the septic tank are all reasons why septic tanks can be "over-watered", resulting in the flooding and possible contamination of a disposal bed. The cost of inspection and replacement of the disposal bed can be steep.

Rainwater from roofs and surface waters can also damage a disposal field if not diverted. The provisions within the Building and Plumbing codes concerning water runoff from

[9] "On-Site System Repair and Rehabilitation". Centre for Water Resources Studies. On-Site Wastewater Technology and Management Research Program. Dalhousie University, Halifax, N.S. [n.d.]

roofs and drain tiles are meant to protect the structure of the building, including the foundation. There is no requirement to protect an on-site septic system disposal field.

At a study site in Lunenburg County, Nova Scotia, during the years 1994-1997, Canadian Mortgage and Housing Corporation researchers found that the use of faucet aerators, a low-flush toilet and a low-flow showerhead reduced the hydraulic load on the on-site system by 30 percent (over average values).[10]

Neither the Nova Scotia Building Code nor the Plumbing Code makes provisions for the installation of simple water conservation devices within the home. These readily available devices are all well recognized in water conservation; they are only recommended but not mandatory within the Plumbing Code, as is also the case with the On-Site Sewage Disposal Technical Guidelines and On-Site Sewage Disposal Systems Regulations.

The Plumbing and Building Codes are regularly amended but the process to do so is a lengthy one. The province adopts the National Building Code within a few months of its issuance, which is roughly every five years. A national standard is being sought by those involved in defining and amending the National Building Code that may make the current process timelier.

The Municipal Government Act allows a municipal council to make by-laws…"prescribing minimum standards of sanitation, plumbing, water supply, lighting, wiring, ventilation, heating, access…."[11] This may allow a municipal unit, by means of by-law, to mandate the use of water conservation devices within their jurisdiction. Although municipalities may currently lack the technical or financial resources to enforce such a by-law, the authority is there. The by-law must be consistent with the standards prescribed pursuant to the Building Code Act and regulations.

The responsibility of Plumbing Inspectors (who are usually also the Building Inspectors) typically ends within a metre of the building (T. Ross, personal communication). At that point, any matters concerning on-site septic systems are under the direct authority of the Nova Scotia Department of Environment and Labour. Although the amount of water flowing from a building can directly affect the performance of an on-site septic system, there is no provision within the Plumbing Code or the Building Code to provide for this.

2.4 Nova Scotia Building Code/National Plumbing Code: Options

Encouraging the use of low-cost water-conservation devices and homeowner education could go a long way toward correcting this cause for on-site septic system failure. Plumbing devices such as low-flow showerheads, low-flush toilets and faucet aerators are readily available. An educational campaign aimed at the homeowners of on-site septic systems outlining the advantages of such devices could result in a greater awareness of

[10] Research Highlights, "Innovative On-Site Wastewater Treatment", Technical Series 01-138, Canada Mortgage and Housing Corporation. [n.d.]
[11] Nova Scotia. *Municipal Government Act* .S.N.S., 1998, c. 18, S. 181(1) (a)

the importance of home water conservation. If the information concerning water conservation was linked to the impact hydraulic overload has on an on-site septic system, for example, it would further educate homeowners about the responsibility they bear in the ongoing operation and maintenance of their own systems.

As mentioned, the process of amending the Building Code and the Plumbing Code is a lengthy one. If more lobbying was done by the environmental community as well as by the public with regard to water conservation, more credence may be given the issue. Anyone may offer suggestions to the standing committees concerning changes to the Codes; it is suggested that valid technical arguments accompany the suggestions.[12] A nominating committee also reviews applications from anyone interested in becoming a member of the standing committee or task forces involved in the amendment process.

The provincial government has the authority to adopt amendments to the Nova Scotia Building Code, yet it is rarely done on the provincial level. Amendments mandating the use of water conservation devices, within both Building and Plumbing Codes, could be lobbied for with input from all sectors of the building industry, government and also the public.

The Nova Scotia Utility and Review Board (NSUARB) is a quasi-judicial public body authorized to control the water utilities within Nova Scotia. A water utility has the authority to present amended or new regulations mandating water conservation devices to the NSUARB for approval. This may be a lengthy process, as historically, new regulations are approved when there is an infrequent petition for a rate change. Regulations restricting the use of water in times of drought, for example, exist in several water utility areas but it is not common.

In the 1980s, the town of New Glasgow began an intensive water conservation program to ensure their public drinking water supply. As well as increasing industry rates to encourage less water consumption in that sector, they instituted an intensive leak detection program within the entire distribution system and also monitored larger water meters to ensure accuracy. Residential rates were increased and retrofit toilets were installed in 300 households. Water consumption was reduced from 804,000,000 gallons/year in the early 1980s to 496,000,000 gallons/year by 1999, even though 1341 additional customers had been added to the water service. (A. Buchanan, personal communication) The education of residents as well as industrial customers was an important part of the town's water conservation focus.

The issue of lobbying for a more stringent approach to water conservation could be accomplished by Nova Scotia Department of Environment and Labour participation in the Nova Scotia Building Code amending process. Lobbying by the NSDEL to the Nova Scotia Utility and Review Board would also bring this issue to the fore.

---

[12] Canada. National Research Council. "Canadian Codes Centre: About the Codes". In: *NRC's Institute for Research in Construction.* Available: http://codes.nrc.ca/codes/about_E.shtml [Dec. 2, 2001]

An encouragement of the use of water conservation devices is a matter that the Nova Scotia Department of Environment and Labour has already dealt with in handouts meant for the public. The topic is an increasingly valid one as our environment is still being degraded through careless- and overuse. As well, drought conditions have been an increasing cause of concern in Maritime communities in the last few years.

Taking a stronger approach to this concern as it relates to individual homeowners and their on-site septic systems would further awareness; educational materials must be readily available and distributed in a concerted way.

2.5 Planning and Development

Also falling within the governance of the Municipal Government Act is Part VIII, Planning and Development. This Part… "enables municipalities to assume the primary authority for planning within their respective jurisdictions…through the adoption of municipal planning strategies and land-use by-laws consistent with interests and regulations of the Province…."[13] Each municipality has the authority to establish one planning strategy for the whole municipal area or several strategies covering different areas of the municipal unit.

Municipalities must comply with provincial regulations when establishing minimum lot sizes within their jurisdiction. For example, NSDEL regulations describing minimum lot sizes for the placement of on-site septic systems should determine a municipality's minimum standard as well.

Poorly controlled development could have a profound impact on the environment as well as the economy of a municipality. Low-density sprawl in rural areas could require expensive central servicing infrastructure; an effective planning strategy that promoted "in-filling" within existing serviced communities would encourage growth centres, resulting in more efficient wastewater treatment.

Unmanaged high-density growth may impact the environment in a negative way, as well as prove costly in future clean-up costs. Concentrated growth that was poorly planned could mean a damaging increase in runoff from roads and lots as well as harmful volumes of sewage being discharged from homes, businesses, and central wastewater utilities.

The inclusion of the "grandfather clause" in provincial and municipal legislation allows previously legal actions to remain unchallenged under new or amended laws. Subdivision approval from the municipality, for example, is not required for subdivision…"resulting from a devise of land by will executed on or before January 1, 2000."[14] The Grandfather Clause in this case may result in extant small-sized lots with older, perhaps degrading, on-site septic systems that are difficult, perhaps impossible, to upgrade or replace under the existing On-Site Sewage Disposal Systems Regulations. Municipalities with large

[13] Nova Scotia. *Municipal Government Act,* S.N.S. 1998, c. 18, S. 190(b).
[14] Nova Scotia. *Municipal Government Act*, S.N.S. 1998, c. 18, S. 268(2)(j)

rural areas may be faced with these kinds of problems should they consider managing on-sites.

"The underlying assumption of growth management is that there are limits to the amount of unmanaged growth that an area can withstand without serious harm to public health, safety, or the environment."[15] A focus on the impacts of development within the municipalities must include an assessment of the role on-site septic systems play. Without a comprehensive approach to municipal planning in place, it is vital to examine all planning strategies in light of the effects they will have on our sensitive coastal environment.

2.6 Municipal Government Act Summary

The Municipal Government Act (MGA) is the provincial legislation that dictates the nature and extent of municipal powers. The Nova Scotia Building Code, the National Plumbing Code referenced within the Nova Scotia Building Code, and the section respecting Planning and Development all fall within the Municipal Government Act. There are several issues directly affecting the control of on-site septic systems in this province that come under the authority of the MGA:

Barriers	Options
MGA does not provide a funding framework for empowering Section 336, which gives municipalities authority to regulate on-site septic systems	develop a funded framework within which Section 336 can be established
WWMDs must ensure own funding	ensure support for WWMDs by developing a fund for that specific purpose
municipalities have no residual power to enforce Sections 336 or 342 (S. 342 enables municipalities to establish WWMDs)	the authority to enact Sections 336 and 342 must be accompanied by powers to finance appropriate framework
water conservation devices are not mandated within Building Code or Plumbing Code	lobbying through appropriate avenues to provide focus on water conservation
Amending of Nova Scotia Building Code and National Plumbing Code is lengthy process	awareness of the importance of water conservation could prompt more timely Code amendment process
Section 181 of MGA, granting municipalities the authority to mandate water conservation devices, is not exercised	municipalities could investigate the feasibility of enacting Section 181 as regards water conservation

[15] Buzzards Bay Project National Estuary Program, Management Plan. *Land-Use Management*. (Online). Available: http://www.buzzardsbay.org/ccmp/landmgt.htm [February 18, 2002]

comprehensive land use planning is needed, especially as relates to on-site septic systems	issue of growth management as regards on-site septic systems should be further investigated

The above outlines some concerns regarding the enforcement of Sections contained within the Municipal Government Act. As with the Environment Act, it can be seen how legislation and the enabling regulations, codes, and by-laws affect particular concerns such as the regulation of on-site septic systems.

Economic resources also affect very strongly the way in which wastewater treatment is regulated and enforced. The following section will deal primarily with the economic perspective. Barriers will be discussed, as will options toward improving current economic circumstances.

3.0 Economic Resources: Introduction

It was recently announced that more than $8½ million dollars would be spent towards the upgrading of central wastewater treatment in several communities in Nova Scotia.[16] The funding will be drawn from the Canada-Nova Scotia Infrastructure Program, a $195-million, six-year project administered by the Atlantic Canada Opportunities Agency and Service Nova Scotia and Municipal Relations.

Traditionally, any government monies allocated towards an upgrade in wastewater treatment has gone toward central wastewater treatment—wastewater management districts or wastewater treatment plants—systems that are public entities and are funded and controlled through these entities.

Considering the state of our coastal waters, in many situations, these are wise investments. In many rural and semi-rural locations, however, central services are far too expensive to build and maintain, as population densities are low and dispersed. Central collection and treatment facilities with only two or three connections per kilometer are extremely inefficient. In these situations, the most cost- and environmentally-effective method for wastewater treatment is the on-site septic system; yet this approach to treatment is not directly funded provincially or federally.

Several barriers to the implementation of a comprehensive plan to manage on-site septic systems will be discussed below.

3.1 Economic Resources: Barriers

There are indications that on-site septic systems being selected, designed and installed now by the private sector may be over-built. Increased private sector involvement has coincided with rising costs to homeowners. As well as regulations and guidelines that

[16] Proctor, S. (2002, Jan. 27). *Antigonish mayor welcomes bucks for water treatment.* Sunday-Herald, p. A6

have raised standards and provided a conservative “safety factor” in the design of systems, there is the question of liability. Those in the private sector involved in the design, selection, and installation of systems, and the Nova Scotia Department of Environment and Labour (as inspectors and issuers of permits and approvals) may be liable if a system fails.

If a system is designed to accommodate a larger number of people than currently occupy the building, less maintenance may be needed, as the system will likely handle more effluent over a longer period of time. It is assumed that once the system is installed it will likely not be monitored or maintained, unless problems arise. This is the “flush and forget” syndrome and describes a prescriptive approach to on-site septic system management.

A larger-than-necessary system may accommodate some neglect and also forestall the problems of liability. This would mean that the homeowner must bear the cost of an over-large system; this may discourage some from upgrading or replacing systems. Homeowners may also be tempted to bypass the regulatory regime altogether and have a smaller system installed; this would mean less cost as well as less time spent in the inspection and approval process.

At the time of property transfer, it is unclear what the true cost of an on-site septic system is. Realtors in Nova Scotia must declare what they know of a property to a prospective client. This is called Full Disclosure—but realtors are dependent upon what they are told by the property owner.

An informal survey conducted by the writer found that most people are only vaguely aware of on-site septic systems at the time of purchase, especially if they are from towns and cities serviced by central sewage treatment. Information can be unclear when old properties are in question; often, no one knows the extent of a disposal tank and field or whether there is one. It is an issue some realtors and homeowners are not comfortable with because of a lack of knowledge. The issue of liability also arises here.

On-site wastewater treatment has not been considered in the same light as other utilities such as electricity, telephone, water, etc. These utilities are managed and funded by private and public sector groups; they are generally well organized to deal with rural, individual service. The funding to establish and maintain these entities is crucial, as would be funding for an on-site septic system management entity or utility.

The importance of homeowner education cannot be forgotten. A recent booklet produced by the Nova Scotia Department of Environment and Labour entitled, “Before You Construct Your Sewage Disposal System” is currently available (ongoing cost has not been established) to the homeowner through NSDEL offices. It contains valuable and practical information and would be of great benefit to those considering building a home as well as owners of on-site septic systems.

The booklet could be distributed to homeowners through the private sector stakeholders (QPIs, QPIIs, installers, etc.) as well as through local planning offices. There is currently no charge to homeowners who wish to have the booklet; even if provided at no cost it may prove cost-effective in the long run, given the practical information concerning on-site septic system maintenance it contains. If more on-site septic systems are maintained on a regular basis, there is less likelihood of costly repairs and replacements.

Homeowner surveys are necessary to determine the perceptions and expectations of homeowners concerning their on-site septic systems. The degrees of responsibility felt by homeowners are probably wide-ranging. Effective approaches to the promotion of on-site septic system awareness and education for homeowners could be determined if barriers such as negative attitudes and a lack of knowledge were known.

One of the problems encountered by some municipalities in promoting the idea of establishing a WWMD was that homeowners felt that on-site septic systems were somehow inferior to central wastewater treatment facilities as a way of treating wastewater.[17] It proved problematical and either helped stall or quash the project. A well-planned homeowner education initiative may have forestalled opposition and delays; education initiatives would require adequate funding.

Government cost-cutting measures such as downsizing and the amalgamation of departments may not result in better services for Nova Scotians. At the same time that standards rise, as in the case of regulation and guidelines governing on-site septic systems, budgets are shrinking. In 2000, the Nova Scotia Department of Environment and Labour's budget was cut by approximately 16%. Between 1995 and 2001 there has been an over-all reduction in the Department's budget of 26%, with a corresponding cutback in personnel of 17%. Fewer NSDEL's employees have less to work with than pre-1995. [18] Although improvements have been made in the regulations concerning on-site septic system installation, there are fewer financial and personnel resources available to enforce these regulations.

The only funding offered to the homeowner in Nova Scotia needing an upgraded or replacement septic system is that available from Nova Scotia Community Services (Housing Services division). Dependent upon income, a homeowner may obtain a grant or low-interest loan from this department. The funding available has been static; in some cases it is inadequate to meet the needs of homeowners seeking assistance (E. Mielke, personal communication). As the homeowner assistance programs are over-subscribed, there is a waiting list. Necessity dictates that health and safety issues be a primary consideration in choosing candidates. On-site septic system dysfunction might normally be a priority but the increased cost of replacing a system affects the ability of these programs to assist the owners of failing on-site septic systems.

---

[17] Nova Scotia. Department of Municipal Affairs. Community Planning Division. Provincial Planning Section. *Municipal Infrastructure Action Plan: Activity #15: Review Merits of Wastewater Management Districts* by Andrew Paton. April 9, 1995.

[18] Province of Nova Scotia. "Budget Documents: Province of Nova Scotia for the fiscal year 2001-02" (Online) Available: http://www.gov.ns.ca/finance/publish/pub27.htm [Feb. 5, 2002]

The stipulation that income be the main criteria for inclusion in these assistance programs could be a definite barrier to many homeowners wishing to upgrade their on-site septic systems. The restrictive nature of this program and the fact that it is over-prescribed means that access to funding for the ordinary homeowner is difficult. The program is not well known; referrals are usually taken from other government departments or agencies.

Although the Housing Services department is now in the process of evaluating these homeowner assistance programs and some changes may occur, it is very likely that income will remain an important criterion when choosing clients. In contrast, a co-operative formed to manage on-site septic systems would not be dependent upon income as a qualifier. The co-operative model will be further discussed in *Section 5:2.*

3.2 Economic Resources: Options

The Infrastructure Canada-Nova Scotia Partnership is investing more than $195 million in Nova Scotia communities. "Green" municipal infrastructure is the first priority for the project. Municipalities are to set their own priorities; the majority of the projects selected will be chosen from proposals submitted by the municipalities.[19] The Infrastructure plan will last for six years; a joint federal/provincial management committee will administer the program and recommend projects for funding.

A private or a public entity that administered a comprehensive management plan controlling the installation, operation and maintenance of on-site septic systems could oversee funding from government as well as monies from private sources. It would be a less costly means of treating wastewater than the establishment and upkeep of central wastewater treatment facilities in rural areas.

The opportunity to introduce funding into communities concerned with creating and implementing management plans for the upgrade of on-site septic systems now exists. Service Nova Scotia and Municipal Relations will manage the infrastructure agreement for the Province; their strong working relationship with municipalities could provide an excellent means of uniting all the stakeholders concerned with the establishment and operation of decentralized wastewater management plans. Municipalities, no matter how small, may lobby for funding. Funding is often problematical for WWMDs; the Infrastructure Canada project funding could eliminate or lessen this barrier.

Several problems could be resolved within a decentralized wastewater management plan. The issue of liability as an economic disincentive for governments as well as those in the private sector could be dealt with by means of a risk insurance fund. This could be an ongoing fund established to provide ongoing inspection and maintenance of on-site septic septic systems, thus reducing the likelihood of system failure. Using monies from fines levied by NSDEL or licensing permits issued by NSDEL could establish a risk insurance fund. In the event of on-site system failure, funds could also be used to repair or upgrade

[19] Canada. Treasury Board of Canada Secretariat. "Infrastructure Canada-Nova Scotia Partnership to Invest more than $195 million in Nova Scotia Communities" (Online). Available: http://www.tbs-sct.gc.ca/news2000/1004a_e.html [February 1, 2002]

a system. The liability would not be individually borne but "shared" by all insured stakeholders within the plan.

If a program of continued Operation & Maintenance (O&M) was incorporated into a management plan, systems could possibly be reduced in size, thus offering a lower cost to the homeowner. Less prescriptive guidelines could be used in the design, selection and installation of on-site septic systems. The possibility of using more innovative systems may mean more flexibility when considering lot size, soil types, geologic features, etc., resulting in less capital cost at time of installation. A management plan might also help to standardize engineers' fees that may be arbitrary or based on a percentage of the system cost.

The issue of liability in the case of malfunctioning or degraded on-site septic systems also arises in real estate. It is a sensitive matter and may not always be dealt with adequately as the replacement costs for on-site septic systems is relatively high. A homeowner who discovers too late that a recently purchased property has a malfunctioning on-site septic system is faced with a problem; the issue of who should pay for upgrades or a replacement on-site septic system may not always be clear.

The Nova Scotia Department of Environment and Labour has a program of education in place to inform realtors about the facts and value of on-site septic systems in the field of real estate. Further study could be conducted on the value of a property with a well-kept on-site septic system at the time of property transfer versus what is lost in financial terms if a property has a poorly functioning or non-existent system.

It has been suggested in several reports as well as by the Legislative Review Committee that a property transfer would provide an opportunity to issue a "certification" permit attesting to the status of an on-site septic system. It would provide proof for the homeowner should the property be sold again that the on-site septic system was in good working order at the time the property was purchased by them. Compulsory re-certification could be included in a decentralized wastewater management plan; time lapsed between permit issues could be decided upon by regulators of the Plan. It would be a positive step toward identifying on-site septic systems as an important part of the property transfer transaction as well as lessening the risks of liability.

The issue of home repair assistance programs is being addressed by the Nova Scotia Community Services (Housing Services division). These programs are now under review; it is hoped that the Housing Service division's vision of creating healthy communities will be realized.

With the exception of the abovementioned under-funded, limited home repair assistance programs managed by Nova Scotia Community Services, there is no funding in place for upgrading or replacing on-site septic systems. When a WWMD is established, capital costs as well as monies for homeowner education, outreach, technical assistance, technology transfer, research, and demonstrations might be available from a fund such as the Infrastructure Canada-Nova Scotia partnership.

Monies spent towards establishing WWMDs or central treatment plants could also be channelled into alternate (whether public or private) management plans for on-site septic systems. These might include the formation of a wastewater co-operative, a "condominium model" utility, or a not-for-profit society formed for the purpose of managing on-site septic systems.

Many reports state that on-site septic systems are an environmentally sound, cost-effective means of treating wastewater. Monies from the Infrastructure Canada-Nova Scotia Partnership fund could be directed toward establishing management plans for those areas in Nova Scotia prepared to make it a priority (perhaps on a demonstration case study basis). The Infrastructure Canada-Nova Scotia Partnership fund agreement allows other entities besides municipal units to apply for funding; the monies put into municipal programs such as WWMDs, for example, could also be directed toward establishing alternate management strategies for on-site septic systems.

Communications between municipalities and provincial departments such as the Nova Scotia Department of Environment and Labour and Service Nova Scotia and Municipal Relations already exist; all government departments currently involved in the management of on-site septic systems could decide upon strategies to be used. Environmental degradation and clean-ups can result in large expenditures for governments—the government's involvement in the establishment of public or private wastewater management could be cost-effective in the long run.

A Small Community Grant Program was instituted in Maine to provide…"grants to towns to help replace malfunctioning septic systems that are polluting a water body or causing a public nuisance."[20] An actual pollution problem must exist; highest priority is given to systems polluting a public drinking water supply or shellfish harvesting areas. The program is not without restrictions but the specific focus is on on-site septic systems; the will is clearly there to assist individual homeowners not served by central utilities. Technical assistance to the towns involved is also provided. If no comprehensive on-site septic system management plan is established in Nova Scotia, a grants program such as this could provide much-needed funding for homeowners.

Again, the Legislative Review Committee Report states …"there are insufficient resources dedicated to implementing the Environment Act…economic instruments to enforce stewardship…are not being utilized." The Committee recommends that the Environmental Trust Fund be activated and that it be funded by channelling monies collected from environmental fines and penalties and by monies directed from the Resource Recovery Fund Board. The Committee further recommends monies in the Fund be used for:

- environmental enhancement;
- education; and

[20] Maine. Department of Environmental Protection. Bureau of Land & Water Quality. "Small Community Grant Program." (Online) Available: http://www.state.me.us/dep/blwq/docgrant/scgpara2.htm [December 11, 2001].

- research.

All three of these areas, if funded, could provide essential support in the area of on-site septic system management.

Intensive lobbying by environmental groups and the public to have the government re-institute budget monies for the Nova Scotia Department of Environment and Labour would at least express to the Province the importance that should be placed on environmental issues. Financial resources are necessary to enforce regulations and guidelines. For instance, the monitoring function provided by the NSDEL during the installation of on-site septic systems may not be strenuous enough, given too few resources. If less than 40% of on-site septic systems are being audited, some problems may be overlooked due to an insufficient workforce.

3.3 Economic Resources Summary

The importance of providing sufficient financial resources to implement and enforce the Environment Act, Municipal Government Act and all regulations and codes falling within those jurisdictions has been discussed. Some major points include the following barriers and options:

Barriers	Options
risk of liability—results in overlarge systems; discourages repair and replacement of old systems	risk insurance fund for use by QPIs and QPIIs supported by monies from fines and permits could lessen liability risks
low perceived value of on-site septic systems; system status not given enough consideration at time of property transfer, resulting in owner ignorance, contributing to neglect	continuation and enhancement of realtor education will disseminate information to homeowners…lending institutions must also become more aware of homeowner liability and effect of wastewater system failure on real estate price
status of on-site septic system services—not given same importance as electricity, fire services, water utilities at time of sale	homeowner education by provincial and municipal governments will help to raise profile of on-site septic systems
lack of funding to educate homeowners re: on-site septic system basic maintenance and care can result in more expense for repairs over time	provincial government must make more funding available to enhance homeowner awareness of on-site septic system importance
financing options for on-site septic system repair and replacement extremely limited—existing program over-subscribed and income-based	provincial department responsible must make programs more accessible to ordinary homeowner and should promote the link between environmental and health aspects of on-site septic system performance

The lack of adequate financial resources impacts all aspects of on-site septic system installation and maintenance. There are many issues here which overlap—inadequate resources in one area will often impact other areas of regulation and enforcement. One area, which also needs a thoughtful approach in regards to funding, is that of education and training.

4.0 Education and Training

An organized approach to homeowner education should be an integral part of any move by government to introduce regulatory change. People may be opposed to any change they perceive as affecting them in a negative way. In educating the homeowner on the positive aspects of upgrading their on-site septic systems and the benefits to the environment, they can make an informed decision rather than simply having change thrust upon them.

Surveys may be necessary to determine the attitudes of those who are in charge of the daily upkeep of on-site septic systems: the homeowners. Random anecdotal information would indicate that most homeowners are not concerned about the workings of their on-site septic systems. Little attention is paid to them until there is "trouble." Survey results demonstrating homeowner attitudes and knowledge of on-site septic systems may indicate why there is little public attention paid to the persistent problem of system failure.

There is limited information available to any homeowner installing a new on-site septic system or upgrading a failing system. The Nova Scotia Department of Environment and Labour provides whatever information is available, online and in printed form, but distribution remains a problem. Direct outreach would be beneficial in the area of homeowner education before the introduction of any on-site system management plan.

A Homeowner Education Program introduced by the Clermont County Health District in Ohio promoted the idea of homeowner responsibility for their own wastewater treatment system; the issue of ongoing monitoring and maintenance was introduced.[21] Also introduced was the idea of alternate systems with the accompanying information about soil types and site conditions being explained.

They found that advisory groups, mass mailings, and word-of-mouth worked best as informational tools within the community. Education of realtors was also seen as important; they not only accrued education credits but also learned how a well-maintained system can increase the resale value of a home. The public education program conducted by the Health District made it much easier to enlist the cooperation of homeowners when introducing change.

The issue of education and training has also become important in the Nova Scotia on-site septic system industry. The government will no longer be fully responsible for the administration of on-site septic systems. All stakeholders must be informed; there is the

[21] Small Flows: Vol. 13, No. 2, Spring 1999. "Education Paves the Path for Regulation."

issue of individual homeowner responsibility as well as the training and education of government employees and private sector participants.

The NSDEL has developed a three-hour awareness course for realtors to educate them about on-site septic systems. Pilot sessions will begin in March 2002, mostly in Metropolitan Halifax, for Nova Scotia realtors. The sessions will be counted as a credit toward mandatory continuing education for realtors.[22] It is planned that further sessions will be held throughout the province in the future.

There have also been steps taken by NSDEL to enhance the training and general awareness of those in the private sector industry designing and constructing on-site wastewater systems. Workshops have been held by a non-government body, Waste Water Nova Scotia, to provide updates concerning government regulations for QPIIs and installers. Those attending the workshops also contribute towards the funding for this training organization. Waste Water Nova Scotia will also be distributing the booklet, "Before You Construct an On-Site Sewage System" to installers and QPIIs who request them.

Adequate funding to support the education initiative could result in greater awareness of environmental degradation due to malfunctioning systems and the responsibilities of the various stakeholders, particularly homeowners. A government commitment to educating homeowners about their on-site septic systems and training all participants in the on-site septic system industry would necessitate providing funding for various publications and training programs. Waste Water Nova Scotia is only partially funded by the government; those in the private sector are also expected to fund the organization through training and certification fees. If not all those in the on-site wastewater industry participate, the goal of having standardized levels of competence may not be achieved.

"The Care and Feeding of Your Septic System", a booklet formerly produced by CARP, is now being updated with the support of the NSDEL. It provides valuable information for the homeowner on the facts of on-site septic system care and maintenance. It will be distributed widely in the Annapolis Watershed area and will also be available from NSDEL offices.

The development of physical training facilities is seen to be important in the instruction and upgrading of wastewater professionals.[23] There are many such centres in the U.S.; one is operational in Ontario, Canada. Participants can include septic pumpers, installers, operators, public health officials, engineers, realtors, and even homeowners; all training results in a direct economic, environmental, and public health benefit to communities.

---

[22] "Realtors to get sewer training". (2002, Dec. 6) The Mail-Star, p. A8

[23] Centre for Water Resources Studies. Dalhousie University. Halifax, N.S. "On-site Wastewater Training Centre" (Online) Available: http://www.dal.ca/~cwrs/cwrs/onsite/train.pdf [Feb. 5, 2002]

As well as providing hands-on training experience and a site for the demonstration of conventional and alternative technologies, they can also house active research sites. A hands-on approach to learning is not the only benefit of training centres; the meeting of all stakeholders in the on-site wastewater industry and the sharing of information also furthers learning. More effort should be expended to ensure that a physical training facility be developed in Nova Scotia.

4.1 Centre for Water Resources Studies

The Centre for Water Resources Studies (CWRS), Faculty of Engineering, Dalhousie University, was established in 1981. The objectives of CWRS are:

> to apply the research resources of the University in a manner that will address real problems in water resources that exist or are anticipated in Nova Scotia and the Atlantic Region;
> to continue and expand the University's contribution to the national and international pool of knowledge about water resources; and,
> to transfer the results of research both at the University and elsewhere to the engineering community in Nova Scotia and the Atlantic Provinces.

Included in the research areas at CWRS is a program to examine the effectiveness of present on-site sewage disposal treatment methods; the program also contributes to the design of new technologies for use in Nova Scotia. Some current and past projects conducted at CWRS include those concerned with water and wastewater treatment, research filter media for water treatment, landfill leachate treatment, sewage lagoons, dissolved air filtration and the characterization of Nova Scotia surface waters.

One committee organized and supported by the Centre for Wastewater Research Studies is the Nova Scotia On-Site Wastewater Advisory Committee—a multi-stakeholder committee that exchanges information and advice, and provides a vehicle of communication to government agencies through its government representatives.

An important outcome of the in-depth research conducted by CWRS is the number of reports concerning wastewater treatment and technologies available to the public.[24] Many of the reports are written in lay terms and are accessible to those with a non-technical background. They are easily attained through the Internet and can be downloaded, as well. The reports that are currently being researched and that will be available in the future are also listed.

Several of the CWRS reports have been cited within this document; there are many more that deal with specific technical issues of interest to professionals in wastewater treatment and relevant government staff.

[24] Centre for Water Resources Studies. Dalhousie University. Halifax, N.S. (Online). Available: http://www.dal.ca/~cwrs/cwrs/onsite/phs4rpt.htm [February 14, 2002].

5.0 Management Plans and Strategies: Introduction

The reality of the continuing devolution of responsibilities onto municipal governments, community organizations, the private sector and the public by the provincial government in Nova Scotia is repeated in many locations in this country as well as globally... "Problems of increasing costs and a lack of resources in many small municipalities are creating significant challenges for local governments and economic development officials."[25] The private sector does not always provide a competitive alternative to government service; a switch from one to the other can mean a substantial increase in costs to taxpayers if no healthy free-market situation exists.

In Nova Scotia, an intense focus on achieving deficit reduction by the provincial government has meant a decline in government services in many areas. For a number of years it has meant that the taxpayer can no longer assume that the government will step in to solve problems through funding, grants, or the provision of services.

Municipal governments in Nova Scotia may choose (by by-law) to require its citizens to maintain their on-site septic systems to standards set out in that by-law. The provincial department, Service Nova Scotia and Municipal Relations, would review any such by-law and as municipalities must comply with provincial laws, NSDEL standards would likely be upheld.

There is a need for a thoughtful and informed approach to any management plan or strategy introduced by a municipality. An infrastructure created by a local government agency would have to include a staff with a wide-ranging knowledge of all the issues at hand, namely:

a working knowledge of relevant government regulations;
an understanding of the role of planning as relates to on-site regulations;
real estate dynamics (concerning issues such as liability);
and the all-important "people" skills to interact with all stakeholders.

Non-traditional approaches to wastewater treatment should be considered. WWMDs, for instance, are municipally controlled and are usually defined within a relatively small geographical area. Private utilities and non-geographically based entities are also viable alternatives.

There are many valid reasons to consider decentralized wastewater treatment for any community. A wastewater plan:

saves money by deciding on a preventive strategy to manage wastewater before a crisis occurs, thereby avoiding unnecessary cost;
allows homeowners to continue to use their properly functioning septic systems;

[25] Henehan, Brian M. and B.L. Anderson, "Considering Cooperation: A Guide for New Cooperative Development." College of Agriculture and Life Sciences. Cornell University. Ithaca, N.Y. 14853-7801, January 2001.

enables better watershed maintenance by eliminating the large transfers to water from one watershed to another that happens with centralized treatment;
may be the most cost-effective treatment strategy for rural communities with sparse populations; and
is appropriate for varying site conditions including ecologically sensitive areas—treatment methods can be tailored to suit different site conditions.[26]

A discussion of a traditional approach to wastewater treatment—the Wastewater Management District (WWMD)—as well as alternate management options is offered below. All approaches offer possible solutions to the problems that groups in rural communities may be facing should they assume responsibility for the upgrading and upkeep of on-site septic systems. No municipality in Nova Scotia to date has an "independent" on-site septic system management plan in place; further study is necessary to ensure that any management plans address fully the regulatory and environmental issues.

5.1 Wastewater Management Districts

The traditional, government-controlled entity treating wastewater beyond the central wastewater treatment plant is the Wastewater Management District. Since a 1982 amendment to the Nova Scotia Municipal and Towns Act, municipalities in Nova Scotia have had the authority to establish and operate a utility to manage privately-owned sewage disposal systems in a designated Wastewater Management District (WWMD). Although the WWMD would have to operate under the provincial guidelines set forth in the Municipal Government Act (having to do with governance) and the Nova Scotia Department of Environment and Labour (having to do with sewage disposal), the WWMD would have control over the following issues:

ownership, purchase, lease, and rental of both real and personal property;
planning, design, construction, inspection, operation and maintenance of all;
types of wastewater disposal systems located within a WWMD;
entering in contracts and undertaking debt obligations;
fixing and collecting charges for use of sewerage systems;
planning service extensions; and,
repairing or replacing malfunctioning systems.[27]

Although Wastewater Management Districts can be a flexible and environmentally effective way of dealing with wastewater treatment, the costs of developing such an entity can be problematical. WWMDs are created by by-law in each municipality

[26] Pipeline (National Small Flows Clearinghouse). Vol. 11, No. 4, Fall 2000. "Decentralized Wastewater Treatment Systems"
[27] Mooers, Jordan D. and Donald H. Waller. "Wastewater Management Districts: the Nova Scotia Experience", Halifax, N.S. Centre for Water Resources Studies, TUNS, 1994.

wanting to create one; such a by-law must include the provision for funding such a structure[28], which can be a barrier to its inception.

Historically, communities in Nova Scotia have been resistant to the idea of the establishment of WWMDs because of the large initial capital costs and the possibility of area rates increasing over time. The issue of limited growth also arises within the Wastewater Management District. Once wastewater treatment infrastructure has been created within the area, further growth becomes problematical, as the initial assessment of volume of sewage generated has determined the size and operation of the infrastructure. Any desired growth in population and/or housing would compel the municipality to enlarge its infrastructure (if it was possible at all); municipal zoning and subdivision by-laws would have to be considered.

In the case of the WWMD created in Port Maitland, Yarmouth County, Nova Scotia in 1982, an initial cost of just under $1 million was needed to service the 139 households in the WWMD. There was some opposition to the concept of creating the WWMD. Homeowners involved were generally not in agreement with having to pay an area rate (the amount charged annually to offset the capital costs, and Operation and Maintenance costs of the system) for a "service" they had paid little or nothing for as owners of individual on-site septic systems. The provincial government was intent on having the project go ahead (it was the first WWMD established in Nova Scotia) and underwrote part of the project; initially, the homeowners paid approximately $35.00/annum toward the costs. The area rate is, 20 years later, eight times that amount (B. Fulton, personal communication).

The WWMD allows a municipality to provide wastewater treatment using a combination of solutions:

> on-site septic system only;
> a combination of on-site septic system and cluster systems; or
> a central plant in combination with on-site septic systems and cluster(s).

Not all on-site systems will be malfunctioning; sometimes upgrades and replacement are not possible due to poor soil conditions or small lot sizes; density of population is also a factor, especially in sparse rural areas. Each municipality can assess their needs and conditions and provide the combination of treatments best suited to them.

The amount of government funding available to municipalities investigating the possibilities of creating a WWMD is now the least certain number in the financial equation. Also, the issue of the possibility of inequity in services and in individual homeowner cost must be identified and resolved before the WWMD can become a reality. For instance, if the area rate to be charged a homeowner, for example, is based on "frontage", those with larger parcels of land will be charged a greater area rate, even if their use of the system is less than those with smaller lots.

[28] *Municipal Government Act*, S.N.S. 1998, c. 18, S. 346.

The Wastewater Management District can provide a somewhat flexible and practical solution to local environment problems. Although to date, all monies directed toward solving on-site septic systems has been directed toward WWMDs, there are non-traditional approaches to be considered. Independent, "private" entities may be considered as viable alternatives to WWMDs—the funding of such entities might be realized through private as well as a combination of government and private monies.

5.2 The Co-operative Model

"Probably the most widely known and proven of collaborative business organizations are cooperatives."[29] A co-operative is a separate, legal, limited-liability corporation whose owner-members are seeking to improve their economic well-being by, among other things, acquiring goods and services at a lower cost. The creators of co-operatives and their members recognize a common social and economic need, and also the advantage of collaborating in order to provide themselves and others with essential goods and services. Each owner-member of a co-operative is a known entity, in contrast to a governmental organization that has no specific "owners" and where real costs and benefits of work done are difficult to determine.

"Globalization and technological changes combined with governments' efforts to control public spending have had an impact on how the social needs of citizens are being met."[30] As well as adequate health care, affordable shelter and secure jobs, the social needs of a community also include a clean environment. Utility, or service, co-operatives have existed in Canada for a long time and have provided their members with services such as electricity and gas distribution, telephone, waterworks, central sewage and fire-fighting. Social needs are as important to communities as the economic needs addressed by co-operatives; they have been shown to provide a viable alternative to public service delivery.

One of a co-operative's objectives is to obtain products or services that would be otherwise unattainable to its owner-members. Several professional and entrepreneurial businesses in the private sector are involved in installing and servicing on-site septic systems; however, there is no vehicle whereby a group can purchase these services as a unit. Volume purchasing of goods and services brings into play the "economies of scale", meaning the members of a co-op could enjoy the benefits of reduced costs. There is also a possibility of returns on their invested monies as a result of their increased bargaining power.

The organizing of a service co-operative would demand attention and initially, time. There are very important steps to be taken to ensure that the co-operative is answering a real need for its members and also to ensure its survival as a viable business concern. One of the more important aspects of a beginning co-operative is that its members fully agree

[29] Henehan, ibid.
[30] Canada. Co-operative Secretariat. "Co-operatives: Solutions to 21st Century Challenges." (Online) Available: http://www.agr.ca/policy/coop-oct01/21st-e.pdf. [Jan. 4.2002]

on their economic need or problem; focus is achieved and goals are then a matter of common interest.

The approach to establishing a service or utility co-operative to manage on-site septic systems in Nova Scotia will be outlined in 'Appendix A'.

5.3 Condominium Entity

Under the Condominium Act, the Registrar of Condominiums must provide a…"statement of the services and amenities available to the units."[31] If a group of homeowners who belonged to a condominium unit chose to manage their own on-site septic systems, or on-site/cluster system, one approach might be to form a private utility. If they belonged to a condominium in an unserviced area, it would be possible for them to control, through their choice of utility (and in accordance with zoning regulations), the type of growth the condominium might enjoy.

A choice of alternative/innovative on-site systems or a combination on-site/cluster systems could be chosen by the condominium group according to research conducted by a private engineer or member of the group itself. Buffer zones, such as forested areas and parks, might be more easily incorporated within a comprehensive plan if wastewater treatment was approached in a flexible way—alternative, innovative or cluster systems may give room for more creative development.

Giving prospective homeowners some choice and control in the makeup of their living environment would be an attractive option for condominium developers to promote. The developer of a new subdivision may want to create a wastewater utility as part of the condominium's legal structure; homeowners could pay an annual fee to build and maintain whatever wastewater treatment infrastructure is to be established.

Funding used to manage the wastewater treatment may be from the corporation itself, as members would buy into the corporation (as they would in a co-operative); funding may also be available from government or other private sources. Annual fees paid by members could cover risk insurance, consultants' fees, or any ongoing maintenance costs.

Communication and support from the local municipal government would be necessary to ensure compliance with zoning and subdivision regulations; NSDEL involvement would also be necessary in order to conform to provincial wastewater treatment regulations.

5.4 Not-For-Profit Society

A not-for-profit society may be another viable alternative to the government-controlled utility. Homeowners living in a watershed area, for instance, may be concerned that zoning regulations are not strict enough to ensure a safe water supply. They could form a not-for-profit society to manage and maintain their own septic systems.

---

28 Nova Scotia. *Condominium Act,* S.N.S. 1989, c. 85.

Funding may be available from private sources to ensure the ongoing maintenance of the private on-site management group. Fundraising is normally an important source of monies for non-profit societies; any "profits" accrued in a business-like transaction within the society would not be available for its members personal gain. As with a "condominium entity", any management plan would have to conform to municipal and provincial regulations concerning zoning, on-site design, selection, and installation.

As with the co-operative, a not-for-profit society need not be geographically limited. Persons wishing to protect sensitive areas like watersheds or wetlands, for example, need not necessarily live in that area. The impetus from an environmental group could be the motivating factor behind the implementation of a private utility for the management of wastewater in that area. Funding from government sources as well as private could establish a fund to provide for ongoing maintenance of such a plan.

5.5 Geographic Information Systems Technology: Introduction

Geographic Information System (GIS) software is used to store, query and analyze geographically referenced data (*spatial* data) and display the results as a map. Geographically referenced data are data tied to a location; they are expressed in a consistent way for all information in the database (latitude and longitude, area code, street address, PID [Property Identification Number], etc.). Locations serve as a way of organizing all other information in the database. Locations are incorporated into a base map that can be "built on", thereby creating layers, using other types of data from other sources. The more consistent and precise the geographically referenced data, the more accurately all layers in a GIS will register, or align spatially.

GIS technology is now being used in many localities to track centralized utility systems with great success. When used in conjunction with other data, it gives a larger view of how the placement of a utility may enhance or damage the environment. The location of wastewater treatment plants, storm drains and new subdivisions can all impact on the environment; the new technology allows decision-making to be based on accurate and all-encompassing environmental information before serious mistakes may be made.

On-site septic systems should be installed in definite locations on a lot. They must be properly sited according to the NSDEL On-site Sewage Disposal Systems Regulations to ensure that drainage and soil conditions are adequate for the system being installed and that water-source distances are maintained. Northing and Easting coordinates are already entered into NSDEL site-evaluation documents; these are the georeferencing coordinates necessary in order to integrate on-site data into a GIS map. As mentioned, these coordinates must be precise and consistent in order for the map to be accurate.

5.5.1 EIMAS

In 2000, the EIMAS (Environmental Information Management System) system was introduced into all NSDEL offices. Its purpose is to allow the Department to begin a new type of recordkeeping for all approved on-site septic systems. The system is currently not

used to its full capacity; eventually, it is to be used to provide a full range of services including:

> the tracking of QPI and QPII certifications;
> the importing of GIS-usable data from a large range of other databases;
> the eventual interaction with the ArcView software used in government Land Information services; and,
> an all-inclusive database recording all information necessary to ensure the proper monitoring and management of on-site wastewater treatment.

The several stages of the EIMAS plan will be adopted as separate "Releases" over the next number of years.

GIS-based geologic information such as maps denoting mineral content and watercourses would be available from other governmental agencies such as The Department of Natural Resources or the Department of Agriculture and Fisheries. As GIS data resolution denoting soil types would not be fine enough for use in on-site appraisals, the NSDEL physical soils assessment done by engineers and installers would still be required.

This GIS data would be invaluable to the NSDEL for use in determining the over-all suitability of on-site septic system sites. How land is being managed via zoning could be determined quickly as suitable or not suitable for a dense grouping of on-site septic systems from information gleaned from, for example, a watercourses map. Sensitive ecological areas such as shellfish harvesting areas could be then zoned differently to ensure protection from residential and industrial overgrowth.

Seventy to -80 percent of the average local government's work involves land or geographically related issues or tasks.[32] It is possible to build a comprehensive, ever-expanding database of information concerning on-site septic systems (location, age, type, designer/installer, functional history, etc.) and link this data to that from other government departments concerned with land planning, municipal and provincial policy-making, and environmental issues. The information gathered and stored could be retrieved by organizations as well as governments at all levels to assist in the management of wastewater services and the creation of effective, long-term policies.

5.5.2 GIS as a Management Tool

The effective management of on-site septic systems is dependent upon the establishment of a comprehensive database containing information about individual systems. Given the advent of an interfacing capability creating the convenient and straightforward exchange of information between several databases for use in GIS format, an enhanced approach to solving problems that now take up much time and resources could be realized.

[32] O'Looney, John. "Beyond Maps: GIS and Decision Making in Local Government", Redlands, California. Environmental Systems Research Institute, Inc., ©2000.

Land use, personnel and resources, geologic information, community decision-making—all these elements could be dealt with in a more cost-effective and efficient manner when "visualized" easily using the GIS tool.

GIS as a general technology has the potential to create new knowledge by showing how the issue of location matters for problems not previously thought of as geographical. The use of GIS within a comprehensive management plan could provide a positive tool for directing all aspects of the installation and on-going maintenance of on-site septic systems. An example of how GIS technology assembles data to enhance knowledge and promote problem-solving is shown in Appendix 'B'.

6.0 Personal Communication

The following persons provided much valued information pertaining to vital aspects of this report; their helpfulness and expertise was of great assistance:

Glen Adams, P.Eng.
Annapolis Technical Services
Annapolis Royal, N.S.

Audrey Buchanan, P.Eng
(Project Engineer)
Town of New Glasgow, N.S.

Grant Cooke, Municipal Advisor
Service Nova Scotia and Municipal Relations
(Municipal Services Division)

Brad Fulton
Municipal Development Officer/Building Inspector
Municipality of Yarmouth, N.S.

Barry Gillis, P.Eng.
Nova Scotia Department of Environment and Labour
(Western Region)

Janet MacKinnon, BSc., CPHI(C)
Nova Scotia Department of Environment and Labour
(Western Region)

Earl J. Mielke, Program Administration Officer
Nova Scotia Community Services Housing Services
(Western Regional Office)

Ted Ross, Building Code Coordinator
Service Nova Scotia and Municipal Relations
(Planning and Advisory Services)

Appendix 'A'

HOW TO GO ABOUT FORMING A CO-OPERATIVE IN NOVA SCOTIA

How to Incorporate

An organization must be incorporated under the Co-operative Association Act of 1998, in order to be called a co-operative. The requirements for incorporation are outlined in the Co-operative Association Act, which is administered by the Department of Economic Development, through the Co-operatives Branch. Incorporation requires two documents: Articles of Incorporation (the application for incorporation), and By-laws.

Articles of Incorporation

The articles of incorporation must include the following:

The name of the association with the word "Co-operative" as part of its name and with "Limited" as the last word in its name (Telephone or write the Inspector of Co-operatives to reserve a name before you complete the articles or by-laws. An alternative name or two will avoid delays in having the documents processed if your first choice of name is for some reason unacceptable.);

The objects of the association (a brief description of the type of business and special aspects of the business);

The limitation of liability for members (a statement which limits the liabilities of the members to their investment in the co-operative);

The par value of shares or the amount of membership fees (usually 10 to 100 dollars) In some very special cases a co-operative may be incorporated without shares. Consultation with the Co-operatives Branch is advised in these situations;

The address of each subscriber next to his or her name (each subscriber must purchase at least one share in the co-operative, and the total number of shares taken by the subscribers is to be recorded);

A list of not less than three, and not more than 7, persons to be provisional directors of the co-operative; and

The witnessed signature of each subscriber to the letters of incorporation (the witness is a responsible adult not directly associated with the new co-operative.

By-laws

A co-operative is required to have by-laws prior to registration. By-laws include such matters as:

The conditions of membership or the ownership of shares;

The election and terms of office of directors and officers;

The value of shares and the terms of payment;

The conditions governing annual or general meetings;

Corporate indemnification provisions;

Borrowing of money provisions;

Matters related to audits and financial reporting; and

Other matters deemed important for the effective operation of the co-operative.

Directors

The provisional directors named in the articles of incorporation (generally the initial subscribers) will serve as directors until the co-operative's first general meeting, when directors are elected for a term of office from among the members or shareholders. The first general meeting is to be held within 4 months of incorporation, at which time the board of directors is to be elected according to the by-laws. Directors are responsible for the management of the co-operative's business and other affairs as set out in the by-laws.

Registration

Prior to submitting an application, it is important to establish the co-operative's basic purpose so that everyone shares the same understanding of the organization's goals and objectives.

In order to apply for incorporation, one copy of the articles of incorporation, one copy of the by-laws signed by the subscribers to the articles of incorporation, and the appropriate fees must be submitted to the Inspector. Upon approval, the Inspector shall forward the application to the Registrar.

Following the registration of the articles of incorporation and the by-laws, the Registrar issues a certificate of incorporation. The co-operative will be incorporated on the date mentioned on the certificate.

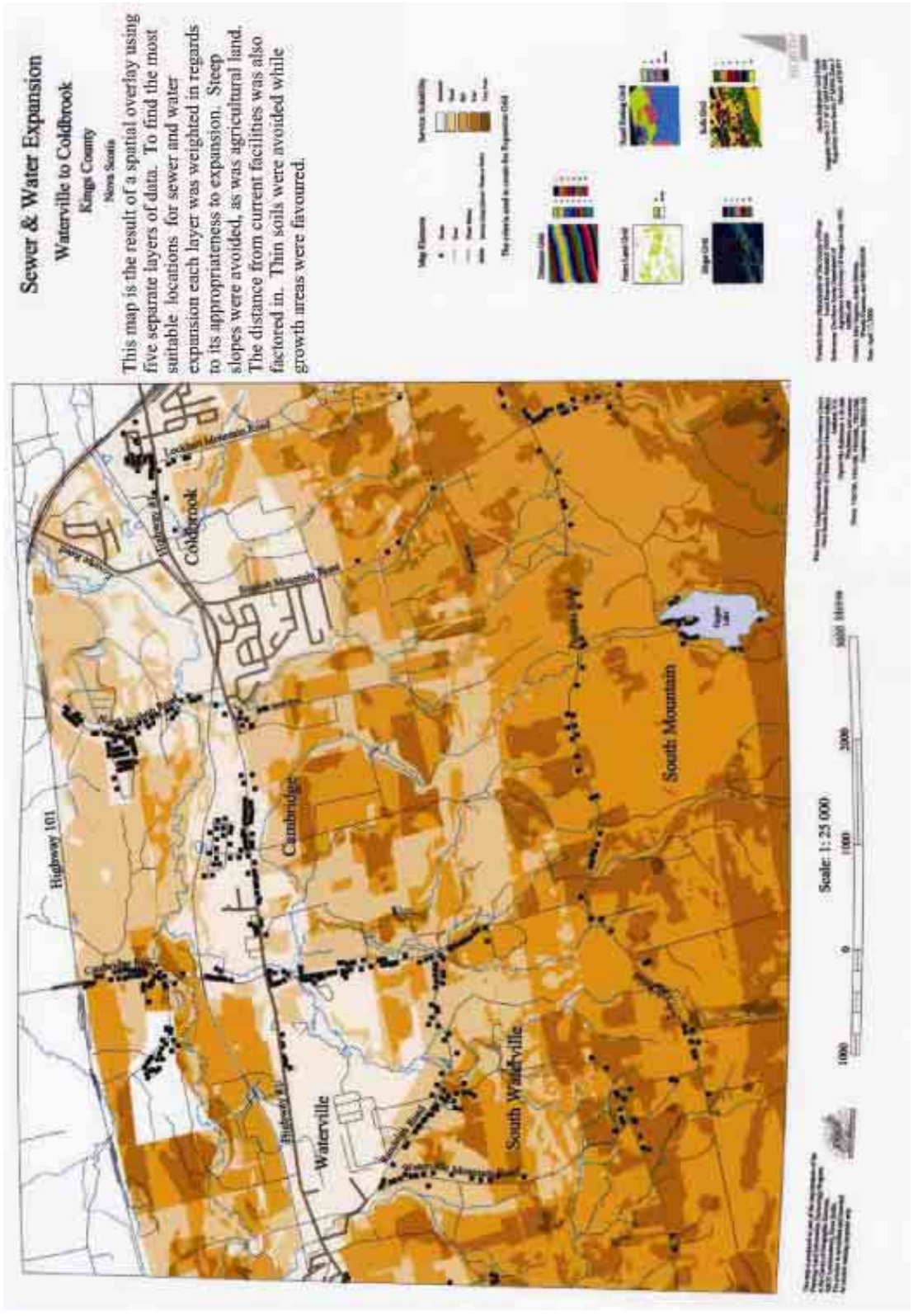
The articles are to be forwarded along with the by-laws to the Co-operatives Branch, 35 Commercial Street, Bank of Montreal Building, Suite 101, Truro, Nova Scotia B2N 3H9. Attach the required registration fee of $25, the cheque should be made payable to: The Inspector of Co-operatives.

A certificate of incorporation will be mailed to the Co-operative's registered address about two weeks after the Inspector approves the documents. Approved copies of the articles and by-laws will accompany the certificate.

If you have any questions, please feel free to contact the Co-operatives Branch for assistance.

Co-operatives Branch
Department of Economic Development
35 Commercial Street, Suite 101
Truro, Nova Scotia Canada B2N 3H9
Telephone: (902) 893-6190 Fax: (902) 893-6108
E-mail: fpierce@gov.ns.ca website: http://www.gov.ns.ca/econ/smrd/coop

Appendix 'B'


Sewer & Water Expansion
Waterville to Coldbrook
Kings County
Nova Scotia
This map is the result of a spatial overlay using five separate layers of data. To find the most suitable locations for sewer and water expansion each layer was weighted in regards to its appropriateness to expansion. Steep slopes were avoided, as was agricultural land. The distance from current facilities was also factored in. Thin soils were avoided while growth areas were favoured.
Coldbrook
Cambridge
Waterville
South Waterville
South Mountain
Highway 101
Scale: 1: 25 000