TOWN OF CHARLESTOWN

ON-SITE WASTEWATER MANAGEMENT PLAN
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Prepared for the Charlestown Wastewater Management Commission by:

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I. INTRODUCTION*Plan Overview:* This plan summarizes the status of on-site sewage disposal systems in Charlestown. It addresses approximate number of systems, causes and impacts of septic system failure and identifies areas of particular concern. It evaluates the continued use of on-site sewage disposal systems both from an environmental and economic perspective and describes local management and research efforts. The projected costs of implementing the On-Site Wastewater Management Program (OWMP) are also provided.

This plan has two main purposes:

1) To provide the Town and the public with a summary of wastewater issues and initiatives of local importance.

2) To enable the Town to qualify for a line of credit under the State's Community Septic System Loan Program (CSSLP).[1]

CSSLP funds are to be used exclusively for the upgrade and repair of (Individual Sewage Disposal Systems (ISDS). A septic system serving more than one lot is not eligible for the program. Highlights of the CSSLP include:

- A line of credit to the community with the obligation to repay only in the case of homeowner default.

- A 4 percent interest rate to the community that must be passed on to the homeowner.

- The use of a financial intermediary, RI Housing to handle owner loan applications, fund balance reporting, collection procedures, etc., thus eliminating a potential administrative burden to the community.

- The ability of the community to add its own features, such as means testing, technical assistance or supplemental grants and loans.

In addition to the above, there are several reasons why it is beneficial for the Town to consolidate and further develop an on-site wastewater management program.

1. Wastewater management is a recommended water quality protection strategy of the Charlestown Comprehensive Plan and Coastal Resource Management Council's (CRMC's) Special Area Management Plan (SAM Plan) for the Salt Ponds.

2. The entire Town of Charlestown is served by on-site sewage disposal systems. Construction of a treatment plant and sewer lines are unlikely given the Comprehensive Plan goals of a continued low tax rate and protection of rural character. A well-designed OWMP provides an efficient, environmentally safe and cost-effective alternative to centralized sewers.

[1] RIDEM must issue a Certificate of Approval for a municipality's plan before the municipality can qualify for the CCSLP funds.

3. Charlestown depends on groundwater resources for 100 percent of its potable water. Its surface waters, both coastal and freshwater, continue to be an economic and recreational resource. An OWMP can help to ensure the protection of ground and surface waters.

4. Impact from malfunctioning septic systems is damaging Charlestown's coastal waters. Poorly functioning systems have caused eutrophication and loss of eel grass habitat due to excess nitrogen, and closure of shellfishing beds due to bacterial contamination.

5. In recent years, septic system technology for enhanced treatment of wastewater has progressed rapidly, providing for improved and cost-effective nutrient and pathogen removal. An effective wastewater management policy will make it easier for residents to avail themselves of enhanced wastewater treatment technologies.

6. The neighboring towns of South Kingstown and Westerly are in the process of developing on-site wastewater management programs. Charlestown's continued commitment to septic system issues will facilitate responsible management of shared resources.

***Background**:* Contaminants associated with septic systems include nutrients (nitrogen and phosphorus), pathogens (bacteria, viruses and parasites), heavy metals and toxic organics associated with household hazardous waste. Fecal coliform, when present in water samples, indicates the presence of other pathogens.

In the 1970's and even into the 1980's, on-site sewage disposal systems were viewed as technically inferior to sewers. They were considered a temporary measure to be used only until sewers could be extended. The design codes associated with on-site systems that were developed during the 1960's and 1970's reflect this attitude. Systems were designed as a throw-a-way technology with little thought to maintenance, and no thought to performance evaluation and improvement. Once buried, a system was generally forgotten until it failed. Unfortunately, many of these systems have now reached their useful life expectancy. In Charlestown, for instance, approximately 1,680 (41%) of the Towns estimated 4100 residential septic systems were installed prior to enactment of the ISDS regulations in 1969.[2]

Realizing that there was no follow-up opportunity for septic system evaluation and associated "mid-course" corrections, most states developed very restrictive septic system design and siting criteria with an emphasis on preventing surface break-outs. Systems were over engineered in terms of design flow and leach field size. Codes included rigid siting criteria and a narrow range of acceptable design options in an attempt to ensure the long-term performance of a system that would probably not be checked or maintained. This prescriptive and conservative approach led to little design flexibility.[3] No thought was given to the need for nutrient removal or the nature of the receiving environment, including its susceptibility to, or the consequences of, septic system pollution.

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[2] This estimate represents the number of homes constructed prior to the adoption of the ISDS regulations in 1969 and is reflected as a percentage of the 1990 census figures. Units served by a package treatment plant (Kingsland Village) have been subtracted from the total. The estimate does not reflect homes constructed prior to 1969, but whose ISDS have been subsequently upgraded. This estimate will be further as part of the Town's ISDS inventory and inspection program.

[3] Hoover, M. T., 1997. A Framework for Site Evaluation, Design and Engineering of On-Site Technologies Within a Management Context. Marine Studies Consortium, Waquoit Bay National Estuarine Research, and *ad hoc* Task Force for Decentralized Wastewater Management Marine Studies Consortium, 400 Heath St., Chestnut Hill, MA 02167.

Today, attitudes toward septic systems have changed. This is due, in large part, to the prohibitive cost of extending sewers into less populated areas. In addition, it has been recognized that the extension of sewers can have many secondary land use and environmental impacts, such as rapid growth, increased density, loss of community character, transfer of groundwater from one watershed to another, and nonpoint source pollution impacts.

II. WASTEWATER MANAGEMENT ISSUES IN CHARLESTOWN

Recent Development: Charlestown is a rural, coastal community of 41 square miles with a 1990 population of 6,478 or 158 persons per square mile (Figure 1). Due in large part to its natural amenities, the Town more than doubled its population between 1970 and 1990. Table 1 depicts population growth from 1900 to 1990.

TABLE 1 CHARLESTOWN POPULATION CHANGE 1900-1990
(US Census Data as taken from the Charlestown Comprehensive Plan, 1992)

YEAR	POPULATION	# CHANGE	% CHANGE
1900	975	---	---
1910	1037	62	6.4
1920	759	-278	-26.8
1930	1118	359	47.3
1940	1199	81	7.2
1950	1598	399	33.3
1960	1966	368	23.0
1970	2863	897	45.6
1980	4800	1937	67.7
1990	6478	1678	35

For the most part population increase is attributable to in-migration and not natural population growth.

Between 1980 and 1990, 1,176 housing units were constructed in Charlestown, an average of 118 per year. Units constructed since 1990 have not yet been calculated. Table 2 depicts housing trends in Charlestown since 1950. It also shows that the proportion of seasonal to year-round housing declined between 1970 and 1980 but remained essentially the same from 1980 to 1990.

TABLE 2: CHARLESTOWN HOUSING CONSTRUCTION 1950 THROUGH 1990
(US Census Data Updated through 1998 with building permit data)

YEAR	TOTAL DWELLINGS	SEASONAL DWELLINGS	PERCENT SEASONAL
1950	936	---	
1960	1376	---	
1970	1971	961	48.8
1980	3064	1087	35.5
1990	4256	1541	36.2

The Natural Environment: Interrelated features of the natural environment such as topography, geology, hydrology and soils affect the functioning, safe density, design and maintenance characteristics of septic systems. Soils in the glaciated northeast are related to the geological features of the area. For example, in Charlestown the principal geological features from south to north are: barrier beach systems, the coastal ponds, the coastal outwash plain, the moraine, the interior lowlands and uplands and the Pawcatuck River.[4] Rocky, till areas are generally associated with the moraines and interior uplands, stratified drift with the coastal and river plain soils and hydric soils with the interior lowlands or coastal marshes. Figure 2 depicts soil constraints for the Town of Charlestown.

Table 3 identifies soils by constraint category. According to the Charlestown Comprehensive Plan, soils in constraint Group A have the lowest constraints relative to septic system functioning. Several of the soil types within this group, however, such as the Enfields, the Gloucester Hinkley complex, the Merrimacs and the Windsors are characterized by excessive permeability, which may result in groundwater contamination. Many of the soils located in the south shore area are so permeable that the effluent discharged into the ground receives only marginal treatment. System backups in these areas occur primarily because of solids buildup in the field due to lack of maintenance and pumping. Depending upon proximity to a critical resource, repairs and new systems in these areas are prime candidates for innovative septic system technologies capable of enhanced nutrient and pathogen removal. Septic systems located in the Paxton soils, also in constraint Group A, need special design due to slow permeability. Effluent breakout would occur more easily in these soils.

Group B soils are moderately well-drained with seasonally high water tables. During the high water season, these systems, especially those that pre-date ISDS regulation, are often in the groundwater.

Soil Category C, characterized by steep slopes and/or shallow depth to bedrock, present severe septic system constraints. Septic systems located in steep slope areas require special design in order to meet RIDEM standards. Systems over shallow bedrock may provide ineffective wastewater treatment prior to discharge to the groundwater. In Charlestown, the areas of concern are in the glacial moraine northeast of Tautog Cove, the area northwest of Watchaug Pond and north of the Indian Cedar Swamp. RIDEM

[4] From: Charlestown Comprehensive Plan, 1992. Natural Resource Element, p 7. Vanesse, Hangen Brustlin,Inc.

records indicate several septic system failures in the area, northwest of Watchaug Pond.[5] Group D soils are either poorly or very poorly drained and are a good indication of wetland ecosystems. These soils do not meet the minimum ISDS standards for separation to groundwater.

Figure 2A depicts the significant groundwater resources of the Town. These high yield aquifers are located in the northern part of the Town and are associated with Pasquisset Pond and School House Pond. They provide potential sources of future public water and must be protected from contamination.

From January 1992 through August 1997 one hundred and eighty one ISDS were repaired in the Town. The Commission is in the process of mapping repairs and ISDS that predate 1969. Approximately 100 of the repairs (56%) occurred in the coastal ponds region. Other notable areas of septic system failure are certain portions of Shannock Road, Route 2, Biscuit City Road, Klondike Road, Buckeye Brook Road, Shannock Road and Old Shannock Road. The mill villages of Shannock and Columbia Heights are also areas concern due to the predominance of sub-standard septic systems on smaller lots.

The impacts of septic system density and of older and failing septic systems on both surface and groundwater quality have been well documented.[6] Fecal coliform when present in water is indicative of other health threatening pathogens. Levels in excess of 15 (most probable number) MPN/100ml are unsafe for shellfishing and levels greater than 50MPN/100ml are unsafe for bodily contact.

Excessive levels of nitrogen in drinking water are known to interfere with the normal functioning of hemoglobin in infants, causing blue baby syndrome. The EPA safe drinking water standard for nitrate in groundwater is 10 ppm. When levels in groundwater approach 5ppm, however, there are often associated spikes of 10 ppm. High nitrogen in groundwater may also indicate the presence of other contaminants.

Nitrogen is also a problem in the coastal ponds, where excessive levels cause eutrophication and stagnation. Symptoms of eutrophication include: reduced biodiversity, loss of eel grass habitat, a shift from filter-feeding to deposit feeding organisms, increase in low oxygen events resulting in the depletion of fish and shellfish, increase seaweed biomass and loss of aesthetic quality and recreational use.[7]

Many ISDS, particularly in the coastal portions of Charlestown, were initially designed for one or two bedroom summer homes. A substantial number of these have been converted to year round use without any corresponding improvements to the ISDS. In addition, many of these homes are routinely used by many more persons that the system was designed to accommodate. Another common problem is that of non conforming lots of record. These lots, which are now considered substandard under current zoning, have

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[5] RIDEM 1993 through August of 1997. Computer printout of permits for ISDS repairs with plat, lot, address and owner.

[6] Charlestown specific data includes DOH testing, Pond Watchers and Watershed watch data, CRMC's SAM plans and several studies by the Coastal Resource Center.
Illinois Department of Natural Resources, 1989. Septic system Density and Groundwater Contamination in Illinois: A survey of State and Local Regulation.
U.S. Geological Survey, 1983. The Relationship of Groundwater to Housing Density, Cape Cod, Massachusetts. Water Resources Investigations Report 86-4093.

[7] RI CRMC. Coastal Ponds SAM Plan, 1997 revisions.

grand fathered rights to construct a dwelling with a septic system. Currently, there are no performance standards regarding the location and functioning of ISDS on lots that are substandard or constrained by poor soils and high watertables.

The Comprehensive Plan notes that degradation of the surface water quality in the coastal and freshwater ponds is related, in part to the density of development, the condition of septic systems and the types of land uses within the watershed. The plan also notes that the wells and septic systems associated with many of the summer cottages built prior to 1970 do not meet current standards. Wells in the Charlestown and Green Hill Beach area have shown high levels of fecal coliform.[8] In Charlestown's Ocean Ridge area, 20 obvious systems failures were found as a result of a visual inspection of 147 lots, representing a thirteen percent failure rate. Several private wells in the area were also contaminated by fecal coliform.[9] In addition, nitrate levels in the Green Hill area, while within the 10 ppm health limit established by EPA, are significantly elevated over background groundwater levels and are indicative of ISDS contamination.[10]

Green Hill Pond has been closed to shellfishing since 1994. In the summer of 1996, 19 out of 20 samples (95%) taken either in the pond or its tributaries showed fecal contamination. One sample, with fecal coliform levels at 1600 MPM/100ml far exceeded the level safe for swimming. Twenty of the samples (65%) taken in Ninigret Pond and its tributaries during this same testing season, were above the fecal coliform levels for safe swimming. Approximately 100 acres of the eastern portion Ninigret Pond are closed to shellfishing. In Quonochontaug Pond and its associated streams, forty eight water samples (61%) were above the fecal coliform levels for safe shellfishing. Seven samples in this pond tested at greater than 1600 MPN/100ml.[11]

In 1997, a study of the Green Hill Pond watershed by URI graduate students made use of a pollutant loading model developed by the URI Cooperative Extension Program.[12] Calculations using the MANAGE model, determined that 57 percent of nutrient loading to surface waters, and 83 percent of nutrient loading to groundwater, is from malfunctioning septic systems. The study also demonstrated that upgrades of existing ISDS with enhanced treatment including denitrification are necessary in order to stem eutrophication and obtain fishable/swimmable waters.

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[8] Charlestown Comprehensive Plan, 1992. Natural Resource Element.
Also, Pond Watchers well testing program data 1997.

[9] RIDEM, 1995. Bulletin for the Non point Source Management Program. Volume 1, No 3 (article on the study conducted by Peter O'Rourke).

[10] Ibid footnote 6.

[11] Salt Pond Watchers, 1997. Winter newsletter.

[12] Jabba, Richard, Jim Lucht, and Samokar, Heidi, 1997. Green Hill Pond Watershed Study. Community Planning, URI. Directed by Dr. Rolf Pendall with assistance from Lorraine Joubert, Cooperative Extension.

Ernst (1996) calculated nitrogen loadings to the groundwater of the salt ponds based upon 1981 and 1992 development levels and projected build-out data.[13] At build-out, nitrogen loadings are projected to increase by 56.2 percent for Point Judith Pond, 93 percent for Potters Pond, 27.6 percent for Green Hill Pond and 29.3 percent for Ninigret Pond. Research by the RI Coastal Resource Center (CRC) has determined that groundwater nitrogen levels in densely developed areas of the salt pond watersheds are as much as 100 time higher than levels in undeveloped areas. When the travel time for pollutants through the groundwater aquifer is taken into account, current water quality data for nutrients may actually reflect land use conditions from several years earlier.[14]

In 1990, a study undertaken by the Town of Charlestown, estimated nitrate loading from present and future land use, based on the Town's current zoning at the time. The study suggested that the salt ponds were already suffering impacts from excessive nitrates and would continue to do so. The study also indicated that Pasquisset Pond, a freshwater pond overlaying a significant groundwater aquifer might also be threatened with nitrate pollution.[15]

The Rhode Island Salt Pond Region: A Special Area Management Plan (SAM plan) recommends on-site wastewater management programs as a strategy for water quality protection. Proposed revisions to the SAM Plan recognize the need for enhanced wastewater treatment systems in order to achieve water quality protection goals. These revisions call for the use of denitrification systems for new subdivisions which do not meet the density requirements for "self-sustaining lands" (1 unit per 2 acres) and "lands of critical concern" (1 unit per 3 acres). In "lands developed beyond carrying capacity" denitrification will be required for all new installations and replacements. CRMC defines denitrification as a system which reduces the total input nitrogen by at least 50 percent as measured on an average annual basis at a point which is at the outlet end of the septic tank.

Comprehensive Plan Goals and Policies: The Facilities, Natural Resource and Land Use Elements of the Comprehensive Plan identify several issues related to on-site wastewater management. These include:

a) Data base development and a lot by lot evaluation in order to pinpoint and document problem septic systems.

b) Implement an ISDS rehabilitation/reconstruction program.

c) Develop alternative strategies and innovative designs such as small scale cluster systems where conventional ISDS upgrade cannot be done effectively.

d) Develop and evaluate alternatives for septage disposal.

e) Develop and evaluate alternative methods for funding a wastewater plan.

Implementing a Wastewater Management District is identified as a high priority of the Natural Resource Element. The element notes that the Town relies entirely on groundwater for its source of potable water.

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[13] Ernst, Laura, 1996. The Cumulative Impacts of Management Decisions on Nitrogen Loading to the RI Salt Ponds. M.A. Marine Affairs, Univ. of RI.

[14] A study conducted by Horsley and Witten in Chatham, MA in 1992 found that due to travel time within the groundwater reservoir, the water quality of their coastal ponds was actually reflective of 1974 development densities.

[15] I.E.P., Inc. and JC Meyers.1990 Draft Wastewater Engineering Study for Charlestown, RI: Phase 2.

This element, as does the Economic Development Element, also notes the importance of resource protection for the economic well being of the Town. Resource-based tourism is an important component of the Town's economic development plan. Financial assistance/incentives for ISDS upgrades, water conservation programs in coastal areas, ongoing ISDS and ambient water quality monitoring and protective zoning for public water supplies are also mentioned in the Comprehensive Plan as possible ISDS-related water quality protection programs.

One of the principle goals of the Facilities Element is, "to develop facilities and services in a way that is compatible with protecting the town's natural and cultural resources, rural character and reasonable tax rate." [16] Charlestown is fortunate that it still retains much of its rural character. With the exception of a small package treatment plant, associated with Kingsland Apartments, the Town relies entirely upon on-site systems for the treatment of sewage. Given the Town's rural nature, the goals of the Comprehensive Plan and the prohibitive cost of constructing a centralized sewage treatment facility, septic systems will continue to be the only practical form of wastewater treatment.

The Land Use Element recognizes that the amount and type of land use affects the tax base and the need for sewer and municipal services, and that the presence of these facilities affect the rate of development. It also recognizes that dense development threatens the quality of ground and surface waters with septic system leachate and stormwater runoff. A stated objective of the land use section is to, "maintain the current, general patterns scale and densities of development, with the most dense development occurring in the villages and generally low density development occurring outside the village areas."[17] Figures 3 and 4 respectively depict existing and future land use in the Town of Charlestown. The future land use map which will serve as the basis of any future zoning map changes, reflects the Towns intent to maintain its rural character and protect its natural resources which are linked to the Town's economic well-being.

The managed use of properly designed, located and maintained septic systems will help to retain rural character, maintain property values, protect the Town's natural resources and contribute to the Town's financial well-being. An on-site wastewater management plan enables the Town to work towards these objectives and provides an affordable alternative to the extension of sewers.

III. DESCRIPTION OF CHARLESTOWN'S WASTEWATER MANAGEMENT PROGRAM

What Is an On-Site Wastewater Management Program? An OWMP is a tool box of strategies designed to ensure the proper function and maintenance and, at times, the proper design, location and construction of on-site sewage disposal systems. When properly developed and implemented an OWMP can help maintain property values and preserve and improve the quality of valuable ground and surface water resources. An OWMP may contain the following principle components:

1. Public outreach, education and technical assistance.

2. A septic system inspection and maintenance program.

3. Zoning and subdivision provisions related to septic system setbacks and performance standards.

[16] Vanasse Hangen Brustlin, Inc. 1991. Charlestown Comprehensive Plan, Facilities Element, p 3.
[17] Vanasse Hangen Brustlin, Inc. 1991. Charlestown Comprehensive Plan, Land Use Element, p 3

4. A financial incentive program for the repair and upgrade of failing and substandard systems.

To Sewer or Not To Sewer? Prior to deciding to implement a town wide wastewater management district, the Town first examined the desirability of sewering certain areas of Town. While no estimates were made of the costs to construct a sewer plant and associated lines for Charlestown, estimates and actual costs of sewer construction projects in neighboring municipalities were considered. In South Kingstown, for instance, it was estimated that extending sewers into the south shore alone would cost about $12,000,000.[18] This figure does not include the associated fiscal and environmental costs of increased development that sewers would bring. Neither does it include the additional costs of constructing a centralized wastewater treatment facility. CRMC regulations prohibit the extension of sewers into Charlestown's south shore communities. As previously mentioned the goals of the Charlestown Comprehensive Plan are also inconsistent with developing a centralized sewer system.

Program Goals: The following are the program goals of the Charlestown Wastewater Management Program:

1. Safeguard public health, and protect and improve ground and surface water resources, by ensuring the proper functioning and maintenance of all septic systems in Charlestown.

2. Minimize nutrient loadings to, and pathogenic contamination of, ground and surface water resources to levels that will achieve management objectives for safe drinking water and fishable and swimmable waters.

3. Prevent system failure, increase system longevity, reduce long-term repair costs, and ensure adequate effluent treatment of all viable septic systems in Charlestown.

3. Recognize the interdependence of resource protection and economic development for the Town of Charlestown and demonstrate that ISDS management is a tool that can foster economic development and resource protection.

4. Provide financial assistance for the upgrade or replacement of failing and/or substandard septic systems in Charlestown.

5. Educate residents and visitors to Charlestown regarding specific techniques for septic system management, the benefits of a wastewater management program, and the detrimental impacts of the no-action alternative.

6. Develop an efficient computer database for ISDS management and tracking, which is capable of linking with a future GIS system. Invest in quality software that will reduce the administrative burden to the Town as much as possible.

[18] Jon Schock, SK Utilities Director. In Sutton, Paul South Kingstown Wastewater Management Study, 1994. SK Planning Department.

7. Investigate the development of performance-based ISDS standards based on specific goals for the protection of critical resource areas.

Wastewater Management Ordinance: Charlestown's Wastewater Management Commission was initiated by the Town Council in 1993 and charged with the responsibility of investigating and developing solutions to Charlestown's on-site wastewater management needs. In order to accomplish its objectives the Commission divided itself into four sub-committees 1) database development, 2) waste disposal options, 3) ordinance preparation and 4) public relations.

Charlestown's ordinance, enacted in September 1994, initially required that a system be pumped once every three years. A septic system owner could, however, petition the Wastewater Management Commission to reduce the pumping frequency, but in no case could a system be pumped less than once every six years. This ordinance was revised in March of 1998 to provide for an inspection-based pumping program. A copy of Charlestown's Wastewater Management Ordinance and amendments are included as an appendix to this report.

ISDS Maintenance Activities: Although the ordinance has been enacted since 1994, the program has been slow to start due to an initial lack of funding. Therefore, although the ordinance is mandatory, it is currently being implemented on a voluntary basis. In 1995, the Commission was awarded a small $3500 grant from RIDEM to purchase a computer, install a phone line, pay for printing and mailing costs, etc. In 1996 Charlestown, along with the neighboring towns of Westerly, Narragansett and South Kingstown were each awarded a RIDEM grant in the amount of $37,500 for the development/implementation of a wastewater management program. Charlestown's primary use of the grant funds is to implement the recommendations of the Comprehensive Plan by conducting a town-wide inventory of ISDS and develop an associated database. Homeowner education, the development of this OWMP and the initiation of the ISDS inspection-based maintenance program are other principal components of this grant. A copy of the grant scope has been included in the Appendix to this plan.

The Commission has sent letters to all owners of single family homes in Charlestown requesting that they pump their septic system. The homeowner is asked to complete a septic system inventory sheet (form 10/80/95) and send the pumper's receipt or a copy of the canceled check to the Commission. The letters were sent out by geographic area and phased over the course of two and a half years. The Notice to Pump Program was first initiated in the environmentally sensitive coastal pond region. The final mailing included plats north of Route 1 and was conducted in April of 1998. Table 4 shows the response by plat. Figure 5 shows the location of the plats. To date there has been about a 30 to 40 percent positive response from the south shore plats. Although it is too early to tell, a high pumping response in plat 9 may have contributed to the substantial improvement in water quality between 1996 and 1997 as measured at the RI Salt Pond Watchers station 12b in Ninigret Pond.[19] Initial pumping response in the northern part of Town has also been favorable. A sample copy of the notice to homeowners and the data sheet that a homeowner is asked to complete and return to the Commission is included in the Appendix.

Subdivision and Zoning Provisions: Charlestown's subdivision regulations require an environmental analysis that addresses sewage disposal and related factors. This includes consideration of such things

[19] David Monk, 1998. Executive Director, RI Salt Pond Watchers. Personal Communication.

Table 4 ISDS DATA SHEET RESPONSE BY PLAT (Through April 30, 1998)

Plat #	# Responses	Plat #	# Responses
1	34	16	62
2	202	17	73
3	54	18	6
4	70	19	16
5	15	20	105
6	no homes	21	15
7	36	22	11
8	no homes	23	55
9	105	24	4
10	119	24a	17
11	133	25	40
12	42	26	12
13	75	27	15
14	24	28	31
15	12	29	25

Septage Disposal: Charlestown has no treatment facility of its own and currently disposes of all its septage at the Lincoln Treatment Plant, which is run by the Narragansett Bay Commission. In addition to negotiating with the Narragansett Bay Commission, Charlestown investigated using the treatment plant at Quonset Point for septage disposal. Charlestown, in discussions with South Kingstown, also researched the possibility of constructing a remote septage receiving facility at the West Kingston end of South Kingstown's sewer main. Septage received at the outlying portions of the sewer district is more easily blended at the head works of the treatment plant. The facility would cost between $150,000 to $200,000, would be operated with a key pad and would require no on-site personnel. The key pad would monitor Ph record septage volumes and bill the septage hauler. This is a project, which Charlestown could pursue with South Kingstown in the future should it find that the Lincoln facility does not adequately meet its needs.

Data Collection: In addition to collecting data forms from each individual homeowner, the Town, using the RIDEM ISDS management grant has obtained DEM's ISDS records to have on file at the town hall. The Commission is currently trying to match plat and lot data on DEM's records with the assessor's records. These files, together with the information obtained form the homeowner data sheet and the upcoming inspection program, will form the basis of the Town's ISDS data records. In addition, the Town has begun a confidential voluntary well testing program in the Green Hill Pond watershed. Of nineteen well samples taken to date, three had high levels of coliform contamination and five wells had nitrate concentrations in excess of 4 ppm. This well testing program will be expanded in the summer of 1998.

ISDS Inspections: Once a septic system has been installed, maintenance is the only factor that can be controlled, and a program of periodic inspection and needed maintenance is advised. A program where

maintenance requirements are based upon inspection results is more equitable to the homeowner than a maintenance program that dictates mandatory pumping every three years. The inspection-based method recognizes that maintenance is primarily based on water use and the number of system users. In addition, this approach places a greater emphasis on inspecting key components of a system to ensure continued system longevity and proper functioning.[20]

State Program: The Rhode Island Department of Environmental Management (RIDEM), recognizing the need for a standard and technically valid ISDS inspection procedure, recently completed *Septic System Check-Up: The Rhode Island Handbook for Inspection*. The handbook, developed in association with the RI Septic System Policy Forum, and various interest groups such as realtors, home inspectors, septage haulers and ISDS installers, provides standardized, state-recommended procedures for evaluating and maintaining ISDS. The handbook includes instructions for gathering ISDS records, locating system components, diagnosing minor in-home plumbing problems, conducting flow trials, dye tracing and the process for determining maintenance needs and scheduling. Procedures and report forms in the handbook have been designed for incorporation into a municipality's inspection and maintenance program.

Three types of inspections are described. The "First Maintenance Inspection" is the first inspection done on a septic system. This inspection involves some record and data gathering, and location of system components that is not usually necessary for subsequent routine inspections. The "Routine Maintenance Inspection" is generally completed after the First Maintenance Inspection. It involves the inspection of a septic system and system site to determine the need for pumping, establish future inspection schedules and to assess whether any repairs are necessary. A "Functional Inspection" typically takes place at the time of a property transfer. It includes an assessment as to whether the system conforms to current design standards, an evaluation of in-home plumbing, and an analysis of ISDS components, including flow trial and dye tracing as appropriate. The RI On-Site Wastewater Training (OWT) Center is contracting with RIDEM to field test this manual on a dozen ISDS in the Green Hill Pond watershed early in the summer of 1998.

Once the manual has been finalized, the OWT Center could offer training programs in its use to interested haulers, installers, home inspectors, etc. Municipalities who do not wish to have an inspector on staff could require that any individual who wishes to inspect systems within the Town to have passed the training course.

Inspection Options: Judging from the experience of other Rhode Island municipalities, the more privatized an OWMP can be, the better the likelihood of success. This approach provides the homeowner with more options and reduces the involvement and cost to the municipality. For example, homeowners could either choose their own septage hauler/inspector, or the Town could sub-contract this service or perform it in-house. If the homeowner is given this responsibility, it provides them with more control over their ISDS, and reduces the overall cost to the Town. Under this scenario, however, the Town could potentially lose some control over the quality of the inspections. The Town, could also arrange to contract with a hauler and inspector for a specific price per system or fee based upon an hourly rate or septage volume. Due to economies of scale this could potentially save the homeowner money. The homeowner could have the flexibility of either hiring the individual under contract with the Town or other qualified professional.

Town Pilot Program: As mentioned earlier, Charlestown recently amendment its 1994 Wastewater Management Ordinance to change from prescribed pumping every three years to an inspection-based ISDS maintenance program. The inspection component of Charlestown's Wastewater Management Program will incorporate the newly developed "Septic System Check-Up". Given the fact that Green Hill Pond is priority

[20] Millar, Scott, 1997. Draft Summary of the Rhode Island Septic System Maintenance Policy Forum.

watershed for wastewater management initiatives for Charlestown, South Kingstown and RIDEM, the Town's inspection program will begin in this area. With a portion of the $37,500 that the Town received from RIDEM to implement its Wastewater Management Program the Town would offer free inspections to residents in this area. The grant-funded inspector(s) would visually inspect the structural condition of the tank and components, perform a functional inspection using the field-tested RIDEM manual and visually check for obvious signs of drainfield failure. Data from the inspection would be entered into the Town's septic system management database.

IV WASTEWATER MANAGEMENT EDUCATION

The Charlestown Wastewater Management Commission has initiated several programs related to on-site wastewater management education. They have a traveling display board that explains program components and the importance of water conservation and maintaining and inspecting one's septic system. Brochures and fact sheets for people to take home are available as part of the display. In addition, the Commission has a packet of information septic system maintenance information that it sends to new homeowners in the area. It has also worked with the pumpers and realtors in the area to inform them about the requirements of the wastewater management ordinance and the availability of grant funds for ISDS repair.

On-Site Demonstration Projects for Enhanced Treatment: The RI On-Site Wastewater Training (OWT) Program, in conjunction with partnership community groups and agencies, is currently involved in three separate projects designed to remediate failed ISDS with enhanced treatment systems.[21] A total of 23 systems located in five Rhode Island coastal communities, including the Green Hill Pond Watershed, are involved. All systems are installed as replacements for failed ISDS on difficult lots and are specifically designed to remove nitrogen and pathogenic organisms from wastewater. The selection of a particular innovative system is based on factors such as lot size, water table, restrictive or excessively permeability, and proximity to critical resources. Homeowners apply to participate in the program and agree that their site may be used for training and monitoring purposes for a fixed period of time (less than 5 years). In return, a substantial portion, and in some cases, all of the design and installation costs, are paid for with project funds.

The actual installations are used as training sessions for participating members of the Contractors Association. Market value replacement costs for each system have been calculated and to date range from about $9,000 to $12,000. Systems are monitored for a variety of water treatment capabilities including nitrogen removal, BOD and TSS.

[21] The Warwick Pilot Project (6 systems) funded by DEM through the Narragansett Bay National Estuary Program; The Aqua Fund On-Site Demonstration Project(12 systems) funded by DEM with Aqua Fund; The Green Hill Pond Watershed (5 systems) Clean Water Act money passing through USEPA to the National Small Flows Clearing House at West Virginia University.

Recently URI's OWT Program was awarded a grant to construct innovative septic systems for remedial use in the Green Hill Pond watershed. Despite existing educational efforts, residents and decision makers in South County are unfamiliar with many aspects of ISDS management, in particular the appropriate use and costs of advanced treatment systems. The Green Hill project will include a total of five replacement systems located in the towns of Charlestown and South Kingstown. Site selection and ISDS design will occur in the summer of 1998 with installation following in early fall. A fact sheet summarizing the Green Hill On-Site Demonstration Project is located in the Appendix.

This project will provide Charlestown with an excellent educational opportunity for innovative wastewater management. Post-construction community-based workshops will be conducted for homeowners, board members, municipal officials, realtors, regulatory agencies and ISDS professionals. Data obtained from these projects will provide the Town with information required to appropriately locate site-specific, alternative systems within critical resource areas. In addition it will provide area residents with the opportunity to see the installed systems and learn about their costs, enhanced treatment capabilities, design and maintenance.

There are existing educational programs that the Town could incorporate into the public outreach component of its OWMP. Notable is the RI On-Site Wastewater Training (OWT) Program operated through the University of Rhode Island's (URI's) Cooperative Extension. The OWT Program provides classroom and field training on all aspects of septic system maintenance, design and installation. The field training site consists of several above-ground, innovative septic designs located adjacent to a denitrifying septic system research and demonstration facility. The use of clean water in its demonstration systems facilitates hands on participation. Established in 1994, it is one of only eleven such programs nationwide. The OWT program offers a wide variety of workshops for homeowners, municipal officials, designers, installers, etc. In addition, they are involved in the installation and monitoring of approximately twenty-two advanced treatment systems as part of the National On-Site Demonstration Program.

The Wastewater Management Commission could work with the OWT Program in the development of the public outreach and education component of the OWMP. The following are some ideas for potential workshops that OWT could offer in association with Charlestown. The costs for developing and hosting the workshops could potentially be shared with other neighboring communities who are assuming a pro-active role in the management of on-site wastewater.

Potential OWT/Conservation Commission Workshops:

- Tour of on-site demonstration sites featuring innovative treatment technologies (Green Hill, Warwick, Portsmouth, North Kingstown). Several workshops focusing on the Green Hill installations could be designed for residents, municipal officials, board members, etc.

- Workshop geared towards ISDS inspectors and maintenance contractors wishing to be registered as knowledgeable in the procedures of RIDEM's *Septic System Check-Up: The RI Handbook for Inspection*.

- Workshop geared towards the homeowner wishing to conduct his/her own maintenance inspections of their ISDS.

- Workshop(s) on the retrofit of conventional ISDS with effluent filters and inspection ports.

- Basic workshop for homeowners interested in knowing more about the costs, options and benefits of enhanced treatment technologies.

Another excellent program operated through the URI Cooperative Extension is Home*A*Syst, a neighborhood-based, confidential and voluntary pollution prevention program. This involves trained volunteers who work with their neighbors to reduce residential non-point source pollution. This grassroots program helps residents assess environmental risks in and around the home and identify what steps are necessary to correct any problems. Property values, public health and the environment all benefit. The Home*A*Syst manual includes an excellent chapter on septic system inspection, and maintenance including some information on alternative systems.[22] Home*A*Syst staff members train program volunteers in the use of the manual. Program volunteers host informational meetings with neighborhood organizations, make display materials available for a community event or work with homeowners to conduct individual home assessments. Home*A*Syst also works in cooperation with the OWT Center to provide training in septic system operation and maintenance to residents and program volunteers.

***Future Educational Efforts**:* The following is a list of potential ideas that could be incorporated into the Wastewater Management Commission's education and public/outreach plan. The education strategy, once fully developed, should include potential funding sources and a timetable for implementation.

- Host a series of workshops/field days relative to the OWMP.
- Develop a high school component to the Cooperative Extension Home*A*Syst Program.
- Host a science fair category in local schools related to septic system maintenance, alternative systems, etc, including prizes.
- Design an eye-catching poster on septic system maintenance.
- Work with the school system to revise science curriculums to include information on septic system functioning, impacts, the importance of maintenance, management efforts, etc.
- Develop educational placemats relative to ISDS management and water quality protection (child and adult versions).
- Develop graphically attractive refrigerator magnets with pertinent information about the Charlestown OWMP, which would be mailed to property owners with septic systems, along with program brochure.
- Use public service announcements involving 30 second sound-bites to be sent to local radio stations.
- Develop a home page and website for the Town's OWMP, which could include related

[22] University of RI Cooperative Extension, 1997. Home*A*Syst, An Environmental Risk-Assessment Guide for the Home. The National Farm*A*Syst/Home*Syst Program in cooperation with the Northeast Regional Agricultural Engineering Services.

environmental issues.

- Maximize use of cable access TV (informational videos, talk shows, meeting announcements, etc.)

In addition to requesting money through the Town's general operating budget to help fund the above activities, federal, state and private grant opportunities should be also be investigated. EPA Education Grants (generally for $5,000) could provide the Commission with seed money to begin a specific project. These applications are generally due in the fall of each year.[23] In 1998 for example, the RI Salt Pond Watchers, in coordination with South Kingstown High School, URI's On-site Wastewater Training Center and Home*A*Syst, received funding to develop a 20-minute student-produced video. The video will discuss wastewater management in Rhode Island, including its importance to the environment and local economy. It will overview state and local regulations regarding septic system management. It will also present an array of advanced wastewater technologies currently being piloted by URI's OWT Program. The objective of the video will be to provide homeowners and businesses with the knowledge to make informed decisions and take responsible actions regarding on-site wastewater treatment. Although this video will be geared towards South Kingstown's program, it will be structured in such a way as to allow other towns to modify it to suit their needs. The Charlestown Wastewater Management Commission has allocated $1,000 to modify the video for use in Charlestown.

V. FINANCIAL ASSISTANCE PROGRAM FOR ISDS REPAIR

Community Development Block Grant (CDBG): CDBG funds provide an existing source of local monies for the repair/replacement of ISDS. In Charlestown, a home owner meeting CDBG's low or moderate income criteria is eligible for a 40 percent grant for the repair of an ISDS. No loan funds are currently available to make up the difference. To date two systems have been repaired through this program. Unless a system has failed to the point of creating an immediate health hazard it is not likely that a family meeting CDBG's low income requirements will have the money to fund the remaining 60 percent of the system repair cost. Under South Kingstown's CDBG program, an applicant meeting the low income guidelines is eligible for a 100 percent grant for up to $6,000 for the repair of a septic system. An applicant meeting moderate income criteria is eligible for 50 percent funding up to $3,000. One possible way to better publicize both the CDBG funds and the CSSLP money is to develop a direct mailing to individuals whose systems are known or suspected to pre-date the ISDS regulations.

RICWFA's Community Septic System Loan Program (CSSLP): The CSSLP provides a powerful tool for the Town in helping fund septic system repairs as part of its On-Site Wastewater Management Plan. Charlestown, along with other South County towns and Glocester will be one of the first towns to implement this loan program. Below is a thumbnail sketch of how the program is likely to operate.

1. The Town receives approval for its OWMP from RIDEM and ISDS repair is listed by the RIDEM as a Priority Project for the Town.

[23] Copies of the grant application guidelines are published in the Federal Register and are also available at"http://eelink.umich.edu/grant.html" or by calling 617-565-9447.

2. The Town requests an open line of credit from RI Clean Water Finance Agency (RICWFA). The amount must be based on the expected number of applicants coming in for repairs of failed systems per year and the average cost to repair each system.

3. The Town is approved for an open line of credit. Prior to approval, the Town must assure re-payment of the loan to RICWFA in case of homeowner(s) default. This can be done by means of a revenue pledge or Town Council resolution. The Town would place liens on the properties of anyone in default of the loan. Some funds for repayment of loans in default should be placed in the contingency fund or a dedicated account.

4. The Town publicizes its program through the development of a program fact sheet, press releases and a letter to ISDS owners.

5. A homeowner wishing to access the funds must obtain a letter from the Charlestown Wastewater Management Commission stating that they are eligible.

6. The homeowner hires the appropriate professional to design the system repair and submits the application to RIDEM for approval; approval is received.

7. RICWFA does not require the homeowner to obtain quotes or sealed bids for the ISDS repair. The Town may, however, elect to do this and grant a loan in the amount of the lowest bid. The work must be undertaken by a licensed installer.

9. Once DEM approves the system design, the homeowner can apply for loan monies through RI Housing which will apply its standard income to debt ratios in evaluating applications. RI Housing may also set up satellite offices, either on its own or through an arrangement with a local financial institution. For instance, a local loan processing center could be set up one or two days per month in the Town Hall or an area school. This is a detail that the Town should work out with RI Housing when it applies for its line of credit.

10. Application approved; RI Housing issues two-party check to contractor and homeowner and prepares loan repayment plan.

11. The homeowner begins repayment of the loan one month after the check is received; all repayment funds are placed back into Charlestown's open line of credit account and are available to other applicants.

12. RI Housing provides monthly or quarterly reports to the Town. The frequency of reports and the data needed should be based on consultation between the Town, RI Housing and RICWFA.

Charlestown's Eligibility Criteria for CSSLP Financing: The Charlestown Wastewater Management District encompasses the entire Town of Charlestown. Based upon proposed Town standards, any ISDS serving a one-to four-family residence in the Town of Charlestown that meets the following criteria shall be eligible for CSSLP funds.

1. Loans are for all single-family and multi-family homes. No institutions, condominiums, or commercial

businesses are to be covered at this time. All state and local approvals and procedures must be in place prior to any acceptance of applications.

2. A failed system is defined by current DEM regulations and the Charlestown Wastewater Management Ordinance. For purposes of accessing the loan funds a failed system also includes substandard systems (i.e. metal tank, undersized tank, cesspool, etc.).

3. If a system is failed, but the repair also calls for an increase in the number of bedrooms, the loan amount shall be limited to that required to repair or replace a system suitable for the original number of bedrooms.

4. In order to qualify for the loan fund, the owner must submit three bids. The construction portion of the loan shall be limited to the low bid plus 10 percent. Engineering and permitting costs are also legitimate loan expenses.

5. The maximum loan amount is to be $15,000 if both DEM and CRMC approvals are required. If only DEM approval is required, the maximum loan amount is $10,000. The use of filters and risers shall be an eligible expense when part of a major repair.

6. All applications must conform to paragraph 218-87 “Water Bodies” of the Charlestown Zoning Ordinance.

7. When the available pool of money is $50,000 or less, hardship situations and emergency repairs will be given priority.

The Town has requested $250,000 from RIDEM for this project. With this money it is anticipated that 25 to 35 systems could be repaired. Once repayment of the loans begins, additional monies would become available. The CSSLP is an integral component of the Town's on-site wastewater management strategy. It is worth noting, however, that additional sources of grant and loan monies will be needed to bring the Town's estimated 1680 sub-standard ISDS up to code.

The Town will publicize this program along with its existing grant program through the development of a program fact sheet, press releases and a letter to ISDS owners in target trouble areas, whose systems are suspected of pre-dating the ISDS regulations. In addition the Town will host an informational meeting on the program and advertise the availability of funds on cable TV. Multiple copies of the program fact sheets will also be made available to realtors and septic system pumpers and installers for distribution to their clients.

The Town Administrator shall be the designated contact person for this program. The Town will evaluate this program annually and, if recommended, reapply for any available CSSLP funds. In addition, it will investigate other potential federal, state and local sources of program funding. Public education and ISDS related zoning provisions will also help to address the Town’s on-site wastewater problems.

VI. PROGRAM COSTS

Funding a staff person to help implement Charlestown's Wastewater Management has been an issue since the ordinance was first passed in 1994. In 1995 it was defeated as a line item at the Financial Town Meeting by a handful of votes. A total of $22,550 has been approved for wastewater management

activities for fiscal year 1998-99. Fifteen thousand of this amount will be allocated for ISDS inspections outside of the Green Hill Pond watershed, the remaining $7,750 will be available to carry out other program related activities.[24]

As mentioned above, there are several alternative strategies for implementing an inspection/maintenance program. A program, which relies on knowledgeable and sufficiently trained private haulers, inspectors and contractors, will cost the Town less. Even if this scenario were selected, however, a staff person or outside consultant, would still be needed to oversee the educational, administrative, grant writing and data entry and tracking components of the program. Selection of a good septic system tracking and management program will help to reduce administrative costs. Program capabilities are discussed in section VI below.

One potential program funding alternative is to calculate the estimated annual program costs and divide by the number of septic systems in Town. This is very similar to the way that sewer user fees are calculated, except, of course, that they are an order of magnitude higher. There are an estimated 4500 ISDSs in Charlestown.[25] If each dwelling unit and business served by an ISDS was assessed a $10 fee annually, the program would have $45,000. The fee, which would appear as a separate item on the tax bill, would also serve to bring attention to the program. Monies collected would be placed in an enterprise fund to be used exclusively for OWMP activities.

VI. RECOMMENDATIONS FOR POSSIBLE FUTURE ACTIONS

The following recommendations were developed based upon a review of new technologies, assessment of ISDS management and financing techniques.

Fiscal Years 1998 to 1999 and 1999 to 2000

1. Initiate Community Septic System Loan Program. Prepare fact sheet and other publicity related to the Town's loan and grant program for ISDS repair.

2. Evaluate various ISDS management software capabilities and select the desired product. The program should have the ability to:

    a) Interface with the tax assessor data and possible future Town GIS capability.

    b) Incorporate the standard septic system inspection forms and procedures developed by RIDEM in *Septic System Check-Up.*

    c) Automatically generate any administrative notices and letters, required as part of the inspection program.

    d) Automatically access calendar-based data in order to generate administrative notices and letters, (i.e.inspection schedule notices, etc.).

[24] The $15,000 was approved by voters as a special referendum at the Financial Town Meeting on June 1, 1998.

[25] This figure uses the census figure of 4256 lots minus 150 units for Kingsland Village, plus an estimated 200 units constructed since 1990. Of these, the Charlestown Wastewater Management Commission estimates that there are about 3,900 single-family homes served by ISDS. To date Charlestown's program has focused on single family homes. Also included in the total ISDS estimate are 200 commercial units, multi-family homes and the trailer park. These figures should be further refined once additional data from the Tax Assessor becomes available.

e) Accept scanned septic system plans and other documents of records.

f) Display site photographs on orthophotos.

g) Develop a variety of reports.

The Wastewater Management Commission, The Town Administrator, the Tax Assessor and the Planning Department should jointly evaluate potential software programs. Cooperative Extension may be able to offer the Town some technical advice in software evaluation.

3. Purchase software and have it customized to Charlestown's specific needs. This may be a cost that Narragansett and South Kingstown might partially share.

4. Continue data input from ISDS records. Focus on repaired systems and systems that pre-date ISDS regulations.

5. Initiate inspection-based maintenance program in Green Hill watershed pilot area. Input data from on-going septic systems inspections in pilot area. Evaluate and refine program and data entry requirements as needed.

6. Prioritize education and program publicity goals, and begin their implementation. This should be coordinated with the Town of South Kingstown, the OWT and Home*A*Syst Program to maximize the educational value of the Green Hill on-site demonstration project. The educational efforts should also be coordinated with the implementation of the septic system inspection and maintenance program in the Green Hill Watershed.

7. Investigate possible alternatives for handling and treatment of Charlestown's septage, including coordinating with South Kingstown regarding a possible satellite septage receiving station in West Kingstown. Calculate future septage needs.

8. Work with Salt Ponds Coalition and South Kingstown High School to do a Charlestown version of the EPA funded video project for alternative septic systems.

Possible Activities for Future Years

1. Expand implementation of the inspection-based maintenance program to other areas of town.

2. Bulk purchase effluent filters for septic tanks and sell at cost or slight mark-up to the homeowner. Hold workshop in the Green Hill area on how to retrofit septic tank with effluent filter. Provide instruction sheet and list of contractors to homeowners.

3. Bulk purchase water conservation kits and sell to homeowners for small fee.

4. Provide funding for a program staff person. Responsibilities would include:

a) Entering information relative to ISDS permit history, including as-built plans from the building inspector’s files, into the ISDS database.

b) Entering data from the ISDS registration program.

c) Developing and sending notification letters for ISDS inspections in pilot areas.

d) Tracking inspection and maintenance results in pilot areas.

e) Assisting the Wastewater Management Commission as needed.

f) Writing grants.

g) Interface with DEM, CRMC, URI and other interest groups.

5. Model build-out scenarios for the Town by watershed. Using MANAGE or similar model calculate impact. Develop and implement ISDS performance standards for critical resource areas.