# Section 2
# Wastewater Disposal Needs

## 2.1 Introduction

This section summarizes the results of the wastewater disposal needs assessment conducted for the Town of Stonington, Connecticut. This assessment reviews current wastewater disposal methods, their functionality, and where improved or alternate facilities are required in order to provide adequate treatment and disposal of the generated wastewater. This assessment is based on the Connecticut Department of Environmental Protection (CTDEP) guidelines and the United States Environmental Protection Agency (EPA) Publication *Construction Grants 1985 (CG-85)*.

It should be noted that the descriptions in this section depict conditions in 2002. No significant changes have occurred since that time, and none of the recommendations of this section have been implemented. However, there are several new subdivisions within or adjacent to the identified sewer needs areas. These new developments are:

- The Stonington Green (River Crest Drive) subdivision borders Aimee Drive, Mark Drive and River Road. This subdivision is sewered within the Pawcatuck service area.
- The Rock Ridge subdivision is under construction adjacent to the Cronin Avenue and Holly Street. This subdivision will be sewered within the Pawcatuck service area.
- The Croft Court subdivision, off Elm Ridge Road, has now been constructed and is presently unsewered.

As applicable, this new information has been incorporated into the 2002 sewer needs analysis. The discussion below includes these revisions.

## 2.2 Current Wastewater Disposal Methods

Presently, about one half of the town's population relies on onsite disposal systems to treat and dispose of wastewater. The most common onsite disposal system is a septic system; however, cesspools are also used. Onsite disposal systems are described below.

The remainder of the population discharges to one of three wastewater collection systems within the town. These collection systems are described in Section 4. A general description of collection system components is presented in Section 2.6.

## 2.2.1 Onsite Disposal Systems

### Septic Systems

A typical septic system consists of a septic tank, distribution box and leaching area as shown in **Figure 2-1**. The septic tank is a common component of the conventional septic system, where the pretreatment of wastewater occurs. It is usually constructed of reinforced concrete with compartments for separation of liquids and solids by settling and floatation, and for solids storage and anaerobic stabilization. The settled and skimmed materials build up over time and can only be removed by pumping and cleaning.

Septic tanks are sized based on the number of bedrooms in the building. A 1,000-gallon tank is required for three-bedroom homes or less, and another 250 gallons are added for each additional bedroom. The Connecticut *Public Health Code*, Section 19-13-B103, requires septic tanks to have a minimum capacity of 1,000 gallons.

Distribution boxes are small structures, typically constructed of concrete. These structures are located between the septic tank and the leaching area and evenly distribute the septic tank effluent to the leaching area.

A leaching area usually consists of perforated or open joint pipe bedded within narrow, shallow trenches filled with a porous medium, such as crushed stone. The porous medium maintains the trench integrity, provides partial biological treatment of septic tank effluent, and distributes the effluent to the surrounding soil. The effluent percolates through the soil and is further treated by filtration and decomposition by microorganisms. Unsaturated soils adsorb viruses, bacteria, and some nutrients. Other nutrients, such as nitrate-nitrogen, pass through to the groundwater. According to the regulations, leaching systems must have a minimum of 6 inches of cover, be built 18 inches above the maximum groundwater level, and be at least 4 feet above ledge. Furthermore, the leaching area must be designed in such a manner as to provide a reserve area, in case of failure.

### Cesspools

A cesspool is a covered tank with wall perforations. Raw wastewater enters the tank, and the liquid portion leaches into the surrounding soil. Solids settle to the bottom and form a sludge blanket, which partially decomposes with time. Cesspools provide less treatment than septic systems and are more susceptible to clogging and failure. As a result, cesspools are considered an outdated technology.

Cesspools that fail are not considered suitable for upgrade. Failed cesspools are required to be replaced with a conventional septic system complying with Public Health Code, or to be replaced with another wastewater disposal alternative, as outlined in this section.

# See Figure 2-1

# 2.3 Review of Available Information

## 2.3.1 Introduction

The wastewater needs analysis was based on the review and evaluation of a considerable amount of data from local, state and federal sources. General data included surficial geology, soil suitability for subsurface disposal, zoning, lot sizes, population density, floodplains, wetlands, surface water, groundwater, drinking water supplies and recharge areas, public water service areas, and public sewer service areas. Site specific information indicating where homes and/or businesses were experiencing difficulties with their wastewater disposal system included questionnaire responses, Board of Health records, and septage haulers' pumping records. In order to organize the analysis required to evaluate wastewater needs in the planning area, a systematic methodology was developed. **Figure 2-2** shows the decision logic of this methodology.

The first step in the analysis was the compilation of a database including information about soils, zoning and land use, floodplains and wetlands, surface water, groundwater, public water and sewer service areas, and Board of Health records. This information was supplemented with a questionnaire survey mailed to each unsewered landowner within Town. A copy of the questionnaire used for the survey is included in Appendix C.

The second step in the analysis was the identification of lots experiencing problems with onsite disposal of wastewater. Based on an analysis of the information outlined above, the density of failures per unit area was determined. Areas of significant problem density were then characterized as problem areas, to be analyzed in detail.

The third step was the analysis of problem areas to determine the probable cause for failure according to the following categories: high groundwater, poor soils, poor maintenance, excessive age and/or hydraulic overload.

The fourth and final step in the analysis was determination of an implementable, reliable, cost-effective means of resolving onsite disposal system problems. Generally, problems caused by poor maintenance, excessive age and/or hydraulic overload were considered solvable by means of rehabilitation, replacement, or enlargement of existing onsite systems. These are relatively simple corrective measures, assuming that conditions prevail that will allow upgrading of onsite disposal systems in conformance with state requirements. Problem areas subject to high groundwater and/or poor soils were evaluated based on their population density. This evaluation was based on guidelines developed by the EPA, which indicate the following:

- where population density is less than 1.7 persons per acre, onsite disposal or community systems are normally cost-effective;
- where population density is greater than 6 persons per acre, collection system projects are normally cost-effective; and

# See Figure 2-2

- where population density is between 1.7 and 6 persons per acre, more detailed evaluation is required.

Therefore, in problem areas with population densities greater than 6 persons per acre, only collector sewers connected to a community system or to the existing collection system were investigated. Where population densities are less than 1.7 persons per acre, onsite rehabilitation, community systems, and collector sewers were investigated, as necessary. In areas where population densities ranged between 1.7 and 6 persons per acre, the methodology involved a differentiation between high groundwater and poor soils as the probable cause of failure. If the problem was mainly soils-related, expansion or rehabilitation of the existing system was recommended, provided land was available for onsite rehabilitation. If the problem was groundwater-related, an assessment of impact was made to determine whether an onsite system could function properly. For this assessment, groundwater observed in the yard was assumed to preclude the use of an onsite disposal system, while groundwater evidenced in only the basement implied use of a mound system for onsite disposal. Section 2.5 expands upon the high groundwater constraints placed by the state on onsite disposal systems.

### 2.3.2 Soils

Specific soils properties and site features are critical for the proper functioning of onsite wastewater disposal systems. The suitability of a particular soil was determined using available Geographic Information System (GIS) mapping from the town, state and other sources and soil descriptions provided in the *Soil Survey of New London County Connecticut* (United States Department of Agriculture, Soil Conservation Service, 1983). Information from these documents was used to determine the suitability of soils for onsite wastewater disposal. The soil survey evaluates the soils at depths between 24 and 72 inches for wastewater disposal. The survey evaluates each soil's permeability, ability to filter, depth to seasonal high water table, wetness, ponding, depth to bedrock, susceptibility to flooding, land slope and other factors to determine its suitability for subsurface disposal.

Soils within Stonington fall within five classifications, as follows:

**S** Suitable for development using typical onsite disposal system design and installation methods.

**D** Suitable for development, but special onsite wastewater disposal system design and installation methods may be required due to low permeability soils, shallow depth to bedrock, or other factors.

**W** Suitable for development using typical onsite disposal system design and installation methods, but may pollute groundwater in places due to the inability of high permeability soils to filter system effluent. Care must be taken to adequately separate onsite wastewater disposal systems from drinking water supplies and their recharge zones.

**D/W** Suitable for development, but special onsite wastewater disposal system design and installation methods may be required due to low permeability soils, shallow depth to bedrock, or other factors. These systems may also pollute groundwater in places due to the inability of high permeability soils to filter system effluent. Care must be taken to adequately separate onsite wastewater disposal systems from drinking water supplies and their recharge zones.

**X** Not recommended for development where onsite wastewater disposal systems would be utilized. These areas generally include soils with a high groundwater table, bedrock near or at the ground surface, steep slopes, and/or other factors.

Soils found in Stonington and their suitability for subsurface disposal are summarized in **Table 2-1**. Much of Stonington's inland soils are rated "D," indicating that mounded septic systems or other special septic system design may be necessary to provide adequate onsite wastewater disposal. Along the Mystic and Pawcatuck Rivers, a lot of the soils are suited to typical septic system design but effluent from these systems may pollute groundwater in places. If this occurs, effluent from these onsite disposal systems would also tend to place a nitrogen load on the rivers and ultimately Long Island Sound (see Section 1.2). There is also a significant area rated **"X"** where development utilizing onsite wastewater disposal systems is not recommended due to the soils' inability to support subsurface disposal of wastewater.

### 2.3.3 Zoning, Land Use, Lot Size and Population Density

Townwide zoning and land use information were obtained from the Town's zoning bylaws and from available GIS mapping (See **Figure 2-3**). In general, zoning by-laws have changed over the years with the intent of increasing minimum lot sizes. Larger lots provide easier installation or rehabilitation of onsite disposal systems. This becomes more prudent as the land becomes more developed, and soils in the remaining undeveloped land become less ideal for subsurface disposal.

The Town's zoning by-laws include the following classifications:

- ***Greenbelt Residential (GBR-130):*** Single-family housing, aquaculture/agriculture and livestock with a minimum lot size of 130,000 square feet. Not more than 2.5 percent of the lot can be covered by structures.

- ***Residential Coastal (RC-120):*** Single-family housing, aquaculture/agriculture and livestock with a minimum lot size of 120,000 square feet. Not more than 2.5 percent of the lot can be covered by structures.

- ***Rural Residential (RR-80):*** Single-family or duplex housing, aquaculture/agriculture and livestock with a minimum lot size of 80,000 square feet. Not more than 10 percent of the lot can be covered by structures.

# See Figure 2-3

# See Table 2-1 (page 1)

# See Table 2-1 (page 2)

- ***Residential Low Density (RA-40):*** Single-family or duplex housing, aquaculture/ agriculture and livestock with a minimum lot size of 40,000 square feet. Not more than 15 percent of the lot can be covered by structures.

- ***Residential Moderate Density (RM-20, RM-15):*** There are two moderate density classifications. These classifications allow single-family or duplex housing. Class RM-20 requires a minimum lot size of 20,000 square feet and not more than 15 percent of the lot can be covered by structures. Class RM-15 requires a minimum lot size of 15,000 square feet and not more than 20 percent of the lot can be covered by structures.

- ***Residential Single Family (RA-20, RA-15):*** There are two single family classifications. These classifications allow only single-family housing. Class RA-20 requires a minimum lot size of 20,000 square feet and not more than 15 percent of the lot can be covered by structures. Class RA-15 requires a minimum lot size of 15,000 square feet and not more than 20 percent of the lot can be covered by structures.

- ***I-95/Route 78 Highway Interchange Zone (HI):*** Commercial office, convention center, hotels and motels, light manufacturing and other commercial uses with an overall lot size of 218,000 square feet, requiring that not more than 60 percent of the area be covered with structures. Stonington's *2004 Plan for Conservation and Development* recommends that this zone be modified to promote more diverse development in this area.

- ***Development Area (DB-5):*** Office buildings, residential, and retail/wholesale commercial uses with a minimum lot size of 5,000 square feet and not more than 60 percent of the lot covered with structures.

- ***Convenience Shopping (CS-5):*** Boarding houses, office buildings, residential and retail/wholesale commercial uses with a minimum lot size of 5,000 square feet and not more than 30 percent of the lot covered with structures.

- ***Local Shopping (LS-5):*** Boarding houses, office buildings, residential and retail/wholesale commercial uses with a minimum lot size of 5,000 square feet and not more than 50 percent of the lot covered with structures.

- ***General Commercial (GC-60):*** Boarding houses, office buildings, residential and retail/wholesale commercial uses with a minimum lot size of 60,000 square feet and not more than 25 percent of the lot covered with structures.

- ***Tourist Commercial (TC-80):*** Boarding houses, office buildings, retail/wholesale commercial uses with a minimum lot size of 80,000 square feet and not more than 30 percent of the lot covered with structures.

- ***Marine Commercial (MC-80):*** Boarding houses, office buildings, single-family housing and retail/wholesale commercial uses with a minimum lot size of 80,000 square feet and not more than 25 percent of the lot covered with structures.

- ***Manufacturing (CM-1):*** Assembly, fabricating, warehousing and packing buildings, lumbering, office space and research and development uses with a minimum lot size of 80,000 square feet and not more than 30 percent of the lot covered with structures.

- ***Light Industry (LI-130):*** Assembly, fabricating, warehousing and packing buildings, office space and research and development uses with a minimum lot size of 130,000 square feet and not more than 25 percent of the lot covered with structures.

Lot sizes and years of development within the 18 potential wastewater needs areas were determined from Town Assessor's data. Population densities were reviewed based on information obtained from 2000 United States census data. The various census tracts within the town were sorted by location – roughly coinciding with the sewer service area boundaries. Population density was determined based on population and number of households.

Population trends and densities are presented in detail in Section 3. In general, persons per household for the Town of Stonington are as follows:

***Mystic:*** 2.3 people per household

***Stonington Borough:*** 2.2 people per household

***Pawcatuck:*** 2.5 people per household

***Remainder of Town (outside of the above areas):*** 2.5 people per household

### 2.3.4 Surface Water and Groundwater

Stonington is located on Long Island Sound and has two harbors, Mystic Harbor and Stonington Harbor. The shoreline is jagged, with several peninsulas and coves. The Town is also bounded by the Mystic River to the west and the Pawcatuck River to the east. Several major brooks also flow through the Town: the Pequotsepos Brook, Copps Brook, Stony Brook and Anguilla Brook.

The Aquarion Water Company of Connecticut's Mystic Reservoir is located on Copps Brook. Silvias Pond is located on Stony Brook and Wequetequock Pond is located on Anguilla Brook.

Groundwater depth is shallow along Stonington's shoreline. In some areas, ledge and low-permeability soils cause groundwater to perch near the ground surface. This is evident in Table 2-1. However, there is little data documenting groundwater elevations within the Town.

### 2.3.5 Floodplains and Wetlands

Available Geographical Information System (GIS) wetlands and floodplain information was collected and reviewed. Federal Emergency Management Agency (FEMA) flood maps were also reviewed. FEMA mapping indicates that the shoreline area below elevation 10 to 11 — as high as elevation 16 in some areas with wave action — is within the 100-year floodplain. Under this condition, the Mystic River, Pawcatuck River, Pequotsepos Brook, Copps Brook, Stony Brook and Anguilla Brook also become flooded several feet above their normal stage.

### 2.3.6 Drinking Water

The town receives drinking water from both Aquarion Water Company of Connecticut (Aquarion) and Westerly (Rhode Island) Water Department. Aquarion serves Stonington's Mystic and Borough water districts. Westerly serves the Pawcatuck area. However, a significant portion of the town relies on private wells for its water supply.

Aquarion's system generally serves the Greenmanville Road/Lantern Hill Road corridor, the Pequot Trail/Flanders Road corridor, downtown Mystic and Stonington Borough. Aquarion has a water supply well and surface water reservoir within Stonington. The well is located off Lantern Hill Road in the northwestern corner of the Town, which has a wellhead protection area surrounding the well itself. Mystic Reservoir parallels Dean's Mills Road between Pelligrino Road and Pequot Trail.

The Westerly water system serves the Liberty Street/River Road corridor, downtown Pawcatuck, and South Broad Street (terminating near Greenhaven Road). Available GIS mapping indicates a major aquifer in the northeastern corner of Stonington, which feeds wells for the Westerly water system.

### 2.3.7 Existing Sewer Service Areas

There are three sewer service areas within the Town of Stonington. These areas — Mystic, Stonington Borough, and Pawcatuck — are described in detail in Section 4.

### 2.3.8 Wastewater Needs Questionnaire

CDM developed a wastewater needs questionnaire for distribution to all non-sewered landowners within the town. Approximately 3,140 questionnaires were mailed in late August 2000. Approximately 50 percent of the questionnaires were completed and returned.

The questionnaire included 33 questions designed to determine whether or not a subsurface disposal problem exists, the type of problem, potential causes of the problem, the age of the system, the number of people using the system, whether the system has been rehabilitated, etc. Data obtained from responses to this questionnaire were tabulated into a database and used to help determine wastewater needs areas. A townwide summary of questionnaire responses is provided in **Table 2-2**. A copy of the questionnaire is included in Appendix C.

# See Table 2-2

### 2.3.9 Onsite Disposal System Pumping and Repair Records

The Town's Department of Health maintains records of septic system installations and repairs. System repairs identified in the town records were added to the database of system repairs noted on the questionnaire responses. The incidence of septic system repairs was considered a wastewater needs assessment criterion.

The Department of Health has little documentation of septic tank pumping trends. Records are kept of septage received at the Pawcatuck WPCF; however, a majority of the town's septage is disposed of at water pollution control facilities in other towns.

Local septage haulers were contacted to discuss trends and/or problem areas, but did not provide specific addresses of their clientele. They identified coastal areas as having higher pumping recurrence rates. Mason's Island and Latimer Point were noted specifically.

### 2.3.10 Public Input

Data supporting the 18 identified potential wastewater needs areas were presented to the Citizen's Advisory Group, the Water Pollution Control Authority and the public at large at a public meeting on February 6, 2001, to solicit public input and confirmation. Further public input was collected throughout the development of the facilities plan. See Section 11 for a full description of the public participation effort.

## 2.4 Wastewater Needs Areas

### 2.4.1 Introduction

Eighteen potential wastewater needs areas were identified for assessment, based on the considerations described above.

- Area 1 — Marjorie Street Area
- Area 2 — Riverbend Drive
- Area 3 — School Street Area
- Area 4 — Roseleah Drive
- Area 5 — Elm Ridge Road Area
- Area 6 — Pequot Trail Area
- Area 7 — Cronin Avenue/Holly Drive Area
- Area 8 — Millan Terrace Area
- Area 9 — Aimee Drive Area
- Area 10 — Mark Street Area

- Area 11 — Greenhaven Road Area
- Area 12 — Meadow Road Area
- Area 13 — Latimer Point
- Area 14 — Mason's Island
- Area 15 — Marlin Drive Area
- Area 16 — Elm Street Area
- Area 17 — Montauk Avenue Area
- Area 18 — North Stonington Road

These areas are described below and have been prioritized, as follows:

1. ***Critical:*** Areas where evidence indicates a potential but not immediate environmental degradation or public health threat.

2. ***High:*** Areas warranting consideration for improved wastewater disposal at the present time due to frequency of problems, but not considered areas of critical concern. Improvements should be made to these areas in later phases of the implementation plan.

3. ***Moderate:*** Areas warranting consideration for improved wastewater disposal at the present time due to frequency of problems, but not considered areas of high concern. Improvements may be made to these areas in the later phases of the implementation plan, should conditions warrant and if the improvements can be afforded.

4. ***Low:*** Areas warranting consideration for improved wastewater disposal in the future because they are showing some problems now and should be monitored for indications of an increase in frequency of problems over time.

Figures showing the boundaries, questionnaire responses, soil suitability for onsite disposal and the adjacent collection system (if any) are included for each wastewater needs area.

### 2.4.2 Area 1 — Marjorie Street Area

Area 1 includes Marjorie Street, Linda Avenue, Laura Avenue and Lantern Hill Road (see **Figure 2-4**). Marjorie Street, Linda Avenue and Laura Avenue are located on a hill with steep (up to 45 percent) slopes, which rises about 100 feet from Lantern Hill

# See Figure 2-4

Road at its peak. At the base of the hill are low-lying croplands and wetlands. Located within the cropland is a well for Aquarion Water Company, which supplies water to this area of Town. This wastewater needs area is comprised of 40 single-family homes. Most of these homes were built in the 1960s. Lot sizes vary, with an average lot size of ½ to ¾ acre.

***Soil Types:*** Soils in this area are predominantly Canton (8 to 35 percent slopes) and Hollis (15 to 45 percent slopes). Hollis soils have approximately 20 percent rock outcrops. The rock outcrops and steep slopes make these soils difficult to develop.

***Suitability for Onsite Disposal Systems:*** Soil characteristics for much of Marjorie Street and Lantern Hill Road suggest that onsite disposal systems may require special design and installation in order to perform properly. Soil characteristics for Linda Avenue and Laura Avenue suggest that these areas are not suited for subsurface disposal. In addition, soils information indicates that effluent from onsite disposal systems in this area may pollute the groundwater - due to insufficient filtration of system effluent as it passes through the soils - as it flows through soils at the base of the hill. This is of critical concern given the proximity of these homes to the adjacent Aquarion Water Company drinking water well site, located approximately 1,000 feet northwest of Lantern Hill Road.

***Zoning:*** Rural Residential, Aquifer Protection Zone

***Wetlands and Floodplains:*** There are two large wetlands located at the base of the hill; one north of the area and one south of the area. Given its elevation, this area is well above the floodplain.

***Surface Water:*** Whitford Brook is located approximately 1,500 feet west of this area. In addition, there are two small ponds located northeast of the area.

***Groundwater:*** This area is within the aquifer recharge zone for the Aquarion Water Company well. As noted above, the groundwater in this area may be influenced by effluent from onsite disposal systems within this wastewater needs area. Several residents on Lantern Hill Road and Marjorie Street indicated a high groundwater table in the area.

***Public Water:*** Yes

***Proximity to Public Sewer:*** Approximately 1.1 miles

***Wastewater Need Priority:*** Critical

### 2.4.3 Area 2 — Riverbend Drive

Area 2 includes Riverbend Drive and a few of homes on Whitehall Avenue (Route 27). The Mystic collection system conveys wastewater from homes along Whitehall Avenue, both north and south of Riverbend Drive. As shown in **Figure 2-5**, Riverbend Drive is located at a gap in sewer service. This area is relatively flat,

# See Figure 2-5

located about 20 feet above the Mystic River. This wastewater needs area is comprised of 42 single-family homes. These homes were built in the late 1960s with an average lot size of ½ acre.

***Soil Types:*** Soils in this area are predominantly Haven with 0 to 3 percent slopes.

***Suitability for Onsite Disposal Systems:*** According to available soil information, soil characteristics for this area suggest that typical onsite disposal systems will perform properly. However, effluent from these onsite disposal systems may pollute the groundwater as it flows through soils to the river, since Haven soils have a poor ability to filter/treat effluent from subsurface disposal systems. If this is the case, onsite systems in this area would contribute to the nitrogen load in the Mystic River and ultimately the Fishers Island Sound.

***Zoning:*** Residential Low Density

***Wetlands and Floodplains:*** There are wetlands to the north and south of the area.

***Surface Water:*** Mystic River flows along the western edge of this area. There are also several wetlands with ponded water in the vicinity of this area.

***Groundwater:*** Several residents indicated a high groundwater table in the area.

***Public Water:*** No

***Proximity to Public Sewer:*** Collector sewers are located within several feet of the Whitehall Avenue/Riverbend Drive intersection. A force main conveys wastewater generated north of this intersection to the collection system located to the south of this intersection.

***Wastewater Need Priority:*** Moderate

### 2.4.4 Area 3 — School Street Area

The School Street Area includes Mistuxet Avenue, School Street, Ivy Road, Borodell Avenue and Wausau Place. As shown in **Figure 2-6**, this area is located on the edge of the Mystic collection system. However, it is on the opposite side of the ridge line, sloping away from the existing collection system and toward Williams Cove and Pequotsepos Brook. This wastewater needs area is comprised of 34 single-family homes. These homes were built between 1900 and 1950, with an average lot size of ½ to ¾ acre.

***Soil Types:*** Soils in this area are predominantly Paxton (3 to 8 percent slopes), Charlton (3 to 45 percent slopes) and Haven (3 to 15 percent slopes). Paxton soils typically have large stones or boulders covering 8 to 25 percent of the surface. Charlton soils are also rocky (covering up to 8 percent of the surface) with a shallow depth to bedrock. Development is difficult where Charlton soils have slopes greater than 15 percent.

# See Figure 2-6

***Suitability for Onsite Disposal Systems:*** Soil characteristics for this hillside suggest that onsite disposal systems may require special design and installation in order to perform properly. A small area near the base of the hill may not be suited for onsite disposal systems due to soil type and slope.

***Zoning:*** Moderate and high density residential

***Wetlands and Floodplains:*** There are wetlands along the edge of Williams Cove and Pequotsepos Brook. Areas below elevation 10 are also within the 100-year floodplain.

***Surface Water:*** Williams Cove and Pequotsepos Brook are located approximately 850 feet east along Mistuxet Avenue and flow along the southeast edge of this area.

***Groundwater:*** Several residents indicated a high groundwater table in the area. Groundwater is likely to be high near the Pequotsepos Cove. Groundwater problems in the remainder of the area may also be related to the low permeability of the Paxton soils.

***Public Water:*** Yes

***Proximity to Public Sewer:*** The existing collection system ends at the ridgeline on Reynolds Hill Road and School Street.

***Wastewater Need Priority:*** Moderate

### 2.4.5 Area 4 — Roseleah Drive

Area 4 (Roseleah Drive) is a small peninsula called Murphy Point in Mystic Harbor (see **Figure 2-7**). The Mystic collection system is located at the beginning of Roseleah Drive. However, this area is slightly lower than the existing collection system and cannot be serviced by gravity. This wastewater needs area is comprised of 15 small single-family homes. The homes were built in the 1960s with an average lot size of ¼ acre. The large parcel at the end of Roseleah Drive is a marina that is sewered by a pump system and a 2-inch dedicated force main that connects to the existing collection system. Therefore, it is not included in the sewer needs area.

***Soil Types:*** Soils in this area are predominantly Udorthents and Westbrook with slopes less than 3 percent. Udorthents are disturbed soils and therefore cannot be categorized without further study. Westbrook soils are a mucky peat and not suited for development.

***Suitability for Onsite Disposal Systems:*** Available soils information indicates that approximately one half of the soils are considered suitable for development using typical onsite disposal systems, and that the remainder is coastal wetland and unsuitable for development. However, given the relative elevation of this area, its proximity to Long Island Sound and the small lot sizes, the actual effectiveness of subsurface disposal systems may be limited. In addition, these systems are likely contributing to the nitrogen load to Long Island Sound.

# See Figure 2-7

***Zoning:*** General commercial and residential coastal.

***Wetlands and Floodplains:*** A significant portion of this peninsula is coastal wetland. The entire peninsula is within the 100-year floodplain. Roseleah Drive is at roughly elevation 5; the 100-year coastal flood (with wave action) is estimated to be elevation 13.

***Surface Water:*** The Roseleah Drive area is surrounded by Mystic Harbor.

***Groundwater:*** Given its low elevation and the extensive wetlands in this area, groundwater is very near to the ground surface.

***Public Water:*** Yes

***Proximity to Public Sewer:*** Intersection of Roseleah Drive and Broadway.

***Wastewater Need Priority:*** High

### 2.4.6 Area 5 — Elm Ridge Road Area

Area 5 is located in the northeast corner of Stonington, on the edge of the Pawcatuck collection system. As shown in **Figure 2-8**, this area is comprised of Elm Ridge Road, Canterbury Lane, Somerset Drive, Nutmeg Road, Fairview Drive, Timber Ridge Drive, Kim Court, Cavendish Lane, Soundview Drive, Devon Drive, Croft Court and Country Lane. Although Timber Ridge Drive and Cavendish Lane are not indicating onsite disposal problems at the moment, these streets were included because of their elevation — allowing problem areas to connect to the existing collection system by gravity, and because the poor soils in the area suggest an inability to support onsite disposal systems. Devon Drive also is not indicating onsite disposal problems, but it has been included in this sewer needs area due to its close proximity to streets where we are recommending sewers. This wastewater needs area is comprised of 205 single-family homes, including the 22-home Croft Court subdivision constructed during preparation of this Plan between Soundview Drive and Devon Drive. Most of the homes in this area were built in the 1970s and 1980's with an average lot size of ½ to ¾ acre. Timber Ridge Drive and Kim Court were built more recently (1990s), with 1-acre lots.

***Soil Types:*** Soils in this area are predominantly Canton (3 to 8 percent slopes), Hinkley (3 to 45 percent slopes), and Haven (3 to 8 percent slopes). Hinckley soils with slopes greater than 15 percent are difficult to develop.

***Suitability for Onsite Disposal Systems:*** Soil characteristics for a majority of this hillside area suggest that typical onsite disposal systems should perform adequately, but may pollute groundwater. However, onsite disposal systems in the western portion of this area may require special design and installation in order to perform properly.

# See Figure 2-8

***Zoning:*** Moderate Density Residential, Aquifer Protection Zone, CTDEP Aquifer Protection Area Level B (partial)

***Wetlands and Floodplains:*** There are no wetlands or floodplain in this area.

***Surface Water:*** A brook flows through this area toward the Pawcatuck River.

***Groundwater:*** A few residents indicated a high groundwater table in the area. However, these seem isolated. In general, the groundwater table should low enough to support onsite disposal systems.

***Public Water:*** Yes

***Proximity to Public Sewer:*** Intersection of Elm Ridge Road and Liberty Street.

***Wastewater Need Priority:*** Critical

### 2.4.7 Area 6 — Pequot Trail Area

Area 6 includes Pequot Trail (Route 234), Asher Avenue, Billings Street, Gallup Court, Wheeler Drive, Castle Hill Road, Roseridge Drive, Roseridge Court and Castle Meadow Drive. As shown in **Figure 2-9**, this area is located on the edge of the Pawcatuck collection system. This wastewater needs area is predominantly comprised of single-family homes.

These homes were built in 1970s and 1980s with an average lot size of ½ to 1 acre. There are estimated to be 113 homes, a church and a condominium complex within this area.

***Soil Types:*** Soils in this area are predominantly Charlton (3 to 45 percent slopes) and Paxton (3 to 8 percent slopes). Paxton soils typically have large stones or boulders covering 8 to 25 percent of the surface. Charlton soils are also rocky (covering up to 8 percent of the surface) with a shallow depth to bedrock. Development is difficult where soils exceed 15 percent slope. There are many lots within this area with significant ledge visible.

***Suitability for Onsite Disposal Systems:*** Soil characteristics for this hillside area suggest that onsite disposal systems may require special design and installation in order to perform properly.

***Zoning:*** Moderate Density Residential, Aquifer Protection Zone (partial), CTDEP Aquifer Protection Area Level B (partial)

***Wetlands and Floodplains:*** There are no wetlands or floodplain in this area.

***Surface Water:*** There is no surface water in this area.

# See Figure 2-9

***Groundwater:*** Many residents indicated a high groundwater table in the area. Groundwater in this area is likely to be perched due to the shallow depth to bedrock or due to low permeability soils.

***Public Water:*** Yes

***Proximity to Public Sewer:*** South Broad Street (Route 1) located approximately 1000 feet south of this area.

***Wastewater Need Priority:*** High

### 2.4.8 Area 7 — Cronin Avenue/Holly Street

Area 7 (shown in **Figure 2-10**) includes Cronin Avenue, Holly Street and Parkwood Drive. These streets are located within the Pawcatuck collection system; however, the area was apparently developed at a later date than the surrounding areas, and was not connected to the system. This wastewater needs area is comprised of more than 30 single-family homes. These homes were built in 1980s with an average lot size of ½ acre. In addition, development of a subdivision off Cronin Avenue is underway. This subdivision will be sewered.

***Soil Types:*** Soils in this area are predominantly Charlton with 3 to 45 percent slopes. There is a large ledge outcrop at the base of the developed portion of Cronin Avenue. Development is difficult where these soils exceed 15 percent slope.

***Suitability for Onsite Disposal Systems:*** Soil characteristics for this hillside area suggest that approximately one half of the onsite disposal systems may require special design and installation in order to perform properly. The remaining area is located on soils that may be unsuited for onsite subsurface disposal.

***Zoning:*** Moderate Density Residential

***Wetlands and Floodplains:*** There is a large wetland at the base of the hill approximately 750 feet from Cronin Avenue.

***Surface Water:*** There is a small brook and pond located west of Parkwood Drive, and another small brook east of Cronin Avenue.

***Groundwater:*** Several residents indicated a high groundwater table in the area. This is likely due to the shallow depth to bedrock.

***Public Water:*** Yes

***Proximity to Public Sewer:*** Lathrop Avenue, Enterprise Avenue and Parkwood Drive.

***Wastewater Need Priority:*** High

# See Figure 2-10

### 2.4.9 Area 8 — Millan Terrace Area

Millan Terrace, Stanley Street and Frank Street comprise Area 8, as shown in **Figure 2-11**. This area is located on the edge of the Pawcatuck collection system. Ledge outcrops are visible on many of the lots in this area. This wastewater needs area is comprised of 38 single-family homes. These homes were built in 1950s with an average lot size of ¼ to ¾ acre.

***Soil Types:*** Soils in this area are predominantly Canton with 3 to 8 percent slopes.

***Suitability for Onsite Disposal Systems:*** Soil characteristics for this area suggest that onsite disposal systems may require special design and installation in order to perform properly. In addition, onsite systems located near Anguilla Brook may also tend to impact groundwater quality.

***Zoning:*** Moderate Density Residential

***Wetlands and Floodplains:*** There is a large wetland located northeast of this area, but no wetlands within the needs area. The area is above the 100-year flood elevation of 24 feet for the nearby Anguilla Brook.

***Surface Water:*** Anguilla Brook is located approximately 300 feet east of this area. This is likely to be perched groundwater resulting from the shallow depth to bedrock.

***Groundwater:*** Several residents indicated a high groundwater table in the area. These areas are likely near Anguilla Brook.

***Public Water:*** Public water is available only in certain parts of this area.

***Proximity to Public Sewer:*** Swan Street near intersection with South Broad Street (Route 1).

***Wastewater Need Priority:*** Moderate

### 2.4.10 Area 9 — Aimee Drive Area

The Aimee Drive Area (Area 9) is located off Greenhaven Road (**Figure 2-12**). This wastewater needs area is comprised of 55 single-family homes. These homes were built in 1980s with an average lot size of ½ acre.

***Soil Types:*** Soils in this area are predominantly Paxton with 3 to 8 percent slopes. Ledge is apparent near Greenhaven Road. Boulders are apparent throughout the development.

***Suitability for Onsite Disposal Systems:*** Soil characteristics for this area suggest that onsite disposal systems may require special design and installation in order to perform properly.

***Zoning:*** Rural Residential

# See Figure 2-11

# See Figure 2-12

***Wetlands and Floodplains:*** There are no wetlands in this area. This area is also above the 100-year flood elevation.

***Surface Water:*** There are no surface water bodies in this area.

***Groundwater:*** Groundwater may be perched in some areas as a result of the shallow depth to bedrock or low permeability soils.

***Public Water:*** No

***Proximity to Public Sewer:*** Approximately 800 feet to Pawcatuck Avenue, or approximately 1,500 feet to the recently constructed sewer in Greenhaven Road. Public sewer is available at the intersection of Renie Drive and River Crest Drive.

***Wastewater Need Priority:*** Moderate

### 2.4.11 Area 10 — Mark Street Area

The Mark Street Area (Area 10) includes Mark Street, Elaine Street, and Ball Street **(Figure 2-13)**. It is surrounded by the Pawcatuck collection system. It is believed that this area was not sewered because its development occurred at approximately the same time as the construction of the Pawcatuck system.

This wastewater needs area is comprised of 41 single-family homes. These homes were built in 1970s with an average lot size of ½ acre.

***Soil Types:*** Soils in this area are predominantly Canton (3 to 15 percent slopes), Merrimac (3 to 8 percent slopes) and Walpole (0 to 3 percent slopes). Walpole soils characteristically have a high groundwater table and poor draining soils. Ponding and wetness result, especially in the fall and spring.

***Suitability for Onsite Disposal Systems:*** Soil characteristics for the Mark Street area are mixed. Some soils suggest that onsite disposal systems may require special design and installation in order to perform properly. Other areas suggest that typical onsite systems would function properly but may also pollute the groundwater as it flows through soils. The northwest corner of the area also indicates that soils may be unsuited for development.

***Zoning:*** Moderate Density Residential

Wetlands and Floodplains: There are no known wetlands in this area. The intersection of Mark Street with River Road is within the 100-year floodplain (elevation 11 feet).

***Surface Water:*** The Pawcatuck River is located approximately 300 feet west of this area. There is also a small brook that flows along the northern edge of this area.

***Groundwater:*** Ponding and wetness are a problem in this area due to poor soils.

# See Figure 2-13

***Public Water:*** Yes

***Proximity to Public Sewer:*** River Road

***Wastewater Need Priority:*** High

### 2.4.12 Area 11 — Greenhaven Road Area

The Greenhaven Area (Area 11) is located on the edge of the Pawcatuck collection system. This area includes Greenhaven Road, Stewart Road, Vars Avenue, Clarence Avenue, Schiller Avenue, Green Avenue, Sunrise Avenue, and Sunset Avenue. However, as shown in **Figure 2-14**, the area is on the opposite side of the ridge, sloping away from the existing collection system. A small wastewater facilities plan was prepared for this area in the late 1990s. It was recommended that this area, as well as the remainder of the River Road/Greenhaven Road peninsula, be added to the Pawcatuck service area. This wastewater needs area is comprised of 143 single-family homes. These homes were built in 1960s with an average lot size of ½ to ¾ acre.

***Soil Types:*** Soils in this area are predominantly Canton (3 to 15 percent slopes), Adrian (0 to 2 percent slopes), Charlton (3 to 15 percent slopes), Sutton (2 to 8 percent slopes), and Agawam (0 to 3 percent slopes). Sutton soils are very stony with a groundwater depth of approximately 18 inches. Charlton soils are also rocky with a shallow depth to bedrock. Adrian soils are mucky with a high groundwater table making them unsuitable for development.

***Suitability for Onsite Disposal Systems:*** According to the available soil information, soil characteristics suggest that a majority of onsite disposal systems may require special design and installation in order to perform properly. However, a small portion of this area is developed on soils that are suggested to be unsuitable for subsurface disposal.

***Zoning:*** This area is zoned for moderate density residential and coastal residential.

***Wetlands and Floodplains:*** There is a large wetland centered within this area. This wetland and adjacent low-lying lots are within the FEMA 100-year floodplain.

***Surface Water:*** A small brook flows west of this area.

***Groundwater:*** Soils information for this area suggests that groundwater is perched due to poor soils.

***Public Water:*** No

***Proximity to Public Sewer:*** It is approximately 100 feet to the intersection of Greenhaven Road and Mary Hall Road. A collection sewer was recently installed in Mary Hall Road and part of Greenhaven Road.

***Wastewater Need Priority:*** High

# See Figure 2-14

## 2.4.13 Area 12 — Meadow Road Area

The Meadow Road Area (Area 12) is located off River Road (see **Figure 2-15**). This area is comprised of Meadow Road, Green Meadow Road, Crestwood Lane and a small section of River Road. This wastewater needs area is comprised of 34 single-family homes. These homes were built in 1960s with an average lot size of ½ to 1½ acres.

***Soil Types:*** Soils in this area are predominantly Windsor (3 to 8 percent slopes), Charlton (3 to 15 percent slopes) and Hollis (3 to 15 percent slopes). There are numerous ledge outcrops and boulders visible in this area.

***Suitability for Onsite Disposal Systems:*** Available soil information for this hillside area suggest that much of the area can be served by onsite disposal systems; however, these systems may pollute groundwater — and ultimately the Pawcatuck River. A small portion of Meadow Road and River Road may require special design and installation in order to perform properly. Soils information for Crestwood Lane suggests that the soils are unsuited for development where subsurface disposal is proposed.

***Zoning:*** This area is zoned for moderate density residential, coastal residential and marine commercial.

***Wetlands and Floodplains:*** FEMA flood mapping indicate that land this area is elevated above the 100-year floodplain (elevation 11). There are no wetlands in this area.

***Surface Water:*** The Pawcatuck River is located approximately 300 feet east of this area. A small brook flows to the river north of this area.

***Groundwater:*** Many residents indicated a high groundwater table in the area. Groundwater in this area is likely perched due to poor soils.

***Public Water:*** Yes

***Proximity to Public Sewer:*** The Pawcatuck collection system is located approximately 2,000 feet north of this area.

***Wastewater Need Priority:*** Moderate to High

## 2.4.14 Area 13 — Latimer Point

The Latimer Point Area (see **Figure 2-16**) includes Latimer Point Road, North Shore Way, Reid Road, Center Road, Crooked Road and East Shore Road. This area was originally seasonal housing, but over time many of these houses have been converted to year-round residences. This wastewater needs area is comprised of 80 single-family homes. These homes have an average lot size of ¼ acre.

# See Figure 2-15

# See Figure 2-16

***Soil Types:*** Soils in this area are predominantly Narragansett (3 to 15 percent slopes), Sutton (2 to 15 percent slopes) and Charlton (3 to 15 percent slopes) soils. Numerous rock outcrops and large boulders are visible, especially within the Charlton soils.

***Suitability for Onsite Disposal Systems:*** Available soils information suggests that typical onsite disposal should perform adequately, with the exception of a small ridge of Charlton and Sutton soils (see Figure 2-16).

***Zoning:*** This area is zoned for moderate density residential and coastal residential.

***Wetlands and Floodplains:*** The 100-year floodplain for this area is below elevation 11 — elevation 14 with wave action. There are no wetlands on Latimer Point.

***Surface Water:*** Latimer Point is surrounded by Fishers Island Sound on three sides.

***Groundwater:*** High groundwater does not appear to be a problem in this area.

***Public Water:*** Spring, summer and fall. Residents rely on private wells during the winter months.

***Proximity to Public Sewer:*** 0.7 miles

***Wastewater Need Priority:*** High

### 2.4.15 Area 14 — Mason's Island

The Mason's Island area is isolated from the existing collection systems (see **Figure 2-17**). The Mason's Island Area includes Nauyaug Point Road, Yacht Club Road, East Forest Road, Point Road, Hickory Ledge Road, Blind Duck Road, and Osprey Lane. This wastewater needs area is comprised of 64 single-family homes. These homes were generally built in 1970s with an average lot size of ½ to ¾ acre.

***Soil Types:*** Soils in this area are predominantly Narragansett (3 to 15 percent slopes), Hollis (15 to 45 percent slopes), Sutton (2 to 15 percent slopes) and Charlton (3 to 15 percent slopes). Large outcrops are visible in areas classified as Hollis soils. These areas also have steep slopes and are not suited for onsite disposal systems.

***Suitability for Onsite Disposal Systems:*** According to the available soil information, soil characteristics for most of the homes experiencing problems suggest that these areas are not suited to onsite disposal or that systems may require special design and installation in order to perform properly.

***Zoning:*** This area is zoned for moderate density residential and coastal residential.

***Wetlands and Floodplains:*** Marsh/wetlands exist along the low-lying shore areas.

***Surface Water:*** Mason's Island is surrounded by Fishers Island sound, with Mystic Harbor located on its western shore.

# See Figure 2-17

***Groundwater:*** Many residents indicated a high groundwater table in the area. Groundwater is likely perched due to the shallow depth to bedrock.

***Public Water:*** Yes

***Proximity to Public Sewer:*** 1.5 miles

***Wastewater Need Priority:*** Moderate

### 2.4.16 Area 15 — Marlin Drive Area

As shown in **Figure 2-18**, this area includes Marlin Drive and a portion of Stonington Road along Wequetequock Cove. This area is isolated between the Stonington Borough and Pawcatuck collection systems. This wastewater needs area is comprised of 72 single-family homes. These homes were built in 1970s with an average lot size of ¼ to ¾ acre.

***Soil Types:*** Soils in this area are predominantly Agawam (3 to 8 percent slopes) and Charlton (3 to 15 percent slopes).

***Suitability for Onsite Disposal Systems:*** Agawam soils can support typical onsite disposal systems but may pollute groundwater. As a result, effluent from onsite disposal systems in this area may contribute a nitrogen load to the cove and ultimately Long Island Sound.

***Zoning:*** This area is zoned for low density residential and coastal residential.

***Wetlands and Floodplains:*** FEMA estimates the 100-year floodplain to be below elevation 11 in this area.

Surface Water: Wequetequock Cove flows along the southern edge of this area. There is also a small brook flowing to the north of Marlin Drive.

***Groundwater:*** Many residents indicated a high groundwater table in the area. This is expected given its proximity to the cove and brook. Groundwater may also be perched as a result of the shallow depth to bedrock.

***Public Water:*** No

***Proximity to Public Sewer:*** 0.25 miles

***Wastewater Need Priority:*** High

### 2.4.17 Area 16 — Elm Street

The Elm Street Area is located east of Town Hall on the edge of the Stonington Borough collection system. However, the area is on the opposite side of the ridge, sloping toward Wequetequock Cove. As shown in **Figure 2-19**, this area includes Elm Street, Watch Hill Avenue, Grandview Park, Meadow Avenue, Island Road,

# See Figure 2-18

# See Figure 2-19

Woodland Avenue and Cheseboro Lane. This wastewater needs area is comprised of 74 predominantly single-family homes. These homes were generally built between 1900 and 1950 with an average lot size of ½ to ¾ acre.

***Soil Types:*** Soils in this area are predominantly Charlton (3 to 15 percent slopes), Hollis (3 to 15 percent slopes), Ninigret (0 to 1 percent slopes), Agawam (0 to 3 percent slopes), Carlisle (0 to 2 percent slopes), and Adrian (0 to 2 percent slopes). Adrian and Carlisle soils are suggested to be unsuited for onsite disposal. Charlton and Hollis soils have bedrock at shallow depths. Ninigret soils have shallow depths to groundwater.

***Suitability for Onsite Disposal Systems:*** According to available soil information, soil characteristics for the hillside area suggest that onsite disposal systems may require special design and installation in order to perform properly. A substantial amount of ledge is visible in the Watch Hill Avenue area, suggesting that more of this area is unsuited for onsite disposal than is reflected by the soils data. Effluent from onsite disposal systems may also pollute the groundwater as it flows through soils at the base of the hill to Wequetequock Cove.

***Zoning:*** This area is zoned for moderate density residential and rural residential.

***Wetlands and Floodplains:*** There is a large wetland on the south side of the railroad right-of-way. There is also a small wetland east of Watch Hill Avenue. Based on FEMA mapping, portions of Cheseboro Lane are within the 100-year floodplain for Wequetequock Cove.

***Surface Water:*** Wequetequock Cove is located southeast of this area.

***Groundwater:*** Many residents indicated a high groundwater table in the area. This is likely a reflection of the poor soils and bedrock.

***Public Water:*** Public water is available only in parts of this area.

***Proximity to Public Sewer:*** Meadow Avenue near Cheseboro Lane.

***Wastewater Need Priority:*** Low

### 2.4.18 Area 17 — Montauk Avenue Area

The Montauk Avenue Area, as shown in **Figure 2-20**, is located on the edge of the Stonington Borough collection system. This area includes Montauk Road, Findlay Way and L'Hirondelle Lane.

This wastewater needs area is comprised of 34 single-family homes. These homes have an average lot size of 2 acres.

# See Figure 2-20

***Soil Types:*** Soils in this area are predominantly Woodbridge with 0 to 8 percent slopes. Woodbridge soils have very low permeability, resulting in ponding and wetness.

***Suitability for Onsite Disposal Systems:*** According to available soil information, soil characteristics for the hillside area suggest that onsite disposal systems may require special design and installation in order to perform properly.

***Zoning:*** Rural residential

***Wetlands and Floodplains:*** There are no wetlands and no floodplain in this area.

***Surface Water:*** A tidal inlet/brook is located approximately 900 feet east of this area.

***Groundwater:*** Many residents indicated a high groundwater table in the area. This is likely a reflection of the poor soils in the area.

***Public Water:*** No

***Proximity to Public Sewer:*** Intersection of Montauk Road and Stonington Road.

***Wastewater Need Priority:*** Low

### 2.4.19 Area 18 — North Stonington Road

The North Stonington Road Area, as shown in **Figure 2-21**, is located on the north side of town, isolated from the existing collection systems. This area includes a small section of North Stonington Road and Wolfneck Road. This wastewater needs area is comprised of 30 single-family homes. These homes were built in 1960s with an average lot size of 1.4 acres.

***Soil Types:*** Soils in this area are varied. Soils include Agawam (0 to 2 percent slopes), Sutton (2 to 8 percent slopes), Canton (3 to 8 percent slopes), and Adrian (0 to 2 percent slopes). Adrian soils are unsuited for onsite disposal. Sutton soils have high groundwater tables.

***Suitability for Onsite Disposal Systems:*** According to the available soil information, soil characteristics for the hillside area suggest that onsite disposal systems may require special design and installation in order to perform properly. Effluent from onsite disposal systems may also pollute the groundwater as it flows through soils at the base of the hill.

***Zoning:*** This area is zoned for rural residential, Aquifer Protection Zone.

***Wetlands and Floodplains:*** There is a large wetland contiguous to this area. There is no floodplain.

***Surface Water:*** There are no significant bodies of water in this area.

# See Figure 2-21

***Groundwater:*** Several residents indicated a high groundwater table in the area. This is likely the result of the high groundwater tables associated with Sutton soils.

***Public Water:*** No

***Proximity to Public Sewer:*** 1.4 miles

***Wastewater Need Priority:*** Low

# 2.5 Wastewater Treatment and Disposal Alternatives

## 2.5.1 Introduction

An analysis of wastewater treatment and disposal alternatives was conducted for each designated wastewater needs area. This section first describes several wastewater disposal alternatives available to the Town. Conveyance alternatives are presented in Section 2.6.

Management practices, including water conservation and onsite disposal system management, were considered as a means of mitigating circumstances that may contribute to solving onsite disposal problems. In many cases, however, problems are related to high groundwater conditions or poor soils, where management practices are inadequate solutions.

The following alternatives were considered for wastewater treatment and disposal for the identified problem areas:

1. Town-Wide No-Action
2. Individual Onsite Wastewater Treatment and Disposal
   - Conventional Septic Systems
   - Innovative/Alternative Technologies
3. Shared Local (Community) Wastewater Treatment and Disposal
   - Conventional Septic System
   - Innovative/Alternative Technology
4. Package or Small Wastewater Treatment Plants
   - Offsite Disposal at a Municipal Water Pollution Control Facility

## 2.5.2 Town-Wide No-Action

From an immediate capital cost perspective, implementation of the town-wide no-action alternative is most desirable, as no major expenditures would be required. However, in many areas the need for improved wastewater disposal makes the no-

action alternative infeasible for public health, environmental, and institutional reasons. If unabated, potential threats to public health from failing onsite disposal systems would persist in many areas. As shown by the wastewater needs investigations described above, many areas have problems with their onsite systems. In some areas, the no-action alternative may prevent homeowners from meeting the requirements of the state's *Public Health Code*. In some cases, compliance with the *Public Health Code* could require a major investment in an innovative or alternative system. Failure to make the necessary investment could possibly prevent home sales. Therefore, a town-wide no-action alternative is not desirable because it does not provide any short or long-term public health or environmental benefits nor does it address disposal systems that do not comply with *Public Health Code* requirements.

## 2.5.3 Individual Onsite Wastewater Treatment and Disposal

This section describes options for wastewater disposal improvements for individual use systems, and includes conventional replacement or upgrades, innovative/alternative systems, and tight tanks. A general description of these options is provided, as there are numerous technologies available. **Table 2-3** summarizes some of the setback requirements and design criteria for onsite wastewater disposal systems in the State of Connecticut.

### Conventional Upgrades or Replacement Systems

Conventional upgrades or replacement of individual onsite systems may be implemented in portions of the town where centralized collection and disposal is cost prohibitive, or where acceptable conditions exist for onsite wastewater disposal. Acceptable conditions include: proper soil percolation, low groundwater table (seasonal high groundwater at least 7 feet below grade), generally flat topography, adequate lot size, adequate depth to bedrock, and proper depth from natural resource areas.

As presented in Section 2.2, a typical *Public Health Code* septic system consists of three components: a septic tank, distribution box, and leaching system. Conventional upgrades can often be used to replace one or more components of an existing onsite septic system to comply with the requirements of a *Public Health Code*. Where conditions are suitable, a failed cesspool or a hydraulically-overloaded septic system should be replaced with a new conventional system. However, if the septic tank and/or distribution box are adequately sized, replacement of these components may not be necessary.

### Innovative/Alternative Systems

In locations with high groundwater conditions, poor soil drainage, lot size restrictions and/or within environmentally sensitive areas, conventional upgrades of an onsite system may not be sufficient to meet *Public Health Code* requirements. In these cases, innovative and alternative technologies may be used. The CTDEP approves use of innovative and alternative technologies on a case-by-case basis for each site.

# See Table 2-3

Alternative systems are those that provide substitutes or alternatives for one or more of the components of a conventional system, while providing the same degree of environmental and health protection. They include:

- humus or other composting toilets;
- alternative mounding systems;
- intermittent or recirculating sand filters;
- incinerating toilets;
- ozone disinfection;
- ultraviolet disinfection;
- any system designed to chemically or mechanically aerate, separate, or pump wastewater; and
- any system designed to control nitrogenous compounds, phosphorus, or pathogenic organisms.

A summary of the more popular innovative/alternative technologies is provided below and in **Table 2-4**.

**Recirculating sand filters** typically include a septic tank, a recirculation tank and pump, and an underdrained open sand filter. Effluent from the septic tank overflows to the recirculating tank and mixes with effluent returned from the sand filter. The mixture is periodically pumped onto the sand filter and evenly distributed over the filter surface. The sand filter is placed above grade for ventilation purposes. Oxygen available within the pores allows aerobic decomposition of the wastewater. A drain line at the bottom of the sand filter collects the effluent and returns it by gravity to the recirculation tank. If the tank is full, effluent overflows to the distribution box and leaching field. If properly designed, operated and constructed, recirculating sand filters can produce effluents of very high quality.

**Humus/composting toilets** have evolved over the years. The most popular type uses wood wastes such as sawdust to provide a composting environment for biodegradation of wastes. These systems are typically equipped with a temperature-controlled fan for aeration. In the past, composters have been used with waterless toilets. Recent innovations include foam flush composting toilets that require one ounce of water and soap per flush, and yard irrigation systems using filtered graywater from sinks, showers, and washing machines.

**Mound systems** have three principal components: a pretreatment unit, dosing chamber, and an elevated mound. Mounds are pressure-dosed sand filters that discharge directly to natural soil. They lie above the soil surface and are designed to

# See Table 2-4

overcome soil permeability problems, shallow soil cover over bedrock, and a high water table. The main purpose of a mound system is to provide sufficient treatment to the natural environment to produce an effluent equivalent to, or better than, a conventional onsite disposal system.

**Effluent tee filters** are fiber filters installed at the outlet of a septic tank. They enhance treatment and prevent septic tank solids from reaching the leaching system.

**Package wastewater treatment facilities** may be feasible solutions for individual onsite systems in Stonington. Small below-ground package plants such as Bioclere ™ trickling filter systems, FAST ™ fixed activated sludge treatment, and Amphidrome ™ filter and fixed-film reactor systems can be designed for flows generated by single family homes (300 gpd). These involve proven technologies for large-scale municipal treatment facilities, but are relatively new with respect to small systems.

## 2.5.4 Community Wastewater Treatment and Disposal

Locally-shared systems may be a viable option for areas where conventional systems and individual innovative/alternative systems are not feasible or are cost prohibitive. Locally shared systems require an available parcel of land with suitable soil, geologic and groundwater conditions for onsite wastewater disposal. Shared systems can be used for a cluster of homes (or businesses) or a small portion of the community. The options for shared onsite systems include: shared leaching systems, locally shared treatment and disposal facilities (e.g., shared septic tank and leaching system), and package treatment plants.

### Shared Leaching Systems

Shared leaching systems are designed to use a parcel of land near a group of homes that have characteristics suitable for disposing of septic tank effluent. Shared leaching systems may be desirable where there are lot-size constraints and/or unsuitable soil or groundwater conditions, which may make it difficult for property owners to upgrade their leaching systems to meet *Public Health Code* requirements. Individual homes (or businesses) would retain their existing septic tank or install a new septic tank for wastewater pretreatment, and gravity or pressure sewers would transport the effluent to a locally-sited community leaching system. If flow by gravity to a common leaching system is not possible, septic tank effluent pumping (STEP) systems may be used to pump the effluent to the common leaching system. Shared leaching systems involve facility siting, as well as creating a community organization to oversee related regulatory, administration, repair, operation and maintenance (O&M) activities, and replacement when necessary.

The restrictions and regulations for individual onsite disposal systems also apply to shared leaching systems. A shared leaching system is constructed similarly to a conventional leaching system, with *Public Health Code* design flows less than 5,000 gpd (flow from approximately 16 or less single-family homes), if sited in an area with suitable soil, groundwater, geologic, and topographic conditions. In areas with unsuitable conditions, such as high groundwater, the use of a mound system or an

innovative/alternative technology could be used to meet *Public Health Code* design requirements. With flows equal to or more than 5,000 gpd, advanced treatment and a CTDEP groundwater discharge permit are required.

### Shared Treatment and Disposal Facilities

Shared treatment and disposal facilities may be used in locations where lot size constraints, setback requirements, and unsuitable environmental conditions make it difficult or infeasible for property owners to upgrade both the septic tank and leaching system. This option is similar to that described for the shared leaching system, except that a large septic tank and distribution box would be installed to provide a centralized facility serving multiple residences or businesses. In this case, pressure or conventional gravity sewers would transport untreated wastewater to a locally-sited community disposal facility. This option would involve facility siting, as well as creation of a community organization to oversee related regulatory, administration, billing, reporting, repair, operation and maintenance activities, and replacement when necessary.

In locations where lot size constraints, setback requirements, and unsuitable environmental conditions make it difficult or infeasible for property owners to upgrade both the septic tank and leaching system, a local community "package" prefabricated treatment plant or a small conventional wastewater treatment plant with subsurface disposal is an option. Package or small wastewater treatment facilities may be feasible solutions for a group of homes, businesses, a small community or an industrial, commercial, or institutional facility that has a *Public Health Code* design flow in excess of 5,000 gpd.

### Package Treatment Plants

Package plants can achieve the same degree of treatment as municipal wastewater treatment facilities, provided their operation is monitored effectively. The term "package" refers to the assembly of various individual treatment processes into a compact area. Package plants normally have a capacity less than 100,000 gpd and have a high degree of automation. They are usually offered by a single company that is able to install pre-assembled equipment in buried tanks or in small buildings. Subsurface disposal is usually the preferred method of effluent disposal due to the difficulty of obtaining the required permits/approvals for a surface discharge. Some systems include septic tanks or pretreatment tanks upstream of the package plant units. They also may include dosing tanks and leaching trench systems downstream of the units for effluent disposal.

Various types of package wastewater treatment facilities may be feasible solutions for single-home or community systems in Stonington. Small below-ground package plants such as Bioclere ™ trickling filter systems, FAST ™ fixed activated sludge treatment, Amphidrome ™ filter and fixed-film reactor systems, and Zenon or M-PAC ™ membrane systems can be used for flows up to 100,000 gpd.

Other traditional wastewater treatment processes may be used in larger package facilities depending on the desired degree of wastewater treatment. Sequencing batch reactors (SBR) and rotating biological contactors (RBC) are two common treatment processes. Either method is capable of achieving standard secondary treatment or advanced wastewater treatment. A brief description of these processes follows:

- **The Sequencing Batch Reactor process** consists of a timed series of process steps using one or more tanks. First, an empty tank fills with untreated wastewater. Once the tank is full, aeration is started, supplying enough oxygen to allow stabilization of the organic waste and conversion of ammonia to nitrates (nitrification). This step typically takes 12 to 18 hours. If nitrogen removal is required, the aeration process is stopped for an additional 4 to 6-hour period to create anoxic conditions, which promote the conversion of nitrates to nitrogen gas and, hence, nitrogen removal from the wastewater. During the next step, the treated wastewater is allowed to settle for approximately a 1-hour period, during which time heavier solids (sludge) settle to the bottom of the tank. After settling, the clear effluent is pumped to a disinfection chamber and then discharged to either a surface or subsurface land disposal facility. The settled sludge is re-used in the tank and occasionally excess sludge is removed by tank truck for disposal at a wastewater treatment facility.

- **The Rotating Biological Contactor process** uses a fixed culture of natural microorganisms, which mechanically rotates on a disk through the wastewater to remove pollutants. To achieve nitrogen removal, two RBCs are normally used in series with one RBC submerged to promote anoxic conditions that foster denitrification. The RBCs are followed by a settling tank, and a sand filter is sometimes required depending on effluent limits. Similar to other package wastewater treatment facilities, a disinfection step is required.

Package treatment plants can be installed below or above ground. When below ground, these systems are installed in concrete, metal, or fiberglass compartments or tanks. Most new, below-ground package plants consist of one or more tanks set on a concrete foundation. The tanks are then buried so that only access hatches are visible from the surface. These systems have been in operation throughout the United States for more than 35 years. When installed above ground, they are constructed with fiberglass enclosures, or more commonly, in small buildings. These facilities usually include one or more concrete buried tanks, but most of the equipment is located in a one-story structure that architecturally blends with its surroundings. Above ground package plants typically serve condominium complexes, apartment buildings, and shopping centers.

Costs for package plants vary considerably depending on whether the plant is constructed above or below ground, the type of treatment process selected, the degree of automation, the degree of treatment required, and the method of effluent disposal. Generally, redundant treatment units are provided for design flows over 40,000 gpd.

A package system that is required to have redundant processes becomes increasingly complex, requires substantially more operator attention, and is more expensive.

**Small Wastewater Treatment Facilities**

A small wastewater treatment plant could be provided instead of a package plant, if flows exceed 100,000 gpd. A sequencing batch reactor (SBR) or an oxidation ditch may be used for secondary treatment in a small wastewater treatment plant. A small wastewater treatment plant requires much more cast-in-place concrete and onsite construction compared to a package plant and, therefore, capital costs for a small wastewater treatment plant tend to be relatively high.

## 2.5.5 Treatment and Disposal at an Existing Water Pollution Control Facility

The Town of Stonington currently operates three water pollution control facilities — the Mystic, Stonington Borough and Pawcatuck WPCFs. A description and evaluation of these facilities is presented in Section 5.

## 2.5.6 Other Treatment and Disposal Solutions

Other alternative solutions to onsite wastewater disposal or septage disposal problems are:

- Solar aquatics facilities;
- Tight tanks; and
- Condemnation of property.

Solar aquatics facilities are appropriate for and become more cost-effective at relatively high (>50,000 gpd) design flows. These types of facilities use greenhouses to store solar energy to treat wastewater without the addition of chemicals. They generally include trains of aerated tanks and constructed marshes. The tanks are typically seeded with a mixture of commercially produced bacteria and snails, and are planted with algae, aquatic and woody plants, which remove nitrates from the wastewater. These systems have a large land requirement due to the low application rate. They also have high energy requirements in the winter months.

Tight tank solutions dictate frequent pumping and transportation of wastewater to an approved treatment facility, making this an expensive, last resort alternative. Tight tank owners must set audio and visual alarms to activate at 60 percent of tank capacity. Aeration or another method of odor control may be required. Also, an operation and maintenance plan should be implemented to ensure proper care of the system.

Land taking or condemnation of property is another possible last resort alternative. Issues to consider include:

- Cost of taking property;
- Whether federal or state funds are available for such activities;
- Legal procedures; and
- Documentation that other alternatives, such as innovative/alternative systems, shared systems, or tight tanks are not feasible.

# 2.6 Screening of Conveyance Alternatives

## 2.6.1 General

This section identifies various wastewater collection alternatives that may be considered in conjunction with the offsite wastewater disposal alternatives described above. Conveyance alternatives are required for all offsite wastewater disposal options, such as treatment at a water pollution control facility, treatment at a package or small wastewater treatment plant, disposal at a local community leaching field, or disposal using a community innovative/alternative technology. The following alternatives are considered for wastewater collection:

1. Conventional Gravity Sewers
2. Pumping Stations and Force Mains
3. Small Diameter Gravity Sewers
4. Pressure Sewers with Septic Tank Effluent Pumps (STEP systems)
5. Pressure Sewers with Individual Grinder Pumps
6. Combinations of the Above

## 2.6.2 Conventional Gravity Sewers

Conventional gravity sewers are generally constructed of polyvinyl chloride (PVC) pipe. The minimum pipe size is 8 inches in diameter, with individual residential service laterals being 6 inches in diameter. Pipelines are laid at a slope to maintain a minimum 2 feet per second velocity to minimize solids deposition. Four-foot diameter manholes are placed along gravity sewers, at a spacing of about 300 feet.

Much of the cost of constructing gravity sewers is associated with excavation and surface restoration. Conventional gravity sewers have traditionally been the preferred method of wastewater conveyance combined with pumping stations and force mains. Based on non-economic factors, conventional gravity sewers remain the preferred method of wastewater conveyance. An analysis, based on cost and non-cost considerations, between conventional gravity sewers and other alternate means of conveyance is included later in this section.

### 2.6.3 Pumping Stations and Force Mains

Pumping stations and force mains are typically used in conjunction with gravity sewer alternatives. Conventional gravity sewer systems collect and convey wastewater by gravity from individual service connections to treatment facilities. If a section of the sewer area is too low to reach a desired location, pumping stations and force mains are used to "lift" the wastewater to a point where the flow can continue by gravity.

Pumping stations are designed for the anticipated peak wastewater flow. Each station has a minimum of two pumps, with one pump capable of pumping the entire flow. The other pump acts as a standby in case of a pump failure. Each station is supplied with an emergency power generator which operates in the event of a power failure.

Force mains are sized to maintain a minimum velocity of 2 feet per second to prevent debris from accumulating, while also minimizing head losses as much as possible. A minimum pipe size of 4 inches in diameter is used for force mains.

### 2.6.4 Small Diameter Gravity Sewers

Small diameter gravity sewers are used in conjunction with a septic tank at each individual residence. The septic system serves to retain solids thereby allowing the use of a smaller diameter gravity sewer. The minimum diameter is generally 6 inches.

Small-diameter sewers have the disadvantage of requiring that a septic tank be maintained at each individual residence. The septic tanks require periodic pumping, similar to a conventional septic tank, to ensure that solids are not conveyed to the small diameter sewers.

Small-diameter sewers are generally most applicable if:

- The effluent from each home needs to be clarified because conveyance is to a common leaching system.
- The effluent is clarified by a septic tank at each individual home to allow a new treatment plant to be constructed without facilities for settling of primary solids and grit.

### 2.6.5 Pressure Sewers with Septic Tank Effluent Pumps

STEP (Septic Tank Effluent Pump) systems consist of a septic tank followed by an effluent pump at each service connection. The effluent pump discharges into a pressure sewer system. The sizes of pipelines within the street depend on the number of homes connected.

The slope of pressure sewers is not important since flow is conveyed by pressure, which allows the pipes to follow the natural slope of the land. Pipes are recommended to be buried at a minimum cover of 5 feet to avoid possible freezing in

the winter months. This represents a potential capital cost savings compared to gravity sewers. Advantages of pressure sewers over gravity sewers are smaller diameter pipelines, little or no infiltration, shallower burial depths, and corresponding smaller trenches.

STEP systems require that a septic tank be maintained at each individual residence, similar to the small diameter sewers alternative. Also, STEP systems require that a pumping system be located on each individual homeowner's property. The pumping system is subject to potential failure; however, the effluent collection chamber provides storage capacity during a power outage.

Similar to small diameter gravity pipelines, STEP systems are most applicable if:

- The effluent from each home needs to be clarified because conveyance is to a common leaching system.
- The effluent is clarified by a septic tank at each individual home to allow a new treatment plant to be constructed without facilities for settling of primary solids and grit.

Otherwise, pressure sewers with individual grinder pumps, described below, are generally more desirable since they do not require that a septic tank remain in service on each homeowner's lot, eliminating the need for periodic pumping to remove solids from the septic tank.

### 2.6.6 Pressure Sewers with Individual Grinder Pumps

This alternative considers pressure sewers used in conjunction with an individual grinder pump at each residence. The grinder pump can be located in or outside of the home. The pump is designed to macerate solids (similar to the way that a kitchen garbage disposal grinds solids) so as to allow a small line size for the pressure sewers. There is no septic tank needed for this type of system. Since there is no septic tank requiring regular pumping, this system is preferred to a STEP system unless the effluent needs to be clarified for disposal at a common leaching field or at a treatment facility without grit removal or screening facilities.

Similar to STEP systems, this type of system is generally used to serve a small cluster of homes in a low-lying area that cannot connect by gravity to a conventional sewer. Its main disadvantage is the need to have a pump at each individual service connection, which requires maintenance and is subject to potential breakdown. Similar to a STEP system, the pump will not operate during a power outage. A typical grinder pump system has approximately 60 gallons available for storage during power failures.

### 2.6.7 Comparison of Conveyance Alternatives

Each of the conveyance alternatives presented in this section is compared based on cost and non-cost factors. The preferred method of conveyance based on non-cost

factors is conventional gravity sewers, since this alternative is the simplest and has the least amount of future operation and maintenance requirements. In general, it is recommended that conventional gravity sewers be used in conjunction with pumping stations and force mains. If less than 20 homes in a low-lying area require pumping, low-pressure sewers with individual grinder pumps will be considered.

Following is an analysis of wastewater collection alternatives.

### Small Diameter Gravity Sewers

Small diameter gravity sewers are not considered further unless a selected treatment alternative requires a clarified effluent. Small diameter gravity sewers are not favored based on both cost and non-cost factors as described below.

- Small diameter gravity sewers with a conventional septic tank at each service are found to be slightly more expensive than conventional gravity sewers based on capital costs (3 to 8 percent), depending on the density of homes. Based on a 20-year life-cycle cost (present worth cost including O&M for 20 years), small diameter gravity sewers were found to cost approximately 8 to 14 percent more than conventional gravity sewers. The increased cost of small diameter gravity sewers are a result of having to provide a *Public Health Code* compliant septic tank at each home where one currently does not exist.

- Small diameter gravity sewers are not as desirable as conventional gravity sewers since a septic tank would have to remain at each household and would need to be pumped out every two to three years.

### STEP Systems

STEP systems with pressure sewers are estimated to be approximately equal in cost to grinder pumps with pressure sewers. Individual grinder pumps are preferred to a STEP system, unless a clarified effluent is required, such as for a leaching system or a package WWTP without screening or grit removal facilities, because maintenance of a septic tank is not required.

STEP systems are not recommended since they require that a septic tank be maintained on each individual's property thereby requiring routine pumping and subsequent disposal of the settled solids from the tank. STEP systems are not considered further since individual grinder pumps are comparable based on capital and life-cycle costs, unless a clarified effluent is required.

### Pressure Sewers with Individual Grinder Pumps

The use of pressure sewers with individual grinder pumps was evaluated versus the use of gravity sewers. Two general cases were evaluated.

- ***Case 1***. The street can flow by gravity to an interceptor.

- ***Case 2***. The street cannot flow by gravity to the mainline interceptor requiring that the gravity sewer alternative be supplemented with a pumping station and force main.

When a street can flow by gravity to an interceptor, gravity sewers are preferred unless the area being sewered is very sparsely populated. Gravity sewers are estimated to be less costly when housing is relatively dense. The higher cost of pipe in a gravity system is offset by not needing a pump at each individual service connection. If housing is relatively sparse; however, the cost of the individual grinder pumps at each home is offset by the less expensive pressure sewer piping in the street. Most streets anticipated for sewers as part of this facilities plan are relatively densely populated and; therefore, gravity sewers will be used when the connection to the interceptor can be made by gravity.

If a street or neighborhood is at an elevation too low to connect to an interceptor by gravity, cost comparisons of using gravity sewers with a pumping station versus pressure sewers with individual grinder pumps show that there is a breakpoint depending on the number of homes and the density of homes. On a present worth cost basis, gravity sewers with a pumping station are generally less expensive for 40 or more homes. Between 20 and 40 homes, the present worth cost comparison of gravity sewers with a pumping station versus pressure sewers depends on the density of homes. For 20 or fewer homes, present worth costs generally favor pressure sewers with individual grinder pumps.

Based on non-cost considerations, the use of pressure sewers with grinder pumps is less desirable than gravity sewers and a central pumping station. Pressure sewers require that a pump be located at each individual residence thereby requiring individual maintenance at each residence. Eventually, pumping units at each of the residences may require major maintenance or replacement. In addition, during a power outage, there is a fixed volume of storage available in the grinder pump unit.

The recommendations, based on this analysis, is that for low lying areas with:

- less than 20 homes pressure sewers with individual grinder pumps be used;
- 20 to 40 homes, consideration be given to using individual grinder pumps; and
- more than 40 homes be served with conventional gravity sewers and a pumping station and force main be used.

## 2.7 Evaluation of Wastewater Management Alternatives for Wastewater Needs Areas

### 2.7.1 Introduction

The following are evaluations of the wastewater management alternatives for each wastewater needs area. These alternatives were determined based on the screening

methodology presented in Figure 2-2 and described in Section 2.5. **Table 2-5** presents a summary of the suitable wastewater collection and treatment alternatives for each area. **Figure 2-22** shows a preliminary layout of proposed wastewater collection and transmission systems for each of the wastewater needs areas. The layout of sewers and pumping stations is based on the Town's five-foot contour plans.

Recommended wastewater management solutions are based on feasibility of implementation, the nature of the onsite disposal problems, expected environmental benefits, and cost considerations. Some of the alternatives discussed in Sections 2.5 and 2.6 were not selected as feasible options for the wastewater needs areas in Stonington. These include:

- No-Action Alternative—As discussed in Section 2.5.2, the no-action alternative is not an option for the areas investigated. Each area was selected specifically because all of its wastewater needs are not being met. Therefore, some action will have to be taken to resolve the area's issues.

- Individual Onsite Systems without Treatment —All 18 areas have issues with one or a combination of the following: shallow bedrock, perched groundwater, small lots, proximity to surface water or other sensitive resource area, and poor/unsuitable soils for septic disposal. Therefore, conventional septic systems will not provide adequate wastewater treatment to meet *Public Health Code* and/or CTDEP requirements. -

- Community System without Treatment (<5,000 gpd)—The only area that has flows less than 5,000 gpd is the Roseleah Drive Area. This area consists of small, developed lots surrounded by Mystic Harbor. Due to its proximity to Mystic Harbor, a community septic system with no additional treatment is not an option.

## 2.7.2 Costs of Wastewater Management Alternatives

Costs of wastewater management alternatives were estimated based on recent CDM projects, bid tabulations and manufacturers' estimates. Capital costs include a 40 percent allowance for construction contingencies, engineering, borings and survey. Costs do not include land acquisition and easement costs. The feasible alternatives identified for each wastewater needs area were evaluated on a common fiscal basis using a present worth analysis.

The initial base year for the present worth analysis is 2002 with all costs referenced to July 2002, *Engineering News Record* (ENR) Construction Cost Index 6605. The costs herein have been escalated to reflect an ENR cost index of 7763 for August 2006. A 20-year planning period is used, and the fiscal year 2004 EPA discount rate is 5.625 percent. Alternatives with the lowest present worth are the most cost-effective over the life of the project.

# See Figure 2-22

# See Table 2-5

Cost estimates for the package treatment facilities include costs to treat effluent to 10 mg/L total nitrogen, and BOD and TSS to 30 mg/L. Annual operation and maintenance costs include power, operator inspections, maintenance, sample testing and septage/sludge disposal. All package treatment plants considered in this report are assumed to be within a 1,000-foot radius of the wastewater needs area.

Life expectancies of equipment and structures were estimated to determine future replacement costs and salvage values at the end of the project planning period. The life expectancies used in the analysis are 20 years for pumps, package treatment facilities, instrumentation and equipment, and 50 years for pipes.

### 2.7.3 Evaluation by Wastewater Needs Area

***Area 1 - Marjorie Street Area***

**Recommendation: Install a gravity collection system, pumping station, force main and community wastewater treatment facility.**

As discussed in Section 2.4, the Marjorie Street Area is a critical needs area with 40 homes. Half of the Marjorie Street Area is within a drinking water aquifer recharge zone. The other half of the needs area has soil that is considered unsuitable for onsite disposal because of the existence of bedrock at shallow depths. Feasible alternatives for this area are:

Treatment:

- Individual onsite treatment systems with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main

Locating onsite wastewater treatment systems within an aquifer recharge zone should be considered only if there is no other practical and feasible alternative. Connecticut Public Health Code stipulates that onsite treatment systems "located within the drawdown area of an existing public water supply well with a withdrawal rate in excess of 50 gpm, or within 500 feet of land owned by a public water supply utility and approved for a future well site by the Commissioner of Public Health" are considered an Area of Special Concern and require special permitting.

A package treatment plant located outside of Area 1 is a viable option. Depending on the location of the plant, Area 1 may be able to be served using gravity sewers. The Connecticut *Public Health Code* may restrict the location of a package treatment

plant (system receiving flows greater than 5,000 gpd) within a public water supply watershed; permission must be granted by the Commissioner of Public Health. Furthermore, sewer piping must be at least 100 feet from, and discharge of raw or treated sewage must be 200 feet, away from any well withdrawing over 50 gpm. Hence, similar to individual onsite wastewater treatment systems, locating community treatment systems within an aquifer recharge area is a last resort alternative.

The Marjorie Street Area will require about 4,300 feet of gravity piping for a wastewater collection system. Area 1 is approximately 5,700 feet from an existing sewer and will require a pumping station and approximately 3,300 feet of force main to connect to the sewer.

**Table 2-6** compares the present worth costs for the Area 1 wastewater management alternatives. The capital cost of installing a gravity collection system and a package treatment plant is significantly less than the cost of connecting to the closest sewer. When operation and maintenance costs are included in the equation, the present worth costs are close, with a package treatment facility slightly more cost-effective than connecting to the sewer. Considering the environmental and public impacts of constructing more than a mile of transmission lines to connect to the nearest sewer, the package treatment facility is the recommended alternative.

***Area 2 - Riverbend Drive Area***
**Recommendation: Install a gravity collection system, pumping station and force main to connect to the nearest sewer.**

Riverbend Drive is a moderate needs area adjacent to the river. The soil has poor filtration capabilities. Appropriate alternatives for the Riverbend Drive Area are:

<u>Treatment:</u>

- Individual onsite treatment systems with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

<u>Collection:</u>

- Gravity sewers
- Pump station and force main

Area 2 is small and will require only 2,800 feet of gravity collection pipe. Riverbend Drive is immediately adjacent to the existing sewer, but it is at a low point so a pumping station and 1,700 feet of force main will be required to connect a local

# See Table 2-6

collection system. The sewage from this area will be conveyed to the Mystic collection system.

A package treatment plant can also be used to provide wastewater treatment; however because the area is small and is close to the existing sewer, this is not a cost-effective solution, as shown in **Table 2-7**.

Based on cost and environmental factors, a gravity collection system, pumping station and force main to the existing sewer is the recommended solution for the Riverbend Drive Area.

***Area 3 - School Street Area***
**Recommendation: Install 23 grinder pumps, low-pressure sewers and a gravity collection system, and connect to the nearest sewer.**

The School Street Area is a moderate needs area where the topography is steep and bedrock is shallow. Furthermore, the area contains wetlands and sections within the 100-year floodplain. The following are the possible wastewater collection and treatment options for Area 3:

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Grinder pumps and pressure sewers
- Combination of Gravity and Low-pressure Sewers

A package treatment plant is not cost-effective because the area is comprised of only 34 homes and is immediately adjacent to the existing sewer system. The north section of the area can be connected to the existing sewer using about 1,750 feet of gravity pipe, 14 grinder pumps and approximately 950 feet of low-pressure sewer. Due to low elevation, pumping is also needed in the south section of the School Street Area. As this section has only 9 homes, grinder pumps and approximately 650 feet of low-pressure sewer is more cost-effective than a pumping station and force main.

Based on the cost analysis shown in **Table 2-8**, the recommendation for this area is to install a combination of grinder pumps, low-pressure sewers, and gravity sewers. The sewage will be conveyed to the Mystic collection system.

# See Table 2-7

# See Table 2-8

Area 4 - Roseleah Drive

**Recommendation: Install grinder pumps and a low-pressure sewer system, and connect to the nearest sewer.**

Roseleah Drive, a high needs area, is a small road on Mystic Harbor with soils that are unsuited for onsite treatment due to wetlands and the proximity to Long Island Sound. The following are feasible collection and treatment alternatives for this area:

Treatment:

- Town water pollution control facility

Collection:

- Grinder pumps and pressure sewers

**Table 2-9** summarizes the costs for this area. The 15-home area are low-lying and will require pumping to connect to the existing sewer. Grinder pumps are more cost-effective than a pumping station and force main. The existing sewer extends to the beginning of Roseleah Drive, so connection to the existing sewer with 1,300 feet of low-pressure pipe is a viable option. The sewage from Roseleah Drive will be sent to the Mystic collection system.

***Area 5 - Elm Ridge Road Area***
**Recommendation: Install 68 grinder pumps, low-pressure sewers, a pumping station and force main, and a gravity collection system to connect to the nearest sewer.**

The Elm Ridge Road is a critical needs area comprised of 205 homes. The soil in Area 5 is poor for septic systems. The following are possible alternatives to handle wastewater in the area:

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main
- Combination of gravity and low-pressure sewers

# See Table 2-9

The majority of the Elm Ridge Road Area can be connected to the existing sewer collection system using 10,000 feet of gravity sewers. However, a small pumping station and approximately 500 feet of force main will be needed to collect wastewater from 43 homes on the south end of the area. Furthermore, grinder pumps and approximately 5,500 feet of low-pressure sewer are required for 68 low-lying homes. The area is close to the Pawcatuck collection system. As shown in **Table 2-10**, connecting Area 5 to the closest sewer is the most cost-effective alternative.

***Area 6 - Pequot Trail Area***
**Recommendation: Install 13 grinder pumps, low-pressure sewers and a gravity collection system to connect to the nearest sewer.**

The Pequot Trail Area, a high needs area, is a fairly large area consisting of 113 homes, a church and a condominium. Area 6 is characterized by shallow bedrock and steep hills. Based on the screening criteria, the following collection and treatment alternatives can address the Pequot Trail Area's wastewater needs.

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Combination of gravity and low-pressure sewers

The Pequot Trail Area is immediately adjacent to the Pawcatuck WPCF collection system, and the area can be connected to the existing sewer via approximately 10,750 feet of gravity pipe. Thirteen grinder pumps and about 1,000 feet of low-pressure sewer may be necessary at the north end of the area. As shown in **Table 2-11**, this is the most cost-effective solution.

***Area 7 - Cronin Avenue/Holly Street***
**Recommendation: Install a gravity collection system and connect to the nearest sewer.**

In general, the soil, wetlands and ledge outcrops in the Cronin Avenue/Holly Street Area are not suitable for onsite disposal. The following wastewater collection and treatment alternatives are possible options for this high needs area:

Treatment:

- Individual onsite treatment with innovative/alternative technologies

# See Table 2-10

# See Table 2-11

- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Combination of gravity and low-pressure sewers

The Cronin Avenue/Holly Street Area is located within the existing Pawcatuck WPCF collection system but was not connected when it was developed. The area can be connected to the existing sewer system via 1,750 feet of gravity pipe. As shown in **Table 2-12**, this option is more cost-effective than installing community or individual treatment systems.

***Area 8 - Millan Terrace Area***
**Recommendation: Install four grinder pumps, low-pressure sewers and a gravity collection system to connect to the nearest sewer.**

The Millan Terrace area is a moderate needs area located at the edge of the Pawcatuck collection system and adjacent to Anguilla Brook. Area 8 is comprised of 38 homes on small lots (about 1/2 acre) and includes wetlands, ledge, high groundwater and a nearby brook. The following are feasible alternatives to meet this area's wastewater needs.

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump Station and force main
- Grinder pumps and pressure sewers
- Combination of gravity and low-pressure sewers

Approximately 3,300 feet of gravity sewer will be needed to collect wastewater in the Millan Terrace Area. The area is located on the edge of the existing Pawcatuck WPCF collection system. Two grinder pumps and approximately 200 feet of low-pressure

# See Table 2-12

sewers will be needed for two homes on Stanley Street, and two grinder pumps may be needed on South Broad Street to connect to a gravity sewer.

A community package treatment plant is an option, but is not the most cost-effective solution because the area is adjacent to an existing sewer. As shown in **Table 2-13**, connecting to the existing sewer is the least costly feasible alternative.

***Area 9 - Aimee Drive Area***
**Recommendation: Install a gravity collection system and connect to the existing wastewater pumping station in Pawcatuck Avenue.**

The Aimee Drive Area is a moderate needs area located just outside the Pawcatuck collection system. The area has ledge and poor soils. Based on the screening criteria, the following are feasible alternatives to meet the wastewater needs of the area:

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main
- Combination of gravity and low-pressure sewers

If a collection system is installed, it will require about 4,200 feet of gravity sewer. Since the lowest area of the system is the northern end, a pumping station and 1,200 feet of force main would be needed to connect to the recently installed sewer in River Crest Drive. The area is too large (55 homes) for grinder pumps to be cost-effective. A less costly alternative is to install a gravity collection system and connect by gravity to the existing pumping station in Pawcatuck Avenue.

A community package treatment plant is feasible, but is not the most cost-effective approach, as shown in **Table 2-14**. The recommendation for this area is to connect to the existing wastewater pumping station in Pawcatuck Avenue by gravity.

***Area 10 - Mark Street Area***
**Recommendation: Install a gravity collection system and connect to the nearest sewer.**

# See Table 2-13

# See Table 2-14

The Mark Street Area is a small area with high priority needs. Area 10 has poor soils for onsite treatment. The following are the feasible wastewater collection and treatment options for this area:

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers

Approximately 3,300 feet of gravity sewer will be required for a collection system in this area.

The Mark Street Area is adjacent to the existing Pawcatuck WPCF collection system. The area can be served via gravity sewers and was not connected to the sewer originally because construction of the sewer preceded development of the area.

Because the Mark Street Area is next to the existing sewer system and can be connected by gravity, connecting to the existing system is the most cost-effective solution (**Table 2-15**).

***Area 11 - Greenhaven Road Area***
**Recommendation: Install 19 grinder pumps, low-pressure sewers, a gravity collection system, pumping station and force main to connect to the nearest sewer.**

The Greenhaven Road Area is a large area with many small lots (143 homes). The area has a high groundwater table and shallow bedrock. A significant wetland, which is unsuitable for development, is within the area. This area is a high priority needs area with the following potential wastewater treatment alternatives:

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers

# See Table 2-15

- Pump station and force main
- Grinder pumps and pressure sewers
- Combination of gravity and low-pressure sewers

If a collection system is constructed in the Greenhaven Road area, about 14,100 feet of gravity pipe will be needed. Because of the topography, some areas (about 19 homes total) will require grinder pumps and about 350 feet of low-pressure sewers. The Greenhaven Road Area is close to the existing Pawcatuck collection system, but a pumping station and 1,700 feet of force main will be required to connect to the system.

**Table 2-16** shows that connecting to the existing system is the most cost-efficient option.

***Area 12 - Meadow Road Area***
**Recommendation: Install a gravity collection system, pumping station and force main to connect to the nearest sewer.**

The Meadow Road Area is a moderate to high priority needs area. It is a small area (34 homes) located next to the Pawcatuck River. Although the majority of the soils are characterized as suitable for conventional onsite treatment systems, onsite treatment systems may pollute the groundwater and add nutrient loading to the river. Furthermore, the ground is characterized by ledge outcrops and boulders. Based on the screening process, the following are feasible alternatives for this area.

<u>Treatment:</u>

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

<u>Collection:</u>

- Gravity sewers
- Pump station and force main
- Grinder pumps and pressure sewers

The Meadow Road Area 1 is located approximately 1,500 feet from the Pawcatuck collection system. Connecting to the Town's existing collection system will require 3,900 feet of gravity pipe. A small pumping station and 3,100 feet of force main will be needed as well. As shown in the cost analysis in **Table 2-17**, connecting to the Town's

# See Table 2-16

# See Table 2-17

system is more cost-effective than individual onsite treatment or a package treatment plant.

***Area 13 - Latimer Point***
**Recommendation: Install eight grinder pumps, low-pressure sewers, a gravity collection system, pumping station and force main to connect to the nearest sewer.**

Latimer Point is a small peninsula that has a large number of homes (80) on small lots (1/4 acre). Latimer Point is currently restricted from development due to inadequate sewage disposal. Implementation of the recommended improvements would remove this obstacle to development.

Treatment:

- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main
- Combination of gravity and low-pressure sewers

Approximately 4,350 feet of gravity sewer, 1 pumping station, 375 feet of force main, 8 grinder pumps and 500 feet of low-pressure sewers will be needed to create a collection system in the Latimer Point Area.

A package treatment plant can be installed to treat this area's wastewater or this area can connect to the existing wastewater collection system. About 3,700 feet of transmission force main is needed to connect the area to the existing sewer system. The route of the transmission line is not densely populated (Figure 2-22). Hence, constructing the force main will not have a large impact on residents of the Town. The route of the transmission line includes a railroad crossing, which adds to the cost of this alternative. However, as shown in the cost analysis in **Table 2-18**, connection to the Town's collection system is the least costly alternative.

***Area 14 - Mason's Island***
**Recommendation: Install 10 grinder pumps, low-pressure sewers, a gravity collection system, two pumping stations, force mains, and community wastewater treatment facility.**

The Mason's Island Area is a moderate needs area consisting of 64 homes on small lots. This peninsula on Fishers Island Sound has wetlands, high groundwater and shallow ledge. Feasible wastewater management options are listed below:

# See Table 2-18

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main
- Grinder pumps and low-pressure sewers
- Combination of gravity and low-pressure sewers

To construct a collection system, 8,150 feet of gravity sewer will be needed. Due to topography, a small area will require a pumping station and 1,200 feet of force main. Ten homes will need grinder pumps and approximately 300 feet of low-pressure sewers.

Mason's Island is over a mile away from the existing wastewater collection system, and 7,000 feet of transmission force main, including a bridge crossing, will be needed to connect the area to the existing system. The route of the transmission main is through very densely populated areas (Figure 2-22), subject to significant construction impacts.

A package treatment plant is a viable option for Mason's Island. The cost analysis in **Table 2-19** indicates connecting to the existing sewer is slightly more cost-effective than constructing a community treatment facility due to annual operation and maintenance costs; however, considering the impacts of constructing 7,000 feet of force main through the densely-populated area north of Mason's Island, the recommended alternative is a community treatment system.

***Area 15 - Marlin Drive Area***
**Recommendation: Install a gravity collection system, pumping station and force main to connect to the nearest sewer.**

The Marlin Drive Area is a high needs area. This area has high groundwater and onsite systems may pollute several nearby surface water bodies. Also, any pollution may increase the nitrogen loading to the cove and Long Island Sound. The Marlin Drive Area contains environmentally sensitive areas and the lots are small. Based on the screening process in Section 2-5, the following are feasible wastewater management alternatives:

Treatment:

# See Table 2-19

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main
- Combination of gravity and low-pressure sewers

Approximately 4,000 feet of gravity sewers are needed to construct a collection system. The Marlin Drive Area is relatively close to the Pawcatuck collection system; however, a pumping station and 4,100 feet of force main will be required because the area is on the other side of a ridge line.

**Table 2-20** indicates connecting to the existing sewer is the least expensive alternative.

***Area 16 - Elm Street Area***
**Recommendation: Install thirty-one grinder pumps, low-pressure sewers and a gravity collection system to connect to the nearest sewer.**

The Elm Street Area is a high needs area with 74 homes. It is characterized by shallow and exposed bedrock, high groundwater, and soil unsuitable for onsite disposal. The following are feasible alternatives to meet the needs of this area:

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main
- Combination of gravity and low-pressure sewers

The Elm Street Area is located adjacent to the Borough wastewater collection system, and a portion of this area may be served by connecting a new 5,900-foot gravity collection system to the existing system at Meadow Avenue. There are three small,

# See Table 2-20

separate areas that cannot be served by gravity sewer. These areas can be served by a total of 31 grinder pumps and 2,050 feet of low-pressure sewers. **Table 2-21** indicates connecting to the existing sewer is the most cost-effective solution.

***Area 17 - Montauk Avenue Area***
**Recommendation: Install two grinder pumps, low-pressure sewers and a gravity collection system to connect to the nearest sewer.**

The Montauk Road Area is a high priority needs area with 34 homes. Although lot sizes are large enough (2 acres on average) for individual onsite treatment, the soil is poor. Below are possible options to address their wastewater management needs.

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main
- Grinder pumps and low-pressure sewers
- Combination of gravity and low-pressure sewers

The Montauk Avenue Area is located immediately adjacent to the Borough wastewater collection system. Several homes in this area are located at a lower elevation than the street. Extensive easements will be required to provide a gravity collection pipe to service the area, or the wastewater will have to be pumped from the homes to a collection pipe in the public way. Costs in **Table 2-22** are for a mostly gravity collection system and only two grinder pumps with 300 feet of low-pressure sewers.

Given the proximity of the Montauk Avenue Area to the existing sewer, connecting to the existing collection system is the recommended option, as shown in Table 2-22.

***Area 18 - North Stonington Road Area***
**Recommendation: Install individual onsite systems with innovative/alternative technologies.**

The North Stonington Road Area is a moderate needs area with 30 homes. Soils in this area are poor for onsite treatment and may pollute the naturally high groundwater. The following are feasible alternatives for this area:

# See Table 2-21

# See Table 2-22

Treatment:

- Individual onsite treatment with innovative/alternative technologies
- Community innovative/alternative technologies (package treatment plant)
- Town water pollution control facility

Collection:

- Gravity sewers
- Pump station and force main
- Grinder pumps and low-pressure sewers
- Combination of gravity and low-pressure sewers

Approximately 3,100 feet of gravity pipe will be required to construct a collection system in this area.

The North Stonington Road Area is located more than a mile (approximately 7,700 feet) from the existing wastewater collection system, which makes connecting to an existing sewer costly. A pumping station and approximately 3,200 feet of force main will be needed to connect the area to the Mystic collection system.

The cost analysis in **Table 2-23** shows that the present worth costs for individual and community systems are very close. Most of the lots in this area are relatively large (greater than one acre), which allows room for siting individual systems. As shown on Figure 2-21, only one resident reported problems with their septic system. Based on the large lot sizes and the low number of reported problems in this area, the recommended alternative for the North Stonington Road area is individual onsite systems with innovative/alternative technologies.

## 2.7.4 Summary of Recommended Alternatives

**Tables 2-24 and 2-25** summarize the recommended alternatives, total capital costs, costs per lot and annual operation and maintenance costs for each of the 18 wastewater needs areas. The needs areas have a variety of problems and issues, including high groundwater, ledge, poor filtration, environmentally sensitive areas and small lots. Installing a collection system and connecting to the existing sewer is the most cost-effective and environmentally sound alternative for 15 of the 18 wastewater needs areas. The other three areas, Marjorie Street, Mason's Island and North Stonington Road, are located relatively far from the existing wastewater collection system, and the impacts of constructing the transmission lines will be significant. Recommended alternatives for these three areas are community treatment systems for Marjorie Street and Mason's Island, and individual onsite systems with innovative/alternative technologies for the North Stonington Road area.

# See Table 2-23

# See Table 2-24

# See Table 2-25

The proposed collection and transmission systems are shown in Figure 2-22. Based on the recommendations and the locations of the wastewater needs areas, four areas will be connected to the Mystic collection system. In addition, nine areas will be connected to the Pawcatuck collection system. The Borough collection system will receive flows from two wastewater needs areas.

# 2.8 Implementation of Recommendations

## 2.8.1 Introduction

The recommendations described in Section 2.7 for each of the 18 needs areas represent a very large capital improvements program. Taken together, the capital cost of implementing the recommended improvements for all 18 areas would be approximately $41 million in August 2006 dollars (ENR 7763), and this total cannot be feasibly afforded by the Town of Stonington over the 20-year planning period. Therefore, the Town plans on implementing the recommended improvements only for those areas of highest need.

## 2.8.2 Ranking of Needs Areas

As described in Section 2.4, each of the needs areas has been prioritized into one of four categories: critical, high, moderate and low. **Table 2-26** summarizes these rankings. As shown, two areas are rated critical: the Marjorie Street and Elm Ridge Road areas; and seven areas are rated high: Roseleah Drive, Pequot Trail, Cronin Avenue, Mark Street, Greenhaven Road, Latimer Point and Marlin Drive. The other areas are ranked either moderate or low.

## 2.8.3 Scheduling and Budgeting of Selected Areas

The critical and high priority areas should be addressed during the 20-year planning period, in such a way to minimize impacts on the Town's citizens. Two phases of implementation are recommended: the critical areas should be addressed early in the 20-year period, and the high-priority areas addressed later. This implementation would result in a planned capital expenditure of approximately $7.3 million in the first phase, and $16.1 million in the second phase (ENR 7763). A proposed implementation schedule is presented in Section 8.

The moderate and low priority areas should be monitored for increased incidence of problems, which could result in re-prioritizing the areas.

## 2.8.4 Flexibility of Implementation

WPCA will plan on the two-phased approach for addressing the critical and high-priority needs areas within the 20-year planning period. However, WPCA has the right and responsibility to continuously review the sewer needs of the Town, and respond to the highest-priority needs as the public health demands and as budgetary constraints allow. Therefore, it is possible that the timing of implementing the recommended improvements may change, either by accelerating or delaying the

# See Table 2-26

schedule, and it is also possible that the needs areas priorities will change. This planning approach is acceptable to CTDEP.

However, CTDEP requires that the projected flows and loads at the treatment plants, as presented in Section 3, be developed under the assumption that ALL of the sewer needs areas are connected during the 20-year planning period. The projections presented in Section 3 include the projected flows from all 18 areas.