Section 4
Wastewater Collection Systems

4.1 System Description

Stonington has three sanitary sewer systems that discharge to the Mystic, Stonington Borough and Pawcatuck WPCF's. These systems are schematically shown on **Figure 4-1.** This section provides a brief description of each system based on a review of records provided by the Stonington Water Pollution Control Authority (WPCA).

It should be noted that the system descriptions in this section depict the collection system in July 2002. No significant improvements have been made since that time. However, the following minor improvements have been made:

- The Stonington Green (River Crest Drive) subdivision has been constructed that borders the Aimee Drive and Mark Drive sewer needs areas. This subdivision is sewered within the Pawcatuck service area.
- The Rock Ridge subdivision is nearly completed adjacent to the Cronin Avenue/Holly Street sewer needs area. This subdivision will be sewered within the Pawcatuck service area.
- Sewers were extended along Coogan Boulevard and Jerry Browne Road to service the Stone Ridge Development and vacant land on the north side of Jerry Browne Road.

4.1.1 Mystic

The Mystic collection system includes approximately 20 miles of gravity sewers, five pumping stations, and the WPCF. The Mystic WPCF, placed on-line in 1972, is located on Edgemont Street and overlooks the Mystic River. Of the 20 miles of sewers in Mystic, there are approximately 12 miles of interceptors and eight miles of lateral sewers. The sizes of the sewers in this system range from 8 inches to 30 inches in diameter. In addition, there are approximately 1.1 miles of force main ranging in size from 4 inches to 10 inches in diameter. Most of the system was constructed during the 1970s. The service area extends eastward from the Mystic WPCF to the intersection of U.S. Route 1 and Chapman Lane, and northward to North Stonington Road. Four of the five pumping stations collect the flow and convey it to the Mystic WPCF via a combination of force mains and gravity sewers. The fifth pumping station (Diversion P.S.) is located at the Mystic WPCF and conveys underflow from the plant's primary clarifiers to the Borough WPCF via a separate transmission main.

4.1.2 Stonington Borough

The Stonington Borough collection system primarily services the Borough and the area immediately north. In addition, the collection system extends north to Deans Mill Road, and the Lord's Point area is also within this system. The Stonington

See Figure 4-1

Borough WPCF, which went on-line in 1975, is located at the end of High Street overlooking Stonington Harbor. Constructed in the 1970s, this system originally included approximately 8.5 miles of gravity sewers, of which four miles are interceptors. The sizes of the sewers in this district range from 8 inches to 30 inches in diameter. There are seven pumping stations located throughout this collection system. These pumping stations convey flow to the Borough WPCF via a combination of force mains and gravity sewers. There is approximately 0.7 miles of force main within this system ranging from 4 inches to 6 inches in diameter, not including Lord's Point or the transmission main from the Mystic WPCF.

In 1999, a transmission force main was placed into service to convey underflow from the Mystic WPCF primary clarifiers to the Stonington Borough system. This transmission main discharges to a gravity sewer at the biofilter odor-control system located on Stonington-Westerly Road (U.S. Route 1) near Rose Lane. From the biofilter, the wastewater flows by gravity to the Ensign Lane Pumping Station, and ultimately to the Borough WPCF.

In addition to the Mystic WPCF underflow, the transmission main also conveys wastewater from the Lords Point area. This flow enters the transmission main at the force main connection from the Lindberg Road Pumping Station at Noyes Avenue.

4.1.3 Pawcatuck

The Pawcatuck collection system services the eastern portion of the town. The Pawcatuck WPCF, placed in service in 1980, is located at the southern end of the collection system along Mary Hall Road. The system extends north along the Pawcatuck River to Interstate 95 (I-95). The western end of the collection system begins near the intersection of U.S. Route 1 and Anguilla Road. The Pawcatuck system consists of approximately 20 miles of sewers. Six miles of these sewers are interceptors, while the remaining 14 miles are laterals. The sizes of the sewers in this district range from 8 inches to 30 inches in diameter. An additional 1.4 miles of force main in this system consist of 2- to 20-inch diameter pipe. These force mains are supplied flow by the six pumping stations operating within the Pawcatuck collection system.

4.2 Capacity Analysis

A hydraulic capacity analysis was conducted for the critical components of each of the three wastewater collection systems, including the interceptors and pumping stations. The interceptors are major "spines" of each system that convey flow from its outer periphery to either the WPCF or a pumping station.

4.2.1 Interceptors

A capacity analysis was performed on the existing interceptors for each of the three collection systems. Manning's equation was used to calculate the capacity of a gravity pipe flowing full, but not surcharged. A roughness coefficient of 0.013, appropriate for

cement-lined pipe, was used to estimate hydraulic capacity. This value is generally accepted engineering practice for design of gravity sewers.

Interceptor capacities for the Mystic, Stonington Borough, and Pawcatuck systems are presented in **Tables 4-1 through 4-3**, respectively.

Each interceptor is divided into major segments between 136 and 5,985 feet in length. The segments were determined based on the location of major connections, changes in pipe size, and/or significant changes in pipe capacity. Within each segment, the hydraulic capacity was calculated for every reach (i.e. manhole to manhole). The capacities listed in Tables 4-1 through 4-3 represent the minimum capacity for any reach within the segment. The actual capacity of each segment may, however, be higher than the capacity listed in Tables 4-1 through 4-3 due to this calculation technique, particularly where the length of the limiting reach is short. This will be discussed in detail for individual segments in the following sections.

Mystic

Interceptors from Mystic WPCF to North Stonington Road

This system includes two major interceptors. The first interceptor starts at the Mystic WPCF on Edgemont Street and runs north in Greenmanville Avenue to a point just south of Riverbend Drive. At this point, it receives flow discharged by the force main from the Old Mystic Pumping Station. The second interceptor extends north from the Old Mystic Pumping Station to the intersection of Main Street and North Stonington Road.

The first interceptor begins as 30-inch pipe at its downstream end at the Mystic WPCF, and decreases to a 24-inch pipe at Roosevelt Street. This interceptor continues as a 24-inch until it reaches Pleasant Street, where it reduces to an 18-inch pipe and continues north to the connection with the 8-inch force main from the Old Mystic Pumping Station. The interceptor has an inverted siphon crossing under a culvert at the I-95 interchange. The second interceptor is an 18-inch pipe extending north from the pumping station to the intersection of Main Street and North Stonington Road.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-1 and as follows:

- 7.6 million gallons per day (mgd) between the Mystic WPCF and Roosevelt Street
- 3.9 mgd between Roosevelt Street and Hinckley Street
- 4.0 mgd in Greenmanville Avenue (Route 27) between Hinckley Street and Pleasant Street
- 2.5 mgd in Greenmanville Avenue between Pleasant Street and Olde Mistick Village

- **See Table 4-1**

See Table 4-2 (page 1)

See Table 4-2 (page 2)

See Table 4-3 (page 1)

See Table 4-1 (page 2)

- 2.5 mgd in Greenmanville Avenue between Olde Mistick Village and Riverbend Drive

- 2.3 mgd in Whitehall Avenue (Route 27) between Clipper Point Road and the intersection of Main Street and North Stonington Road

The above capacities are the same as shown in Table 4-1, except for the segment between Roosevelt Street and Hinckley Street. This segment includes one reach of 185 feet with a capacity of about 2.6 mgd. The capacity is based on Manning's Equation, assuming that the pipe is flowing full, but not surcharged. However, greater hydraulic throughput can be achieved if the pipe is allowed to surcharge (surcharged pipes are hydraulically similar to pressurized pipe). Surcharging may be acceptable over short lengths of pipe because the surcharging is not large enough to significantly impact flow in upstream pipe reaches. Therefore, based on upstream and downstream flow capacities, the segment can handle approximately 3.9 mgd, when slightly surcharged, without any adverse impacts.

Interceptor along Hinckley Street from Greenmanville Avenue to Cutter Drive Pumping Station

The 8-inch sewer in Hinckley Street discharges to the 24-inch interceptor in Greenmanville Avenue. A 4-inch force main from the Cutter Drive Pumping Station supplies the primary flow to the interceptor. The estimated full pipe capacity is 0.5 mgd at both the upstream and downstream ends of the interceptor with no intermediate capacity restrictions.

Interceptor along Roosevelt Street from Broadway Avenue to west of Peqoutsepos Cove

The downstream end of the 24-inch interceptor along Roosevelt Street connects to the 24-inch Broadway Avenue interceptor. The upstream end of the interceptor is located on the west side of the Pequotsepos Cove where it connects to the 10-inch force main from the East Mystic Pumping Station. The estimated full pipe capacity of the interceptor is 4.0 mgd.

Interceptor from the East Mystic Pumping Station to Allen Street

This interceptor is one of three major interceptors' tributary to the East Mystic Pumping Station and provides service to the area south of the pumping station. The interceptor is an 18-inch pipe from the pumping station to Hatch Street and has capacity of about 2.9 mgd. The interceptor reduces to a 15-inch pipe in Hatch Street and Allen Street and has a 1.6 mgd capacity.

Interceptor from the East Mystic Pumping Station to Mistuxet Avenue

This interceptor is also tributary to the East Mystic Pumping Station and provides service to the area north of the station. The interceptor is a 15-inch pipe from the pumping station to Golden Road Extension and has capacity of about 1.6 mgd. The interceptor reduces to a 12-inch pipe from Golden Street to Mistuxet Avenue with a

1.1 mgd capacity and then to an 8-inch pipe in Mistuxet Avenue to its end with a 0.5-mgd capacity.

The above capacities are the same as shown in Table 4-1, except for the segment between the East Mystic Pumping Station and Golden Road Extension. This segment includes a 130-foot reach with a capacity of 1.4 mgd. However, the segment can handle about 1.6 mgd when slightly surcharged, without any adverse impacts.

Interceptor from the East Mystic Pumping Station to Old Stonington Road
This interceptor is also tributary to the East Mystic Pumping Station and provides service to the area east of the station. The interceptor is an 18-inch pipe extending cross-country east and south to Route 1 and has capacity of about 1.9 mgd.

Stonington Borough

Interceptor from the Borough WPCF to Deans Mill Road
The main interceptor serving the area north (upstream) of the Borough begins at the Borough WPCF as a 24-inch pipe with an approximate capacity of 4.0 mgd. The interceptor then continues north on Front Street and then merges onto Water Street. The interceptor reduces to an 18-inch pipe as it crosses under the railroad tracks, and then reduces again to a 12-inch pipe in North Water Street. The 12-inch interceptor continues to a point just downstream from Quanaduck Cove, at which point a 6-inch force main from the Ensign Lane Pumping Station connects into it.

According to record drawings, the Ensign Lane Pumping Station and the interceptor heading north from the station were built under a separate contract in the early 1990's. The interceptor begins at the pumping station as an 18-inch pipe and continues north to Stony Brook. At this point, the interceptor changes to an 8-inch pipe. The 8-inch sewer continues to a location just upstream from Collins Road, at which point a 6-inch force main from the Shawondasee Drive Pumping Station connects into it. The interceptor upstream from the Shawondasee Drive Pumping Station is an 8-inch pipe, and terminates in Deans Mill Road.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-2 and as follows:

- 4.0 mgd between the Borough WPCF and the railroad tracks
- 2.3 mgd through the pipe jacking under the railroad tracks
- 1.8 mgd in Water Street and N. Water Street between the railroad tracks and a point just north of Palmer Street
- 2.1 mgd in Flanders Road from the Ensign Lane Pumping Station to Stony Brook
- 0.5 mgd in Flanders Road from Stony Brook to a point just north of Collins Road

- 0.5 mgd in Flanders Road and Deans Mill Road from the Shawondasee Pumping Station to the end of the pipe

The above capacities are the same as shown in Table 4-2, except for the segment between the railroad tracks and a point just north of Palmer Street. This segment includes one reach of 231 feet with a capacity of about 1.3 mgd, which is shown in Table 4-2. However, the segment can handle about 1.8 mgd, when slightly surcharged, without any adverse impacts.

Interceptor along Water Street from the Borough WPCF to Omega Street
This interceptor begins at the WPCF as a 24-inch and continues south (upstream) into the Borough along Northwest Street as a 15-inch pipe. At Water Street, it continues south changing to a 12-inch pipe, and then reduces to a 10-inch pipe. At the intersection of Water Street and Diving Street, the 10-inch interceptor changes to an 8-inch pipe and continues upstream until it terminates just south of Omega Street. The analysis does not show any evidence of capacity restrictions along the interceptor.

A short section of 8-inch sewer branches off this main interceptor and continues east along Diving Street toward the Diving Street Pumping Station. A 4-inch force main from the pumping station connects into this gravity sewer approximately halfway up the street. The capacity of this sewer is approximately 0.6 mgd.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-2 and as follows:

- 1.6 mgd between the Borough WPCF and Water Street
- 1.1 mgd in Water Street between Church Street and Harmony Street
- 0.8 mgd in Water Street between Harmony Street and Diving Street
- 0.5 mgd in Water Street between Diving Street and Omega Street

Interceptor along Mathew Street and Railroad Tracks from Water Street to Bayview Avenue
The 18-inch interceptor along Mathew Street connects to the 18-inch interceptor in Water Street at the downstream end. As the interceptor continues easterly (upstream) along the railroad tracks, it reduces to a 15-inch pipe just north of the tracks. The pipe terminates at Bayview Avenue.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-2 and as follows:

- 2.1 mgd in Mathew Street between Water Street and the railroad tracks
- 2.5 mgd from the railroad tracks to Bayview Avenue

Interceptor along Williams Street from North Water Street to Elm Street
This interceptor branches off of the trunk line, or main interceptor, at North Water Street and services the area to the east. The interceptor starts as a 12-inch pipe in Williams Street and continues east along Cutler Street. In Cutler Street, the interceptor changes from a 12-inch pipe to a 10-inch pipe, and changes again to an 8-inch pipe further upstream. The 8-inch interceptor continues north on Elm Street and terminates at Town Hall.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-2 and as follows:

- 1.1 mgd in Williams Street between North Water Street and North Main Street
- 0.7 mgd in Cutler Street from North Main Street to Trumbull Avenue
- 0.5 mgd in Cutler Street from Trumbull Avenue to Elm Street
- 0.5 mgd in Elm Street from Cutler Street to the end of the pipe

Interceptor along North Main Street from Williams Street to Palmer Street
The downstream end of this 10-inch interceptor connects to the Williams Street interceptor, and travels about 1,000 feet north (upstream) to collect flow from several streets. The pipe capacity is approximately 0.75 mgd throughout the interceptor.

Interceptor along U.S. Route 1 from North Water Street to the Biofilter
This interceptor branches off of the trunk line, or main interceptor, at North Water Street as an 18-inch pipe and services the area to the west. As the interceptor continues westerly (upstream) along U.S. Route 1, it reduces to a 15-inch pipe just east of Collins Road. The pipe terminates at the biofilter near Rose Lane.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-2 and as follows:

- 2.2 mgd in U.S. Route 1 between North Water Street and a location east of Collins Road
- 4.4 mgd from east of Collins Road to the biofilter near Rose Lane

Pawcatuck

Interceptor from Pumping Station No. 3 to Interstate I-95
This system includes three major interceptors. The first starts at Pumping Station No.3 and runs north in River Road to a point just south of Burdick Lane where it receives flow discharged by the 12-inch force main from Pumping Station No. 1. The second extends north from the Pumping Station No. 1 to the intersection of Liberty Street and Glasgow Road where it receives flow discharged by the 6-inch force main from White Rock Road Pumping Station. The third extends north from the White Rock Road Pumping Station to I-95.

The first interceptor begins as 30-inch pipe at its downstream end at the Pawcatuck WPCF and decreases to a 24-inch pipe at Clark Street. The interceptor continues as a 24-inch pipe in Mechanic Street until it reaches a point just south of Burdick Lane and connects to the 12-inch force main from Pumping Station No. 1.

The second interceptor begins as a 24-inch pipe at Pumping Station No.1 and extends north in Mechanic Street and West Broad Street to Liberty Street. The interceptor decreases to a 21-inch pipe in Liberty Street. The interceptor continues north cross country along the Pawcatuck River as a 20-inch pipe, and increases to a 21-inch pipe where it intersects Walnut Street. The 21-inch pipe continues north to Stillman Avenue. At River Street, the pipe size decreases to 18-inch diameter and continues south in Antoinette Street, and then west in West Arch Street to Liberty Street continuing north to Glasgow Road.

The third interceptor is a 21-inch diameter pipe extending north from the White Rock Road Pumping Station.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-3 and as follows:

Interceptor 1:

- 7.5 mgd in River Road between Pumping Station No. 3 and Clark Street
- 5.1 mgd in River Road between Clark Street and Pumping Station No. 1

Interceptor 2:

- 4.2 mgd in Mechanic Street between Pumping Station No. 1 and Liberty Street
- 3.3 mgd in Liberty Street between West Broad Street and cross country
- 2.3 mgd in the 20-inch cross-country segment along the Pawcatuck River
- 2.8 mgd in the 21-inch cross-country and Stillman Avenue segment to the intersection of River Street
- 6.4 mgd in River Street/Antoinette Street/West Arch Street between Stillman Avenue and Woodlawn Street
- 3.2 mgd in West Arch Street between Woodlawn Street and Liberty Street
- 3.2 mgd in Liberty Street between West Arch Street and Glasgow Road

Interceptor 3:

- 2.4 mgd in Liberty Street between White Rock Road to the end of the pipe (intersection with Interstate 95)

The above capacities differ from those shown in Table 4-3 in five of the ten segments. Two of these segments are in Interceptor 1, two are in Interceptor 2, and one is in Interceptor 3.

The first segment that differs in capacity is located in River Road between Pumping Station No. 3 and Clark Street. This segment includes one reach of 84-feet with a capacity of about 7.1 mgd, which is shown in Table 4-3. However, the segment can handle about 7.5 mgd, when slightly surcharged, without any adverse impacts.

The second segment that differs in capacity is located in Mechanic Street between Clark Street and Pumping Station No. 1. This segment includes a 114-foot reach with a capacity of 3.1 mgd, which is shown in Table 4-3. However, the segment can handle about 5.1 mgd, when slightly surcharged, without any adverse impacts.

The third segment is the 21-inch cross-country interceptor along the Pawcatuck River. This segment includes one reach of 177 feet with a capacity of about 1.5 mgd, which is shown in Table 4-3. However, the segment can handle about 2.8 mgd, when slightly surcharged, without any adverse impacts.

The fourth and fifth segments are located in Liberty Street. The fourth segment extends from West Arch Street to Glasgow Road. This segment includes a 299-foot reach with a capacity of 2.9 mgd, as shown in Table 4-3. However, the segment can handle about 3.2 mgd without any adverse impacts. The fifth segment extends from White Rock Road to the end of the pipe at Interstate 95. This segment includes a 359-foot reach with a capacity of 2.4 mgd. However, the segment can handle about 3.2 mgd, when slightly surcharged, without any adverse impacts.

Interceptor along Mary Hall Road and Greenhaven Road from Pumping Station No. 3
This 8-inch interceptor, which runs along a small section of Greenhaven Road and Mary Hall Road to Pumping Station No. 3, is about 2,800 feet long. Table 4-3 shows a minimum capacity of 0.4 mgd in a 250-foot reach of this segment in Mary Hall Road. However, this segment can handle additional flow, when slightly surcharged, without any adverse impacts.

Interceptor along Mystic Avenue from River Road to Pawcatuck Avenue
The 10-inch interceptor along Mystic Avenue serves a small area west of the trunk line and slightly north of the WPCF. The interceptor has an approximate pipe capacity of 0.6 mgd. The 10-inch pipe continues upstream along Trumbull Street to the intersection of Pawcatuck Avenue. At this location, the interceptor decreases to an 8-inch pipe and continues west along Pawcatuck Avenue to Hawley Street, where the pipe ends. However, there is a 2-inch force main from the Pawcatuck Avenue Pumping Station that connects into this pipe terminus.

This 8-inch segment includes a 240-foot reach with a pipe capacity of 0.7 mgd, as shown in Table 4-3. However, this segment can handle about 1.0 mgd, when slightly surcharged, without any adverse impacts.

Interceptor along Clark Street and cross-country from River Road to Pumping Station No. 2

This interceptor receives flow from the Pumping Station No. 2 force main and serves an area west of the railroad tracks and south of Burdick Lane. The interceptor runs west from River Road in Clark Street, crosses the railroad tracks and continues west cross-country to Pumping Station No. 2. The pipe is 15-inch diameter from its connection to the 30-inch trunk line in River Road for about 325 feet, 18-inch diameter for about 1,250 feet, 15-inch diameter for about 630 feet and 18-inch diameter for about 425 feet.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-3 and presented below:

- 7.2 mgd in Clark Street between River Road and Pawcatuck Avenue
- 3.4 mgd in the cross-country segment between Pawcatuck Avenue and a location just west of the railroad tracks
- 7.2 mgd in the 15-inch cross-country segment west of the railroad tracks
- 3.7 mgd in the remaining 18-inch cross-country segment to Pumping Station No. 2

Interceptor along Spellman Drive and South Broad Street (US Route 1)

This interceptor receives flow from the Extrusion Drive Pumping Station force main and serves the area along Spellman Drive and South Broad Street. The interceptor extends west from Pumping Station No. 2 to Spellman Drive as an 18-inch pipe. The connection from the Extrusion Drive Pumping Station force main is about 600 feet upstream from the end of Spellman Drive, which is where the interceptor turns north. The pipe continues north as an 18-inch pipe for another 740 feet, and reduces to a 15-inch pipe for the remainder of Spellman Drive. The pipe is 8-inch diameter for about 625 feet east in South Broad Street. A relatively new 18-inch interceptor extends east along South Broad Street from the 8-inch pipe.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-3 and presented below:

- 2.4 mgd in Spellman Drive between Pumping Station No. 2 and manhole 6-24 (15-inch connection)
- 1.8 mgd in Spellman Drive between manhole 6-24 and South Broad Street
- 0.5 mgd in South Broad Street between Spellman Drive and manhole 6-30 (18-inch connection)
- 2.1 mgd in South Broad Street between manhole 6-31 and the end of the pipe

The above capacities are the same as shown in Table 4-3, except for two of the segments. The first segment that differs in capacity between Table 4-3 and the previous discussion is located in Spellman Drive between Pumping Station No. 2 and manhole 6-24. This segment includes a 116-foot reach with a capacity of about 1.3 mgd, which is shown in Table 4-3. However, the segment can handle about 2.4 mgd, when slightly surcharged, without any adverse impacts.

The second segment that differs in capacity is located in South Broad Street between manhole 6-30 and the end of the pipe, also shown in Table 4-3 as the 18-inch segment. This segment includes a 230-foot reach with a capacity of 1.6 mgd. However, the segment can handle about 2.1 mgd, when slightly surcharged, without any adverse impacts.

Cross-country Interceptor from Spellman Drive to Force Main from the Extrusion Drive Pumping Station
The downstream end of the interceptor connects to the 15-inch interceptor in Spellman Drive as an 18-inch pipe. The upstream end of the pipe is 10-inch and connects to the 6-inch force main from the Extrusion Drive Pumping Station. The pipe capacity is approximately 0.7 mgd.

Interceptor along Constitution Avenue from the Extrusion Drive Pumping Station to South Broad Street (U.S. Route 1)
The downstream end of the 10-inch interceptor connects to the suction side of the Extrusion Drive Pumping Station. The interceptor continues west along Constitution Avenue and Oriole Street to Wren Street. The pipe then travels north on Wren Street. Finally, the interceptor continues onto Robin Street where it terminates just south of South Broad Street (U.S. Route 1). The pipe capacity is approximately 0.6 mgd.

Interceptor along Burdick Lane from Pumping Station No. 1 to West Broad Street
The interceptor begins at Pumping Station No. 1 as a 10-inch pipe, and serves the area west of the trunk line and north of Clark Street. The interceptor continues west cross-country to Burdick Lane. The interceptor then changes to a 12-inch pipe and continues north along Moss Street. The pipe makes several bends before turning onto Palmer Street, where it becomes a 10-inch pipe. After continuing north on Courtland Street for a short distance, the interceptor decreases to an 8-inch pipe and travels cross-country to Mayflower Avenue. The interceptor increases to a 10-inch pipe along Mayflower Avenue, but then decreases again to an 8-inch pipe while continuing north through an easement north of South Broad Street before terminating at West Broad Street.

The estimated hydraulic capacities of each sewer segment are summarized in Table 4-3 and as follows:

- 1.5 mgd in Burdick Lane between Mechanic Street and the railroad tracks
- 1.3 mgd between the railroad tracks and Palmer Street

- 0.8 mgd as a 10-inch pipe in Palmer Street and Courtland Street
- 1.0 mgd in the right-of-way (ROW) easement between Courtland Street and Mayflower Avenue
- 0.8 mgd as a 10-inch pipe in Mayflower Avenue and South Broad Street
- 0.5 mgd in the ROW easement between South Broad Street and West Broad Street

Interceptor along West Broad Street from Liberty Street to Wilcox Manor
The 10-inch interceptor in West Broad Street serves the area west of the trunk line and north of the Burdick Lane area, and has a capacity of about 1.1 mgd. The interceptor changes to an 8-inch pipe at the intersection of Lincoln Avenue, and continues as such along West Broad Street to its terminus at Wilcox Manor. The approximate pipe capacity of this segment is 1.0 mgd.

4.2.2 Pumping Stations

Data such as pump motor horsepower, dimensions and configuration of wet wells and backup power capability was obtained from the WPCA and via station inspections conducted by CDM. This information will be used in evaluating the present operating efficiency of the stations and determining the upgrades necessary to provide adequate capacity for projected flows from new development and sewer system extensions for the planning period.

The stations are described in the following sections.

Mystic

The Mystic sewer system includes five pumping stations.

<u>The East Mystic Pumping Station</u> is located on Hewitt Road near Judd Avenue. The service area includes the sewer system east of the Pequotsepos Cove and south of Mistuxet Avenue. The station is a built in place structure with separate enclosures for the wet well and pumps and a single story above grade structure. A hatch outside the building provides access to the wet well.

The station has two pumps, each driven by a close coupled, 10 hp, 1170 RPM constant speed motor. The pumps are vertical, non-clog dry pit type with mechanical seals and have a design capacity of 800 gallons per minute (gpm). Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by a 45KW, 6.3KVA diesel engine generator located in the building. Diesel fuel is stored in an above ground tank outside the building.

<u>The Cutter Drive Pumping Station</u> is located at the east end of Cutter Drive. The station provides local service to houses on five streets in the area. The station is a factory built prefabricated reinforced concrete below ground station with separate

enclosures for the wet well valve vault. Access to both wet well and valve vault is provided by hatches.

The station has two submersible pumps each driven by an 11.3 hp, 1750 RPM constant speed motor. The pumps have a design capacity of 110 gpm. The discharge piping of each pump has a check valve in the valve vault. The control panel is located in a pedestal cabinet on the site. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by a diesel engine generator located on the site in a weather tight cabinet. Diesel fuel is stored in an above ground tank.

The Maritime Drive Pumping Station is located on Maritime Drive and serves commercial establishments south of Coogan Boulevard. The station is a factory built prefabricated reinforced concrete below ground station with separate enclosures for the wet well valve vault. Access to both wet well and valve vault is provided by hatches.

The station has two submersible pumps each driven by a 24 hp, 1750 RPM constant speed motor. The pumps have a design capacity of approximately 320 gpm. The discharge piping of each pump has a check valve in the valve vault. The control panel is located in a pedestal cabinet on the site. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by an 80KW, 100KVA diesel engine generator located on the site in a weather tight cabinet. Diesel fuel is stored in an underground tank.

The Old Mystic Pumping Station is located on Greenmanville Avenue (Route 27) south of Pequot Trail. The service area includes the sewer system north of Clipper Point Road. The station is a reinforced concrete below ground structure with separate enclosures for the wet well and pumps. Access to both the wet well and pump chamber is provided by hatches.

The station has two pumps each driven by a close coupled, 7.5 hp, 1150 RPM constant speed motor. The pumps are vertical, non-clog dry pit type with mechanical seals and have a design capacity of 450 gpm. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by a 45KW, 56.2KVA propane engine generator located in the station. Propane cylinders are located on a concrete slab at grade.

The Diversion Pumping Station is at the Mystic WPCF. It is unique in that it pumps underflow from the treatment plant's primary clarifiers to the Stonington Borough WPCF. The pumps are vertical, non-clog dry pit and have a design capacity of 230 gpm.

Stonington Borough

The Stonington Borough sewer system includes seven pumping stations.

The Diving Street Pumping Station is located at the east end of Diving Street. The station provides service to a small area on Stonington Point. The station is a factory built prefabricated reinforced concrete below ground station with separate enclosures for the wet well valve vault. Access to both wet well and valve vault is provided by hatches. The pumps were recently replaced.

The Ensign Lane Pumping Station is located on Flanders Road at Ensign Lane. The service area includes the sewer system north of Stonington Road (US Route 1) including the flow pumped by the Shawondasee Pumping Station. The station also receives the underflow from the Mystic WPCF Diversion Pumping Station.

The original submersible pumps were recently replaced to provide capacity for the Mystic WPCF underflow. Additional improvements were also made including a new building containing a chemical feed system for sulfide control and carbon scrubber odor control system. The pumps are located in a 7-foot diameter wet well.

The station has two submersible pumps each driven by a 40 hp, 1800 RPM motor with variable speed drive. The pumps have a design capacity of 590 gpm. Pump control is based on wet well liquid level provided by a transducer type level indicator with a mercury type float switch back-up and alarm system. The pump control panel and standby power generator are located in the building. The generator is an 80KW, 100KVA diesel engine generator with a skid mounted fuel storage tank.

The Shawondasee Pumping Station is located on Flanders Road at Shawondasee Drive. The service area includes the sewer system in Shawondasee Drive, Meadowlark Road, Carriage Drive and Hillcrest Drive, and the sewer system in Flanders Road extending north into Deans Mill Road. The station is a factory built prefabricated reinforced concrete below ground station with separate enclosures for the wet well valve vault. Access to both wet well and valve vault is provided by hatches.

The station has two submersible pumps each driven by a 3.7 hp, 1750 RPM constant speed motor. The pumps have a design capacity of 125 gpm. The discharge piping of each pump has a check valve in the valve vault. The control panel is located in a pedestal cabinet on the site. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by a 25KW, 31KVA diesel engine generator located on the site in a weather tight cabinet. Diesel fuel is stored in a below ground tank.

The Lindberg Road Pumping Station is located on Lindberg Road near Noyes Street. The service area includes all of Lords Point including the flow from the three other pumping stations on Lords Point. The station is a factory built prefabricated

reinforced concrete station with an above grade wood frame structure built over the wet well. Separate enclosures are provided for the wet well valve vault. Hatches inside the wood frame building provide access to both the wet well and valve vault. The station also has a recently constructed wood frame building containing a chemical feed system for sulfide control.

The station has two submersible pumps each driven by a 15 hp, 1750 RPM constant speed motor and have a design capacity of 180 gpm. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by a 50KW, 62.5KVA diesel engine generator located in the building. Diesel fuel is stored in an above ground tank outside the building.

The Boulder Avenue, Wolcott Avenue and Quarry Path Pumping Stations are located on Lords Point and provide service to houses on Lords Point. The stations are 6-foot diameter factory built prefabricated reinforced concrete below ground stations. Access to the wet well is provided by a hatch.

Each station has two submersible pumps driven by 2.8 hp, 1750 RPM constant speed motors. The pumps have a design capacity of 100 gpm. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. The control panel is located in a pedestal cabinet on the site. The pedestal cabinet has an externally mounted receptacle for a portable generator connection to provide standby power.

Pawcatuck

The Pawcatuck sewer system includes six pumping stations.

Pumping Station No. 3 is located on the east side of River Road near Mary Hall Road. All flow to the Pawcatuck WPCF is pumped at this station. The station is a built in place structure with separate enclosures for the wet well and pumps and a single story above grade structure. Recent improvements have been made to the station including replacement of the pumps and motors.

The station has two pumps each driven by a close coupled, 25 hp, 1190 RPM motor with variable speed drive. The pumps are vertical, non-clog dry pit type with mechanical seals and have a design capacity of 1,500 gpm. Pump control is based on wet well liquid level provided by a compressed air system with a mercury type float switch back-up and alarm system. A 40KW diesel engine generator located inside the building provides on-site standby power. Diesel fuel is stored outside the building in a below ground tank. The wet well influent channel has a newly installed comminutor (September 2002), similar to those installed at the Mystic and Borough WPCF's.

Pumping Station No. 2 is located east of Spellman Road. The station serves the western part of the sewer system extending north to the streets along Stonington Road (US Route 1) and west to Robin Street including flow from the Extrusion Drive

Pumping Station. The station is a built in place structure with a single story above grade structure and separate wet well containing the pumps. Access to the wet well is provided by a hatch at grade.

The station has two submersible pumps each driven by a 29 hp, 1150 RPM constant speed motor. The pumps have a design capacity of 800 gpm. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by a 70KW, 88KVA diesel engine generator located in the building. Diesel fuel is stored outside the building in an underground tank.

The Extrusion Drive Pumping Station is located at the southern end of Extrusion Drive. The station serves the westernmost part of the Pumping Station No. 2 service area. The station is a factory built prefabricated reinforced concrete below ground station with separate enclosures for the wet well valve vault. Access to both wet well and valve vault is provided by hatches.

The station has two submersible pumps each driven by a 7.5 hp, 1750 RPM constant speed motor. The pumps have a design capacity of 350 gpm. The discharge piping of each pump has a check valve in the valve vault. The control panel is located in a pedestal cabinet on the site. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. A diesel engine generator located on the site in a weather tight cabinet provides on-site standby power. Diesel fuel is stored in a below ground tank.

The Pawcatuck Avenue Pumping Station is located on Pawcatuck Avenue west of Ingersoll Street. The station provides service to several houses west of Ingersoll Street. The station is a 5-foot diameter factory built prefabricated reinforced concrete below ground station. Access to the wet well is provided by a hatch.

The station has two submersible grinder pumps each driven by a 3.0 hp, 3450 RPM constant speed motor. The pumps have a design capacity of 70 gpm. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. The control panel is located in a pedestal cabinet on the site. The pedestal cabinet has an externally mounted receptacle for a portable generator connection to provide standby power.

Pumping Station No. 1 is located on the east side of River Road near Prospect Street. The service area includes the sewer system north of the station including the flow pumped by the White Rock Road Pumping Station. The station is a built in place structure with a single story above grade structure and separate wet well containing the pumps. Access to the wet well is provided by a hatch at grade.

The station has two submersible pumps each driven by an 18 hp, 860 RPM constant speed motor. The pumps have a design capacity of 1,125 gpm. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by a

70KW, 88KVA diesel engine generator located in the building. Diesel fuel is stored in a tank inside the building.

The White Rock Road Pumping Station is located on White Rock Road east of Liberty Street (Route 2). The station provides service to local commercial establishments. The station is a factory built prefabricated reinforced concrete below ground station with separate enclosures for the wet well valve vault. Access to both wet well and valve vault is provided by hatches.

The station has two submersible pumps each driven by a 30 hp, 1750 RPM constant speed motor. The pumps have a design capacity of 300 gpm. The discharge piping of each pump has a check valve in the valve vault. The control panel is located in a pedestal cabinet on the site. Pump control is based on wet well liquid level provided by an ultrasonic level indicator with a mercury type float switch back-up and alarm system. On-site standby power is provided by a 100KW, 125KVA natural gas engine generator located on the site in a weather tight cabinet.

Present Condition and Capacity

Table 4-4 lists all of the WPCA's wastewater pumping stations and their existing capacity. The capacity reported in this study is "firm" capacity, defined as the maximum station capacity with the largest pump out of service.

The general structural and mechanical condition of the pumping stations is good. Deficiencies identified from the data review and site inspections are summarized below.

Pumping Station No. 1

The cycle time between pump starts is less than the recommended minimum of 15 minutes for motors of the size at this station. Presently the operating range of the wet well is 2-foot, which provides 668 gallons of storage and results in a minimum cycle time of 4.75 minutes per pump. If the storage were to be maximized by operating the pumps over the full vertical distance between the invert of the influent pipe to the wet well and the pump cut out elevation, the minimum cycle time would increase to 10.3 minutes.

The minimum recommended cycle time could be met by installing variable frequency drives, as was done recently at Pumping Station No. 3, and should be considered.

Pumping Station No. 2

The cycle time between pump starts is less than the recommended minimum of 15 minutes for motors of the size at this station. Presently the operating range of the wet well is 1.25 feet, which provides 655 gallons of storage and results in a minimum cycle time of 6.55 minutes per pump. If the storage were to be maximized by operating the pumps over the full vertical distance between the invert of the influent pipe to the wet well and the pump cut out elevation, the minimum cycle time would increase to 18.3 minutes. Revising the pump operating range should be considered at this station.

See Table 4-4

Pumping Station No. 3
A new comminutor was installed in the station in September 2002. Prior to this improvement, clogging of the pumps was a common problem due to passing of large solids through the influent channel. The new comminutor is expected to alleviate this problem.

Extrusion Drive Pumping Station
The manufacturer of the existing standby generator is no longer in business, and therefore replacement parts and manufacturer assistance are unavailable. Replacement of this generator should be considered.

4.3 Wastewater Flow Analysis

An analysis of both existing and future peak wastewater flow from each area was conducted to determine the impacts to the collection system, and to identify pipe segments that are or may be inadequate to handle projected peak flows, depending on actual development. The existing and future wastewater flow information for each collection system is based upon the system-wide flow projections presented in Section 3.

Existing and future peak wastewater flows, in addition to corresponding interceptor capacities for the Mystic, Stonington Borough, and Pawcatuck systems are presented in **Tables 4-5 through 4-7**.

4.3.1 Interceptors

A wastewater flow analysis was performed on the existing interceptors for each collection system. Each collection system was broken down into smaller sub-areas, in a manner similar to the capacity analysis discussed previously. Existing and future flow information for domestic flow, presented in Section 3, was apportioned to each sub-area based on the number of residential lots. The number of lots was determined by the total acreage of each collection sub-area and its minimum lot size specified in the zoning designation. Institutional, industrial, and commercial flows were attributed directly to the sub-areas where they are projected to occur. A cumulative flow for each sub-area was calculated by adding the flow contributed by the particular sub-area with all of the flow entering the sub-area from upstream reaches of the collection system. Infiltration and inflow (I/I) was apportioned by sub-area size and then peaked based on historical WPCF flow records. A cumulative peak I/I flow was determined for each sub-area. The cumulative peak I/I was then added to the cumulative flow for each sub-area to determine the total cumulative peak flow that is projected to occur in that particular interceptor reach. The highest cumulative flow occurred in the most downstream sub-area of each collection system and equaled the peak instantaneous flow at the WPCF.

The future wastewater flow analysis was performed similar to the existing wastewater flow analysis, except that it accounted for future residential, institutional, industrial, and commercial flows, and the sewer needs areas.

See Table 4-5

See Table 4-6 (page 1)

See Table 4-6 (page 2)

See Table 4-7 (page 1)

See Table 4-7 (page 2)

Tables 4-5 through 4-7 present the results from both the wastewater flow analysis for existing and future conditions and the capacity analysis. Comparison of the pipe capacity and the projected peak flow allow determination of whether the pipe will be adequate. The pipes can sufficiently handle existing and future flows if projected peak flows do not exceed 80 percent of the pipe's capacity.

The results from this analysis are discussed below.

Mystic

All of the interceptors within the Mystic collection system are sufficient for existing peak wastewater flows. In addition, all interceptors are sufficient for projected future peak wastewater flows, as shown in Table 4-5.

The existing peak wastewater flows vary between 6 percent of capacity at the most upstream reaches of the collection system and 56 percent of capacity near the Mystic WPCF, whereas the future peak wastewater flows vary between 7 percent and 73 percent of capacity, respectively.

Stonington Borough

All of the interceptors within the Stonington Borough collection system are sufficient for existing peak wastewater flows. In addition, all interceptors are sufficient for projected future peak wastewater flows, as shown in Table 4-6.

The existing peak wastewater flows vary between 2 percent of capacity at the upstream reaches of the collection system and 47 percent of capacity in Flanders Road. In addition, the future peak wastewater flows vary between 4 percent and 62 percent of capacity, respectively.

Pawcatuck

All of the interceptors within the Pawcatuck collection system are sufficient for existing peak wastewater flows. In addition, all interceptors are sufficient for future peak wastewater flows except for two pipe segments, as shown in Table 4-7.

The existing wastewater flows vary between 5 percent of capacity at the upstream reaches of the collection system and 49 percent of capacity in Mechanic Street near the southern portion of the collection system.

The projected future peak wastewater flows vary between 13 percent of capacity at the upstream reaches of the collection system and 88 percent of capacity in Mechanic Street near the southern portion of the collection system. There are two pipe segments within the Pawcatuck collection system that exceed theoretical 80 percent capacity, based on Manning's Equation.

A 24-inch pipe segment of about 115 feet in Mechanic Street is the limiting segment in this 2,000-foot pipe reach and will theoretically be loaded at 88 percent of capacity at the projected peak flow. Although typical design criteria use 80 percent capacity as a

guideline, at 88 percent capacity this pipe will still have sufficient excess capacity to allow for proper venting and buffer capacity. In addition, the pipe segments upstream and downstream of this 115-foot limiting pipe segment are capable of handling significantly higher flows. The wastewater flow is based upon future population projections and proposed development in this area. If actual growth exceeds these projections, consideration should be given to replace this pipe segment with a larger diameter pipe in the future.

During projected peak flows, there is a limiting pipe segment in Mary Hall Road that exceeds the 80 percent capacity design criteria. The 250-foot pipe segment in Mary Hall Road is expected to flow at 91 percent capacity during projected peak flows. Since downstream pipe segments can handle significantly higher flows, the projected peak flow through this pipe segment should not have any impacts to the rest of the pipe reach in Mary Hall Road. However, if actual growth exceeds the population projections and development in this area, consideration should be given to replace this 250-foot pipe segment with a larger diameter pipe in the future.

4.3.2 Pumping Stations

A comparison of pumping station capacities and wastewater flows, for both existing and future peak flow conditions, was performed for each collection system. **Table 4-8** shows the results of this comparison.

The results of this comparison are discussed below.

Mystic

All of the pumping stations within the Mystic collection system have adequate capacity to handle all existing and future peak wastewater flows.

Stonington Borough

All of the pumping stations within the Stonington Borough collection system can adequately handle existing peak wastewater flows. However, in order to adequately handle projected future peak wastewater flows, the Shawondasee Drive pumping station must be upgraded. The upgrade would include replacing the existing submersible pumps with larger pumps in order to handle the increased flow. The existing 6-inch force main can sufficiently handle the future peak wastewater flow from this pumping station. This improvement can be timed to coincide with the actual pace of development in the area.

Pawcatuck

All of the pumping stations within the Pawcatuck collection system can adequately handle existing peak wastewater flows. However, two pumping stations must be upgraded in order to adequately handle projected future peak wastewater flows, including Pumping Station No. 3 and the White Rock Road pumping station.

See Table 4-8

Pumping Station No. 3 can easily be upgraded to handle future peak wastewater flows by adding another pump to the station. The station is designed to allow another pump to be added within the existing dry well. In addition, the existing 20-inch force main can sufficiently handle the projected peak wastewater flows.

The White Rock Road Pumping Station can be upgraded to handle future peak wastewater flows by replacing the existing submersible pumps with two larger pumps. The existing 6-inch force main can sufficiently handle the projected peak flows.

4.4 Infiltration / Inflow Program Summary

As part of the facilities planning process, limited collection system monitoring was performed to understand the extent of infiltration/inflow (I/I) flows. Infiltration is defined as water, other than wastewater, that enters a sewer system through such means as leaky pipes, pipe joints, connections, or manholes. Inflow is defined as water, other than wastewater, that enters a sewer system from sources such as roof gutters and downspouts, cellar drains, basement sump pumps, manhole covers, and others.

The monitoring program performed for each of the three separate collection systems included:

- Identify ratio of flow monitoring locations for each of the three collection systems. Locations were chosen so that flows could be attributed to sub-areas situated off of the main interceptors. See Table 4-1.
- Two nights of flow monitoring (night sticking) at each location.
- Determine if excessive I/I flows exist. (Excessive I/I is that flow which is less economic to transport and treat than to remove).
- Prioritize key subsystems exhibiting high I/I requiring additional evaluation.
- Conduct additional flow monitoring in locations identified based on the first round of monitoring.

A collection system study was performed to define the extent and problem areas of Infiltration /Inflow (I/I) in the wastewater collection system. The first part of the program involved identifying sub-areas located off of the main interceptors for each of the three sewer districts. Flow monitoring locations were then selected so that extraneous flows measured in a length of sewer pipe could be attributed to a specified sub-area upstream of the monitoring point. Flow monitoring was conducted for the purpose of targeting and prioritizing the subsystems exhibiting excessive I/I.

As a result of the flow monitoring, inflow was found to be excessive in seven study areas, all of which are located within the Mystic drainage basin. **Table 4-9**

See Table 4-9

summarizes the areas that exceeded an I/I rate of 5,000 gpd per inch-mile of pipe, which in CDM's experience is symptomatic of excessive flow.

Table 4-9 lists the seven areas that may be contributing excessive I/I into the Mystic collection system. The I/I program was conducted over three late night/early morning periods, with each location being monitored twice. The three monitoring dates were April 11, April 17, and April 19, 2001. The first night of testing for each location provided the most useful data, in that the flow results from each location correlated well with monitored flows upstream and downstream of each location. All of the results listed above are based upon data from April 11, 2001.

Based on the results shown in Table 4-9, four of the worst areas were targeted for additional flow isolation. The additional flow-isolation program took place during the week of May 14, 2001. Dry weather over the previous several weeks had already diminished the amount of groundwater entering the system. However, most of the target areas were located along the Mystic River, which lessened the impact of dry weather to the groundwater levels in these areas.

4.5 Odor Control Facility at Rose Lane

In 1998, construction of the transmission main carrying underflow from the Mystic WPCF to the Borough WPCF was completed. The purpose of the force main is to allow diversion of a portion of the Mystic WPCF flow in order to alleviate overload conditions at the Mystic facility. The underflow is a combination of raw wastewater and sludge from the primary clarifiers. The force main system consists of one 6-inch and one 12-inch pipe arranged in parallel, from the Mystic WPCF to the new odor control facility near the intersection of Rose Lane and U.S. Route 1. The force main from the Mystic WPCF ends at the odor control facility, and feeds into a gravity sewer that continues to the Stonington Borough collection system. The underflow is pumped through the 6-inch pipe only, while the 12-inch pipe is reserved for future flows.

When the system was put into service in August/September 1999, the underflow was treated with sodium hypochlorite at the Mystic WPCF for hydrogen sulfide control and to prevent odor formation in the transmission system. The Town switched from sodium hypochlorite to Bioxide™ shortly after start-up, after experiencing treatment problems at the Borough facility associated with excess sodium hypochlorite. Bioxide™ is also added at the Lindberg Road Pumping Station.

The odor control facility is located on a small parcel adjacent to a high point on U.S. Route 1 near the intersection of Rose Lane. The facility consists of a small building, which houses a blower and controls, and a chemical feed system, and the outdoor biofilter. The biofilter is located adjacent to the building, and consists of perforated PVC pipe system covered by wood chips. The blower draws air from the manhole at the terminus of the force main and forces the air up through the biofilter via the perforated piping. The chemical feed system is used to dose hydrogen peroxide in the gravity sewer downstream of the station, but it is only used when necessary.

According to the WPCA, there is no standard operation and maintenance (O&M) program in effect for the odor control facility. The biofilter design documents recommend replacing the filter media every 2 to 3 years, which is consistent with typical biofilter O&M programs. The life of a biofilter is a function of the surface area, type of media, odor producing gas(es) and its concentration entering the filter.

4.6 Summary of Recommended Improvements

Based upon the information presented in this section, CDM's recommendations regarding improvements to the Town's wastewater collection system are as follows. These improvements are needed regardless of the overall town-wide wastewater treatment alternative implemended.

- **Existing Interceptor and Pumping Station Improvements**
  - *Mystic Collection System:* No recommended improvements.
  - *Stonington Borough Collection System:* No recommended improvements.
  - *Pawcatuck Collection System:*
    - *Pumping Station No. 1*: Installation of variable frequency drives should be considered to increase the cycle time between pump starts.
    - *Pumping Station No.* 2: Revision of the pump operating range at this station should be considered to increase the cycle time between pump starts.
    - *Pumping Station No.* 3: A new comminutor was installed in this station in September 2002 to prevent clogging of the pumps.
    - *Extrusion Drive*: Replacement of the existing generator at this station should be considered before maintenance requirements increase with age, and also because the manufacturer is no longer in business.
- **Pipe Capacity Upgrade**
  - *Mystic Collection System*: No recommended improvements.
  - *Stonington Borough Collection System*: No recommended improvements.
  - *Pawcatuck Collection System*:
    - One segment of pipe in Mechanic Street is barely sufficient to handle projected future peak wastewater flows. If actual development of this area exceeds the future projections presented in this report, conveyance capacity of this pipe segment should be augmented to handle the projected flows.

- The projected peak flow of one segment of pipe in Mary Hall Road was calculated to exceed the 80 percent capacity design criteria. However, additional capacity in downstream pipe sections will allow this segment to sufficiently handle the projected peak flows without any adverse impacts to the pipe reach in Mary Hall Road.

- **Future Pumping Station Capacity Upgrades**
  - *Mystic Collection System:* No recommended improvements.
  - *Stonington Borough Collection System:*
    - Shawondasee Drive Pumping Station: Consideration should be given to replacing the existing submersible pumps with larger pumps to meet the projected future peak wastewater flows, as actual development dictates.
  - *Pawcatuck Collection System:*
    - *Pumping Station No. 3*: Consideration should be given to adding another pump within the existing dry well to meet the projected future peak wastewater flows, as actual development dictates.
    - *White Rock Road Pumping Station*: Consideration should be given to replacing the existing submersible pumps with larger pumps to meet the projected future peak wastewater flows, as actual development dictates.

- **Future Force Main Upgrades**
  - *Mystic Collection System*: No recommended improvements.
  - *Stonington Borough Collection System*: No recommended improvements.
  - *Pawcatuck Collection System*: No recommended improvements.

- **Inflow / Infiltration (I/I)**
  - Several days of night sticking were conducted to determine areas of high I/I. A more detailed evaluation of the sewer system should be implemented to target direct causes of I/I in the collection systems.

- **Costs**
  - Probable costs for implementing the recommended improvements are presented in **Table 4-10**.

See Table 4-10