Section 3
Projected Flows and Loads

3.1 Introduction

This section summarizes the development of projected wastewater flows and loads within the Town of Stonington in 2025. This evaluation was initially completed in July 2002, based on plant data from July 1999 to June 2002. Some minor changes in flows and loads have occurred since our analysis was initially performed. However, plant data beyond June 2002 was not reviewed because it would not change the previous conclusions. Changed conditions are largely related to the following:

- Mystic Color Labs in the Mystic service area has closed. This was the only permitted industrial use in Town. There are redevelopment plans for the site which include a 45-unit condominium development.

- The Stonington Green (River Crest Drive) subdivision that borders River Road, Aimee Drive, and Mark Drive has been constructed. This subdivision is sewered within the Pawcatuck service area.

Table 3-6 reflects the existing flow and load assumptions made in July 2002. These flows and loads are the basis for the collection system evaluation in Section 4 and the wastewater facilities evaluation in Section 5. Tables 3-7 through 3-14 reflect the minor existing conditions changes noted above. Tables 3-7 through 3-14 also project flows and loads for year 2025. These revised 2025 flows and loads are the basis for future planning including the water quality analysis (Section 6), the wastewater treatment alternatives evaluation (Section 7), and the recommended plan (Section 8).

This section documents the procedures and methods used to develop the flow and load projections used in this Wastewater Facilities Plan, and is separated into several sections:

- Section 3.2 presents a review of previous reports, studies and data;

- Section 3.3 presents the available population planning data that apply to the Town of Stonington, and develops population projections that are separated into the following areas of Stonington: Mystic, Borough, Pawcatuck, and "Remainder";

- Section 3.4 summarizes water consumption data for the water districts that provide service within the Town of Stonington;

- Section 3.5 summarizes recent flow and load data at each of Stonington's three wastewater treatment plants – the Mystic, Borough and Pawcatuck Water Pollution Control Facilities (WPCFs); and

- Section 3.6 develops and summarizes the projected future flows and loads.

3.2 Previous Reports, Plans and Studies

The following sources were reviewed as part of this task.

3.2.1 Plan of Development (May 1992)

The Town of Stonington Planning and Zoning Commission adopted a *Plan of Development* on May 21, 1992. This *Plan of Development* is a precursor of the *2004 Plan of Conservation and Development* and recommends the principles that should be followed as the Town develops. It outlines several goals, including short and long-term economic growth, preservation of the environment, management of housing construction, and infrastructure improvements. Among the items outlined in the *Plan of Development* that are pertinent to growth, development, and projections of future wastewater collection and treatment needs are:

- Goals for economic development include: 1) identification of potential sites for industrial and commercial expansion; 2) redevelopment and revitalization of the three downtown commercial areas of the Town; and 3) redevelopment and revitalization of the existing industrial sites of the Town.

- To manage growth of residential housing units in the Town to not more than 100 units per year.

- To designate areas of the Town where sewers will eventually be provided, and to develop a sewer avoidance program. No Town-wide subsequent work has been conducted regarding sewer planning prior to the Wastewater Facilities Plan, though a sewer avoidance program is in place.

3.2.2 Water and Sewer Needs Analysis, Stonington, CT (November 1997)

Prepared by Marin Environmental, Inc., this report analyzes the full build-out water and sewer needs for the Highway Interchange (HI) Zone, the MAN-Roland property, and the Rosalini's restaurant site. All three of these sites are located within the drainage area of the Pawcatuck WPCF. The following items outlined in this *Water and Sewer Needs Analysis* are pertinent to the Wastewater Facilities Plan:

- Commercial development, influenced heavily by tourism demands, was projected to be the most likely future use within the HI Zone. This zone consists of 257 acres in the northeast corner of Stonington, and is located along the Route 2 corridor. Full development of this area was expected by 2017. Most of the development was anticipated by 2007.

- The Town had reserved 200,000 gallons per day (gpd) of wastewater treatment capacity at the Pawcatuck WPCF to treat flow from North Stonington. This document noted that North Stonington's potential use of this capacity could be impacted by a potential 600-acre development in North Stonington for use as an

amusement park. However, since publication of the *Water and Sewer Needs Analysis*, the amusement park project is no longer projected to go forward.

- Projected average daily sewage flow, including the 200,000 gallon per day allotment from North Stonington, from the HI Zone, the MAN-Roland property, and the Rosalini's Restaurant site was as follows:

  - Five-year projection (2007): 620,000 gpd
  - Ten-year projection (2012): 910,000 gpd
  - Build-out projection (2017): 1,020,000 gpd

It should be noted that North Stonington has recently indicated that there are no plans to use the 200,000-gpd allotment. Stonington, with CTDEP's consent, will not continue to reserve this allotment in its planning effort.

3.2.3 Regional Conservation and Development Policy Guide for Southeastern Connecticut (October 1997)

The Southeastern Connecticut Council of Governments (SCCOG) prepared this report to provide guidance for coordinating land use planning at the municipal level, and to assist in planning efforts such as this Wastewater Facilities Plan. The following items outlined in this document are pertinent to the Wastewater Facilities Plan:

- The Southeastern Connecticut region has undergone some significant changes in recent years. These include the reduction in defense-related employment, and the boom in development and employment resulting from the Foxwoods and Mohegan Sun casinos. Much of the area's future development will be impacted by these fundamental changes.

- A land use map is included in the plan. The region's existing and planned sewer systems were used as a basic factor for locating future intensive urban uses, and these areas are projected if they are within 1,000 feet of existing or planned sewer lines.

3.2.4 1999 Master Transportation Plan (January 1999)

The State of Connecticut Department of Transportation (ConnDOT) prepared the *1999 Master Transportation Plan*, which presents ConnDOT's plans for the state's transportation services and facilities for the period from 2000 to 2009. Major projects are described. One major project will impact future growth of the Town of Stonington: improvements to the Route 2/2A/32 corridor. This project will upgrade the corridor between Norwich and Stonington, increasing the capacity of Routes 2 and 2A. Aspects of this project have already been completed.

The Master Plan also includes recommendations that may impact future growth in Stonington: 1) increased promotion of commuter parking lots; 2) expanded marketing

efforts for the use of rail service; and 3) expansion of two-lane segments of Interstate 95 from the Rhode Island border to the Branford/East Haven town line to three lanes. All of these recommendations indicate that access between Stonington and neighboring towns will be upgraded in the future, perhaps reducing commuting times and making Stonington a more attractive place to live or work.

3.2.5 Draft Environmental Impact Statement, Route 2/2A/32 (March 1999)

ConnDOT completed a *Draft Environmental Impact Statement* for the Route 2/2A/32 Corridor project described above. The draft EIS evaluates six alternatives for improving the anticipated traffic congestion and associated safety problems. Although no final alternative is recommended in the draft EIS, it is now known that the project involves major improvements to Routes 2, 2A, 32 and 164. A portion of the project will be the expansion or relocation of Route 2 from Norwich to the interchange with Interstate 95 in northeast Stonington.

Stonington is not subject to most of the direct impacts of this project. However, the fact that increased highway capacity will be available from the Stonington Route 2/Interstate 95 interchange to Norwich will decrease commuting time between the two areas, and may tend to encourage residential growth in Stonington as a result. Commercial land use in the vicinity of the interchange could also be impacted.

3.2.6 Conservation and Development Policies Plan for Connecticut 1998-2003 (May 1998)

The *Conservation and Development Policies Plan for Connecticut* — prepared by the Connecticut Office of Policy Management (OPM) — is a statement regarding Connecticut's policies on growth, resource management and public investment. Among the items outlined in this document that are pertinent to this Wastewater Facilities Plan are the following:

- The statewide population is expected to grow slowly from 2000 to 2010 (1.5 percent), but more rapidly between 2010 and 2020 (6.4 percent).
- This document reinforces the probable impacts due to the boom in development and employment resulting from the Foxwoods and Mohegan Sun casinos, and the importance in considering these impacts in planning efforts.
- The use of community wastewater systems should become part of development schemes, since on-lot systems have considerable impact on allowable lot sizes (and therefore, land and housing costs).
- The plan encourages adoption of municipal ordinances that will encourage proper functioning of septic systems.

This Wastewater Facilities Plan should conform to the guidelines described in the *Conservation and Development Policies Plan for Connecticut*. However, there are

significant conservation and development policy differences between this plan and town's plan (see Section 3.2.7 below). See Section 9 for additional discussion.

3.2.7 2004 Plan of Conservation and Development (June 2004)

The Town of Stonington's Planning and Zoning Commission adopted the *2004 Plan of Conservation and Development* on June 29, 2004. This plan is "intended to provide a framework for consistent decision-making by Town boards, commissions and residents with regard to conservation and development" through the year 2020. The report includes population, demographic and economic trends; land use and zoning issues; plans to protect important community resources (e.g., open space, natural resources, historical resources and scenic resources) and to preserve and/or enhance the three village areas (i.e., Mystic, Stonington Borough and Pawcatuck); guidelines that attract desired development in key areas along Interstate 95 and other desired areas within the Town; recommendations for management of residential growth and housing needs; suggested community facilities and infrastructure needs and management practices; and an implementation guide. This plan was prepared with considerable community input including workshops, public meetings, telephone surveys and working meetings.

Topics presented in the plan that are pertinent to this Wastewater Facilities Plan are:

- Population projections for 2010 and 2020 indicating approximately 5.5 percent growth rate per decade.
- Estimation of about 1,300 new housing units (each housing 1.5 persons) constructed between 2000 and 2020.
- Community philosophy to "protect and enhance Stonington's community character and high quality of life", including a desire for more open space.
- Suggested modifications to the Highway Interchange (HI) Zone and surrounding area to modify permitted uses, increase lot coverage, reduce area/frontage requirements, protect natural resources and encourage consolidated (mixed use) development.
- Suggested possible extension of wastewater collection facilities to service land on Jerry Brown Road south of Interstate 95.
- Discussion of Stonington's wastewater treatment and collection facilities, which notes construction of new in-town facilities as well as the possible connection to the Town of Groton for treatment of the town's wastewater.

There are significant conservation and development policy differences between the OPM plan outlined in Section 3.2.6 above and this plan. See Section 9 for additional discussion.

3.3 Population Projections

3.3.1 State

In September 1995, the Connecticut Office of Policy and Management (OPM) released population projections for each town in the state. Projections were made for the years 1995 through 2020 at 5-year intervals, based on the 1990 U.S. Census. OPM has not yet updated its projections using the 2000 U.S. Census as a baseline. **Table 3-1** summarizes the OPM projections for the Town of Stonington, as well as the three surrounding towns (Groton, North Stonington and Ledyard) and the entire southeastern Connecticut region, which includes 17 towns in southeast Connecticut, framed by Colchester, Salem and East Lyme to the west, and Franklin, Sprague, Lisbon, Griswold and Voluntown to the north. The southeastern Connecticut planning region encompasses all of New London County, except for the towns of Lyme, Old Lyme, and Lebanon.

The OPM projections do not provide more detailed breakdowns within Stonington (i.e., there are no published separate projections for the Mystic, Borough or Pawcatuck areas).

Figure 3-1 graphically presents the OPM projection for the Town of Stonington, and the additional OPM projections for Groton, North Stonington, Ledyard and the entire 17-town southeastern region of Connecticut. As shown in Figure 3-1, OPM projects no net growth in the Town of Stonington by 2020, and in fact projects a temporary decreasing trend until 2005, when the population is projected to climb again, ending in a 1.0 percent decrease from 1990 to 2020. Figure 3-1 also shows projected population growth by 2020 in Groton (12 percent), North Stonington (11.2 percent) and Ledyard (21.2 percent). Region-wide, OPM projects a significant increase in population between 2000 and 2020 (13.8 percent), after a period of no growth. **Table 3-2** summarizes the OPM-projected percentage population growth of these areas, using the 1990 U.S. Census as a baseline.

Similarly, by extrapolation, OPM's projections would suggest a population growth between 2000 and 2025 of less than one percent for Stonington while it's neighboring communities, and the southeastern region as a whole, would continue to see double digit growth rates. Extrapolated growth estimates are shown as dashed extensions of each OPM projection shown in Figure 3-1.

3.3.2 Federal

U.S. Census data for 2000 has become available since the development of the 1995 OPM projections. These data indicate that the population growth within Stonington was faster than projected by OPM from 1990 through 2000. **Figure 3-2** presents the OPM projection, and the 2000 U.S. Census data point for Stonington. As shown in the chart, the 2000 U.S. Census population in Stonington is 17,906, significantly higher than projected by OPM in 1995 (16,340).

See Table 3-1

See Figure 3-1

See Table 3-2

See Figure 3-2

3.3.3 Regional

The regional planning authority (SCCOG) has not developed its own population projections. SCCOG uses the projections developed by OPM, as tabulated and described above.

3.3.4 Local

Stonington's recently adopted *2004 Plan of Conservation and Development* includes population projections for the entire Town. However, there is no breakdown of population by area (e.g., Mystic, Stonington Borough, Pawcatuck, etc.) This plan notes the historical U.S. Census data through 2000 and projects a 5.5 percent growth rate through 2020, which is higher than the state average of approximately 4 percent. Population projections for 2010 and 2020 are 18,893 and 19,880, respectively.

The plan notes a decreasing average household size. The average household size in 1990 was 2.4 persons, whereas, the average household size in 2000 was 2.31 persons. The plan also suggests that new housing units would house approximately 1.5 persons. This rate is consistent with the trend toward condominium development but appears too conservative to reflect town-wide development trends.

3.3.5 Wastewater Facilities Plan

The goal of the Wastewater Facilities Plan population projection is to develop a reasonable estimate of future population within the Town of Stonington, considering the studies issued by planning agencies, as wells as the town and regional growth patterns, and to use the estimated population to project future domestic wastewater flows and loads. Planned future infrastructure improvements will be based on these projected needs. The following paragraphs describe the methodology and results used to develop projections for use in this Wastewater Facilities Plan.

The 1995 OPM projections had forecast essentially no population growth within the Town of Stonington until the year 2020. However, OPM also projected that the 2020 population of the southeastern region of Connecticut would increase significantly, by 13.8 percent. With the anticipated growth in the commercial areas of the Town, the tourism industry, and the planned infrastructure projects expected to improve access between Stonington and other towns in the region, it is prudent to assume that the Town of Stonington will share in some of the region's population growth. Therefore, the OPM projection for Stonington is considered to be the lower boundary of potential population growth. This is especially true considering the 2000 U.S. Census data.

A reasonable upper boundary on population growth within Stonington can be estimated by the Town's ordinance limiting new home construction to no more than 100 units per year on average. The assumed 100 new households per year with 2.2 persons per household provides an upper limit on population growth. This average household size estimates town-wide development trends and is consistent with the observed decrease in household size.

To refine projections, it is necessary to make assumptions regarding the rate of population growth in each area of the Town, taking into consideration the current development patterns, the Town's *2004 Plan of Conservation and Development*, and the requirements of Connecticut's Conservation and Development (C&D) Plan. Stonington is presently issuing building permits for new home construction at a rate of approximately 50 units per year. This suggests a rate of growth of approximately one-half that allowed by the Town ordinance. Assuming a household size of 2.2 persons, the resultant rate of growth would be slightly higher than, but consistent with, the Town's *2004 Plan of Conservation and Development*. Historic growth patterns suggest that the Borough area of the Town of Stonington will experience a slow rate of population growth. The Mystic and Pawcatuck areas can be expected to grow in population faster than the Borough area, and the remaining area of the Town, not within the three village areas and primarily the north of Interstate 95, will be the fastest-growing area, percentage-wise.

Tables 3-3 and 3-4 and **Figure 3-3** summarize the projected growth rates and populations based on the following information:

- Projections provided by the Connecticut Office of Policy and Management (The OPM projections are based on projected growth rates building upon the 2000 U.S. Census population.)
- Projections provided in Stonington's *2004 Plan of Conservation and Development*
- Maximum Buildout Rate of 100 Units per Year
- Trend Based on Building Permits Issued

Tables 3-3 and 3-4 also include an estimated distribution of population within the Town's four U.S. Census tracts. Anticipated growth is consistent with the OPM *Conservation and Development Policies Plan for Connecticut*.

The population projection based on building permit trends has been selected as the basis for this Wastewater Facilities Plan. This rate of growth reflects town-wide development trends as well as the declining household size shown in the U.S. Census data. This rate of development is slightly higher than, but consistent with, the Town's *2004 Plan of Conservation and Development*. Table 3-3 shows that, by 2025, the projected percentage of growth in the Town of Stonington would be 15.4 percent based on the 2000 U.S. Census population. Population growth in the Borough area of Stonington is projected to be only 1.6 percent. The Mystic area is projected to grow rapidly, at 16.0 percent. The projected 2025 populations in Pawcatuck and the "Remainder" areas of Town are projected to increase by 11.4 and 43.8 percent, respectively. Table 3-4 shows the projected populations in each of the Town's areas, at five-year intervals, with a town-wide projected population of 20,656 by 2025.

Figure 3-3 shows that the projected population growth to be used for the development of flows and loads — based on the trend of building permits issued —

See Table 3-3

See Table 3-4

See Figure 3-3

is a moderate rate between the lower limit (the OPM projection) and upper limit (the maximum building rate of 100 homes per year) of growth. Figure 3-3 also shows the projected population based on the Town's *2004 Plan of Conservation and Development*. As shown, these projected population growth rates are very close. Note that the pre-2000 historical data, and the post-2000 projections, are virtually identical in slope. This indicates that the growth rate projected in the future is consistent with the growth experienced in Stonington between 1990 and 2000.

3.4 Review of Existing Data

3.4.1 Review of Water Consumption Data

Two separate water suppliers service Stonington: the Aquarion Water Company of Connecticut (formally the Connecticut American Water Company) supplies water to portions of the Mystic and Borough drainage areas, and the Town of Westerly, Rhode Island provides water to the Pawcatuck area. Water consumption data was obtained from both suppliers to determine the total water demand within these three areas, and the approximate usage by category (domestic, institutional, industrial and commercial). These data are summarized on **Table 3-5.**

Referring to Table 3-5, billing record data from each customer within each of the three drainage areas was first evaluated to determine the total water usage for the billing period (Row A). It is assumed that 90 percent of the water used eventually flows into the sewer collection system as wastewater, which is within the typical range of observed conditions, to calculate wastewater flow. Rows B and C illustrate this calculation. The 2000 U.S. Census data was reviewed, together with mapping of the existing service areas, to estimate the population served by public sewer within each area (Row D). A per-capita average daily wastewater flow rate of 70 gpd was then used to determine total domestic wastewater flow (Rows E and F).

The total non-domestic wastewater flow was calculated as the difference between total wastewater flow minus domestic (Row G). Water billing records were then reviewed, together with typical factors for wastewater generation, to categorize this non-domestic flow as institutional, industrial and commercial (Rows H, I and J). The results of this evaluation are used in the flow projections presented in Section 3.5.

3.4.2 Review of Recent WPCF Flow and Load Data

Section 5 contains an evaluation of the three existing water pollution control facilities (WPCFs), and plant data are analyzed in detail in that section. **Table 3-6** summarizes the influent flows and loads to the three plants, based on plant data from July 1999 through June 2002. Parameters include flow, biochemical oxygen demand (BOD), total suspended solids (TSS), ammonia-nitrogen (NH_3-N), and total nitrogen (TN).

Note that in September 1999, the Stonington WPCA implemented a 280,000 gallon-per-day pumping process that diverts flow from the Mystic WPCF to the Borough WPCF. The influent flows and loads summarized in Table 3-6 do NOT consider this

See Table 3-5

See Table 3-6

diversion (i.e., the influent flow and load to the Mystic WPCF includes the 280,000 gpd, and the influent flow and load to the Borough WPCF does NOT include the 280,000 gpd). The influent flows and loads to each plant, therefore, represent the flow and load from within the service area contributing to each plant. The impacts of the diversion on current loadings to the plants are evaluated in Section 5.

The pollutant concentrations evidenced by the flows and loads, and the peaking factors resulting from the ratios of maximum-month and maximum-day loading to average loading, will be used in Section 3.5 to project future flows and loads for these conditions.

3.5 Projected Flows and Loads

3.5.1 Domestic Flows

Wastewater flow generated in homes, apartments, condominiums, etc. is defined as domestic flow. **Table 3-7** summarizes the existing and projected future domestic average wastewater flow estimates for the sewered and unsewered areas. Separate summaries are provided for each of the Mystic, Borough, Pawcatuck, and remaining areas.

Existing Sewered Areas

As shown in Table 3-5, the 2000 U.S. Census population within the Mystic drainage area is 2,566. An average wastewater flow of approximately 179,600 gpd is estimated, based on a per-capita wastewater flow of 70 gpd.

Similar analyses can be conducted to determine the domestic wastewater flow to the Borough and Pawcatuck WPCFs. For the Borough area, a population of 1,151 is estimated to be within the service area, resulting in an average of approximately 80,570 gpd of domestic sewage flows to the Borough WPCF, based on a per-capita wastewater flow of 70 gpd.

The Pawcatuck area U.S. Census data shows that 4,323 people within the service area, resulting in a flow of 302,610 gpd from residential customers. This represents a per-capita wastewater flow of 70 gpd.

Existing Unsewered Areas

The sewer needs analysis described in Section 2 identifies five unsewered problem areas within the Mystic WPCF drainage area: Riverbend Drive, School Street, Roseleah Drive, Latimer Point and Mason's Island. These areas are itemized on Table 3-7, along with their associated design average flows, which are based on an assumed per-capita flow of 70 gpd. The current population within these five areas is about 553 people. Table 3-7 also itemizes "Other Areas" within the Mystic drainage area. These "Other Areas" are within the Mystic drainage area, but are not currently connected to the sewer system, and are also not accounted for in the five problem areas. The estimated current population within these areas is 811 people. Using the 70 gallons

See Table 3-7

per capita per day design criterion, the estimated wastewater flow from these areas is 56,770 gpd.

For the Borough drainage area, the sewer needs analysis in Section 2 identifies two existing unsewered problem areas: Elm Street and Montauk Road. These areas are itemized on Table 3-7, along with their associated design average flows, again based on an assumed per-capita flow of 70 gpd. The current population within these two areas is about 237 people. Table 3-7 also itemizes "Other Areas", which is comprised of the remaining areas within the Borough WPCF drainage area that are not currently connected to the sewer system, and are not accounted for in the two problem areas. The estimated current population within these areas is 129 people. Using the 70 gallons per capita per day design criterion, the estimated wastewater flow from these areas is 9,000 gpd.

For the Pawcatuck drainage area, the sewer needs analysis identifies nine existing unsewered problem areas, and these areas are itemized on Table 3-7, along with their associated design average flows. The current population within these nine areas is about 1,827 people. Table 3-7 also itemizes "Other Areas", as described above, that are within the Pawcatuck WPCF service area. The estimated current population within these areas is 379 people. Using the 70 gallons per capita per day design criterion, the estimated wastewater flow from these areas is 26,500 gpd.

Finally, the remaining area of Stonington is entirely unsewered. The estimated 2000 population in this remaining area is 2,770 people. There are two identified problem areas: Marjorie Street and North Stonington Road. The estimated 2000 population in these two areas is 175 people, and the design flows from these areas are tabulated. The rest of the remaining area has an approximate population of 2,595 people, and a total wastewater flow rate of approximately 181,650 gpd.

Projected Sewered Areas

As shown on Table 3-3, the population within the Mystic WPCF drainage area is projected to increase 16.0 percent by the year 2025. It is assumed that this growth rate will be uniform throughout the Mystic district, and that the per-capita wastewater flow rate will remain the same, for the purpose of projecting future flows. In addition, the former Mystic Color Labs site is being developed as condominiums with projected flow of 13,500 gpd. The existing sewered area flow will therefore increase from 179,600 to 221,800 gpd. Based on the analysis described in Section 2, if all of the identified problem areas with the exception of Mason's Island are connected to the sewer system, the projected flow would be 254,700 gpd in 2025.

The population within the Borough WPCF drainage area is projected to increase 1.6 percent by the year 2025. It is assumed that this growth rate will be uniform throughout the Borough district, and that the per-capita flow rate will remain the same, for the purpose of projecting future flows. The existing sewered area flow will therefore increase from 80,570 to 81,900 gpd. In addition, based on the analysis

described in Section 2, if the Elm Street and Montauk Road problem areas are connected to the sewer system the projected flow would be 98,800 gpd in 2025.

The population within the Pawcatuck WPCF drainage area is projected to increase 11.4 percent by the year 2025. It is assumed that this growth rate will be uniform throughout the Pawcatuck district, and that the per-capita flow rate will remain the same, for the purpose of projecting future flows. The existing sewered area flow will therefore increase from 302,610 to 337,100 gpd. Based on the analysis described in Section 2, if all of the identified problem areas are connected to the sewer system, the projected flow would be 479,500 gpd in 2025.

The population within the remaining area is projected to increase 43.8 percent by the year 2025. It is assumed that this growth rate will be uniform, and that the per-capita flow rate will remain the same, for the purpose of projecting future flows. The flow will therefore increase by the same rate.

3.5.2 Institutional Flows

Wastewater generated in schools, hospitals, nursing homes, medical centers, correction facilities, public rest rooms, marine pump-out facilities, etc. is defined as institutional flow. **Table 3-8** summarizes existing and projected future average institutional wastewater flow estimates.

There are currently six public schools in the Town of Stonington, with a total student enrollment of approximately 2,400. The Mystic Middle School (2002-2003 enrollment of 457 students) is connected to the Mystic WPCF. The Dean's Mill School is within the Borough WPCF drainage area. The Dean's Mill School had an enrollment of 506 students for the 2002-2003 academic year. The remaining four schools (the West Vine Street School, the West Broad Street School, and Pawcatuck Middle School and the Stonington High School) are within the Pawcatuck WPCF drainage area. The total enrollment of students in these four schools was 1,414 in the 2002-2003 academic year. Wastewater flows from these schools are estimated using a per student flow rate of 15 gpd.

Future student enrollment projections do not extend beyond 2010. For the purpose of estimating future flow from the schools, it is assumed that the student enrollment will increase by 15.4 percent, the average town-wide population growth estimate, by 2025. The projections of future wastewater flow from the schools reflect this estimated enrollment increase.

There are no hospitals, large medical centers, or prisons within the Town of Stonington. The Pendleton nursing and rehabilitation center on Maritime Drive has a flow of 28,100 gpd, and this is not expected to increase. The Stone Ridge retirement community on Jerry Browne Road is within the Mystic WPCF drainage area, and is planned to be built in two phases. According to a previous projection, reported by PARE Engineering, the flow from this facility will be approximately 37,000 gpd after all phases of the community are complete.

See Table 3-8

The Connecticut Department of Environmental Protection has suggested that marine pump-out facilities be upgraded and/or improved in capacity, as a way of protecting harbor water quality. Each of the Mystic, Borough and Pawcatuck areas has pumpout facilities connected to the sewer systems. These pumpout facilities are privately owned, and are associated with the Town's many marinas. Since the neighboring towns of Groton and Westerly, Rhode Island also have public pump-out facilities, increased flows within the Mystic and Pawcatuck WPCF service areas associated with public pumpout facilities are assumed to be minor, at 5,000 gpd. CTDEP has suggested that a public pumpout facility be located in the Borough area, and it is anticipated that a new facility will be in place within the Borough WPCF area within the planning period. A projected future allowance of 10,000 gpd is allocated for this public pump-out facility, in addition to the allowances shown for the existing commercial pump-out operations provided by the numerous marinas located along the water line in all three areas of the Town.

3.5.3 Industrial Flows

Wastewater generated in manufacturing facilities and other major processing facilities is defined as industrial flow. **Table 3-9** summarizes existing and projected future average commercial wastewater flow estimates.

Existing Sewered Areas

There are no permitted industrial users in the Town of Stonington at this time. However, there are three un-permitted industries with discharges to the sewer system; namely:

- Mystic Aquarium
- Davis Standard Corp.
- MAN-Roland site (Mashantucket Pequot Tribe)

The Mystic Aquarium discharges to the Mystic WPCF system. An average of approximately 10,000 gpd is discharged from the animal pool filters at the aquarium, and the aquarium visitors, food service, and other sanitary uses generate an additional flow of approximately 24,200 gpd. The pool filter discharge is similar to typical domestic sewage, with higher concentrations of ammonia-nitrogen, alkalinity, and higher pH, and lower concentrations of BOD and COD. The Stonington WPCA has reviewed the aquarium discharge water quality and determined that it is acceptable for treatment at the Mystic WPCF.

The Davis Standard Corp. is a manufacturing facility located on Extrusion Drive, and discharges to the Pawcatuck WPCF system. Permitted discharges from this facility include an average of 1,000 gpd resulting from the manufacturing process, and 5,600 gpd from non-contact cooling water and domestic uses. However, recent water consumption data indicates that the facility is only discharging about 4,900 gpd.

See Table 3-9

The 41.92-acre MAN-Roland property, located on Liberty Street north of Interstate 95, is part of the Highway Interchange (HI) zone. Currently this site is owned by the Mashantucket Pequot Tribe and is used as an ancillary facility for its Foxwoods casino operations. Current flows average 4,000 gpd. Since the property may be used for manufacturing in the future, the projection includes a 1,000-gallon per acre per day allotment for this property. Note: this property was previously evaluated in the Marin Environmental report described in Section 3.2.2. The Marin Environmental report conservatively assumed a per-acre flow of 2,400 gpd. However, given the site's historical use, the 1,000 gallons per acre per day criterion is appropriate and used for this Wastewater Facilities Plan.

Projected Sewered Areas

It is assumed that flow from the Mystic Aquarium will increase in the future due to a likely increase in visitors, and perhaps growth of the facility. It is assumed that by 2025, the flow from the aquarium will increase by 10 percent over the current permitted flow rate.

The old airport property within the Borough district has been identified for a partial development as a vineyard. The developable portion of this property is approximately 19.8 acres. Since the wastewater collection and treatment needs for this property are not clearly defined, a planning per-acre flow rate of 1,000 gpd was assumed, resulting in a projected flow of 19,800 gpd from this area.

The Pawcatuck WPCF drainage basin includes two areas where industrial development may occur. There already is some industrial activity at the Extrusion Drive area, as described earlier. An assumed increase in activity from current levels is appropriate for planning purposes. The total acreage of this manufacturing area is about 90 acres, and the maximum allowable coverage is 30 percent, or 27 acres. Using 1,000 gallons per acre per day as a planning-level flow, 27,000 gpd is projected.

One light industry zone is located in the remaining area of Stonington, outside the drainage basins of the three plants, in the vicinity of Interstate 95 (Exit 90), the Pequot Trail and Taugwonk Road. The total area zoned as light industry in this area is about 95 acres, and 30 percent, or about 29 acres, is usable. By applying a per-acre flow of 1,000 gpd for this area, results in a projected flow of 29,000 gpd. It is assumed that this area will not be sewered.

3.5.4 Commercial Flows

Wastewater generated in stores, restaurants, motels, etc. is defined as commercial flow. **Table 3-10** summarizes existing and projected future average commercial wastewater flow estimates.

Existing Sewered Areas

The estimated current commercial wastewater flows are estimated by the water consumption data presented in Table 3-5. The table shows that the total commercial

See Table 3-10

water consumption for the Mystic area is approximately 159,805 gpd. For the Borough area, the commercial water consumption is approximately 74,900 gpd. For the Pawcatuck area, the total commercial water consumption is approximately 76,100 gpd.

Projected Sewered Areas

The predominant commercial area within the Mystic WPCF service area is the area around the seaport and harbor. Stonington and Groton have plans to increase activity in this area, and are projecting significant economic development as a result. Specific components of this increase are not known at this time, although with increased tourism, additional flow from hotels and restaurants are expected. Commercial flow within the Mystic WPCF service area will increase, and the projection includes a 20 percent increase on existing commercial flow.

Stonington also has a stated goal of increasing the economic vitality of the Borough area. Specific proposals have not been developed, but increased commercial flow will result from revitalization of the area. The projections include a 10 percent increase on existing commercial flow.

In addition, a new development — Stonington Commons — is under construction within Stonington Village, involving redevelopment of the Monsanto property on Water Street. It will primarily be single-family and condominium residential, and includes a yacht club and a small amount of potential commercial office space. The entire development's projected flow based on the developer's intended land use is approximately 21,300 gpd. Though some of this flow will be from residential sources, the overall development flow is accounted for in the commercial category.

Within the Pawcatuck service area, the Highway Interchange (HI) zone is the major area where commercial growth is expected. As described in Section 3.1, this area has previously been studied in detail as described in the Marin Environmental *Water and Sewer Needs Analysis*. The land use assumptions used in the *Water and Sewer Needs Analysis* are very ambitious. As part of the review of the original draft of this Wastewater Facilities Plan report, it was the consensus view of a Citizens Review Panel, WPCA, the Stonington Planning and Zoning Department, and CDM that the HI Zone will not become more commercially developed than the Coogan Boulevard/Whitehall Avenue area. It follows from this judgment that the projected wastewater flow from the commercial area should not exceed actual measured flow from the Coogan Boulevard/Whitehall Avenue area. The projected commercial flow from the HI-zone is thus 159,800 gpd.

Stonington WPCA has, in the past, reserved capacity at the Pawcatuck WPCF, and in the interceptor system that feeds the plant, of 200,000 gpd for use by North Stonington. North Stonington presently does not have plans to use this reserve, and does not foresee use in the future. WPCA has no obligation to reserve this capacity, and a reserve is NOT included in the future wastewater projections.

There are no areas zoned for commercial use in the remaining area of the Town.

3.5.5 Infiltration and Inflow

Groundwater that leaks into the sewer system is defined as infiltration, and inflow is extraneous flow that enters the sewer system via roof leaders, sump pumps or other means. **Table 3-11** summarizes existing and projected future extraneous flow due to infiltration and inflow within the three existing drainage basins.

Existing Sewered Areas

Estimates of existing wastewater flow due to infiltration/inflow are made based upon data collected at the three wastewater treatment plants. Evaluation of the daily average, daily maximum and especially the daily minimum flow rates at each plant results in a reasonable estimate of existing extraneous flow to each plant. These records should also compare well with the observed difference between the water use within the service area and the actual wastewater flows at the plants.

Data collected at the Mystic WPCF indicates that during dry-weather periods (mainly late summer and fall of each year), the daily minimum flow rate was typically approximately 200,000 gpd. Since the daily minimum flow rate occurs in the early morning hours, when actual wastewater flow is close to zero, it is likely that most of this flow is infiltration. Assuming that only about 25 percent of this flow is wastewater, the extraneous flow during dry-weather periods is estimated at about 150,000 gpd.

The same type of data evaluation was conducted to estimate infiltration flow to the Borough and Pawcatuck WPCFs. The Borough WPCF data shows that the minimum daily flow to the plant varies between 40,000 gpd and 100,000 gpd. It is assumed that 90 percent of this minimum flow rate is infiltration. A typical value of 50,000 gpd is used. At the Pawcatuck WPCF, a typical value of 70,000 gpd is used.

Proposed Sewered Areas

It is assumed that the existing service area will not experience a change in the infiltration/inflow rates, neither an increase nor a decrease. No major reduction program is planned to decrease extraneous flows, and routine maintenance will be conducted to keep infiltration and inflow from increasing as the piping system ages.

Additional infiltration and inflow can be expected from those areas that will be provided with new sewer systems. The areas identified in the Section 2 will contribute flow as shown on Table 3-11. Infiltration rates for these areas are estimated based on a preliminary layout of sewers in the area, assuming that 1) the sewers will be 8-inches in diameter, and 2) an infiltration rate of 500 gpd per inch-mile of pipe.

3.5.6 Septage Wastes

In this section, an estimate is developed of the total quantity of septage wastes produced from on-site wastewater systems. Septage volume is assumed to be a

function of the population in unsewered areas, because the majority of the unsewered areas are residential.

See Table 3-11

Table 3-12 summarizes the estimated existing and projected future septage volumes generated throughout Stonington. For each of the four areas, the total existing septage volume is calculated based on the estimated 2000 population within each area NOT provided with sewer service, assuming an average number of persons per household, an average septic tank volume of 1,200 gallons, and an average pumpout interval of 3 years. The projected future septage volume from within the existing sewered areas is calculated the same way, except using the projected future populations. Those areas that will be provided with sewers are then subtracted from this amount, resulting in a total estimated septage volume.

The Pawcatuck WPCF is the only Stonington WPCA facility that can receive septage. Current records indicate that about two loads per week are currently hauled to the plant, amounting to a weekly volume of about 3,500 gallons (500 gpd). Most of the septage generated within the Town of Stonington is hauled to other plants, so an increase in hauling to the Pawcatuck WPCF is not expected.

3.5.7 Flow Summary

Table 3-13 summarizes and sums the components of flow described in Sections 3.5.1 through 3.5.6.

3.5.8 Flows and Loads

The projected future flows summarized in Table 3-13 can be used to project future loads to each of the three WPCFs. A review of the table indicates that the overall contributing percentages of constituents of the wastewater flow (e.g., domestic, institutional, etc.) are not changing significantly in proportion to one-another. This indicates that the characteristics of the wastewater should remain similar to the existing conditions. In addition, the projections do not include any additional significant industrial users that could alter the wastewater characteristics. Therefore, the wastewater is expected to be of similar strength, and contain similar concentrations of the important pollutants such as BOD, TSS and nitrogen components as the existing wastewater.

Table 3-6 presented a summary of the existing flows and loads to the three WPCFs, for average day, maximum month, and peak day conditions. Peaking factors on flows and loads can be calculated by comparing different loading conditions. It is assumed that these peaking factors will not change in the future, e.g., the ratio of maximum month flow to average flow to the Mystic WPCF (0.772 mgd/0.570 mgd = 1.35) will remain the same in the year 2025.

Table 3-14 summarizes the flows and loads to each of the three WPCFs, assuming that the wastewater quality parameters, and the peaking factors for different loading conditions, will not change. The flows and loads presented in Table 3-14 are used for the Alternatives Evaluation presented in Section 7.

See Table 3-12

See Table 3-13

See Table 3-14

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