

**EXECUTIVE SUMMARY**  
**COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING STUDY**  
**NEEDS ASSESSMENT REPORT**  
**TOWN OF CHATHAM, MASSACHUSETTS**

**BACKGROUND**

The Town of Chatham is performing this Comprehensive Wastewater Management Planning Study (Study) to provide a comprehensive strategy for wastewater treatment and disposal issues for the next 20 years. The Study is meant to be consistent with the Town's Growth Policy Plan developed in 1988, and the Town's Local Comprehensive Plan, which is currently being prepared. These plans share a consistent goal that the Town protect its natural resources and provide a year-round economic base for its residents.

This Needs Assessment Report completes the first of three phases of the Comprehensive Wastewater Management Planning Study. The Needs Assessment provides the framework and necessary background information to complete the second phase of the Study where alternatives to remedy wastewater problems will be developed and evaluated (screened) for overall feasibility. The final phase of the Study will consist of detailed cost evaluation and environmental impact analysis of feasible alternatives, and a recommended plan of action.

This Needs Assessment Report utilizes existing information and estimations of future land use, populations, and water usage to project future wastewater flows and loadings for the year 2020. Wastewater issues and specific problem areas of the Town were identified and evaluated. Regulatory requirements and the Town's goals relating to wastewater management and growth management were incorporated into the Study.

The Needs Assessment Report was completed through the coordinated efforts of the Chatham Wastewater Management Citizens Advisory Committee (CAC) and Technical Advisory Committee (TAC). The CAC is comprised of eleven voting members from all geographic areas of Chatham, and five non-voting ex-officio members representing various groups in Chatham. The voting CAC members are listed below.

- Herbert Bernard representing Morris Island, Stage Island, and Little Beach
- Philip Christophe representing West Chatham
- Robert Depatie, At-Large
- Fred Jensen, CAC Chairman representing Central Chatham
- Dede Lovett representing Sears Point
- David MacAdam representing the Old Village
- Kevin Mikita representing Chatham port
- John Payson, At-Large
- Charles Pollard representing South Chatham
- John Randall, At-Large
- Scott Tappan representing Stage Neck

The ex-officio members are:

- Chris Diego representing the Chamber of Commerce
- Tim Linnell representing the Chatham Shellfish Advisory Committee
- William Schweizer representing Chatham Conservation Foundation
- James Scott representing the Chatham Water and Sewer Advisory Committee
- Patricia Siewert representing Friends of Chatham Waterways

The TAC is comprised of the following people representing key Town departments:

- William Redfield, P.E., Water and Sewer Department Manager
- Robert Duncanson, Ph.D., Chatham Water quality Laboratory Director
- Margaret Swanson, Town Planner
- Terrance Hayes, Town Health Agent

These two groups have met frequently during the preparation of this report and provided valuable insight to Chatham's existing conditions and wastewater needs.

A joint regulatory review process with the Massachusetts Executive Office of Environmental Affairs, MEPA Unit and the Cape Cod Commission has been initiated for the Study. An Environmental Notification Form and a Development of Regional Impact document were prepared and submitted to these two regulatory agencies for their review and comment. A public hearing was held at the Chatham Town Hall on March 19, 1998 to discuss the Study and receive public comment on these two documents. This review resulted in the April 10, 1998 Certificate of the Secretary of Environmental Affairs, which accepted the project scope with few comments. The Study has been authorized to follow special procedures in the environmental review process, which allows public review and comment after each phase of the work has been completed.

## **FINDINGS AND CONCLUSIONS**

The Town of Chatham faces unique challenges in wastewater treatment and disposal. The Town is surrounded on three sides by water and possesses natural beauty that attracts thousands of vacationers each year. The vacationers visit mainly in the summer season swelling the population from approximately 7,000 residents to as many as 25,000 people. This population increase places a severe strain on the individual on-site wastewater disposal systems that are used in most of Chatham. The major findings and conclusions of the Needs Assessment Report are summarized below.

**A. Wastewater Planning History.** A wastewater management plan was last completed for Chatham in June 1982. It focused on unsewered areas with wastewater problems and problems at the Chatham Water Pollution Control Facility (WPCF). The plan recommended an upgrade of portions of the Chatham WPCF, expansion of the existing wastewater collection system, expansion of the public water supply system, improved on-site septic systems, and development of cluster treatment and disposal systems. Additional studies were performed after 1982 to find alternative effluent disposal sites for the Chatham WPCF. The final management plan never gained approval at Town Meeting, but many of its recommendations have been implemented.

**B. Regulatory Issues.** On November 1987, Massachusetts Department of Environmental Protection (DEP) issued an Administrative Consent Order to the Town requiring that the effluent flow from the Chatham WPCF be limited to 100,000 gallons per day or less to minimize the risk of treated effluent migrating to public water supply wells. It also required that the Town begin efforts to upgrade the WPCF. In October 1996, the Town completed modifications at the WPCF to remove nitrogen from the treated effluent to meet the Class I groundwater standard of 10 parts per million (ppm) nitrate nitrogen. Recently (September 1998) the Administrative Consent Order was modified to allow expansion of effluent flow to 150,000 gallons per day, and to modify the schedule for completing this plan. The submittal of a Draft Comprehensive Wastewater Management Plan and Draft Environmental Impact Report is now planned for April 2000.

The major regulatory requirements for on-site wastewater treatment and discharge systems in Chatham are provided in the State Environmental Code Title 5: Minimum Requirements for the Subsurface Disposal of Sanitary Sewage, commonly called the Title 5 Regulations. These regulations provide design standards for Title 5 on-site septic systems including: setback requirements, maximum allowed design flows, restrictions for septic systems in floodways and velocity zones, and variance procedures. These

regulations are administered by the local Board of Health and the Massachusetts Department of Environmental Protection.

**C. Nitrogen Loading to Coastal Embayments.** Nitrogen discharges into the groundwater system from on-site septic systems and from other sources are impacting water quality in several of the Town's coastal embayments. State and federal regulations protect public health by limiting nitrogen levels in drinking water; however, recent studies have shown that these limits are not sufficient to protect sensitive coastal waters. Septic systems, even those meeting the current Title 5 Regulations, provide minimal nitrogen removal.

Coastal embayments are sensitive to nitrogen inputs because nitrogen is typically the limiting nutrient in these surface water systems. This means that coastal waters have more than enough phosphorus and other nutrients to fertilize marine plants; and the growth of these plants is limited by the nitrogen content in the water. Therefore, as more nitrogen is added to the system, more plant material is produced. As more plant material is produced, the water quality may become impacted especially as the plant material dies and settles to the bottom.

Nitrogen enters a coastal embayment through its recharge area (watershed). The nitrogen originates from on-site septic systems; discharges from wastewater treatment plants; fertilization of lawns and agricultural lands; wetlands; atmospheric deposition and stormwater runoff from impervious surfaces. The nitrogen quantities that are produced from each of these sources will depend upon the specific land uses and level of development within the watershed. For the Ryder Cove Watershed; wastewater nitrogen loading comprises 73 percent of the total loading, while roof and road runoff comprise 9 percent, lawn areas comprise 15 percent, and natural areas comprise 3 percent of the total nitrogen loading. In summary, everyone contributes to nitrogen discharges. Wastewater treatment plants are currently designed to remove nitrogen; therefore, the discharge of

treated wastewater from wastewater treatment plants has a lower nitrogen concentration than discharge from individual septic systems. On-site septic systems are usually the largest contributors of nitrogen to coastal embayments.

How much nitrogen a coastal embayment can assimilate is a function of its depth and tidal flushing characteristics, and is unique to each embayment. Often coastal embayments are impacted by average embayment nitrogen concentrations as low as 0.35 ppm. This is far lower than the State drinking water standard of 10 ppm. The assimilative capacity is often called the critical nitrogen loading and must be determined for each embayment through a nitrogen loading assessment.

The nitrogen loading (existing and projected future values) and critical nitrogen loading values have been calculated for each of the embayments in the Pleasant Bay System, the Stage Harbor System, and the South Coast Embayments of Taylor Pond/Mill Creek and Sulfur Springs/Bucks Creek. Comparison of the future nitrogen loading values and the critical nitrogen loading values (calculated using the most stringent water quality standard) indicates that the following embayments exceed the surface water standards under existing conditions.

- Muddy Creek
- Little Mill Pond
- Taylor Pond
- Sulfur Springs

The following embayments exceed the surface water standards under future conditions.

- Muddy Creek
- Little Mill Pond

- Taylor Pond
- Sulfur Springs
- Mill Creek
- Ryder Cove

Several water quality standards can be used to judge whether the nitrogen loading to an embayment exceeds the critical loading. The standard used to identify the embayments listed above is the most stringent proposed by the Cape Cod Commission for Pleasant Bay. The Citizens Advisory Committee and Technical Advisory Committee have reviewed these standards and have come to the realization that remedial costs will vary greatly depending on the surface water standard that is used. They feel that the standard that is ultimately selected for the recommended plan must consider the potential costs to attain the standard. As a result, they have identified more than one standard that will be used in future evaluations to remediate excessive nitrogen loading to these coastal embayments. The Citizens Advisory Committee decisions are discussed in Chapter 9 of the report.

The embayment watersheds listed above that exceed critical nitrogen limits have been identified as Wastewater Areas of Concern. Nitrogen management options will be developed for these areas in following phases of this Study.

**D. Centralized Wastewater Treatment Facilities.** The Chatham WPCF performs well at treating wastewater. The average effluent total nitrogen concentration in 1997 was 5.6 ppm, which compares very favorably with the typical total nitrogen concentration of 35 ppm from a standard Title 5 system.

The existing treatment process has a capacity of approximately 200,000 gallons per day, which is 25 percent greater than the Administrative Consent Order (average annual) limit of 150,000 gpd. It is also approximately 15 percent greater than the existing (1997)

maximum month flow of 171,000 gpd. This treatment capacity may need to be expanded to treat additional flows from areas of Chatham that want (or need) to connect to the centralized collection system.

**E. Centralized Effluent Discharge Facilities.** Four effluent sand beds are used for effluent discharge to the groundwater system at the Chatham WPCF site. They have a total area of 166,000 square feet (3.8 acres) and a total capacity of 410,000 gallons per day (gpd). DEP has limited the discharge at these beds to 150,000 gpd due to concerns that groundwater mounding (an increase in the groundwater elevation under the beds) could affect the natural groundwater flow pattern, which could allow treated wastewater to flow to a water supply well. It also could redirect contaminated groundwater from the landfill toward a water supply well.

The investigation of new effluent discharge alternatives will be a major focus of following phases of this Study. If new effluent discharge facilities or methods can not be found, the Chatham WPCF may be limited to a treatment and discharge limit of 150,000 gpd, and the plant will not be able to receive additional wastewater flows from areas of Town that want and or need to connect to the collection system.

The effluent discharge at the upper reaches of the Cockle Cove Watershed has minimal impact on Cockle Cove Creek. A new flow and water quality monitoring station was located on Cockle Cove Creek in March 1999. This station will provide an indication of the quantity and quality of the groundwater that is emerging from the watershed and flowing into the creek.

**F. Centralized Wastewater Collection System.** The existing centralized wastewater collection system is well maintained and is operating well. It has sufficient capacity for existing sewered flows and does not have excessive extraneous flows (inflow and infiltration) entering from leaking gravity sewers, roof leaders or other sources.

The collection system pumping stations are being renovated, as the equipment needs replacement. The system capacity has been evaluated, and this information will be used in future evaluations to learn if additional wastewater can be handled by the system.

**G. Water Supply Issues.** Groundwater conditions, water system demand, and water system capacity have been evaluated for the existing and future conditions in Chatham. Chatham has high-quality supplies and has established a Water Resource Protection District to protect the existing and projected future water supply zones of contribution. Nitrogen loading to areas of Town that contribute groundwater to the public water supply has been evaluated by the Cape Cod Commission in the 1996 Monomoy Capacity Study. Nitrogen loading to these zones will not pose a health threat.

The Town's public water supply system has seven municipal wells with a total capacity of 5.75 million gallons per day (mgd). The Indian Hill Well is currently not in service due to low concentrations of tetrachlorethylene, commonly called PCE. With this well off line, the water supply system has a capacity of 4.75 mgd. This capacity is sufficient to meet the existing 1997 peak day demand of 3.07 mgd.

The peak day future water demand is projected to be 5.2 mgd. This demand can not be met with the existing capacity and the largest well field off line. The Town is in the process of developing and permitting two additional 1 mgd wells: one at the Town Forest area, and one at the Training Field area. These wells are expected to be on-line in three to five years. Three additional sites have also been identified as potential supply well locations, and one of these could be brought on line in approximately 10 years.

The current Water Resource Protection District was developed based on existing and planned supply wells being pumped. This area will need to be expanded and modified slightly as the two new wells are brought into service.

**H. On-Site Wastewater and Treatment Systems.** Chatham’s wastewater needs are primarily served by individual on-site systems for individual properties. In general, Chatham’s properties are big enough to fit the larger on-site systems now required by the Title 5 Regulations. Town Board of Health Regulations require that all cesspools be upgraded to Title 5 systems at the time of property transfer.

As mentioned in previous sections, Title 5 approved on-site systems provide minimal nitrogen removal. They are usually the largest source of nitrogen to coastal embayments and drinking water supplies. Typical Title 5 approved systems can be upgraded to remove nitrogen, and these systems (often called “Title 5 Plus” systems) will be evaluated in future phases of this Study.

**I. Wastewater Areas of Concern.** As a result of Stearns & Wheler’s evaluations, ten Wastewater Areas of Concern (AOC) have been identified. These areas are reviewed in detail in Chapter 7 and briefly described below.

As discussed earlier in this Executive Summary, six coastal embayment watersheds are identified as Areas of Concern because they are (or will be) impacted by excessive nitrogen loading. These watersheds are for the following embayments:

- Muddy Creek
- Ryder Cove
- Little Mill Pond
- Taylor Pond
- Sulfur Springs
- Mill Creek

Two areas of Town have industrial zoning, which groups this land use into concentrated areas to support industrial activity, and provide year-round employment to the Town

residents. The two areas are identified as the Enterprise Drive Industrial Area and the Commerce Park Industrial Area, named for the two roads that access most of these industrial zoned properties. The properties in these areas are typically car and boat repair businesses, which have a real potential to introduce contaminants into the groundwater system. Both areas are located adjacent to existing centralized wastewater facilities. A large percentage of both areas are located within the Town's Water Resource Protection District; and both areas are located within Coastal Embayment Watershed Areas of Concern. These two areas will be evaluated for sewerage due to the need to remove their wastewater discharges from the Water Resource Protection District and their coastal embayments.

A group of eight properties at the west end of Eliphamets Lane are located next to Mill Pond, and are in low elevation areas and the 100-year flood zone. Several of these properties are small, and have minimal area for raised on-site septic systems. The Town Health Agent has requested that this group of properties be evaluated for improved wastewater treatment facilities. This group of properties is called the Eliphamets Lane Area of Concern.

Several properties on Tom's Neck along Morris Island Road and Little Beach Road have had to install raised systems to meet the requirements of Title 5 and the Town's health regulations on upgrading existing systems in 100-year flood zones. Several of these small properties have installed concrete retaining walls to construct Title 5 systems. These raised systems are expensive to build and are considered unsightly. This area will be evaluated for improved wastewater facilities in the next phase of this Study.

**J. Buffer Areas around Fresh Water Ponds and Lakes.** Available water quality data was reviewed for the fresh water ponds and lakes in Chatham, and it was observed that these fresh water bodies have good water quality. Phosphorus present in septic system effluent can impact fresh water bodies because it is the limiting nutrient in these

waters. This means that the more phosphorus that enters the water body, the more algal growth will occur. Unlike nitrogen, phosphorus can not travel far in the groundwater system. Previous research indicates that phosphorus is retained by the soil within 300 feet from where it is discharged.

## **NO ACTION ALTERNATIVE**

Under the “No Action Alternative”, future wastewater treatment at the Chatham WPCF would be limited to 150,000 gallons per day as directed by the Administrative Consent Order agreed to by the Town of Chatham and Massachusetts DEP. If the Town did not comply with this Order by not finishing the Comprehensive Wastewater Management Planning Study, or not implementing recommendations of the plan, the Town could be fined \$10,000 by DEP as allowed by the Order.

In this scenario, existing substandard on-site systems would be upgraded to meet the standards of Title 5 and the local Board of Health regulations. Because these regulations do not address nitrogen loading to coastal embayments, the Town’s coastal embayments would be impacted by nitrogen discharges from the embayment watersheds.

Nitrogen loading assessments of this Study and the Pleasant Bay Resource Management Plan have determined that existing nitrogen loading into Muddy Creek, Little Mill Pond, Taylor Pond, and Sulfur Springs Watersheds currently exceeds one or more of the nitrogen loading standards for those embayments. This indicates that additional nitrogen loading into these watersheds will further impact water quality in these embayments. These nitrogen loading assessments have also determined that projected future nitrogen loading into the Ryder Cove and Mill Creek Watersheds as well as the four watersheds listed above will exceed one or more of the nitrogen loading standards for that embayment.

Nitrogen impacts to these coastal embayments would threaten the shellfishing industry and vacation economy that depends on the vitality of coastal embayments for their success.

Embayments that exceed critical nitrogen loading limits result in low or absent dissolved oxygen concentrations. This in turn causes loss of shellfish due to lack of oxygen, and production and release of hydrogen sulfide odors (rotten egg odors) from bottom sediments. Herring will not advance into these embayments because of low dissolved oxygen. Eelgrass will disappear and macroalgal mats will become the dominant plant species. It is noted that people will still be able to moor their boats, and the embayments will still look good from a distance. However, most people probably would not want to go swimming in this type of water (CCC, 1998). Ultimately, as these water quality impacts continue, property values could decline.

## GLOSSARY OF COMMON ACRONYMS

ACEC	Areas of Critical Environmental Concern
AOC	Area of Concern
A-Zones	Floodway areas designated by FEMA
BOD	Biochemical Oxygen Demand
BOH	Board of Health
CAAA	Corrective Action Alternative Analysis
CCC	Cape Cod Commission
CFR	Code of Federal Regulations
CHMP	Comprehensive Harbor Management Plan
CMR	Code of Massachusetts Regulations
COD	Chemical Oxygen Demand
CSA	Comprehensive Site Assessment
CZM	Coastal Zone Management
DEIR	Draft Environmental Impact Report
DEM	Department of Environmental Management
DEP	Department of Environmental Protection
DMF	Division of Marine Fisheries
DO	Dissolved Oxygen
DPW	Department of Public Works
DRI	Developments of Regional Impact
DWPC	Division of Water Pollution Control
EID	Environmental Information Document
EIR	Environmental Impact Report
EIS	Environmental Impact Statement
ENF	Environmental Notification Form
EOEA	Executive Office of Environmental Affairs
FEIR	Final Environmental Impact Report
FEMA	Federal Emergency Management Agency
GAC	Granular Activated Carbon
GIS	Geographic Information System
I/I	Infiltration and Inflow
JRP	Joint Review Process
LCP	Local Comprehensive Plan
M&E	Metcalf & Eddy Engineers
MADEP	Massachusetts Department of Environmental Protection
MBE	Minority Business Enterprise
MCL	Maximum Contaminant Level
MEPA Unit	Massachusetts Environmental Policy Act Unit

MGD	Million Gallons Day
mg/l	milligram per liter
MGL	Massachusetts General Law
MISER	Massachusetts Institute for Social and Economic Research
MLE	Modified Ludzack-Ettinger
MSL	Mean Seal Level
NH <sub>4</sub> -N	Ammonia Nitrogen
NEPA	National Environmental Policy Act
NO <sub>3</sub> -N	Nitrate Nitrogen
PCE	Tetrachloroethylene
PF	Peak Flow
POTW	Publicly-Owned Treatment Works
ppm	parts per million
PSTF	Privately-Owned Sewage Treatment Facility
RAS/WAS	Return Activated Sludge/Waste Activated Sludge
RBC	Rotating Biological Contactor
RPP	Regional Policy Plan
S&W	Stearns and Wheler
SDWA	Safe Drinking Water Act
SMCL	Secondary Maximum Contaminant Level
SRF	State Revolving Fund
SWWTP	Small Wastewater Treatment Plants
TDS	Total Dissolved Solids
THM	Trihalomethane
TKN	Total Kjeldahl Nitrogen
Total N	Total Nitrogen
TSS	Total Suspended Solids
USDA	United States Department of Agriculture
USGS	United States Geologic Survey
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tanks
VFD	Variable Frequency Drives
VOC	Volatile Organic Compound
V-Zones	Velocity Zones designated by FEMA
WPCF	Water Pollution Control Facility
WSE	Waste Stream Environmental
ZOC	Zones of Contribution