# Collection System Extension and Improvements Project
# State Revolving Fund (SRF) Application
# 2013 Project Evaluation Form (PEF)

## Town of Chatham, Massachusetts

August 2012

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**Massachusetts Department of Environmental Protection**
**Bureau of Resource Protection**
**Division of Municipal Services**
**Clean Water State Revolving Fund (CWSRF)**

# 2013 Project Evaluation Form

Town of Chatham
LGU
01-C
Project No. (from Item 4 of Part I)

## Instructions to Applicant

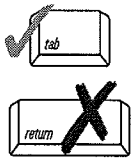
The purpose of the Clean Water SRF Project Evaluation Form (CW PEF) is to assist the MassDEP in selecting proposed clean water projects that address the most serious risk to human health and the environment, that are needed to ensure compliance with state and federal wastewater discharge requirements, and address wastewater systems most in need based on state affordability criteria.

MassDEP strongly encourages municipalities to perform energy audits and include energy-efficiency components in their proposals. MassDEP also will offer financial assistance support for renewable-energy generation projects, especially those proposing anaerobic digestion at treatment facilities. In addition, MassDEP will lend its support to applicants for any federal grants that may become available for renewable-energy projects. PEFs that include energy savings and energy generation components will be awarded additional points in scoring and ranking the 2013 proposals.

In completing the 2013 CW PEF, applicants are strongly encouraged to use the 2013 CW PEF Instruction and Guidance document found on the MassDEP State Revolving Fund website: (http://www.mass.gov/dep/water/approvals/srfforms.htm).

## Part I - Proponent and Project Identification and Certification

**Important:** When filling out forms on the computer, use only the tab key to move your cursor - do not use the return key.




1. Local Governmental Unit (LGU)

Town of Chatham — City, Town, or District Name
04-6001110 — Federal Employer Identification Number
Jill R. Goldsmith — Authorized Representative: Name
Town Manager — Title

Mailing Address:

549 Main Street — Street Address
Chatham — City
MA — State
02633 — Zip Code
508-945-5105 — Telephone
508-945-3550 — Fax
jgoldsmith@chatham-ma.gov — E-mail address

2. LGU Contact Person (If different from Item 1)

Robert Duncanson, Ph.D. — Name
Director of Health and Environment — Title

Mailing Address:

549 Main Street — Street Address
Chatham — City
MA — State
02633 — Zip Code
508-945-5165 — Telephone
508-945-5163 — Fax
rduncanson@chatham-ma.gov — E-mail address

Massachusetts Department of Environmental Protection
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Division of Municipal Services
Clean Water State Revolving Fund (CWSRF)

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## Part I - Proponent and Project Identification and Certification (cont.)

3. Engineer or Consulting Firm

GHD Inc. | 98-0425935
Firm/Agency | Federal Employer Identification Number

Nathan C. Weeks, P.E.
Contact Person

Mailing Address:

1545 Iyannough Road
Street Address

Hyannis | MA | 02601
City | State | Zip Code

774-470-1630 | 447-470-1631 | nate.weeks@ghd.com
Telephone | Fax | E-mail address

4. Project Identification

Identify the project(s) for which you are seeking financial assistance. IMPORTANT: If more than one project, number the projects sequentially, and attach separate Part II and Part III forms for each project. Use Part IIA for Construction projects; Part IIB for Planning projects.

| No. | (P)lanning or (C)onstruction | Name/brief description of project (If a planning project, indicate type – Comprehensive Wastewater Management Plan, Project Evaluation Report, Stormwater Management Plan, etc.) | River Basin(s) |
|---|---|---|---|
| 01 | C | Collection System Extension and Improvements Project, Phase 1C | Cape Cod |
| 02 | | | |
| 03 | | | |
| 04 | | | |

5. Certification

To the best of my knowledge and belief the information provided on this form and the accompanying forms and attachments is true, correct, and complete; and I am authorized to file this form on behalf of the below-named LGU.

Town of Chatham
Local Governmental Unit

Jill R. Goldsmith | Town Manager
Typed Name | Title

Signature | 8/30/12
Date

**Massachusetts Department of Environmental Protection**
**Bureau of Resource Protection**
**Division of Municipal Services**
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# 2013 Project Evaluation Form

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## Part II A - Project Schedule and Costs for Construction Projects

1. Funding Authorization

Has local funding been authorized?
☐ Yes ☒ No (If yes, attach copy of appropriate document.)

If yes, date of authorization

Amount authorized

May 13, 2013
If no, planned date for authorization

2. Project Schedule (Indicate projected dates in mm/dd/yy format.)

(For steps already accomplished, follow the date with the letter "A" to indicate an actual date.)

| | Start | Finish |
|---|---|---|
| Planning (If planning has been completed, provide title and date of report.) | | Final CWMP-FEIR May 2009 (A) |
| Design (Preparation of project plans and specifications.) | 04/01/13 | 10/01/13 |
| Permitting and Environmental Review | 04/01/13 | 10/01/13 |
| Construction/Implementation | 03/01/14 | 05/01/15 |

Loan Application Submittal date: 10/15/13

3. Project Costs (State estimated costs in $1000s)

*Attach an explanation of the basis of the cost estimate and reference the source of data.* ***DMS recommends use of ENR Index of 9550.***

*If the project includes costs for* ***police traffic details,*** *provide an explanation and detailed breakdown of the estimate.*

| | | Total Cost | Eligible Cost |
|---|---|---|---|
| Construction | | | |
| Contract No. | 1 | $6,920 | $6,920 |
| Contract No. | 2 | $10,090 | $10,090 |
| Contract No. | 3 | $2,540 | $2,540 |
| Total Construction: | | $19,550 | $19,550 |
| Construction Contingency: | | $1,960 | $1,960 |
| Construction Services: | | $1,550 | $1,550 |
| Police Traffic Detail: | | $1,180 | $1,180 |
| Total: | | $24,240 | $24,240 |

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## Part II A - Project Schedule and Costs for Construction Projects (cont.)

4. Other Assistance

Are you seeking, or have you been awarded, a loan and/or grant from another program for this project or a portion thereof?

| Loan/Grant Program | Type of Assistance | Amount Requested | Amount Received |
|---|---|---|---|
| Federal | | | |
| State | | | |
| Regional | | | |
| Private | | | |
| Other | | | |

## Part II B - Project Schedule and Costs for Planning Projects

1. Funding Authorization

Has local funding been authorized? (If yes, attach copy of appropriate document.) ☐ Yes ☐ No

If yes, date of authorization _____ Amount authorized _____

If no, planned date for authorization _____

2. Project Schedule (Indicate projected dates in mm/dd/yy format.)

(For steps already accomplished, follow the date with the letter "A" to indicate an actual date.)

| | Start | Finish |
|---|---|---|
| Selection of consultant ("finish" date = date Engineering contract executed) | | |
| Preparation of Scope of Work ("finish" date = date Scope submitted to DEP) | | |
| Planning ("finish" date = date draft CWMP, PER, etc. submitted to DEP) | | |

Loan Application Submittal date: _____

3. Project Costs (State Estimated Eligible Cost In $1000s)

Total Eligible Cost: _____

4. Other Assistance

Are you seeking, or have you been awarded, a loan and/or grant from another program for this project or a portion thereof? ☐ Yes ☐ No

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## Part II B - Project Schedule and Costs for Planning Projects (cont.)

| Loan/Grant Program | Type of Assistance | Amount Requested | Amount Received |
|---|---|---|---|
| Federal | | | |
| State | | | |
| Regional | | | |
| Private | | | |
| Other | | | |

NOTE: The Department understands that the purpose of undertaking a planning project is to try to identify the nature and extent of the water quality and public health problems, then to recommend solutions. At the planning stage, it may be unlikely that you have a good understanding of the situation. Consequently, not all of the criteria listed within the Project Evaluation Form may apply to your planning project. Please address all that apply and include a copy of relevant sections of any reports that you may have completed.

## Part III - Project Narrative/Checklist

A. Project Summary – Description, Objectives, and Planning Basis

Use the checklist to confirm that the project narrative has adequately described the project and its benefits. Applicants are reminded to provide documentation for those questions in which points are being requested (refer to instructions and guidance for types of documentation needed for each question). (Check)

Project objectives; documentation of public health and water quality issues to be addressed. ☒

Scope of project, key facilities or tasks; environmental and public health benefits. ☒

Identification of project area using site plan and/or locus map. ☒

Planning basis of project; copy of pertinent pages of approved planning document. ☒

Basis of cost estimate; engineer's estimate for construction projects ☒

Is this primarily a nutrient management project? ☒ Yes ☐ No

**Massachusetts Department of Environmental Protection**
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## Part III - Project Narrative/Checklist (cont.)

B. Public Health Criteria

| Item. | Pts | 1. **What is the cause of the environmental/public health problem project will address?** | (Check) | Page Number in Narrative | Attachment ID & Page # |
|---|---|---|---|---|---|
| 1 | 3 | Contaminated stormwater | ☐ | | |
| 2 | 4 | Illicit connection to stormwater system | ☐ | | |
| 3 | 5 | Combined Sewer Overflows >20 /year | ☐ | | |
| | 4 | 11 – 20/year | ☐ | | |
| | 3 | 1 – 10/year | ☐ | | |

| Item. | Pts | 1. **What is the cause of the environmental/public health problem project will address?** | (Check) | Page Number in Narrative | Attachment ID & Page # |
|---|---|---|---|---|---|
| 4 | 2 or 5 | Widespread septic system failure | ☒ | 3,4 | A, ES-4 |
| 5 | 5 | Raw sewage back-up from municipal system | ☐ | | |
| 6 | 5 | Sanitary Sewer Overflow > 3/year | ☐ | | |
| | 4 | 3/year | ☐ | | |
| | 3 | 1 – 2/year | ☐ | | |
| 7 | 1 | Water pollution related odor problem | ☐ | | |
| 8 | 2 | Landfill leachate (if exceeds MCL) | ☐ | | |
| 9 | 2 | POTW malfunction, i.e. inadequate disinfection | ☐ | | |
| 10 | 1-3 | Contaminated Groundwater<br>Other | ☒ | 3 | |

| | | **II. What is the nature of the resource affected?** | (Check) | Page Number in Narrative | Attachment ID & Page No. |
|---|---|---|---|---|---|
| 11 | 5 | Public drinking water supply | ☒ | 3 | |
| | | Is alternate supply available? ☐ Yes ☒(No +1) | | 3 | |
| 12 | 5 | Private drinking water supply | ☐ | | |
| | | Is alternate supply available? ☐ Yes ☐(No +1) | | | |

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## Part III - Project Narrative/Checklist (cont.)

| | | | | | |
|---|---|---|---|---|---|
| 13 | 4 | Private homes | ☐ | | |
| 14 | 4 | Public streets or parklands | ☐ | | |
| 15 | 3 | Swimming beaches | ☒ | 3, 4 - 5 | H, I |
| 16 | 2 | Boating areas | ☒ | 3, 4 - 5 | H, I |
| 17 | 1 | Sensitive population affected | ☐ | | |
| 18 | 3 | Population affected >10,000 | ☒ | 3 | |
| | 2 | 25 – 9,999 | ☐ | | |
| | 1 | 1 - 24 | ☐ | | |
| 19 | 1-3 | Eutrophication of coastal and inland waters (Other) | ☒ | 3, 5 | C, A |

C. Environmental Criteria

| Item | Pts | **I. What is the nature of the environmental problem encountered?** | (Check) | Page Number in Narrative | Attachment ID & Page # |
|---|---|---|---|---|---|
| 20 | 3 | NPDES limits exceeded | ☐ | | |
| 21 | 3 | Aquatic toxicity | ☒ | 5 | |
| 22 | 2 | Nutrients | ☒ | 3 | |
| 23 | 2 | Dissolved oxygen | ☒ | 3, 5 | |
| 24 | 1 | Temperature | ☐ | | |
| 25 | 2 | Bacteria | ☐ | | |
| 26 | 2 | Turbidity | ☒ | 5 | |
| 27 | 1 | Noxious aquatic plants | ☒ | 5 | |
| 28 | 1 | Aesthetics | ☒ | 3, 4 | |
| 29 | 1-3 | TMDL Exceeded (Other) | ☒ | 3, 4, 5 | |

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## Part III - Project Narrative/Checklist (cont.)

| Item | Pts | II. What environmental resource(s) is affected? | (Check) | Page Number in Narrative | Attachment ID & Page # |
|---|---|---|---|---|---|
| 30 | 3 | Public water supply – Surface Zone A | ☐ | | |
| 31 | 3 | Public water supply – Groundwater Zone I | ☐ | | |
| 32 | 2 | Outstanding Resource Water (ORW) | ☒ | 3, 4 | L |
| 33 | 2 | Area of Critical Environmental Concern (ACEC) | ☒ | 3, 4 | A; Figure 10-4 |
| 34 | 2 | Public water supply – Surface Zone B | ☐ | | |
| 35 | 2 | Public water supply – Groundwater Zone II | ☐ | | |
| 36 | 2 | Commercial fishery | ☒ | 3, 4 | H, I |
| 37 | 2 | Endangered species habitat | ☒ | 4 | A; Figure 10-3 |

| Item | Pts | II. What environmental resource(s) is affected? (cont.) | (Check) | Page Number in Narrative | Attachment ID & Page # |
|---|---|---|---|---|---|
| 38 | 2 | Sole source aquifer | ☒ | 4 | |
| 39 | 2 | Ocean Sanctuary | ☒ | 4 | |
| 40 | 1 | Recreational fishery / shellfish area | ☒ | 4 | |
| 41 | 1 | Federally designated river (scenic, historic, etc.) | ☐ | | |
| 42 | 1-3 | Esturaine water quality based on nitrogen TMDLs (Other) | ☒ | 5 | |

D. Project Effectiveness

| Item | Pts | I. How and to what extent will the project eliminate or mitigate the problem? | (Check) | Page Number in Narrative | Attachment ID & Page # |
|---|---|---|---|---|---|
| | | Reduces violations of water quality standards | ☒ | 5 | |
| | | Restores designated uses | ☒ | 5 | |
| | | Reduces potential adverse impacts to sensitive resources | ☒ | 5 | |
| | | Protects designated uses | ☒ | 5 | |
| | | Reduces or eliminates public health problems/nuisances | ☐ | | |
| | | Protects public health resources from contamination | ☒ | 5 | |
| | | Other | ☐ | | |

## Part III - Project Narrative/Checklist (cont.)

| | | | | | |
|---|---|---|---|---|---|
| | | Other | ☐ | | |
| 43 | 30 | Project substantially eliminates or mitigates problem | ☒ | 4 | |
| | 15 | Project moderately mitigates problem | ☐ | | |
| | 0 | Project minimally mitigates problem | ☐ | | |

E. Program and Implementation Criteria

| Item | Pts | **I. Consistency with EOEA/MassDEP Watershed Management Plans or priorities** | (Check) | Page Number in Narrative | Attachment ID & Page # |
|---|---|---|---|---|---|
| 44 | | Implements a recommendation within: | | | |
| | 35 | - a CWMP/EIR (if necessary) that has completed review through MEPA. | ☒ | 1 - 2 | G, E |
| | 30 | - a TMDL (case specific) or CEP. | ☒ | 1 - 2, 3 - 4 | |
| | 25 | - a TMDL (case specific), PER, SSES, Stormwater Management Plan, or CWMP/EIR (if necessary) if DEP has indicated support and few if any serious issues need to be addressed. | ☐ | | |
| | 20 | - a Water Quality Assessment Report, Diagnostic/ Feasibility Study or EOEA Watershed Management Plan that specifically identifies the project. | ☐ | | |
| | 15 | - a Local Planning Study or CWMP/EIR (if necessary) if greater than 15 years old or if recently submitted to DEP but comments have not yet been made. | ☐ | | |
| 45 | | **II. Compliance and Enforcement** | | | |
| | 12 | Project restores compliance with DOJ or AG referral. | ☐ | | |
| | 10 | Project achieves compliance with enforcement order. | ☒ | 6 | |
| | 8 | Maintains permit compliance level. | ☐ | | |
| | 6 | Achieves voluntary compliance (violation w/no order). | ☐ | | |

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## Part III - Project Narrative/Checklist (cont.)

| | | | | | |
|---|---|---|---|---|---|
| 46 | | **III. Multi-community, regional or basin solution** | | | |
| | 8 | Project substantially addresses regional problem. | ☒ | 6 | |
| | 6 | Project includes significant I/I reduction or stormwater recharge. | ☐ | | |
| | 4 | Project moderately addresses regional problem. | ☐ | | |
| | 2 | Project includes significant I/I or stormwater recharge. | ☐ | | |
| 47 | | **IV. Innovative/Alternative Technology** | | | |
| | 2 | Project utilizes MassDEP-approved I/A technology. | ☐ | | |
| 48 | 2 | **V. Pricing System under MGL c. 40, s.39J** | ☐ | | |
| | | Certification attached | ☐ | | |

F. Green Projects

| Item | Pts | | (Check) | Page Number in Narrative | Attachment ID & Page # |
|---|---|---|---|---|---|
| 49 | | **I. ENERGY EFFICIENCY** | | | |
| | | ***This project is recommended by an Audit*** | ☐ | | |
| | 10/20 | Project Efficiency: substantial (>25%). | ☐ | | |
| | 5/10 | Project Efficiency: moderate (10 – 25%). | ☐ | | |
| | 2/4 | Project Efficiency: nominal (<10%). | ☐ | | |
| 50 | | **II. RENEWABLE ENERGY** | | | |
| | | ***This project is recommended by an Audit*** | ☐ | | |
| | 10/20 | Project renewable energy: substantial (>50%). | ☐ | | |
| | 5/10 | Project renewable energy: moderate (20 – 50%). | ☐ | | |
| | 2/4 | Project renewable energy: nominal (<20%). | ☐ | | |

## Part III - Project Narrative Checklist (cont.)

G. Threshold Criteria

An affirmative answer to either question below could disqualify the project from review

| Item | | (Yes/No) |
|---|---|---|
| 51 | Indicate whether and to what extent the capacity to be provided by the project duplicates existing treatment or disposal capacity | No |
| 52 | Identify and describe the extent of any potential negative impacts to water quality, water quantity, or to the public health | No |

H. QUALIFYING EPA GREEN PROJECTS

**Please read the instructions before completing this section.**

Item

53 (a) List the project item codes from the checklist that qualify as green:

(b) List the total value of the green items:

(c) List the percentage green of the project:

Please submit two copies of the Project Evaluation Form (one paper and one electronic copy on CD) not later than noon on August 31, 2012 to:

John Felix, Deputy Director
MassDEP Municipal Services
One Winter Street, 6th floor
Boston, MA 02108

# Project Narrative

# 1 Project Summary

The Town of Chatham has made great efforts over the last decade to restore and protect the health and quality of the coastal embayments that surround the Town on three sides; its groundwater and its fresh surface waters. A Comprehensive Wastewater Management Planning (CWMP) project was completed in May 2009. The CWMP project and the Massachusetts Estuaries Project (MEP), along with a variety of other efforts, documented the need to reduce nitrogen loading within the coastal watersheds through multiple technical reports, nitrogen Total Maximum Daily Load (TMDL) reports, and the CWMP/Final Environmental Impact Report (EIR).

Without addressing the nitrogen loading concerns, Chatham would continue to lose natural and economic resources, including declines in fin-fishing and shell-fishing resources, declines in property values, continued algal blooms in coastal embayments, beach closures and declines in tourism as the adverse impacts continue to impair the Town's water resources (coastal and fresh). For example, Chatham has experienced the loss of naturally occurring oysters in Oyster Pond, increased algal blooms in Oyster Pond and Little Mill Pond (among other embayments), loss of eel grass in the majority of the Town's coastal embayments, and impacts to freshwater ponds. There is also the potential for impacts to the Town's drinking water supply, which comes from an EPA designated sole source aquifer. TMDLs for nitrogen have been established for the estuaries in Chatham to reduce and reverse these negative impacts.

The CWMP/Final EIR, released in May 2009 (see Appendix A) and subsequently approved by the Executive Office of Energy and Environmental Affairs (EOEEA) (see Appendix G), provides the plan to mitigate these problems through expansion of the existing Chatham Water Pollution Control Facility (WPCF) in Chatham and expansion of the wastewater collection system. The recommended plan is a comprehensive strategy for wastewater and nitrogen management in Chatham for a 20-year period; and with a perspective on the ultimate build-out condition for the Town. The 20-year period (Phase 1) is the estimated time period for implementation of wastewater facilities to meet the immediate (TMDL) wastewater needs in Town. The recommended plan also includes the strategy to further extend wastewater collection and treatment facilities to the rest of the Town (Phase 2) within approximately 10 years of the completion of Phase 1.

The Collection System Extension and Improvements Project (CSEIP) allows the Town to continue moving forward in addressing the nitrogen loading concerns by further extending the wastewater collection system (Phase 1C). The first step, initiated in 2010, was the expansion of the WPCF to provide sufficient capacity, and enhanced treatment, to meet the required TMDLs, and included initial expansion (Phase 1A) of the wastewater collection system. These first steps were funded by SRF and USDA. The second step is to upgrade the Stage Harbor Pump Station and further extend the wastewater collection system (Phase 1B) and will initiate construction in March 2013. This third step (Phase 1C) is a continuation of the implementation of nitrogen mitigation efforts and will include collection system extension to the sewersheds detailed in Table 1-1 and the construction of two pump stations. Appendix B shows the project location and a listing of the street names within the project boundary. The pumps stations will be designed for the following average annual flow rates:

- Sewershed 35 PS: 14,000 gpd
- Sewershed 76 PS: 54,000 gpd

The project is broken down into three contracts. Contract No. 1 will occur in year one. Contracts No. 2 and No. 3 are expected to be carryover projects.

**Table 1-1 Collection System Expansion by Sewershed**

| | | Gravity (LF) | Low Pressure Sewer (LF) | | | Force Main (LF) | |
|---|---|---|---|---|---|---|---|
| | Sewershed | 8" | 1.5" | 2" | 3" | 4" | 8" |
| Contract 1 | CTE-1 | 1,950 | | | | | |
| | CTE-2 | 3,200 | | | | | |
| | CTE-3 | 400 | | | | | |
| | CTE-6 | 500 | | | | | |
| | CTE-7 | 950 | 300 | 550 | | | |
| | CTE-8 | 860 | | | | | |
| | CTE-12 | 900 | | | | | |
| | Pipeline Improvements required for CTE sections | | | | | | |
| | Pumping Station Improvements | | | | | | |
| Contract 2 | 37 | 11,370 | 2,040 | 3,260 | 2,850 | | |
| | 43 | 6,925 | 890 | 1,420 | 1,250 | | |
| | 76 | 1,100 | | | | 850 | |
| Contract 3 | 35 | 4,463 | 700 | | | | 1,300 |

Appendix B shows which lots were developed prior to and after July 1, 1995. As demonstrated in the figure at least 85% of the expected flow into the proposed system will be for flows that were in existence as of July 1, 1995 (672 out of the 774 developed properties). It is noted that this sewer is not being installed to promote growth or additional flow but to remediate impacted water quality in the estuaries down gradient of these properties. It is also noted that Chatham has a flow neutral regulation (see Appendix F) therefore this sewer will not encourage additional growth or flow.

The documents and evaluations that have been completed that are relevant to the CSEIP include:

- Final Needs Assessment Report for Comprehensive Wastewater Management Planning Study – August 1999
- Action Plan for the Town of Chatham Ponds – November 2003
- Technical Memorandum on Findings of USGS Modeling for Effluent Recharge Alternatives and Effects on the Landfill Plume – July 2005

- Infiltration Loading Test – July 2006
- Treated Water Recharge Site Evaluations – June 2007
- Technical Memorandum on Findings of Groundwater Modeling for Treated Water Recharge at Existing WWTF Site and Site NO. 1 – June 2007
- Collection System and Wastewater Treatment Facilities Preliminary Designs – April 2006
- Draft Comprehensive Wastewater Management Plan and Draft Environmental Impact Report and Notice of Project Change – April 2008
- Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Stage Harbor, Sulphur Springs, Taylors Pond, Bassing Harbor and Muddy Creek, Chatham, Massachusetts – December 2003
- Stage Harbor, Sulphur Springs, Taylors Pond, Bassing Harbor and Muddy Creek Total Maximum Daily Loads for Total Nitrogen – November 2004
- Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Pleasant Bay System, Orleans, Chatham, Brewster and Harwich, Massachusetts – May 2006
- Draft Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen – July 2006
- MEP Technical Memorandum Final; Cockle Cove Salt Marsh Nitrogen Threshold – November 2006
- Linked Watershed-Embayment Model to Re-evaluate Critical Nitrogen Loading Thresholds for Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek, Chatham, MA – February 2007
- FINAL Pleasant Bay System Total Maximum Daily Loads for Total Nitrogen – May 2007
- DRAFT Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evaluations for Total Nitrogen – January 3, 2008
- Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load Re-Evaluations for Total Nitrogen – December 31, 2008
- Final Comprehensive Wastewater Management Plan and Environmental Impact Report (Final CWMP and FEIR) - May 2009
- Massachusetts EOEEA Approval Certificate of the Final CWMP and FEIR – July 17, 2009
- Cape Cod Commission Approval Decision for Final CWMP and FEIR – October 29, 2009
- Adaptive Management Plan for Comprehensive Wastewater Management Plan (CWMP) Compliance – July 2011

## 2 Public Health Criteria

The reliance on onsite septic systems has resulted in **contaminated groundwater** in the project area (as documented by the MEP Technical Reports) and the need to mitigate the excessive wastewater nitrogen loadings to the Town's estuaries.

Although the **public drinking water supply** is currently of good quality, the groundwater that is the source of the water supply has been designated a sole source aquifer. Onsite septic systems do not provide significant removal of nitrogen or other potential contaminants ("emerging contaminants").

As development continues, either new development or re-development of existing properties, and septic systems are installed, nitrogen will continue leaching into the groundwater system and may potentially reach a point where it is impacting the quality of the drinking water supply.

Chatham is a popular destination for locals and visitors alike. A large number of **boating areas** and **swimming beaches** are available in Town. The Long Range Comprehensive Plan reports over 800 acres of beaches and more than 10 acres of Town Landings/Water Access in Town (see Appendix I).

The **population** of the Town of Chatham, all of which will be affected by the proposed project, was most recently reported as 6,247 (as of June 1, 2011). The population of summer residents and tourists, which is largely drawn to the area because of the attractiveness of Chatham's water resources, is well in excess of 10,000 (20,000 – 30,000) and will also be affected by the proposed project.

Nitrogen and phosphorous from onsite septic systems has resulted in **eutrophication of coastal and inland waters**. Eutrophic waterbodies have decreased water quality and the increased nutrient concentrations pose a potential threat to human and environmental health. Refer to Appendices A and C.

## 3 Environmental Criteria

As discussed previously and documented in various reports, **nutrient** loading, primarily nitrogen from onsite septic systems, is the major contributor to degradation of the coastal water quality. Nitrogen TMDLs have been established for Chatham's estuaries. This project will address nitrogen loading by removing the current septic system discharges via wastewater collection and advanced treatment at the WPCF.

As detailed in the MEP reports, habitat quality is clearly related to the level of nitrogen enrichment. **Dissolved oxygen** is one of the habitat quality indicators that is discussed in the MEP reports. As the nitrogen loading to the estuaries is reduced, dissolved oxygen levels will increase, providing higher quality habitats.

The MEP reports discuss the **aesthetic** degradation that results from nutrient enrichment of the estuaries. Abundant nitrogen promotes algal blooms, which appear as floating green mats on the water surface. Reduction of nutrient loading will reduce the frequency and intensity of algal blooms.

The majority of the estuaries in Chatham currently exceed the **TMDL limits** issued by EPA. Sewering has been identified as a way to achieve compliance with TMDL limits.

The Pleasant Bay **Area of Critical Environmental Concern** (ACEC) (see Figure 10-4 in Appendix A) encompasses northern portions of Chatham (this area is also designated an **outstanding resource water**). The major water bodies and landmasses in the Chatham portion of the ACEC are: Mill Pond (in

northwest Chatham), Muddy Creek, Minister Pond, Lovers Lake, Stillwater Pond, Frost Fish Creek, Pleasant Bay, Ryder's Cove, Crows Pond, Bassing Harbor, Strong Island, and Nauset (North) Beach. The entire Pleasant Bay ACEC is over 9,000 acres and includes 12 threatened or endangered species, with an additional 16 species identified as of special concern in Massachusetts. The Pleasant Bay Resource Management Plan (Pleasant Bay TAC, et al, 1998) was adopted in 1998, updated in 2003 and 2008.

The Long Range Comprehensive Plan reported that **commercial fisheries** in Chatham provided $15 million in fish landings (calendar year 2000) and $5.6 million from the 2001 shellfish harvest. (See excerpts of the Comprehensive Plan in Appendix I). In addition to the commercial fisheries, **recreational fisheries/shellfish areas** are abundant in Chatham. 297 commercial shellfishing permits and 2,246 recreational shellfishing permits were issued in 2010.

As shown on Figure 10-3 of Appendix A, the majority of Chatham's estuaries and freshwater ponds provide **endangered species habitat**. The quality of the water impacts the health and vitality of the entire ecosystem. Endangered species habitat may be lost as coastal estuaries and freshwater ponds are negatively impacted by nutrient loading.

As mentioned earlier, the drinking water supply for Chatham is obtained from a **sole source aquifer**.

The waters surrounding Chatham are included in State-designated **ocean sanctuaries**.

# 4 Project Effectiveness

The proposed project will play a significant role in mitigation of the problems discussed in previous sections of this PEF. They are part of the overall nutrient mitigation program. The construction of the two proposed pump stations will allow additional septic system flows (currently contaminating the groundwater system) to be conveyed to the WPCF for advanced treatment. The sewer extensions detailed above will expand nitrogen mitigation of those watersheds and associated marine estuaries.

# 5 Additional Information on Specific Criteria

## Criteria #4, Widespread Septic System Failure

The nitrogen TMDLs for the estuaries around Chatham have indicated that sewers need to be extended to 66 percent of the Town properties because the existing septic systems are not removing sufficient nitrogen from the wastewaters. These may not be "failing septic systems" by the historic meaning of the term (i.e. hydraulic failure), but they are "failing" to protect the environmental health of the estuaries as determined by the nitrogen TMDLs and they need to be remediated.

## Criteria #10, Contaminated Groundwater as an "Other Cause of the Environmental/Public Health Problem"

The Town's drinking water comes from the USEPA designated Sole Source Aquifer. These Collection System Extension and Improvements projects will further remediation and protection of the Sole Source Aquifer by removing the current septic system discharges that are impacting this resource. The contaminated groundwater is a potential human health risk due to consumption of groundwater impacted by emerging contaminants and other contaminants originating from septic systems. Septic system impacted groundwater is a known environmental health problem because its recharge to the coastal estuaries (waters of the US) is causing excessive nitrogen loadings which exceeds the nitrogen TMDLs.

## Criteria #15 and #16, Swimming Beaches and Boating Areas

The nitrogen TMDLs have indicated that the estuary waters do not meet the State's criteria for marine surface waters in that they are swimmable, fishable and suitable for boating. Periodic algae blooms caused by the current excessive septic system nitrogen loads are causing the impacts to the swimmability and boatability of the waters.

## Criteria #18, Population Affected

The Chatham year-round population is approximately 6,247; however the population of summer residents and tourist is well in excess of 10,000 (20,000 – 30,000). This significant increase in summer population is in large measure a result of the attractiveness of Chatham due to its water resources and the associated activities (swimming, boating, fishing, shellfishing etc.)

## Criteria #19, Other (Eutrophication of Coastal and Inland Waters)

The project is designed to meet the nitrogen TMDLs and remediate the eutrophication.

## Criteria #21 and #23, Aquatic Toxicity and Dissolved Oxygen

The eutrophication (exceeded nitrogen TMDLs) is causing excessive algae production which in turn reduces oxygen for the estuarine benthic communities. The loss of oxygen and the subsequent production of anoxic products such as hydrogen sulfide are toxic to these benthic communities.

## Criteria #26, Turbidity

The excessive septic system nitrogen loads (documented in the nitrogen TMDLs) causes increased algae production and turbidity which in turn shades the eel grass. Eel grass shading due to turbidity is one basis of the nitrogen TMDL.

## Criteria #27, Noxious Aquatic Plants

Similar to the discussion for Criteria #26, the septic system nitrogen causes production of noxious aquatic plants (algae) which causes turbidity and shades the eel grass which causes the nitrogen TMDL to be exceeded.

## Criteria #29, Other (TMDL Limits Exceeded)

See Criteria # 19.

## Criteria #42.1, Reduces Violations of Water Quality Standards

This project is designed to remove septic system nitrogen loads from the estuarine watersheds and "reduce violations of TMDL non-compliance".

## Criteria #42.2, Restores Designated Uses

This project is designed to restore the estuarine environmental health by meeting the nitrogen TMDL.

## Criteria #42.3, Reduces Potential Adverse Impacts to Sensitive Resources

This project is designed to reduce the current impacts to the benthic community caused by excessive nitrogen loading from septic systems as the basis of the nitrogen TMDL.

### Criteria #42.4, Protects Designated Uses

By extending sewers, providing advanced treatment, and meeting the nitrogen TMDLs; this project would be protecting the designated uses of the estuarine waters, pond waters, and sole source aquifer drinking waters.

### Criteria # 42.6, Protects Public Health Resources From Contamination

Similar to Criteria # 42.4, this project will protect the public health resource of clean drinking water from our public water supplies as well as private water supplies.

### Criteria # 43 Project Effectiveness

The project will substantially eliminate and mitigate the eutrophication problem, meet the TMDL and subsequently fix the problem for the area of the project.

### Criteria # 44, Recommended Implementation

This project is a recommendation of a CWMP and of a TMDL.

### Criteria # 46, Regional Solution

This project substantially addresses a regional problem.

- Chatham has engaged in ongoing dialogue with Harwich which is the neighboring town on two sides and shares several watersheds regarding the potential for shared infrastructure.
- Chatham is an active member of the Pleasant Bay Alliance which is one the sites of MassDEP's Pilot Studies on regional solutions and has pioneered regional cooperation on Cape Cod. (Four additional points.)

## 6 Program and Implementation Criteria

The collection system improvements and expansion continue the wastewater nitrogen mitigation of the areas that have been identified as needing collection systems in the recommended plan.

The development of the CWMP was prompted by the issuance of an Administrative Consent Order (ACO). This ACO was not issued for a nutrient related infraction; it was issued due to lapse of time associated with renewal of an effluent discharge permit in 1987 as summarized below.

| Type of Action | Subject | Reference Number | Section & Page |
|---|---|---|---|
| Administrative Consent Order | Lapse of time on effluent discharge permit renewal, leading to completion of CWMP and wastewater and treatment disposal needs | ACO-SE98-1002 | IV, pp 4-8 |

Pleasant Bay is a regional resource that is shared by the towns that border the bay – Orleans, Brewster, Harwich, and Chatham. This project is part of the Town's ongoing nutrient management program (as documented in the approved CWMP) to address a regional problem by constructing sewer infrastructure in the Chatham portion of the Pleasant Bay watershed. The Town of Harwich, which is the only town that borders Chatham, is in the process of developing a CWMP. The upgrade of the Chatham WPCF contains

provisions for future additions to allow the neighboring portions of Harwich to connect to the WPCF as discussed in the CWMP.

Currently, operation of the Chatham WPCF is funded by means of user fees and funds from the Town General Fund. The small number of users currently connected does not allow the Town to cover operational expenses solely through user fees. However, as the system is expanded and new connections are made, the Town will continue to calculate rates in order to "adopt a pricing system which includes the costs of the provision of water and sewer services to the residents and industrial and commercial users of said city or town receiving said services" as described in **M.G.L. c.40s.39J**. The whole Town will be served by this system upon full implementation of Phase 1 and 2; the whole Town will pay for it through a system of user fees, and appropriations from the Town General Fund.

## 6.1 Criteria Consistency with Environmental Bond Bill (Amendments to Section 6 of Chapter 29c) Requirements for 0% Loans

This project meets the criteria requirements of the Environmental Bond Bill and the amendments to Section 6 of Chapter 29c as described below; as such, the project requests placement on the Intended Use Plan (IUP) and the opportunity for a 0% loan.

1. The project is intended to remediate and prevent nutrient enrichment of the Stage Harbor system, which includes Mill Pond, Mitchell River and Oyster Pond. All of these waterbodies have nitrogen TMDLs developed with the Town of Chatham, SMAST, MassDEP and the MEP.
2. The applicant is not currently subject to a MassDEP enforcement order due to violation of a nutrient-related TMDL standard or other nutrient based standard. As stated above, the Town is subject to a violation related to lapse of time in renewing their effluent discharge permit in 1987.
3. Chatham has an approved Final CWMP and FEIR.
4. The project is consistent with regional water resource management plans as determined by Cape Cod Commission in their Final CWMP and FEIR review and approval letter (Appendix E).
5. The Town has passed (at Town Meeting) their Growth Neutral Regulation (Appendix F), which limits unintended growth and wastewater flows to the amount authorized under zoning and wastewater regulations. This component has been reviewed by MassDEP and approved as part of the Department's review and approval letter on the Final CWMP and FEIR (Appendix G).

The project's ability to meet the criteria of the Environmental Bond Bill will be presented in the full SRF application as required by the SRF Instructions and Guidance.

## Legend

- Existing or Proposed Pumping Station
- Proposed Manhole
- Proposed Gravity Sewer
- Proposed Low Pressure Sewer
- Proposed Force Main
- 2 — Sewershed with ID#
- Sewershed with Relay Pumping Station
- Existing Sewered Area
- Watershed Boundary

Existing WWTF

Stage Harbor Pump Station

CTE-4 and CTE-5 Areas

### ESTIMATED PERCENT WASTEWATER NITROGEN REMOVALS

Town of Harwich

100% Final Percentage of Wastewater Nitrogen Removal Suggested by MEP

File Source: G:\Jobs\90000\91057\Figures\USDA Application\Application igures\MXD-Environmental70098F4.mxd

GHD CLIENTS | PEOPLE | PERFORMANCE

Hyannis, Massachusetts

Date: 8/8/2011

TOWN OF CHATHAM, MASSACHUSETTS

2012 SRF
PEF APPLICATION

SEWERSHEDS TO MEET TMDL GOALS
FIGURE 1

# Appendix A

## Excerpts from Chatham Final CWMP and FEIR
## May 2009

# Final Comprehensive Wastewater Management Plan and Final Environmental Impact Report

Town of Chatham, Massachusetts

Volume #1

May 2009

# EXECUTIVE SUMMARY

# FINAL COMPREHENSIVE WASTEWATER MANAGEMENT PLAN / FINAL ENVIRONMENTAL IMPACT REPORT

# TOWN OF CHATHAM, MASSACHUSETTS

## ES.1 BACKGROUND

The Town of Chatham (Town) is completing this Comprehensive Wastewater Management Planning (CWMP) Project to provide a comprehensive strategy for wastewater management in Chatham, Massachusetts for a 20-year planning period; and with a perspective on the ultimate build-out conditions for the Town. The 20-year period is 2010 to 2030, which is the estimated time period for the recommended Phase 1 facilities to be constructed to meet the immediate wastewater and nitrogen management needs of the Town. Extension of sewers to the remaining portions of Town will take an additional ten years, estimated for completion in approximately 2040.

This Comprehensive Wastewater Management Plan and Final Environmental Impact Report (CWMP/FEIR) documents the many evaluations and reports that were completed for this project. It also documents the recommended plan for Chatham's wastewater management system and the environmental impact analysis completed to demonstrate that there will be minimal impacts and a significant environmental benefit to proceeding with this plan. This CWMP/FEIR also addresses the comments that we received from the environmental review (MEPA office) on the Draft CWMP.

These documents are being prepared for review by MassDEP and as part of the Massachusetts Environmental Policy Act and Cape Cod Commission Development of Regional Impact review process.

## ES.2 SUMMARY OF WASTEWATER PROBLEMS AND NEEDS IN CHATHAM

The full identification and understanding of the wastewater problems and needs in Chatham has taken many years, and has been a very comprehensive evaluation and public education process.

The "Needs Assessment Report" (Stearns & Wheler, August 1999) was the first summary of wastewater needs and provided a detailed summary of water consumption, wastewater flows, evaluations of the existing wastewater treatment facility (WWTF), nitrogen loadings, and regulatory constraints and requirements. Regulatory comments provided after review of this document indicated that additional evaluations of fresh-water and marine-water quality were needed to completely define the wastewater problems and needs in Chatham and these additional evaluations are provided in this CWMP/FEIR.

The "Action Plan for the Town of Chatham Ponds" (Stearns & Wheler, November 2003) summarized water quality problems (due to wastewater and other sources of nutrients) of the freshwater ponds, and set an action plan to mitigate nutrient-related problems. The Town is currently (2009) evaluating recommendations and developing an implementation plan to remediate water quality problems in Stillwater Pond and Lovers Lake.

Detailed evaluations have been completed by the Massachusetts Estuaries Project (MEP) to identify nutrient loading problems to Chatham's marine waters. This project was created by the Massachusetts Department of Environmental Protection (MassDEP) and the University of Massachusetts School of Marine Science and Technology (UMass SMAST) to accurately define the nitrogen limits of coastal estuaries in Southeast Massachusetts; and Chatham's estuaries were the first in Massachusetts to have limits defined. The MEP, UMass SMAST, and MassDEP have produced the following reports and technical memorandum to define wastewater and nitrogen loading problems to the Town's coastal estuaries.

- The December 2003 Technical Report (MEP, 2003) quantified the nitrogen loadings to the Town's major estuaries (excluding Pleasant Bay/Chatham Harbor) and identified the amount of wastewater nitrogen that needs to be removed from the watersheds of the estuaries to meet the nitrogen limits.

- The November 2004 Total Maximum Daily Load (TMDL) Report (MassDEP, 2004) summarized the nitrogen limits developed in the December 2003 Technical Report and formatted this information to be acceptable to the USEPA to become TMDLs. TMDL is a regulatory term for the pollutant limit of a waterbody.
- The May 2006 Technical Report (MEP, 2006) re-quantified the nitrogen loadings and nitrogen limits to the Town's estuaries in the Pleasant Bay system. This document refined the amounts of wastewater nitrogen that needs to be removed from the Chatham portion of the Pleasant Bay watershed to meet the nitrogen limits.
- The July 2006 Pleasant Bay Total Maximum Daily Load (TMDL) Report (MassDEP, 2006) summarized the nitrogen limits developed in the May 2006 Technical Report and formatted this information to be acceptable to become TMDLs.
- The November 2006 Technical Memorandum on the Cockle Cove Creek Salt Marsh nitrogen threshold (MEP, 2006) developed the nitrogen limit for this salt marsh component of the Sulphur Springs Estuary. The December 2003 Technical Report identified that this area was not overloaded with nitrogen, but did not provide a nitrogen limit. The Technical Memorandum evaluated this area as a salt marsh system (as opposed to an embayment system as done in the December 2003 Technical Report), and found that it is very resilient to nitrogen loadings. In fact, its nitrogen limitation is not based on a loading; it is based on a maximum nitrogen concentration in the upper reaches of the creek. This was an important finding, because the Town's Wastewater Treatment Facility is located in this watershed. The Technical Memorandum found that a total nitrogen concentration of approximately 3 milligrams per liter (mg/L) at the upper portion of the creek (and as a groundwater recharge from the treatment facility) would be protective of the water quality in the creek.
- The February 2007 Technical Report (MEP, 2007) reevaluated the nitrogen loadings to Chatham's south side estuaries (Stage Harbor system, Sulphur Springs/Bucks Creek, and Taylor's Pond/Mill Creek) to correct for the errors that occurred in the December 2003 Technical Report, and to incorporate additional water quality data and more recent findings into the nitrogen limit development. This report produced slight modifications to the quantities of nitrogen that need to be removed from the watersheds.

- The April 2008 TMDL Report for Chatham's southeastern estuaries (MassDEP 2008) summarized the limits developed in the February 2007 Technical Report and formatted this information to be acceptable to become TMDLs.
- The May 2007 Final Pleasant Bay Total Maximum Daily Load (TMDL) Report (MassDEP, 2007) summarized the nitrogen limits developed in the May 2006 Technical Report and formatted this information to be acceptable to become TMDLs.
- The August 2007 Technical Memorandum on Wastewater Modeling Scenario for Bucks Creek. This Technical Memorandum identified that both the threshold level at the Sentinel Station and the TN levels within Cockle Cove Creek are acceptable based on the wastewater effluent nitrogen load provided (MEP, 2007). This like the previous analysis for Cockle Cove Creek was an important finding, because the Town's Wastewater Treatment Facility is located in this watershed.
- The January 2009 Draft Total Maximum Daily Load (TMDL) Report (MassDEP, 2007) summarized the re-evaluated nitrogen limits developed in the February 2007 Technical Report and formatted this information to be acceptable to the USEPA to become TMDLs.
- The December 2008 Stage Harbor/Oyster Pond, Sulphur Springs/Bucks Creek, Taylors Pond/Mill Creek Total Maximum Daily Load (TMDL) Re-Evaluations for Total Nitrogen (MassDEP, 2008) summarized the nitrogen limits developed in the February 2007 Technical Report and formatted this information to be acceptable to become TMDLs.

These MEP, SMAST, and MassDEP reports represent a large body of work completed by these groups and the Town of Chatham to accurately identify the nitrogen limitations of the estuaries and needed wastewater management to meet the limits. The nitrogen limitations that they identified were based on detailed measurements of the major sources of nutrient enrichment and the impacts that the nutrient enrichment is causing, including:

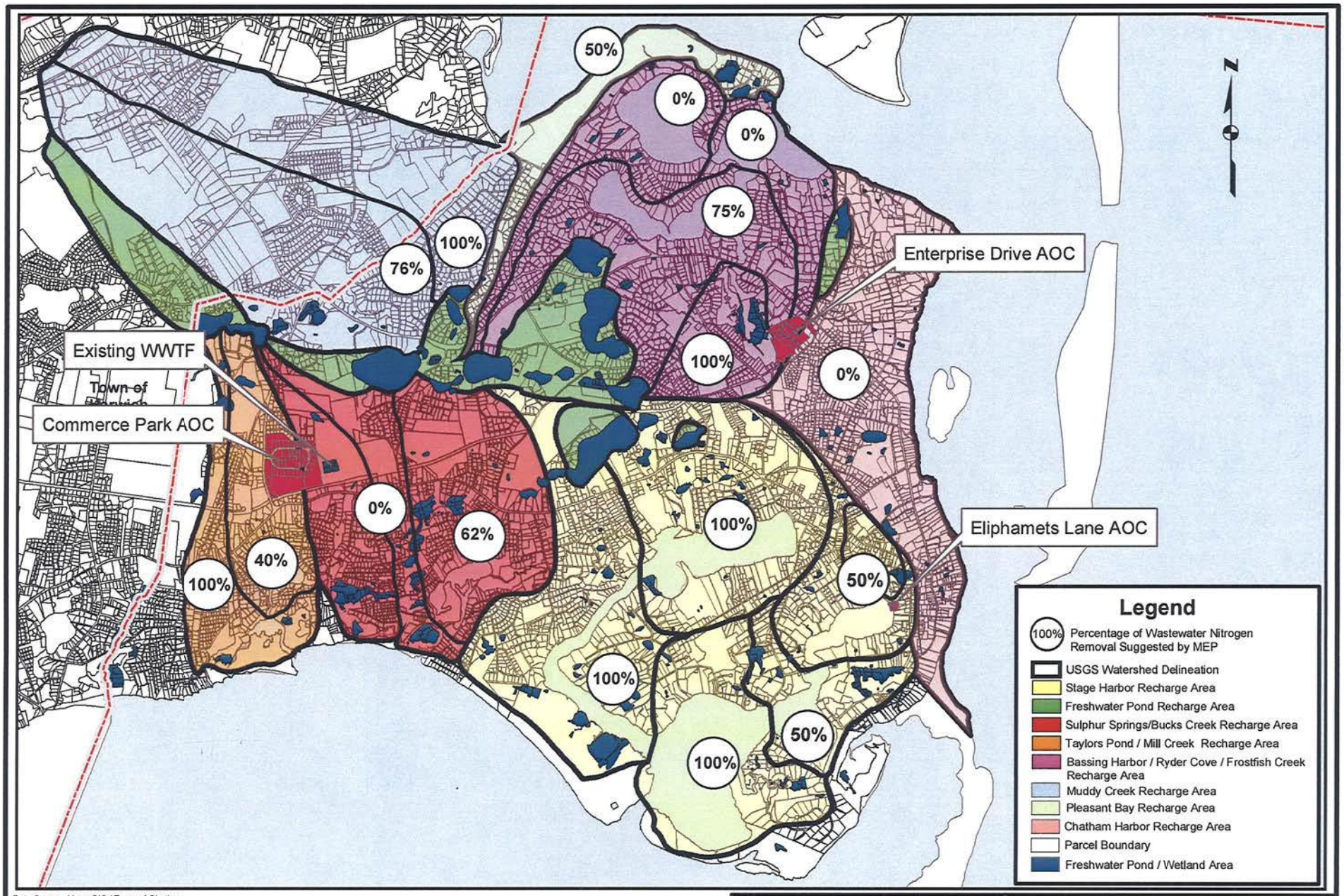
- Loss of eel grass in many of the estuarine systems.
- Poor water clarity.
- Low dissolved oxygen in the lower waters.
- Low diversity of the animals living in (and on) the floor of the estuaries.

These findings led to their summary that portions of these estuaries were moderately to significantly impaired and are expected to get worse if no changes are made.

It is noted that the estuaries' nitrogen limits identify a large wastewater nitrogen management problem that tends to overshadow other wastewater needs in the Town. The full wastewater needs resulting from this project are briefly listed below:

- Stage Harbor, Oyster Pond, Oyster Pond River, Frost Fish Creek, Mill Creek, and Muddy Creek lower require 100 percent wastewater nitrogen removal to remediate impacted estuarine water-quality and habitat conditions.
- Muddy Creek Upper, Sulphur Springs, and Ryder's Cove require 60-80 percent wastewater nitrogen removal to remediate impacted estuarine water-quality and habitat conditions.
- Mill Pond, Little Mill Pond, Mitchell River, and Taylors Pond require 40-50 percent wastewater nitrogen removal to remediate impacted estuarine water-quality and habitat conditions.
- Two Industrial Parks in Chatham (Commerce Park and Enterprise Drive) require sewering to protect the groundwater at these areas.
- Eliphamets Lane requires a permanent wastewater solution to address failing septic systems in that area.

This summary of wastewater needs and the areas of Town where the needs apply are illustrated on Figure ES-1. As stated in the 1999 Needs Assessment Report, impacts to water supplies and other water resources were identified. However, the focus of the CWMP since 1999 has shifted towards remediating current impacts to marine waters as identified in the several MEP/MassDEP reports identified above. The Town has been very active in the protection of its public drinking water supplies, private water supplies and evaluating impacts to its fresh water systems. Solutions presented here will not only be focused on addressing the nutrient impacts on marine waters but will also further protect these other resources.




Data Source: Mass GIS / Town of Chatham

0 0.25 0.5 1 Miles

NOTE: The percent removals indicated are only one scenario that could meet the TMDL - This scenario is suggested by MEP & MassDEP
An "AOC" is a wastewater area of concern.

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DATE: 4/15/2008

TOWN OF CHATHAM, MASSACHUSETTS

COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

SUMMARY OF NEEDS
FIGURE ES-1

## ES.3 SUMMARY OF ALTERNATIVE EVALUATIONS TO REMEDIATE THE WASTEWATER PROBLEMS

Detailed evaluations were completed to investigate the feasible methods to address the wastewater and nitrogen problems, including use of individual nitrogen management septic systems, small treatment facilities to treat and recharge wastewater from neighborhood areas, and upgrade and expansion of the Chatham WWTF to collect and treat wastewater from large areas of Chatham. The evaluations were completed on a watershed by watershed basis to identify the most appropriate wastewater and nitrogen treatment concepts for each watershed to meet the specific nitrogen removal limits for the watershed. The primary findings of these evaluations are summarized below.

- The long-term performance of individual nitrogen management septic systems indicates an approximate 50 percent nitrogen removal in these systems compared to a standard septic system. This performance is not sufficient to meet the majority of the nitrogen limits for the Town, as illustrated on Figure ES-1. These systems rely on the individual property owners for operation and monitoring of their systems; and this method of operation and maintenance has much variability. Also, the performance of these systems has been proven to decline for houses with seasonal usage such as Chatham.
- The expected performance of many small treatment and recharge facilities is approximately 75 percent nitrogen removal. This performance is greater than the individualized nitrogen removal septic systems because these systems benefit from professional operations, greater (and consistent) wastewater flows, and more complete performance safeguards. These types of systems could meet the limits for many portions of the estuarine watersheds in Chatham, but not all. However, the Town lacks available properties that could be used for these types of facilities. Also, the centralized location of the existing treatment facility and its close proximity to areas that could be served by potential small facilities indicates that these areas are best served by the existing facility or a new facility located at that site.
- The expected nitrogen removal performance of an upgraded and expanded Chatham WWTF will be approximately 95 percent, and would remove nitrogen to a level of 3 mg/L in the treated water. This level of treatment can be attained in larger facilities where there is the economy of scale and consistent wastewater flows to facilitate this

performance. It is a performance that is called Enhanced Nitrogen Removal (ENR) and it makes use of the best wastewater nitrogen treatment technology available.

Findings of these evaluations were presented at five televised Board of Selectmen meetings for the four major watershed areas in Town, and an overview of the complete Town. Each of these presentations followed presentations to the Town's Wastewater Planning Technical Advisory Group and then to the Town's Wastewater Planning Citizen Advisory Committee (televised meetings) to assist in the public education process.

The general consensus of the meetings (and the votes of the Citizens Advisory Committee and Board of Selectmen) were to proceed with plans to expand the existing wastewater collection system and upgrade the treatment facility.

As the watershed evaluations were proceeding, the Town's Technical Advisory Group was evaluating mechanisms on how a collection system expansion and treatment facility upgrade would be financed in Town. Several presentations were completed by the Town Manager and Town Finance Director to the Board of Selectmen to outline the financial options, and to develop a capital plan that would allow a sewer expansion and treatment facility upgrade to proceed without jeopardizing other capital projects in Town and with a fair (and affordable) distribution of costs to the Towns people.

At the same time, a prominent property-owner group in Chatham (the Summer Residents Advisory Committee), which is comprised of residents that own summer homes in Chatham, but maintain year-round residency outside of Chatham (and therefore cannot vote at Chatham Town Meetings), expressed the view that they would like to see the entire Town served by a modern wastewater collection and treatment system in a period of 8 to 10 years to deal conclusively with these wastewater and nitrogen problems. Subsequent evaluations by Stearns & Wheler and the Town's Wastewater Planning Technical Advisory Group indicated that the implementation of sewers at this pace would cause major disruptions in Town to traffic, business, etc. during the 8- to 10-year period and could damage the summer-time vacation economy. It would also place a strain on the planning of other capital projects in the Town. After review with the Citizens' Advisory Committee and Board of Selectmen, general consensus indicated that a 20-year implementation was the most practical and feasible for the treatment plant upgrade and sewer expansion to those portions of Town with the critical wastewater nitrogen management needs

(i.e., to the areas affected by the nitrogen TMDLs). This 20-year period would be called the Phase 1 implementation and would be followed by a 10-year Phase 2 implementation to further expand the treatment facility and extend the sewers to the remaining portions of Town.

Additional evaluations were completed to be sure that the full volume of treated water could be recharged at the existing treatment plant site or at additional sites around Town. Many potential recharge sites were identified and evaluated. The most favorable (and available) sites were explored with subsurface investigations, groundwater modeling, and hydraulic load testing (large-scale percolation tests). These evaluations led to the following findings:

- The soils at the existing treatment plant are highly permeable and well suited for the infiltration of treated water.
- A design loading rate of 30 gallons per day per square foot (gpd/sf) is appropriate for infiltration bed sizing based on hydraulic load testing and groundwater modeling. This rate is six times greater than the rate that is typically allowed by MassDEP. The higher rate will significantly reduce land area requirements, system construction and system operation costs.
- The majority of the treated water recharged at the treatment plant site will mix with the groundwater and recharge to Cockle Cove Creek. Small percentages of the treated water will also flow to other watersheds. Nitrogen loading evaluations found that the small nitrogen content (3 mg/L on average) in the treated water will not impact these water bodies.
- MEP modeling of the proposed treated water flow from Town-wide sewering recharged in the Cockle Cove Creek watershed indicates that the threshold nitrogen level at the Sentinel Station in Bucks Creek is achieved and Total Nitrogen levels in Cockle Cove Creek are acceptable.

Additional evaluations were completed to determine the best ways to extend the collection system and to upgrade the WWTF. Public meetings with the Board of Selectmen and with the Citizens' Advisory Committee reviewed the advantages and disadvantages of the various collection system technologies. Most people wanted a gravity collection system that would not rely on a grinder pump system located on individual properties. However, many properties are located at low elevations relative to proposed sewer main depths and will require a pump to convey their wastewater to the system. Otherwise, the majority of the Town will be served by

gravity sewers. A preliminary gravity sewer layout was evaluated to make the most efficient use of the typography (to reduce expensive excavations) in Chatham and to identify feasible locations for pumping stations that can be implemented as part of a large sewer master plan.

Evaluation of the potential wastewater flows from the area of Town that cannot meet the TMDLs (Phase 1 flows) represents approximately two-thirds of the total flow from the entire Town (Phase 1 and Phase 2 flows). Detailed cost and non-monetary (implementation, operational, and performance) evaluations indicated that the WWTF should be constructed in a modular approach so that it could be constructed in phases to allow for increased flow over time.

The findings from these evaluations resulted in the Recommended Plan for Wastewater Management in Chatham as summarized in the following section.

Even though there was general consensus for the plan of expanding and upgrading the existing collection and treatment system to meet the wastewater and nitrogen management needs; there were members of the Wastewater Planning Citizens Advisory Committee that wanted a detailed evaluation of the feasibility and costs to pursue additional Wastewater and Nitrogen Management plans. As a result, the following alternative management plans were evaluated in detail:

- No Action Alternative.
- Combination of Sewers and I/A Technology in select watersheds.
- Sewer extensions to meet TMDLs.
- Town-wide sewer.

The detailed evaluations of these alternative management plans are presented in the text of this document. The primary finding of the evaluations is that expansion of the existing collection and treatment system is the most practical and cost-effective long term solution.

## ES.4 SUMMARY OF RECOMMENDED PLAN FOR CHATHAM

As mentioned earlier, the recommended plan is a comprehensive strategy for wastewater and nitrogen management in Chatham for a 20-year period; and with a perspective on the ultimate build-out condition for the Town. The 20-year period is 2010 to 2030, which is the estimated

time period for implementation of the wastewater facilities to meet the immediate wastewater needs in Town. The recommended plan also includes the strategy to extend wastewater collection and treatment facilities to the rest of the Town within approximately 10 years of the completion of Phase 1 (from 2030 to 2040).

The recommended plan includes the major components as discussed below.

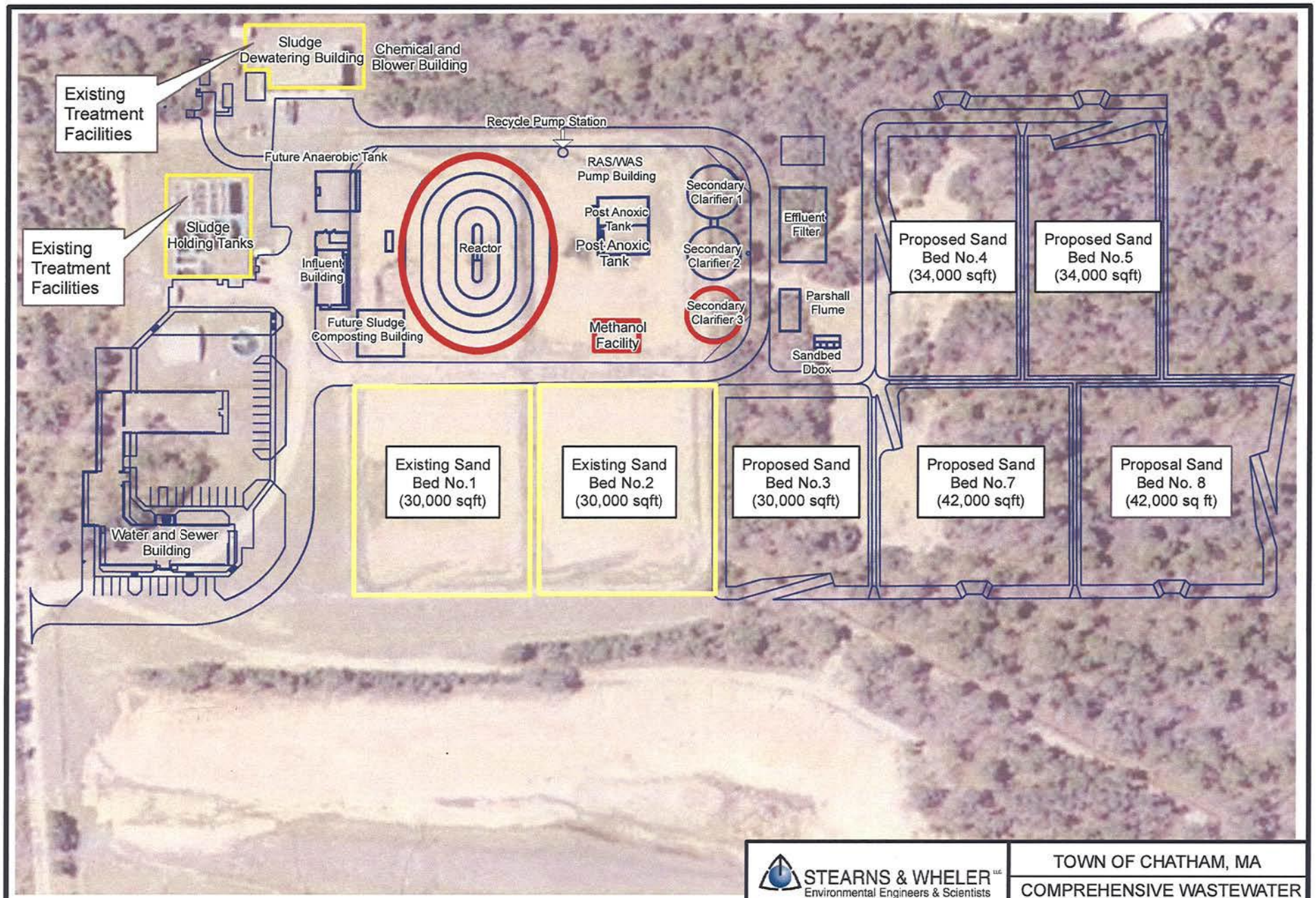
1. **Phased Upgrade and Expansion of the Wastewater Treatment Facility.** This component involves upgrade of the facility to Enhanced Nitrogen Removal (ENR) standards to provide a nitrogen concentration of 3 mg/L total nitrogen in the treated water (on average). This upgrade would include the following technologies and strategies:

- New WWTF headworks for wastewater pretreatment (screenings and grit removal).
- New Orbal® biological nitrogen removal process in an oxidation ditch and settling tank process configuration.
- New tertiary denitrification filters.
- Conversion of the existing aeration tanks and the existing sludge management process to improved sludge management facilities to produce dewatered biosolids for disposal or reuse at a regional management facility.
- Expansion of the existing sand infiltration bed system for increased recharge of the treated water at the WWTF site.

This upgrade and expansion would utilize a modular approach to allow the expansion to proceed in two phases.

These components are illustrated on Figure ES-2. Costs are discussed in Chapter 9 and included in Table 9-3.

- Phase 1 to treat approximately 1.3 million gallons (mgd) on average (2.1 mgd for the July and August months) to meet TMDL requirements for the coastal estuaries and meet the wastewater needs in the other areas of concern.
- Phase 2 to expand treatment to a total of 1.9 mgd on average (3.1 for the July and August months) to treat wastewater from all portions of Town.

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Date: 04/21/2008

TOWN OF CHATHAM, MA

COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING

Recommended Plan for WWTF
Figure ES-2

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This phasing will be accomplished by adding another ring to the oxidation ditch process configuration.

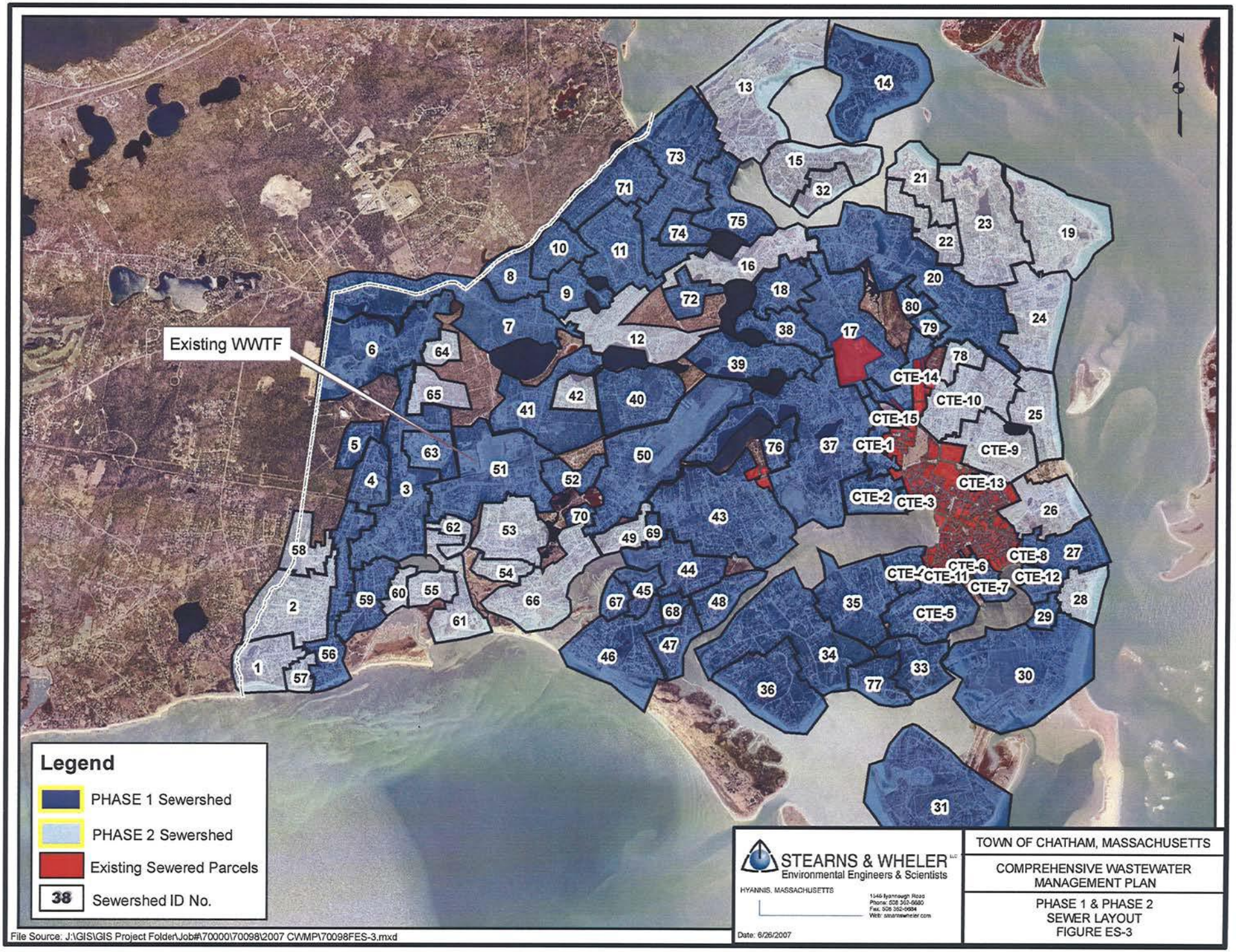
The WWTF upgrade will also include the construction of a new Operations Building.

Space at the WWTF site will also be reserved for additional treatment process expansion to accommodate possible flows from portions of the Town of Harwich. Chatham has begun preliminary discussions with Harwich regarding this possibility; however Harwich is in the early stages of CWMP planning. Initial consideration has been given to accommodating areas of Harwich immediately adjacent to some of the proposed Chatham sewersheds. Chatham will continue to work with neighboring towns to address the issue of a regional solution. Given the time necessary to undertake WWTF final design after completion of the CWMP, Chatham will continue to explore opportunities to develop/evaluate regional solutions.

2. **Multi-Phased Expansion of the Wastewater Collection System.** An expansion to the existing wastewater collection system is recommended in a means that:

- Builds efficiently upon the existing collection system.
- Utilizes gravity sewers as much as possible.
- Allows implementation in a prioritized but flexible manner to minimize construction impacts, and to implement a benefit to Chatham's estuaries as quickly as possible.
- Takes advantage of redevelopment opportunities promoted by developers that want connection to the sewer and are willing to contribute a portion of the shared infrastructure (pump station, gravity collection system, or force main) to allow the redevelopment to proceed.

The proposed collection system is illustrated on Figure ES-3 broken out as "sewersheds". A sewershed is a representation of the area of land or group of properties that would contribute flow to a wastewater collection pumping station. The area extent of a sewershed is typically a function of topography and the availability of road layout for sewer installation. Areas highlighted in "red" indicate the extent of the existing collection system and privately run cluster treatment facilities, "dark blue" areas represent sewersheds in the parts of Town proposed to be addressed as part of Phase 1, and "light blue" areas represent sewersheds proposed to be addressed in Phase 2.


Existing WWTF
Legend
PHASE 1 Sewershed
PHASE 2 Sewershed
Existing Sewered Parcels
38 Sewershed ID No.
File Source: J:\GIS\GIS Project Folder\Job#\70000\70098\2007 CWMP\70098FES-3.mxd
STEARNS & WHELER LLC
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Date: 6/26/2007
TOWN OF CHATHAM, MASSACHUSETTS
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
PHASE 1 & PHASE 2
SEWER LAYOUT
FIGURE ES-3

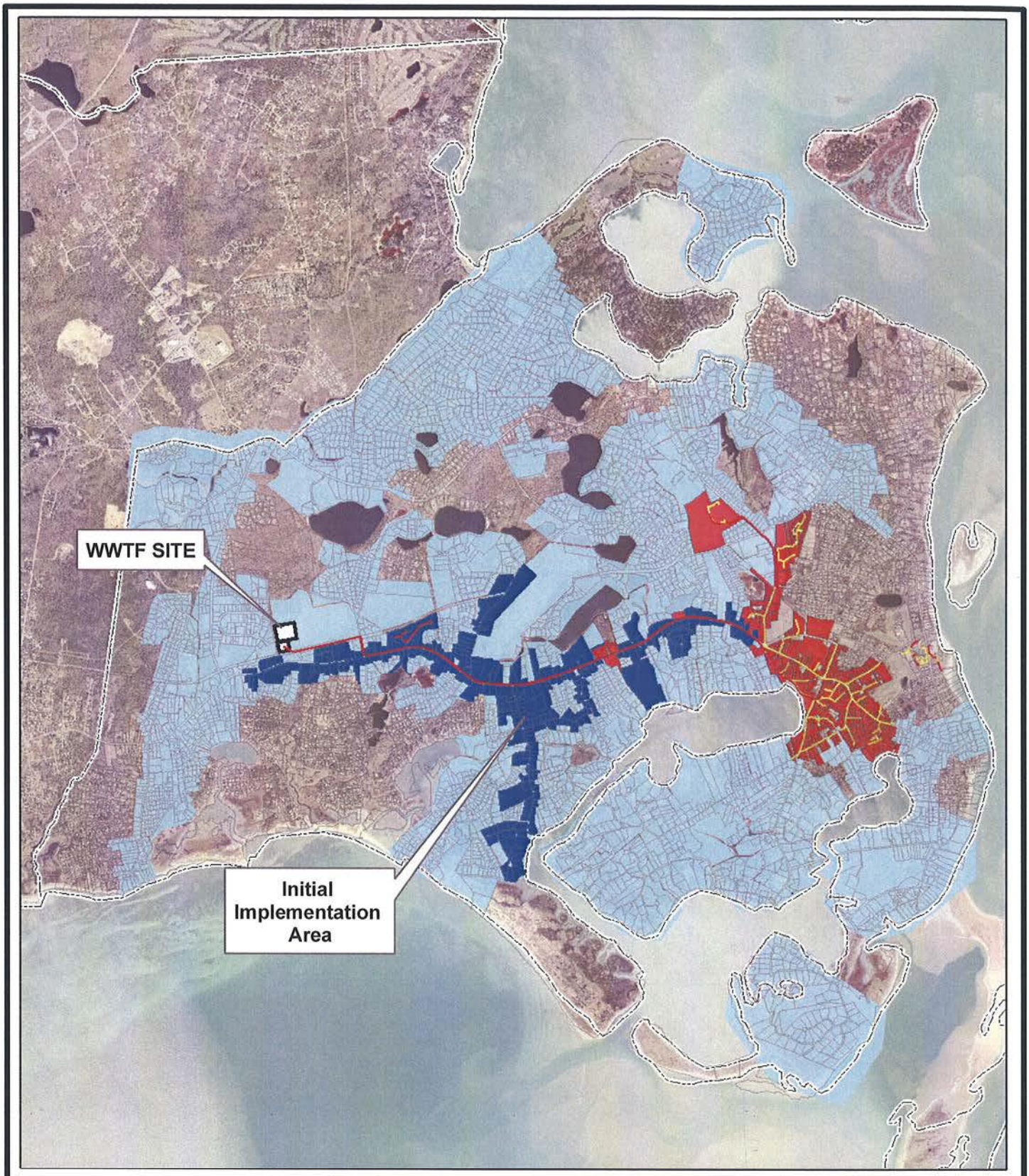
3. **Continued Work to Investigate Nitrogen Attenuation in the Muddy Creek Watershed.** This component is the possible restoration of an old (permitted) dyke in the Muddy Creek drainage basin and watershed to change the habitat of the upper portion of the creek from a brackish water body to a freshwater body and/or opening of an undersized culvert at the Route 28 crossing. The upper portion of the creek is currently severely impacted due to nitrogen enrichment problems. Restoration of the dyke will convert the upper creek to a freshwater system that would naturally remove a large portion of the nitrogen and help remediate nitrogen enrichment in the lower portion of the creek and in Pleasant Bay as a whole. Opening of the culvert at the Route 28 crossing would restore the creek to its natural tide flow and would improve water quality as well. Several discussions and meetings with the regulatory agencies that would need to approve and permit these modifications have been productive. The meetings have indicated that additional evaluations are needed.

The Pleasant Bay Alliance has obtained grant funding for additional evaluations and is currently leading the effort to remediate this water resource that is shared between Chatham and Harwich.

4. **Continued Stormwater Management.** A total of 18 direct stormwater discharges from the road system in Chatham to various ponds and estuaries was documented in the Needs Assessment Report. The primary impact from the direct discharges is not nitrogen; it is road contaminants and sediment that is carried off the road by the stormwater and deposited in these surface waters. Fecal material deposited on the roads by wild and domestic animals will mix with the stormwater and raise the fecal coliform content in the water bodies which in turn will cause closure of shell fishing areas.

Since the Needs Assessment Report, the Town has entered into a stormwater discharge permit agreement with USEPA (Phase II Stormwater Permit) to regulate and improve these types of discharge (this is a country-wide program). Also, since the Needs Assessment Report, the Town has completely remediated 6 of the 18 discharges and is completing design on 2 more.

Also, since the Needs Assessment Report, the Town has remediated several of these discharges including a large one to Oyster Pond that has resulted in the reopening of Oyster Pond to shellfishing.

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Location: G:\Jobs\70000\70098\2007 CWMP\
2008 Figures70098ES-4.mxd

Job No.: 70098 Date: 5/26/2009

Town of Chatham, Massachusetts

*Comprehensive Wastewater Management Planning*

Initial Implementation Area

**FIGURE ES-4**

The Town will continue with the efforts to remediate the 12 remaining discharges in compliance with the USEPA permit and with overall Town goals.

5. **Education on Proper Fertilizer Application and Management.** The other main nitrogen source to the groundwater system and then to the estuaries is fertilizer use on lawns, gardens, and agricultural areas. Two educational efforts have been launched by the Towns of Dennis and Falmouth to educate the public on the need not to over fertilize, and not to use fertilizers improperly. These programs have been identified as models for a county-wide or for a focused Town of Chatham program. The Town will continue to work with interested Town advocacy groups (water quality, gardening, etc.) and the Cape Cod Water Protection Collaboration to develop and distribute useful educational materials to prevent improper use of fertilizers.

## ES.5 ESTIMATED COSTS AND FINANCING PLANS

This recommend plan is a large capital investment in the Town's infrastructure and will be carefully implemented to reduce costs and impacts, as well as to produce the needed nitrogen mitigation in the Town's estuaries. The first phase will be implemented in the 20-year planning period of this plan (2010 to 2030), and the second phase will occur from 2030 to 2040. The estimated costs for Phase 1 implementation to occur in the 20-year planning period are summarized below:

| **Phase 1 Cost Summary** | |
|---|---|
| **Component** | **Capital Costs** [1] |
| WWTF upgrade and expansion | |
| Construction Costs | $28,000,000 |
| Contingencies | $5,700,000 |
| Fiscal, Legal, and Engineering | $5,900,000 |
| **Total** | **$40,000,000** |
| Collection System Expansion | |
| Construction Costs | $110,000,000 |
| Contingencies | $28,000,000 |
| Fiscal, Legal, and Engineering | $28,000,000 |
| **Total** | **$170,000,000** |

(1) *All costs are rounded to two significant digits and are referenced to a date of May 2007.*

The Town's Technical Advisory Group, Town Manager, and Town Financial Director have actively evaluated mechanisms on how a collection system expansion and treatment facility upgrade would be financed and implemented in Town. Several scenarios were presented to the Board of Selectmen to outline the financial options, and to develop a capital plan that would allow a sewer expansion and treatment facility upgrade to proceed without jeopardizing other capital projects in Town and with a fair distribution of costs to the Town's people. Based on these evaluations, the Town Selectmen voted to pay the Town's General Fund (Town property taxes) and not to charge betterments to the properties served. It is believed that these improvements are needed to improve the marine water quality that benefits all Chatham properties.

The Town has received commitments for funding from both the USDA Rural Development Program and the State Revolving Fund (SRF) to fund part of the WWTF construction project and sewer projects. The Town will also utilize Federal stimulus funds for the initial implementation that will start in early 2010.

The Town's current sewer user fee is not anticipated to increase.

The Town currently does not have a Debt Service Reserve, but plans on setting up a Short-Lived Asset Reserve, as part of a 5-year capital plan once construction starts. A detailed schedule would be developed following final design when the upgrade and expansion is identified in detail.

The Town has also actively pursued the use of independent review of the proposed wastewater treatment facilities costs through a Value Engineering process and select recommendations from this process are incorporated into the recommended plan and the costs were adjusted accordingly.

## ES.6 CWMP PROJECT COMPLETION AND IMPLEMENTATION TIMING

As discussed earlier, the Phase 1 facilities will be implemented during a 20-year time period to meet the nitrogen TMDL limits (approximately 2010 to 2030); and the Phase 2 facilities will be implemented in the next 10-year period (approximately 2030 to 2040). The planned milestone dates are listed below:

- May 2009: Submittal of the Final CWMP and FEIR to the State and CCC public review process.
- June 25, 2009: Planned public presentation and formal review process hearing.
- July 2009: Expected State approval of plan.
- September 2009: Expected County approval of plan.
- August 2009: MassDEP review of the detailed design of the initial implementation components (WWTF upgrade and sewer extension along Route 28) of the Phase 1 Plan and State loan (SRF and stimulus funds) full application review.
- December 2009: MassDEP review of initial implementation to be complete.
- February 2010 through 2012: Construction of the initial implementation.
- 2010 through 2030: Total Phase 1 Plan implementation.
- 2030 through 2040: Remaining Phase 2 Plan implementation.

The schedule, as outlined above, provides an estimate of the time frame of events between the completion of this report and the start of construction of the first new sewer areas in 2010. The initial sewer implementation area is shown in Figure ES-4 in dark blue, and primarily follows Main Street (Route 28), George Ryder Road and Barn Hill Road.

The Town is evaluating the findings of this Draft CWMP in the context of other Town projects and meeting the goals of the TMDLs in order to select those initial areas for sewering that will be identified in the best interests of the Town. In order to provide the Town the greatest flexibility in the implementation of the entire CWMP, specific prioritization of the Town (as described in Chapters 9 and 11) will only identify the initial areas to be addressed within the first 2-5 years. Throughout Phase 1 of the CWMP (20 years to meet the nitrogen TMDLs), those areas of Town identified as critical for meeting the TMDLs will be prioritized in the greater context of other Town projects (for example, combining sewer projects with areas identified for repaving, water main extensions, stormwater improvements, and utility work) to take advantage of common construction practices where practical. However, there will be areas that will be addressed regardless of other related Town projects.

## ES.7 LONG-TERM EMBAYMENT MONITORING

The overriding need to extend sewers is to remediate the current nitrogen loading to coastal estuaries as identified by the nitrogen TMDLs. MassDEP will require embayment monitoring of water quality, eel grass coverage, and benthic habitat to verify that the sewer extension and nitrogen remediation efforts are effective.

Working with MassDEP, CCC, and SMAST, the Pleasant Bay Alliance (an inter-municipal organization of Chatham, Harwich, Brewster and Orleans implementing the Pleasant Bay ACEC Resource Management Plan) has taken the lead in defining the scope and content of a long-term embayment monitoring program to meet nitrogen TMDLs. They have recognized the following key items about such a program:

- The ultimate goal is to restore the marine habitat to the levels that are the basis of the TMDLs.
- The attainment of the threshold nitrogen concentrations at the estuary sentinel stations are an indicator of the condition at which habitat can repair itself.
- The implementation of Phase 1 (to remediate watershed nitrogen loadings as the method to meet the TMDLs) will require a period of 20 years. The positive response of the water quality and benthic habitat will require several more years, given the lag in groundwater travel time from the watersheds to the estuaries, and the release and flushing of the stored benthic nitrogen loads.
- Some portions of the habitat such as regrowth of eel grass may not be possible due to other factors such as past deposition of organic solids, on-going boat traffic, etc.
- Once the water quality returns to a level near the threshold concentration, active eel grass restoration efforts may be needed.
- The embayment monitoring will be a long-term effort and will need to be a team effort between the communities within the embayment watersheds and MassDEP.

Working with MassDEP, CCC, and SMAST, the Pleasant Bay Alliance is currently working on a pilot project to develop an embayment monitoring program for that water body, with the expectation that its primary monitoring criteria, parameters, and overall structure can be used by the communities at other embayment watersheds. The Town of Chatham, represented by Dr. Robert Duncanson, is an active member in this group and will continue to work for the

development and implementation of the embayment monitoring program for Pleasant Bay; as well as its application to the Stage Harbor, Sulfur Springs/Bucks Creek, and Taylor Pond/Mill Creek systems.

## ES.8 GROUNDWATER MONITORING

The current groundwater monitoring program for the treated water recharge at the Chatham WWTF is based on agreements between the Town and MassDEP as guided by the Administrative Consent Order on the WWTF. The current program includes the following components:

- Water level is monitored at approximately 50 monitoring wells.
- Water quality is monitored from eight of the wells. Two of the wells are directly downgradient of the treated water recharge to measure any elevated nitrogen or conductivity level, and the remaining six wells are outside of the groundwater affected by the recharge. The water quality monitoring typically includes field parameters of specific conductance, temperature, and pH; nitrate and nitrite nitrogen; total Kjeldahl nitrogen; and dissolved sodium. In FY 2007, several samples were analyzed for total organic carbon.

This monitoring program is expected to be incorporated into a new groundwater discharge permit after approval of the CWMP. The permit and monitoring program will receive public review at that time.

## ES.9 SUMMARY

This CWMP/FEIR is the result of many years of work by the Town's Wastewater Planning Technical Advisory Group (TAG) and Citizen's Advisory Group (CAC) as well as the Town Manager and Board of Selectmen. It has been greatly assisted by the efforts of the Massachusetts Estuaries Project (comprised of MassDEP, SMAST, and the Cape Cod Commission) to develop the nitrogen limits (TMDLs) for the Town's estuaries and to identify the amount of wastewater nitrogen that must be removed to meet the limits.

This plan is developed to remediate the current nitrogen loading problems of the Town estuaries and will take 20 years to implement.

It represents a strong commitment by the Town to maintain a healthy environment in Chatham for regulatory compliance and for the Town's people to enjoy for generations to come.

# Chapter 11
# Summary of Recommended Plan

# CHAPTER 11

# SUMMARY OF RECOMMENDED PLAN

## 11.1 INTRODUCTION

This chapter identifies and presents the Comprehensive Wastewater Management Plan's Recommended Plan. The chapter is a culmination of the findings presented in the previous documents prepared as part of this project, the evaluations included in this Report, and the findings of the MEP work related to the Town of Chatham. This Chapter outlines the recommended plan, mitigation measures necessary as part of the implementation, and a proposed schedule to implement the plan. The Chapter also discusses the financial planning efforts, future work, and other institutional considerations necessary for the plan.

The goals of the recommended plan are to achieve the estuarine nitrogen TMDLs for the Town, address other areas of concern (AOCs) within Town, and provide an adaptive management approach to implementation such that as the plan is executed it can be adjusted based on the environmental and economic impacts that may result during its implementation.

## 11.2 IDENTIFICATION OF THE RECOMMENDED PLAN

The recommended plan for Chatham would involve the implementation of an adaptive management approach including the following major components:

- Two-phased implementation of WWTF expansion at the existing WWTF site. Phase 1 would treat approximately 1.3 mgd on an average annual basis to meet total nitrogen TMDL requirements in Stage Harbor, Pleasant Bay, Sulphur Springs, and Taylor's Pond watershed areas. Phase 2 would expand this facility to 1.9 mgd on an average annual basis to serve the remaining areas of the Town of Chatham. WWTF flows are summarized on Table 9-5.

- Expansion of the existing collection system to match the two Phases of the WWTF expansion with the possibility of sewering all of the 94 sewersheds identified. Sixty-one (61) of the 94 sewersheds identified would need to be sewered in order to address the TMDL requirements.
- Further evaluation of the freshwater restoration of the upper reaches of Muddy Creek which could provide a quicker remediation of the nitrogen impacts to this waterbody and to Pleasant Bay as a whole.
- Continuation of a modified coastal embayment water quality monitoring program for TMDL compliance and continued groundwater monitoring at the WWTF site.
- Continued public education on fertilizer use and management of other controllable sources of nitrogen within the Town.
- Continued enforcement of the Town of Chatham's Board of Health Nitrogen Loading Regulation in those areas not designated for immediate (next five to ten years) connection to the WWTF as part of addressing the Town's TMDLs.
- Implementation of Article 2 of the Rules and Regulations of the Sewer Department regarding growth-neutral and the new sewer use regulations.
- Continued implementation of storm water improvements and management.

The components of the wastewater collection and treatment systems expansion is summarized below.

A. **WWTF Expansion.** The following wastewater treatment processes have been identified throughout the development of the CWMP. The following list is a summary of the core technologies that will make up the new WWTF's major components.

Preliminary Treatment:

- Pre-engineered system for screening and grit removal.

Secondary Treatment:

- Orbal® process constructed in a modular design to allow Phase 2 expansion as the flow increases.
- Three secondary clarifiers (2 for Phase 1, third for Phase 2).

Filtration:

- Continuous backwash denitrification sand filters.

Disinfection:

- Achieved through filtration in the sand infiltration beds. (An ultraviolet disinfection system is not being proposed at this time)

Sludge Processing:

- System expansion with a 1.0 m Belt Filter Press.

Odor Control:

- Activated Carbon.

Support Facilities:

- Return activated sludge (RAS) and waste activated sludge (WAS) pumping (centrifugal pumps).
- Plant water (pumps and hydropneumatic tank).
- Sodium hypochlorite for nocardia control – chemical tank and pumps.
- Sodium hydroxide for alkalinity addition – chemical tank and pumps.
- Methanol – for supplemental carbon.

Other considerations as requested by the Town for flexible future site operations:

- Provide space for a physical/chemical total phosphorus removal system, and a possible additional anaerobic zone for total phosphorus removal.
- Provide space for return activated sludge (RAS) processing for the possible consideration of a Cannibal® sludge minimization process.
- Provide space for additional expansion to accommodate possible flows from portions of the Town of Harwich. Chatham has begun preliminary discussions with Harwich regarding this possibility; however Harwich is in the early stages of CWMP planning. Initial consideration has been given to accommodating areas of Harwich immediately adjacent to some of the proposed Chatham sewersheds. Chatham will continue to work with neighboring towns to address the issue of a regional solution. Given the time necessary to undertake WWTF final design after completion of the CWMP,

Chatham will continue to explore opportunities to develop/evaluate regional solutions.

Table 9-6 provides a list of proposed Phase 1 equipment.

At the time of the Draft CWMP, disinfection was not being proposed; however, following subsequent discussions and reviews as described in Chapter 1 and 9, UV disinfection will be provided at the proposed facility.

B. **Collection System.** The collection system will be phased in over 30 or more years. The first 20 years will target the expansion of the collection system to address those areas in Town identified as AOCs in order to achieve the total nitrogen TMDLs. This will include the extension of sewers within 61 sewersheds (Phase 1) shown on Figure 9-6, and extension of sewers for the 33 remaining sewersheds over the ten years following the Phase 1 implementation as shown in Figure 9-1. The total length of proposed sewer is approximately 110 miles, 88 miles of which are proposed gravity and 18 miles of which are proposed low pressure, compared to the existing system of approximately 5 miles of gravity mains.

The total number of low pressure grinder pumps is estimated at 1,200. This number is based on one grinder pump per building/property. Though there are grinder pump units suitable for multiple buildings, these installations can become difficult to manage if buildings are owned by different parties; therefore this plan is based on one pump per property.

Of the 1,200 grinder pumps proposed, approximately 530 belong to buildings where a gravity main is installed in the road, but the elevation of the building is lower than the gravity main; therefore a pump is needed to convey the wastewater to the higher elevation in the main. The remaining 670 grinder pumps belong to buildings that have low pressure sewers based on discussions and the cost analysis reviewed with the Town.

A total of 80 new pumping stations are required for this Town-wide sewer master plan.

Approximately ten easements will be needed to implement the collection system as identified during the preliminary design. These easements are identified in Appendix U on Sheets 1

through 15 and are highlighted in yellow. Attaining these easements is a critical next step for the Town in order to implement the collection system within these sewersheds.

Sewersheds along the border of Chatham and Harwich, namely 1, 2, 7 and 58 include provisions to sewer Harwich properties that can be reached by gravity collection systems.

Mitigation measures previously identified in the Chapter 11 of the Draft CWMP/DEIR have been moved to Chapter 12 - MEPA DRAFT SECTION 61 FINDINGS AND MITIGATION MEASURES, of this document.

## 11.3 PLANNED IMPLEMENTATION TIMING

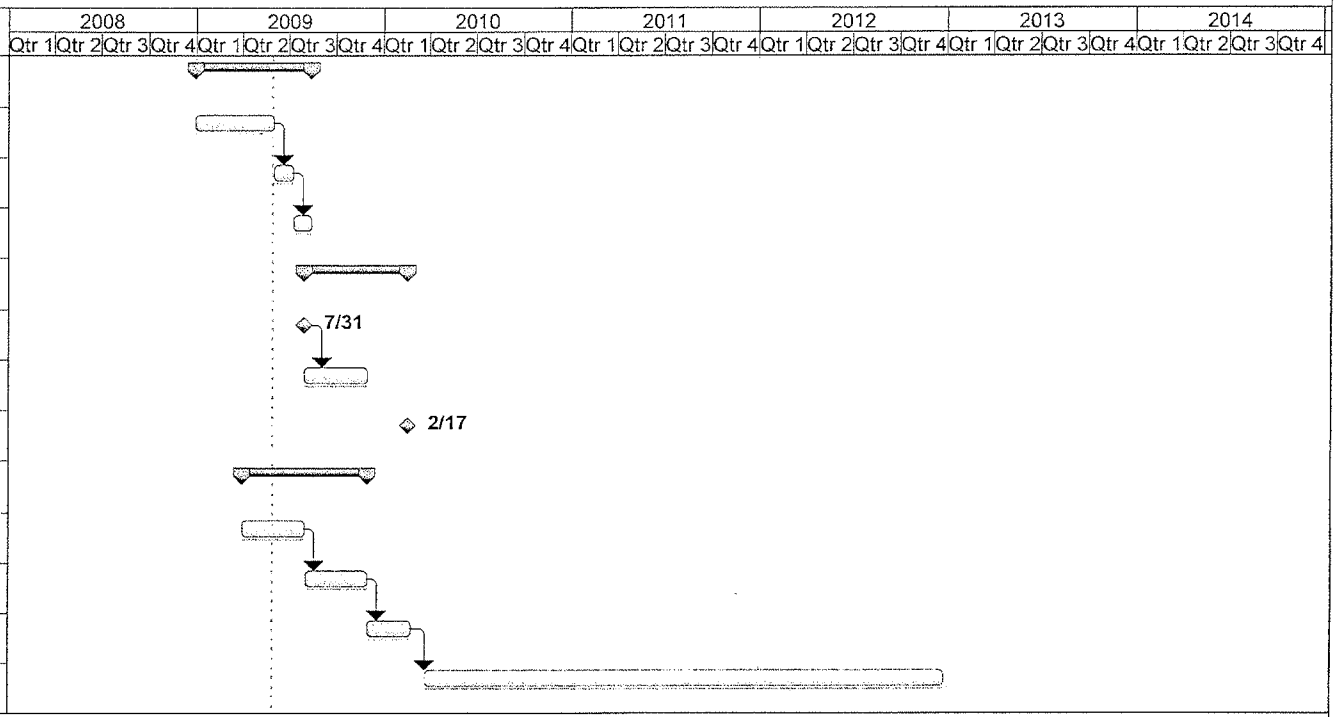
A critical piece to the facilities planning process is the implementation timing of the recommended plan. The recommended plan is a comprehensive strategy for wastewater and nitrogen management in Chatham for a 20-year period; and with a perspective on the ultimate build-out condition for the Town. The 20-year period is 2010 to 2030, which is the estimated time period for implementation of the wastewater facilities to meet the immediate (TMDL) wastewater needs in Town. The recommended plan also includes the strategy to extend wastewater collection and treatment facilities to the rest of the Town within approximately 10 years of the completion of Phase 1 (from 2030 to 2040).

The Town plans to proceed rapidly with design and construction of new facilities following the approval of the CWMP. Figure 11-1 provides a proposed schedule depicting the completion of the Final CWMP/FEIR and milestones for securing State Revolving Fund (SRF) low-interest loans; design of the first portion of the recommended plan; and expansion and upgrade of the WWTF.

The CWMP approval process is comprised of the Massachusetts Environmental Policy Act (MEPA) and Cape Cod Commission's Development of Regional Impact (DRI) reviews and ultimate compliance with the MassDEP Administrative Consent Order (ACO). The MEPA and DRI processes provide for several public comment periods and public hearings. Once the project moves through this part of the CWMP process, the Town will look to Town meeting to appropriate funds necessary to implement the initial steps in the approved plan. Once funds,

TOWN OF CHATHAM, MASSACHUSETTS
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
PROPOSED CWMP AND INITIAL
IMPLEMENTATION SCHEDULE
FIGURE 11-1

| ID | Task Name |
|---|---|
| 1 | **CWMP Completion** |
| 2 | Finalize CWMP/EIR |
| 3 | MEPA Review |
| 4 | DRI Review |
| 5 | **SRF Items** |
| 6 | WWTF Design to MassDEP |
| 7 | MassDEP Review Period |
| 8 | ARRA Notice of Award Deadline |
| 9 | **WWTF Design** |
| 10 | Design |
| 11 | DEP Review |
| 12 | WWTF Bidding |
| 13 | WWTF Construction |




Project: Figure 11-1 alt
Date: Thu 5/28/09

Task
Split
Progress
Milestone
Summary
Project Summary
External Tasks
External MileTask
Split

including State Revolving Fund (SRF) loans, are secured the project can move into implementation as shown.

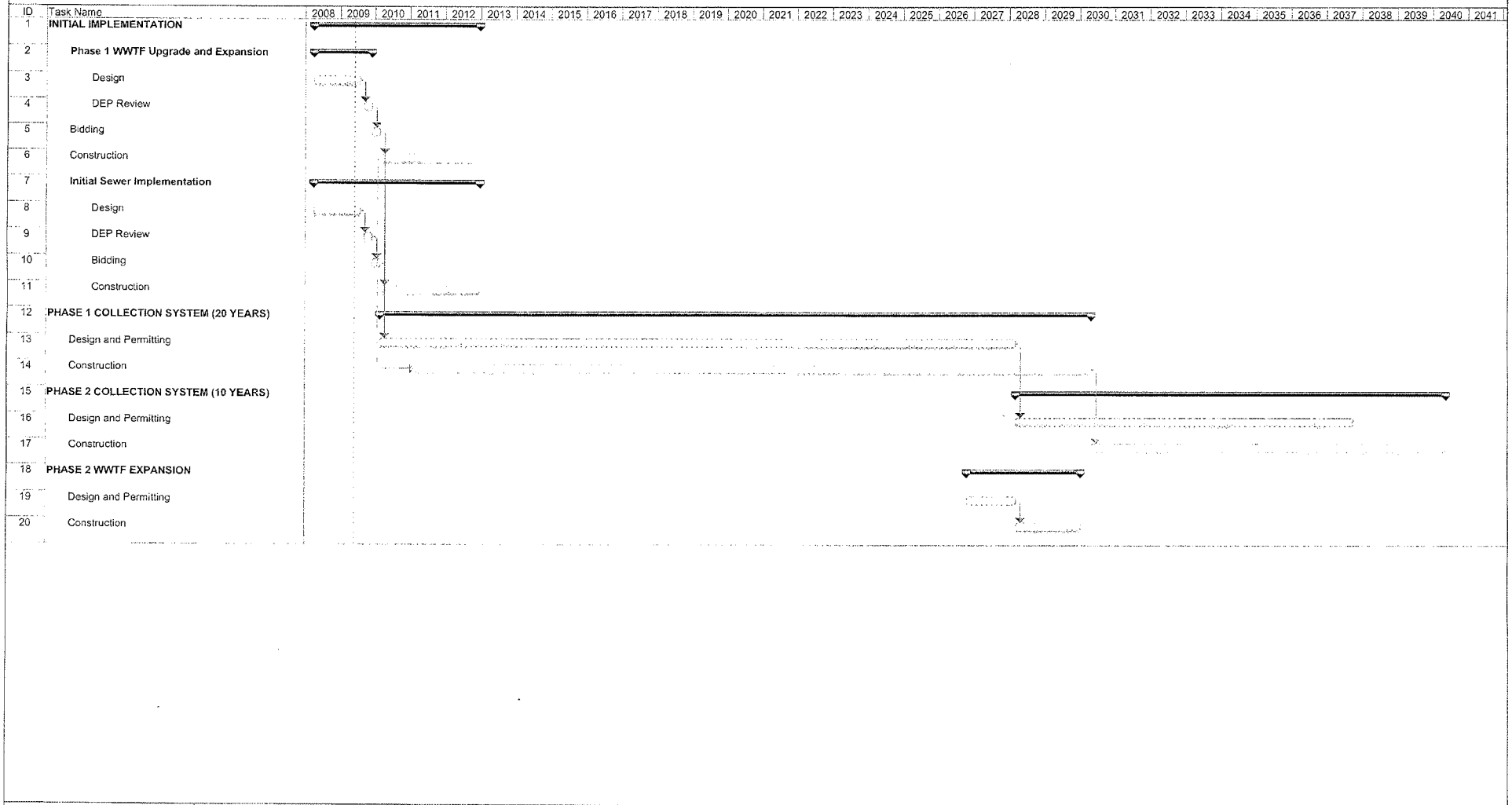
Several alternative timelines were considered for the extension of the future collection system. The Summer Residents Advisory Committee, a Town advocacy group comprised of residents that own summer homes in Chatham, but maintain year-round residency outside of Chatham (and therefore cannot vote at Chatham Town Meetings), expressed the view that they would like to see the entire Town served by a modern wastewater collection and treatment system in a period of 8 to 10 years to deal conclusively with these wastewater and nitrogen problems. Subsequent evaluations by Stearns & Wheler and the Town's Wastewater Planning Technical Advisory Group indicated that the implementation of sewers at this pace would cause major disruptions in Town to traffic, business, etc. during the 8- to 10-year period and could damage the summer-time vacation economy. It would also place a strain on the planning of other capital projects in the Town. After review with the Citizens' Advisory Committee and Board of Selectmen, general consensus indicated that a 20-year implementation was the most practical and feasible for the treatment plant expansion/upgrade and sewer expansion to those portions of Town with critical wastewater nitrogen management needs (i.e., to the areas affected by the nitrogen TMDLs). This 20-year period would be called the Phase 1 implementation and would be followed by a 10-year Phase 2 implementation to further expand the treatment facility and extend the sewers to the remaining portions of Town.

Figure 11-2 provides a preliminary schedule of how wastewater treatment and collection facilities would be implemented over this 30 year period. The schedule is subject to change based on when the Town has completed the MEPA/CCC review process and has the necessary approvals to move forward and begin implementation.

It is noted that the previous completion of the collection system preliminary design and master plan provides much flexibility on how the collection system is implemented. The flexibility of this plan will be used in an adaptive management approach to meet the nitrogen TMDLs, meet other Town wastewater priorities, and take advantage of other priorities (redevelopment, road paving, sidewalk reconstruction, etc.) to efficiently install the sewers.

The Town of Chatham has established several criteria that will be used in the process of prioritizing areas for sewering, as presented in this report. These criteria include:

TOWN OF CHATHAM, MA
COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING
PROPOSED PHASE 1 AND PHASE 2
IMPLEMENTATION SCHEDULE
FIGURE 11-2




Project: Figure 11-2
Date: Wed 5/27/09

Task | Progress | Summary | External Tasks | Split
Split | Milestone | Project Summary | External MileTask

- High priority watersheds based on total nitrogen TMDLs.
- Related capital projects where projects can be completed with mutual advantage.
- Coordination with other infrastructure projects (roads, water, etc.), including MassHighway Route 28 work.
- Coordination with private development and re-development that offsets some public expense for infrastructure.
- Coordination of infrastructure relay pumping stations.
- Recommendations by TAG and Water and Sewer Advisory Committee.

The recommended plan provides guidance and flexibility on which areas should be addressed in order to achieve the TMDLs; however, it will be the ultimate decision of the Town to identify which areas will be addressed first through this process and prioritize the remaining areas such that the ultimate 20 year plan (Phase 1) can be implemented efficiently.

As discussed in Chapter 1, the Town is working to secure funding from several sources in order to proceed with the implementation of the initial phase of sewer expansion and the upgrade to the WWTF. Figure 1-2 presents the extent of the initial phase of sewer phasing, and Figure 9-3 shows the proposed improvements to the existing WWTF.

## 11.4 FINANCIAL PLAN

The Town's Technical Advisory Group has been actively evaluating mechanisms on how a collection system expansion and treatment facility upgrade would be financed and implemented in Town. Several scenarios were presented by the Town Manager and Finance Director to the Board of Selectmen to outline the financial options, to develop a capital plan that would allow a sewer expansion and treatment facility upgrade to proceed without jeopardizing other capital projects in Town, and to provide a fair distribution of costs to the Towns people.

The Town has already applied to the USDA Rural Development Program and will apply to the State Revolving Fund (SRF) to fund the WWTF construction project and future sewer projects as applicable. The Town has developed several approaches for funding and debt repayment.

The Town of Chatham adopted a Capital Facilities Plan in Fiscal Year 2003 to address the issue of its aging infrastructure. A portion of this replacement plan is dedicated to the Wastewater Facility Expansion.

A financial plan was developed in 2006 that was aimed at funding the Capital Facilities Plan without increasing the tax rate. This plan includes an infrastructure replacement phase-in schedule of 20 year bond issues (30 years for sewer expansion). To accomplish this goal, the Town stabilized its debt at $4.7 million. A policy was instituted to insure that as the debt is paid off, and therefore reduced each year, the Town would continue to be able to fund the $4.7 million. This policy enables the Town to use the "debt drop-off" to achieve its goal of funding its infrastructure replacement without a tax rate increase. The Town's 2005 fiscal analysis, as presented to the Board of Selectmen, is included in Appendix V.

The program level 2005 fiscal analysis was followed in April 2006 by another fiscal presentation targeted to individual homeowners. This April 2006 presentation, Appendix W, provided examples of the fiscal impacts at the individual property level, based on cost estimates at the time. This presentation also examined various betterment options versus the property tax.

The Wastewater Treatment facility alone is a $35 million capital project that will be funded partly through debt drop-off. The remaining funds will come from the tax rate and other sources as shown below. The Town is proposing the following approach for financing the project:

- Sewer user rates will cover 100 percent of the O&M, and ultimately, 25 percent of the debt (including the collection system);
- Debt drop-off and the tax levy would cover the remaining 75 percent of the debt (50 percent debt drop-off; 25 percent increase levy declining for the duration of the bond).

The Cape Cod Water Protection Collaborative sponsored legislation, passed by the Legislature in August 2009 that would allow Towns with a completed and approved CWMP, and meeting other criteria, to be eligible for SRF funding at zero percent interest, down from the two percent interest for current loans.

The Town's current sewer user rate is not anticipated to increase from those provided in Table 8-1. Seventy-five (75) percent of the current rate goes towards operations and maintenance costs for the existing WWTF. This is expected to continue following the completion of this project.

The Town currently does not have a Debt Service Reserve. The Town does plan on setting up a Short-Lived Asset Reserve as part of a 5-year capital plan once construction starts. A detailed schedule would be developed following final design when the upgrade and expansion is identified in detail.

Table 11-1 provides a summary of the plan costs. This Table shows costs for both Phase 1 and Phase 2 and are based on costs developed and referenced to a date of June 2007. The implementation and phasing of these costs will be spread out over the 30 plus years of implementation.

Fiscal presentations made to the Board of Selectmen and the community have provided information on the expected direct costs to the individual property owner. These costs include:

- One-time Connection Cost – estimated between $3,000 to $10,000 depending on the home/business distance from the street, the need for a grinder pump, and other characteristics of the property.
- Annual User Charge – estimated at $400/year, based on current system users.

The Town has also undertaken a Value Engineering (VE) review of the proposed preliminary design of the wastewater treatment facilities included as part of the recommended plan. Costs have been reduced as part of this process.

As discussed previously, the prioritization of the collection system expansion has not been formalized and will be a function of the criteria established above and the adaptive management process executed during the 20 year planning process. However, the Town of Chatham has determined that based on the Total Capital Costs developed and summarized in Table 11-1, that they will be looking to appropriate $40 million for construction of the proposed Phase 1 wastewater treatment facility. The Town also anticipates appropriating approximately $170 million (2007 dollars) over a 20 year period (2010 to 2030) for the collection system.

## TABLE 11-1

### RECOMMENDED PLAN COST SUMMARY[1][2]

| DESCRIPTION | PHASE 1 | PHASE 2 (INCLUDES PHASE 1 COSTS) |
|---|---|---|
| Collection System Construction Cost [3] | $ 110,000,000 | $ 170,000,000 |
| Collection System Contingency (25%) | $ 28,000,000 | $ 42,000,000 |
| Collection System Design Engineering | $ 11,000,000 | $ 17,000,000 |
| Fiscal, Legal and Construction Engineering (15%) | $ 17,000,000 | $ 25,000,000 |
| **Collection System Design/Construction Subtotal** | **$ 170,000,000** | **$ 250,000,000** |
| Estimated Collection System Operation & Maintenance Costs (annual) | $ 900,000 | $ 1,400,000 |
| **Collection System Operation & Maintenance Costs (present value[2])** | **$ 13,000,000** | **$ 20,000,000** |
| **Collection System Total** | **$ 180,000,000** | **$ 270,000,000** |
| WWTF Construction Costs [4] | $ 28,000,000 | $ 35,000,000 |
| WWTF Contingency (20%) | $ 5,700,000 | $ 7,000,000 |
| WWTF Design Engineering | $ 1,600,000 | $ 2,000,000 |
| Fiscal, Legal and Construction Engineering (15%) | $ 4,300,000 | $ 5,400,000 |
| **WWTF Design/Construction Subtotal** | **$ 40,000,000** | **$ 50,000,000** |
| Estimated WWTF Operation & Maintenance Costs (annual) | $ 1,000,000 | $ 1,200,000 |
| **WWTF Operation & Maintenance Costs (present value[2])** | **$ 15,000,000** | **$ 18,000,000** |
| **WWTF TOTAL** | **$ 55,000,000** | **$ 67,000,000** |
| **TOTAL** | **$ 240,000,000** | **$ 340,000,000** |

Note:
1. Costs are based on May 2007 and an ENR of 7942.
2. Costs rounded to two significant figures.
3. Costs include grinder pumps and grinder pump connection to sewer (purchased and installed).
4. Costs include new treated water recharge beds.

Appropriations would likely be in the $15-$20 million range every two years for design and construction of collection systems in order to achieve the TMDLs.

## 11.5 INSTITUTIONAL CONSIDERATIONS

The following section identifies and discusses several primary institutional considerations related to plan implementation:

- Prioritization
- Proprietary equipment
- Ownership, and operation and maintenance considerations
- Easements
- Monitoring programs

A. **Design and Construction Issues.** As the Town moves forward in implementing the recommended plan, several issues will need to be resolved during design and construction:

- Proprietary equipment / sole sourcing of equipment.
- Standardization of equipment (mainly pump station and grinder pump units).
- Grinder pump unit ownership.

During the evaluation of technologies as part of the preliminary design, interest by the TAG on some specific technologies has been expressed. The Town understands that the Commonwealth of Massachusetts requires projects be open to as many contractors and equipment suppliers/manufacturers as possible to make the process competitive and to encourage fair pricing. The Commonwealth also encourages performance-based specifications in those areas where a particular technology or piece of equipment is sought, however, the Massachusetts General Laws (MGLs) do allow for selection of a specific piece of technology if it is deemed in the best interest of the project and endorsed and documented by the Town.

The recommended plan calls for an Orbal® advanced secondary process which is an oxidation ditch type process. Construction of the concrete tanks will be competitively bid. However, there may be components of the equipment that are provided by the Orbal® process manufacturer in order for them to provide performance guarantees on their process. To the fullest extent

possible, components of the Orbal® process will be specified naming three manufacturers or equal, including: pipes, valves, gates, pumps, motors, etc.

The Town may also wish to standardize around a particular piece of equipment, for example grinder pump units or pumping station equipment, in order to minimize storage of spare parts for several different manufacturers and minimize operational and maintenance issues and training associated with maintaining different manufacturers equipment for the same application. Although grinder pumps are the most common collection system component where this might be applied, the Town may have a desire to standardize around a valve, pump or other equipment manufacturer for other collection system and WWTF components.

In the case of grinder pump units, the Town needs to make decisions prior to collection system design on ownership issues associated with these units. The Town may elect to:

- Purchase, install, own, operate and maintain the equipment.
- Purchase equipment and property owners install, own operate and maintain.
- Let the property owner purchase and install, and the town operate and maintain.
- Let the property owner maintain complete ownership and maintenance requirements.

This issue will be addressed by the Town during final design and implementation.

B. **Embayment Monitoring.** The overriding need to extend sewers is to remediate the current nitrogen loading to coastal estuaries as identified by the nitrogen TMDLs. MassDEP will require embayment monitoring, which may include water quality, eel grass coverage, and benthic infauna habitat, to verify that the sewer extension and nitrogen remediation efforts are effective.

Working with MassDEP, CCC, and SMAST, the Pleasant Bay Alliance has taken the lead in defining the scope and content of a long-term embayment monitoring program to meet nitrogen TMDLs. They have recognized the following key items about such a program:

- The ultimate goal is to restore the marine habitat to the levels that are the basis of the TMDLs.
- The attainment of the threshold nitrogen concentrations at the estuary sentinel stations are an indicator of the condition that habitat can repair itself.

- The implementation of Phase 1 (to remediate watershed nitrogen loadings as the method to meet the TMDLs) will require a period of 20 years. The positive response of the water quality and benthic habitat will require several more years, given the groundwater travel time from the watersheds to the estuaries, and the release and flushing of the stored benthic nitrogen loads.
- Some aspects of habitat restoration, such as re-growth of eel grass, may not be possible due to other factors such as past deposition of organic solids, on-going boat traffic, etc.
- Once the water quality returns to a level near the threshold concentration, active eel grass restoration efforts may be needed.
- The embayment monitoring will be a long-term effort and will need to be a team effort between the communities within the embayment watersheds and MassDEP.

Working with MassDEP, CCC, and SMAST, the Pleasant Bay Alliance is currently working on a pilot project to develop an embayment monitoring program for that water body, with the expectation that its primary monitoring criteria, parameters, and overall structure can be used by communities at other embayment watersheds. The Town of Chatham, represented by Dr. Robert Duncanson, is an active member in this group and will continue to work for the development and implementation of the embayment monitoring program for Pleasant Bay; as well as its application to the Stage Harbor, Sulfur Springs/Bucks Creek, and Taylor Pond/Mill Creek systems.

C. **Groundwater Monitoring.** The current groundwater monitoring program for the treated water recharge at the Chatham WWTF is based on agreements between the Town and MassDEP as guided by the Administrative Consent Order on the WWTF. The current program includes the following components:

- Water level is monitored at approximately 50 monitoring wells (some are screened in the upper aquifer and some are screened in the lower aquifer) as indicated in Appendix X. These levels are monitored three times per year (typically in April, August, and December).
- Water quality is monitored (at the same time periods) from eight of the wells. Two of the wells are directly downgradient of the treated water recharge to measure any elevated nitrogen or conductivity level, and the remaining six wells are outside of the

groundwater affected by the recharge (plume area). The water quality monitoring typically includes field parameters of specific conductance, temperature, and pH; nitrate and nitrite nitrogen; total Kjeldahl nitrogen; and dissolved sodium. In FY 2007, several samples were analyzed for total organic carbon.

This monitoring program is expected to be incorporated into a new groundwater discharge permit after approval of the CWMP. The permit and monitoring program will receive public review at that time. As treated water flows increase, the water level monitoring network may need to be expanded to observe any changes in groundwater elevations as indicated by recent groundwater modeling (Appendix G). These changes are expected to occur over a long period.

Due to the long time period that will occur as recharge flows increase, groundwater level monitoring at the 50 wells should be changed to once per year for two out of every three years, and seasonally (three times per year) every third year. Groundwater quality monitoring for the current monitoring parameters should continue three times per year.

D. **TMDL Compliance and Adaptive Management Plan.** Discussions with MassDEP have indicated that nitrogen TMDL compliance will be met with the restoration of the habitat quality that has been targeted by the MEP. These discussions have identified that this restoration may take several years after new wastewater facilities are installed due to the long groundwater and nitrogen flow travel times. The same discussions have also indicated that steady implementation of the CWMP will demonstrate compliance with the TMDL because the CWMP has been established to meet the TMDLs using the scientific methods supported and approved by MassDEP. The commitment to steady implementation has been stated in the Financial Plan of Section 11.4.

It is understood that ongoing and proposed environmental monitoring activities may observe environmental changes (hopefully for the better, but possibly to the worse) and that mid-course corrections to the plan implementation may be needed. This understanding of possible mid-course correction is called "Adaptive Management". The following text summarizes the major components of the TMDL compliance and Adaptive Management Plan. It is understood that this plan will be updated as time proceeds in the spirit of Adaptive Management.

1. **Implementation of the CWMP.** The CWMP will be implemented as indicated in the recommended plan portion of this Chapter (Section 11.2). The Phase 1 wastewater facilities will be implemented over a 20-year period (approximately 2010 to 2030) and the Phase 2 wastewater facilities will be implemented in the next 10 years (approximately 2030 to 2040).

The Town has committed to fund the implementation at $15,000,000 to $20,000,000 every two (2) years for the 30-year implementation period. The May 2009 Annual Town Meeting recently approved $59,508,000 for the initial implementation discussed in Section 1.7. This initial appropriation indicates a 6- to 8-year "jump start" on the program.

2. **Documentation of Capital Expenditures.** The primary TMDL compliance tool used by MassDEP will be verifying that the Town has applied to the SRF program for low interest loans in the $15,000,000 to $20,000,000 range per 2-year period committed by the Town. MassDEP's support of the SRF applications will be needed to facilitate implementation.

3. **Compliance with the Groundwater Discharge Permit.** The design for the WWTF upgrade will be accompanied by a MassDEP discharge permit application. MassDEP will review the application information and develop a draft discharge permit for public review. Once the permit is finalized, the Town will need to comply with the various treatment, sampling, and reporting requirements specified in the permit. Compliance with the groundwater discharge permit will be a major component of the TMDL compliance.

4. **Reporting on Groundwater Elevation and Quality Monitoring in the Vicinity of the WWTF.** This monitoring and reporting will be part of the Groundwater Discharge Permit requirements and the Discharge Permit requirements and the Discharge Permit will identify the monitoring plan.

5. **Reporting on Estuarine Water Quality Monitoring.** The Town of Chatham continues to sample and analyze the marine waters in their estuaries even though the MEP Technical Reports and TMDLs are complete. The Town has a large group of volunteers who do this sampling, and the volunteers have been an important support group for the CWMP and the initial implementation of the CWMP. Now that the MEP work is complete, the Town has reduced the monitoring frequency and locations (in consultation with SMAST and MassDEP) from a very analytical strategy (needed to develop the TMDLs) to more of a program to develop

and investigate long-term trends. This monitoring is closely coordinated with the other Pleasant Bay communities through the Pleasant Bay Alliance. As discussed earlier in this chapter, the Town is participating in the MassDEP Pilot Project to develop a standard protocol for long-term monitoring in the estuaries.

6. **Habitat Assessments That May be Completed by the Town, MassDEP, and/or Regional Organizations.** As part of the MassDEP Pilot Project to develop standard protocols for estuarine water quality and habitat monitoring programs, there has been much discussion on who will perform these assessments and who will pay for them. It has been generally agreed:

- The timeline for wastewater infrastructure implementation and the groundwater travel times indicate that the first habitat assessment (that could be correlated to wastewater system improvements) will not be needed for several years; therefore, there is time to develop the program.
- MassDEP will continue its eel grass mapping program (if state funding continues).
- Individual Towns or resource groups such as the Pleasant Bay Alliance will probably be the responsible parties to complete the benthic habitat surveys. The protocols, goals, and reporting procedures for these surveys will be a major focus for the MassDEP Pilot Project.

7. **Continued Coordination with the Pleasant Bay Alliance for Regional Model Runs.** The Town will continue to be an active member of the Pleasant Bay Alliance to develop and support water quality model runs of the Pleasant Bay system. Several model runs have recently been completed to investigate the effects of the new breach (2007). Additional model runs are in the planning stages for a future nitrogen loading scenario based on the developing wastewater plans of the 4 Pleasant Bay Towns.

8. **Periodic Watershed Assessments and Other Evaluations.** Watershed assessments will be completed periodically (every 5 to 10 years) to tabulate water consumption, estimated septic system discharges, WWTF recharge and treatment performance, and nitrogen loadings from the non-wastewater sources to summarize changes of nitrogen loads to the estuaries over time. These nitrogen loading summaries will be compared to the water quality monitoring trends to investigate possible correlations between water quality and nitrogen loading. Other evaluations of nitrogen and/or phosphorus loading will be completed as needed.

9. **Possible Changes to this Plan as Part of Adaptive Management.** This plan is still being developed as evidenced by the ongoing MassDEP Pilot Project. Changes will occur as the Town moves forward with its wastewater implementation program. The WWTF Discharge Permit needs to be renewed every 5 years (by regulatory statute) and will provide a formal opportunity for permitted change.

# Additional Referenced Figures and Tables

## TABLE 8-1

### TOWN OF CHATHAM
### 2007 SEWER RATE SCHEDULE[1]

| SERVICE CHARGE | WINTER | SUMMER |
|---|---|---|
| Billed Quarterly in arrears and includes 1,000 c.f. usage. | | |
| 5/8" Meter | $33.75 | $67.50 |
| ¾" Meter | $33.75 | $67.50 |
| 1" Meter | $33.75 | $67.50 |
| 1 ½" Meter | $33.75 | $67.50 |
| 2" Meter | $33.75 | $67.50 |
| 4" Meter | $33.75 | $67.50 |
| **METERED RATES** | **WINTER** | **SUMMER** |
| Usage above the minimum per 100 (hundred) cubic feet | | |
| 1st Step: (1,001-3,000 c.f.) | $4.15 | $6.70 |
| 2nd Step: (3,001-5,000 c.f.) | $4.50 | $7.15 |
| 3rd Step: (over 5,000 c.f.) | $4.75 | $7.35 |

Note:
1. Data provided by the Town of Chatham Water and Sewer Department.

## TABLE 9-1

## TOWN-WIDE SEWER COST

| COST COMPONENT | UNITS | PRICE | QUANTITY | ITEM COST | TOTAL |
|---|---|---|---|---|---|
| **GENERAL ITEMS** | | | | | **$3,000,000** |
| Record Drawings & Construction Photos | ea | $5,000 | 84 | $420,000 | |
| Erosion Control | ea | $10,000 | 84 | $840,000 | |
| Final Clean Up and Site Restoration | ea | $5,000 | 84 | $420,000 | |
| Test Pits | cy | $55 | 23,250 | $1,278,750 | |
| Sewer Testing | lf | $2 | 720,000 | $1,440,000 | |
| **GRAVITY SEWER** | | | | | **$81,000,000** |
| 8" Gravity Sewer, 0 to 12 Feet Deep, Town Road | lf | $90 | 286,000 | $25,740,000 | |
| 8" Gravity Sewer, 0 to 12 Feet Deep, State Road | lf | $150 | 13,000 | $1,950,000 | |
| 8" Gravity Sewer, 12+ Feet Deep, Town Road | lf | $120 | 156,000 | $18,720,000 | |
| 8" Gravity Sewer, 12+ Feet Deep, State Road | lf | $180 | 10,000 | $1,800,000 | |
| Dewatering | lf | $105 | 49,800 | $5,229,000 | |
| Service Lateral | ea | $700 | 5,100 | $3,570,000 | |
| Lateral Fittings | ea | $300 | 5,100 | $1,530,000 | |
| 4' Manhole | ea | $4,200 | 2,250 | $9,450,000 | |
| Connection to Existing System | ea | $1,250 | 14 | $17,500 | |
| By-Pass Pumping for Connections | ea | $4,000 | 14 | $56,000 | |
| Misc. (chimneys, clean outs) | ea | $5,000 | 94 | $470,000 | |
| Upgrade C.H.A.P.S. | ea | $2,000,000 | 1 | $2,000,000 | |
| Upgrade Queen Anne P.S. | ea | $2,000,000 | 1 | $2,000,000 | |
| Upgrade Stage Harbor P.S. | ea | $2,000,000 | 1 | $2,000,000 | |
| Pipe Line Improvements to Existing Collection System | lf | $150 | 40,000 | $6,000,000 | |
| **FORCE MAIN** | | | | | **$8,000,000** |
| Force Main, Town Road | lf | $65 | 139,000 | $9,035,000 | |
| Force Main, State Road | lf | $100 | 15,000 | $1,500,000 | |
| *Credit for Sharing Trench* | *lf* | *-$45* | *100,000* | *-$4,500,000* | |
| Air Release / Flushing Manholes | ea | $6,100 | 300 | $1,830,000 | |
| **LOW PRESSURE SEWER** | | | | | **$18,000,000** |
| Small Diameter Pressure Main, Town Road | lf | $45 | 100,000 | $4,500,000 | |
| Small Diameter Pressure Main, State Road | lf | $80 | 1,000 | $80,000 | |
| Air Release / Flushing / End Manholes | ea | $4,500 | 149 | $668,382 | |
| Connection to Manhole | ea | $2,800 | 41 | $114,800 | |
| Grinder Pump | ea | $10,500 | 1,200 | $12,600,000 | |
| *Pump, Panel, Lateral Kit (Model # 2010-93)* | | *$3,000* | | | |
| *Installation of Pump* | | *$3,000* | | | |
| *Installation of Lateral* | | *$3,000* | | | |
| *Engineering* | | *$1,500* | | | |
| **PUMP STATIONS** | | | | | **$19,000,000** |
| 0 - 100 gpm (0.14 mgd) | ea | $175,000 | 63 | $11,025,000 | |
| 100 - 500 gpm (0.72 mgd) | ea | $425,000 | 16 | $6,800,000 | |
| 500 - 1000 gpm (1.44 mgd) | ea | $1,500,000 | 1 | $1,500,000 | |
| **RESTORATION** | | | | | **$17,000,000** |
| 4" Trench Base (T-base) | cy | $17 | 57,640 | $979,880 | |
| 2" Trench Binder | ton | $75 | 58,688 | $4,401,600 | |
| 1" Trench Top Course | ton | $75 | 29,344 | $2,200,800 | |
| 1-1/2" Top Course - Full Width Overlay | ton | $58 | 156,240 | $9,061,920 | |
| Misc Paving Items (Paving Cont.) | % | 3% | $16,644,200 | $499,326 | |
| **SUBTOTAL** | | | | | **$140,000,000** |
| GENERAL CONDITIONS | % | 5% | $140,000,000 | 5% | $7,000,000 |
| BONDS AND INSURANCE | % | 3% | $140,000,000 | 3% | $4,000,000 |
| MOBILIZATION / DEMOBILIZATION | % | 5% | $140,000,000 | 5% | $7,000,000 |
| **ESTIMATED CONSTRUCTION COST** | | | | | **$160,000,000** |
| CONTINGENCY | % | 25% | $160,000,000 | 25% | $40,000,000 |
| DESIGN | % | 10% | $160,000,000 | 10% | $16,000,000 |
| FISCAL, LEGAL, & ENGINEERING | % | 15% | $160,000,000 | 15% | $24,000,000 |
| **ESTIMATED PROJECT COST (2006)** | | | | | **$240,000,000** |
| **ESTIMATED PROJECT COST (2007)** | | | | | **$250,000,000** |

Note:

1. Costs are referenced to construction in March 2006 based on Engineering News Record (ENR) index of 7692, **except** final total (May 2007 ENR Index 7942). Costs must be increased by a ratio of the appropriate ENR indices for construction costs in subsequent years.
2. Record drawings, erosion control, and final site clean based on lump sum cost of $15,000 per sewershed.
3. Trench work (gravity, low pressure and force mains) in town roads to include: excavation, backfill, and traffic control. State Roads also include control density fill (CDF).
4. Dewatering based on 50% length of all mains over 15 feet deep.
5. Gravity service lateral based on $50 per foot based on approximately 14 feet to property line (on average).
6. Lift stations are based on Gormann-Rupp suction pump stations with generator and instrumentation.
7. Cost of grinder pumps based on quote from E-1. Large scale purchases may be a reduction in unit cost.
8. Low pressure lateral based on $34 per lf and average distance of 80 feet with $275 per connection.
9. Trench width based on the following:
   - 6 feet for low pressure, force mains, and gravity mains less than 12 feet deep.
   - 12 feet for gravity mains greater than 12 feet deep.
10. Full width overlay based on 27 foot wide right of way.
11. Misc. paving items to include aprons, saw-cutting, curb repair and other contingencies.
12. Estimated Project Cost does not include utility relocation (stormwater drains and other).
13. Estimated Project Cost does not include allowance for hazardous waste removal.
14. Pump station cost based a basic architectural design. Custom modification to architectural appearance will increase the cost.

## TABLE 9-5

## PHASE 1 AND 2 WWTF DESIGN FLOWS [1]

| CONDITION | PHASE 1 FLOWS (MGD) | PHASE 2 FLOWS (MGD) |
|---|---|---|
| Startup Minimum Month Flow | 0.08 | 0.8 |
| Average Annual Design Flow | 1.3 | 1.9 |
| Average Summer Design Flow | 1.8 | 2.7 |
| Minimum Month Design Flow | 0.65 | 1.2 |
| Maximum Month Design Flow | 2.1 | 3.1 |
| Peak Day Design Flow | 2.3 | 3.5 |
| Peak Hourly Design Flow | 3.5 | 5.1 |

Note:
1. Includes I/I.

## TABLE 9-6

## INVENTORY OF EXISTING AND PROPOSED FACILITIES AND PROCESS EQUIPMENT

**(All equipment is NEW unless identified as "existing")**

| COMPONENT | PRELIMINARY DESIGN PHASE 1 |
|---|---|
| **PRELIMINARY FACILITIES** | |
| *Pre-Engineered System* | |
| Number of Units | 1 |
| Location | Influent Building |
| Capacity (Peak) | 2.8 MGD |
| Screen Spacing | 6-mm (1/4-inch) |
| Grit Removal Efficiency | 80% removal for 65 mesh |
| *Dewatered Screenings and Grit Conveyor* | |
| Number of Units | 1 |
| Location | Influent Building |
| Approximate Length | 40 feet |
| *Manual Bar Rack* | |
| Number of Units | 1 |
| Location | Influent Building |
| Screen Spacing | 1-inch |
| *Influent Sampler* | |
| Number of Units | 1 |
| Location | Influent Building |
| **SECONDARY TREATMENT FACILITIES** | |
| *Reactor Flow Distribution* | |
| Type | Slide/Sluice Gates |
| Number of Units | 4 |
| Location | Reactor Junction Box |
| *Oxidation Ditch Reactor* | |
| Process Type | Orbal® Process (Nitrification-Denitrification) |
| Number of Channels | 3 |
| MLSS | 3,000 mg/L (max month) |
| Overall Dimensions | 176 ft (L) x 116 ft (W) x 12 ft (D) |
| *Oxidation Ditch Aeration System* | |
| Type | Horizontal Rotary Disc Aerators |
| Location | Oxidation Ditch |
| Number of Units | 2 - 40 HP serving inner and middle channels |
| Number of Units | 2 - 30 HP serving outer channels |
| *Oxidation Ditch Nitrate Recycle Pump* | |
| Type | Submersible In-Line Propeller |
| Location | Inner Channel (Orbal® Oxidation Ditch) |
| Number of Units | 1 |

**TABLE 9-6 (continued)**

**INVENTORY OF EXISTING AND PROPOSED FACILITIES AND PROCESS EQUIPMENT**
**(All equipment is NEW unless identified as "existing")**

| COMPONENT | PRELIMINARY DESIGN PHASE 1 |
|---|---|
| **SECONDARY TREATMENT FACILITIES (CONT.)** | |
| *Reactor Scum Pump* | |
| Type | Submersible Centrifugal Chopper Pump |
| Location | Reactor scum box |
| Number of Units | 1 |
| Capacity, each | 150 gpm |
| *Secondary Clarifier Flow Distribution Slide Gate* | |
| Type | Slide Gates |
| Location | Clarifier Distribution Box |
| Number of Units | 2 |
| *Secondary Clarifier* | |
| Type | Circular, Center Feed with EDI, Peripheral Overflow |
| Number of Units | 2 |
| Tank Diameter | 55 feet |
| Side Water Depth | 13 feet |
| Surface Overflow Rate (Peak) | 800 gpd/sf (all units in service) |
| *Return Activated Sludge Pump* | |
| Type | Centrifugal Non-Clog |
| Location | Process Building |
| Number of Units | 3 (including 1 installed spare) |
| Capacity, each | On VFD; 860 gpm |
| *Return Activated Sludge Flow Meter* | |
| Type | Magnetic Type |
| Location | Process Building |
| Number of Units | 3 |
| Size | 4-inch |
| *Waste Activated Sludge Pump* | |
| Type | Centrifugal Non-Clog |
| Location | Process Building |
| Number of Units | 2 (including 1 installed spare) |
| Capacity, each | 150 gpm |
| *Waste Activated Sludge Flow Meter* | |
| Type | Magnetic Type |
| Location | Process Building |
| Number of Units | 2 |
| Size | 3-inch |

**TABLE 9-6 (continued)**

**INVENTORY OF EXISTING AND PROPOSED FACILITIES AND PROCESS EQUIPMENT**
**(All equipment is NEW unless identified as "existing")**

| COMPONENT | PRELIMINARY DESIGN PHASE 1 |
|---|---|
| **SECONDARY TREATMENT FACILITIES (CONT)** | |
| *Secondary Clarifier Scum Pump* | |
| Type | Submersible Centrifugal Chopper Pump |
| Location | Secondary Scum Box |
| Number of Units | 2 |
| Capacity, each | 150 gpm |
| **SUPPLEMENTAL CARBON FACILITIES** | |
| *Methanol Storage Tank* | |
| Type | Aboveground Concrete Encased Steel |
| Location | Supplemental Carbon Facility |
| Capacity | 6,000 gallons |
| *Methanol Feed Pump* | |
| Type | Peristaltic, on VFD |
| Location | Supplemental Carbon Facility |
| Number of Units | 2 (plus an uninstalled spare) |
| Flow Range | 0.002 to 34.8 gph |
| **FILTRATION** | |
| *Denitrification Filters* | |
| Type | Continuous Backwashing Sand Filters |
| Location | Filter Building |
| Capacity | 4 mgd |
| Number of Cells | 7 |
| Number of Modules per Cell | 2 |
| Filtration Area Per Cell | 100 sq. feet |
| Total Filtration Area | 700 sq. feet |
| Peak Hour Loading Rate (all cells in service) | 3.85 gpm/$ft^2$ |
| Compressed Air Required | 42 scfm |
| *Air Compressor* | |
| Type | Reciprocating |
| Location | Process Building |
| Number of Units | 1 |
| Motor HP | 20 |

**TABLE 9-6 (continued)**

**INVENTORY OF EXISTING AND PROPOSED FACILITIES AND PROCESS EQUIPMENT**
**(All equipment is NEW unless identified as "existing")**

| COMPONENT | PRELIMINARY DESIGN PHASE 1 |
|---|---|
| **ODOR CONTROL** | |
| *Activated Carbon Odor Control System* | |
| Type | Radial Flow |
| Location | Adjacent to Sludge Dewatering Building |
| Media | High Capacity Activated Carbon |
| Capacity | 20,000 cfm |
| Fan HP | 50 |
| Fan Note | Fan provided with weather protection enclosure |
| **SLUDGE TREATMENT FACILITIES** | |
| *Waste Activated Sludge Holding Tank* | |
| Note | Reuse Existing |
| Number of Units | 2 |
| Dimensions, each | 37 feet x 37 feet x 10.2 feet side water depth |
| *Waste Activated Sludge Holding Tank Aeration System* | |
| Type | Removable Coarse Bubble Diffusers |
| Location | Sludge Holding Tanks |
| Design Air Flow | 425 scfm for each tank |
| *Waste Activated Sludge Holding Tank Blower* | |
| Type | Positive Displacement, Tri-Lobe with Sound Enclosure |
| Location | Process Building |
| Number of Units | 2 (including 1 installed spare) |
| Capacity, each | On VFD |
| *Belt Filter Press Feed Pump* | |
| Type | Progressive Cavity |
| Location | Sludge Processing Building |
| Number of Units | 2 (including 1 installed spare) |
| Capacity, each | On VFD; 370 gpm |
| *Belt Filter Press Feed Flow Meter* | |
| Type | Magnetic Type |
| Location | Sludge Dewatering Building |
| Number of Units | 2 |
| Size | 4-inch |
| *Sludge Dewatering Equipment* | |
| Type | Belt Filter Press |
| Location | Sludge Dewatering Building |
| Number of Units | 1 new + 1 existing |

**TABLE 9-6 (continued)**

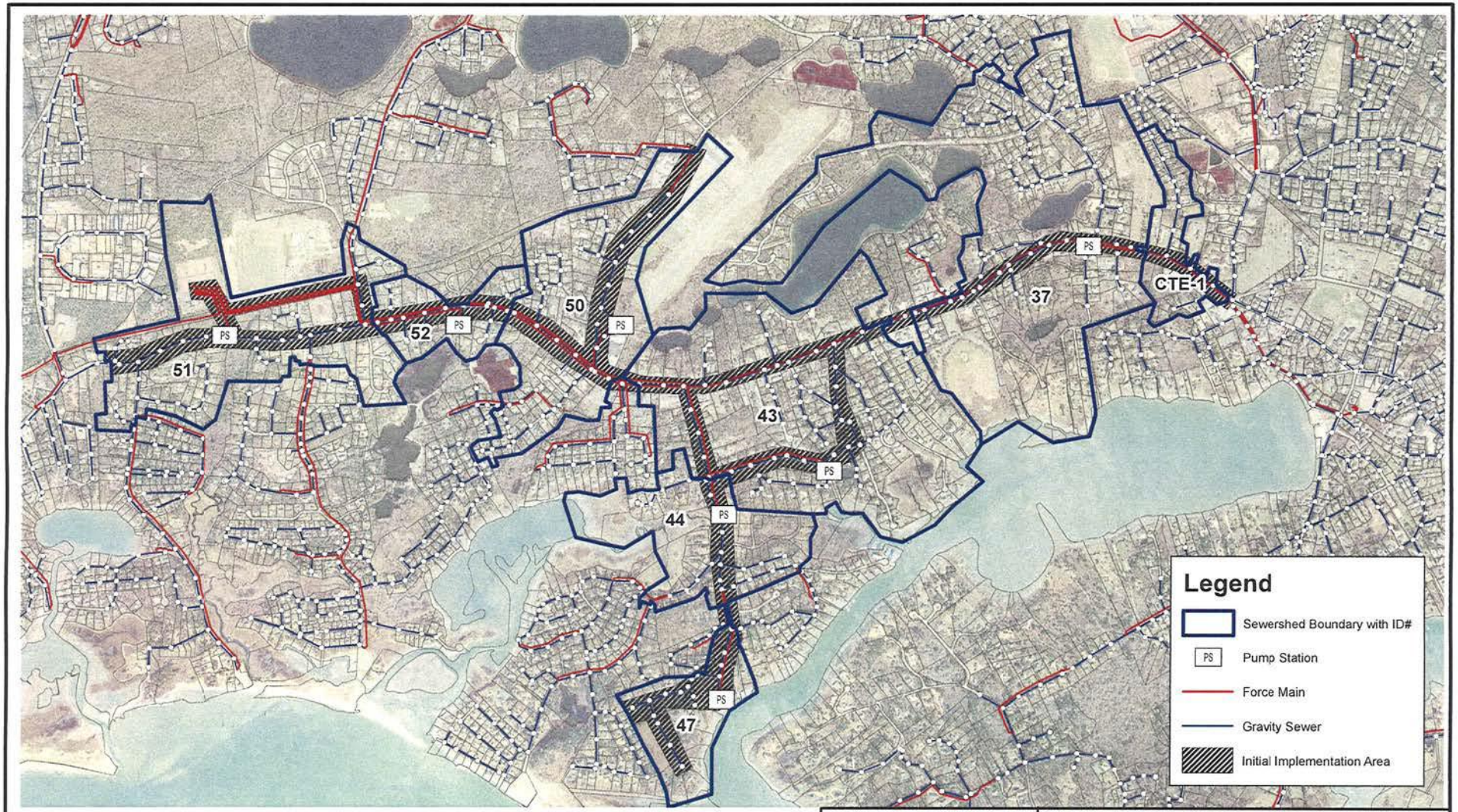
**INVENTORY OF EXISTING AND PROPOSED FACILITIES AND PROCESS EQUIPMENT**
**(All equipment is NEW unless identified as "existing")**

| COMPONENT | PRELIMINARY DESIGN PHASE 1 |
|---|---|
| **SLUDGE TREATMENT FACILITIES (CONT.)** | |
| Size | New: 1-meter; Existing: 1-meter |
| *Water Booster Pump* | |
| Location | Sludge Dewatering Building |
| Number of Units | 1 |
| Capacity, each | 90 gpm @ 120 psi |
| **OTHER FACILITIES** | |
| *Plant Water Pumps* | |
| Type | Skid-Mounted |
| Location | Process Building |
| Number of Units | 3 |
| *Plant Water Hydropneumatic Tank* | |
| Number of Units | 1 |
| Location | Process Building |
| *Recycle Flow Pumps* | |
| Type | Submersible Non-Clog Centrifugal |
| Location | Recycle Flow Pump Station |
| Number of Units | 2 |
| *Parshall Flume* | |
| Type | FRP |
| Number of Units | 1 |
| Location | UV/Parshall Flume Structure |
| Size (Throat Width) | 12-inches |
| Capacity | 320 gpm |
| *Influent Sampler* | |
| Number of Units | 1 |
| Location | Outside of the Influent Building |
| *Effluent Sampler* | |
| Number of Units | 1 |
| Location | UV/Parshall Flume Structure |

**TABLE 9-6 (continued)**

**INVENTORY OF EXISTING AND PROPOSED FACILITIES AND PROCESS EQUIPMENT**
**(All equipment is NEW unless identified as "existing")**

| COMPONENT | PRELIMINARY DESIGN PHASE 1 |
|---|---|
| **OTHER FACILITIES (CONT.)** | |
| *Sodium Hypochlorite Storage Tank* | |
| Type | FRP Cylindrical |
| Location | Process Building |
| Number of Units | 1 |
| Capacity | 6,000 gallons |
| Tank Diameter | 10 feet |
| *Sodium Hypochlorite Feed Pumps* | |
| Type | Peristaltic |
| Location | Process Building |
| Number of Units | 3 (including 1 installed spare) |
| *Sodium Hydroxide Storage Tank* | |
| Type | FRP Cylindrical |
| Location | Process Building |
| Number of Units | 1 |
| Capacity | 6,000 gallons |
| Tank Diameter | 10 feet |
| *Sodium Hydroxide Feed Pumps* | |
| Type | Peristaltic |
| Location | Chemical and Blower Building |
| Number of Units | 2 (including 1 installed spare) |
| **TREATED WATER RECHARGE FACILITIES** | |
| Sand Beds | |
| Number of Existing Sand Beds | 2 |
| Area (sf) each | 30,000 |
| Area (sf) total | 60,000 |
| Capacity, total (30 gpd/sf) | 1.8 mgd |
| Number of New Sand Beds | 2 |
| Area (sf) total | 80,000 |
| Capacity, total (30 gpd/sf) | 2.4 mgd |
| Total Capacity | 4.2 mgd |
| Capacity with 50% beds resting | 2.1 mgd |

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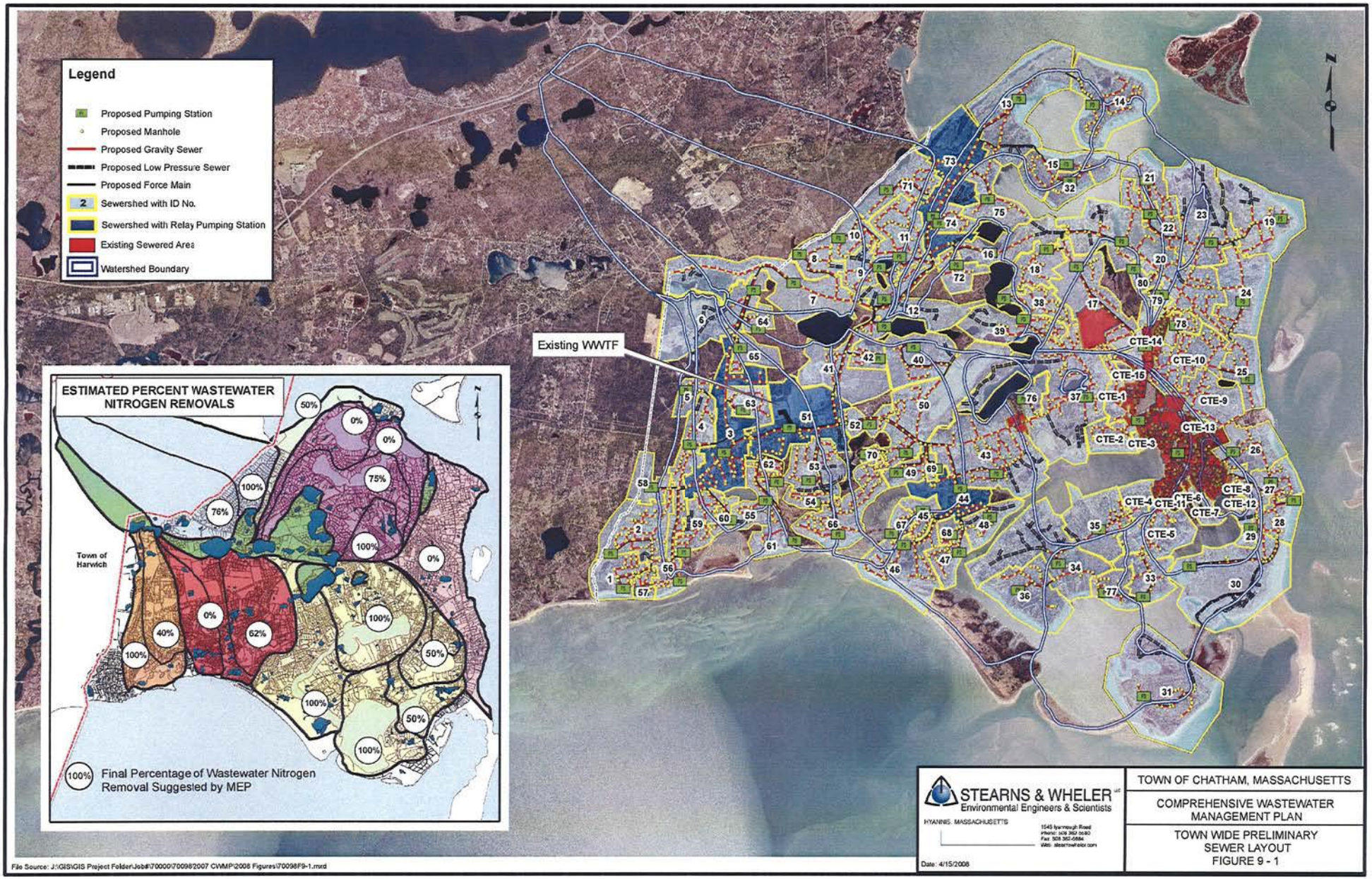
HYANNIS, MASSACHUSETTS

PROJECT NO.: 91057 DATE: 5/20/09

**Town of Chatham, Massachusetts**

**Comprehensive Wastewater Management Planning**

**FIGURE 1-2**
**Initial Phase of Sewer Implementation**

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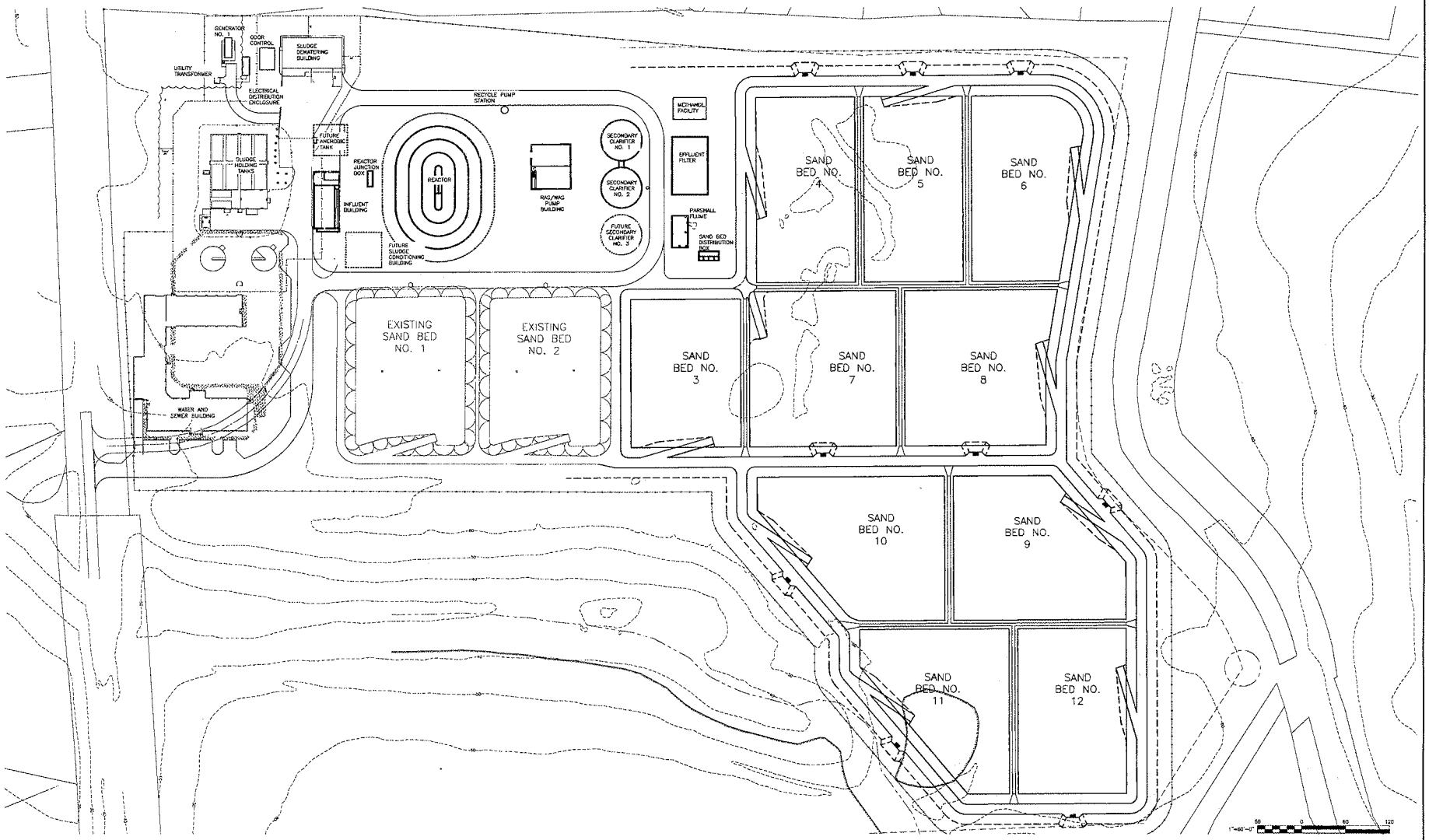
TOWN OF CHATHAM, MASSACHUSETTS

COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

TOWN WIDE PRELIMINARY SEWER LAYOUT
FIGURE 9 - 1

Date: 4/15/2008

File Source: J:\GIS\GIS Project Folder\Job#\70000\70098\2007 CWMP\2008 Figures\70098F9-1.mxd




SITE PLAN – OVERALL
SCALE: 1"= 60'-0"

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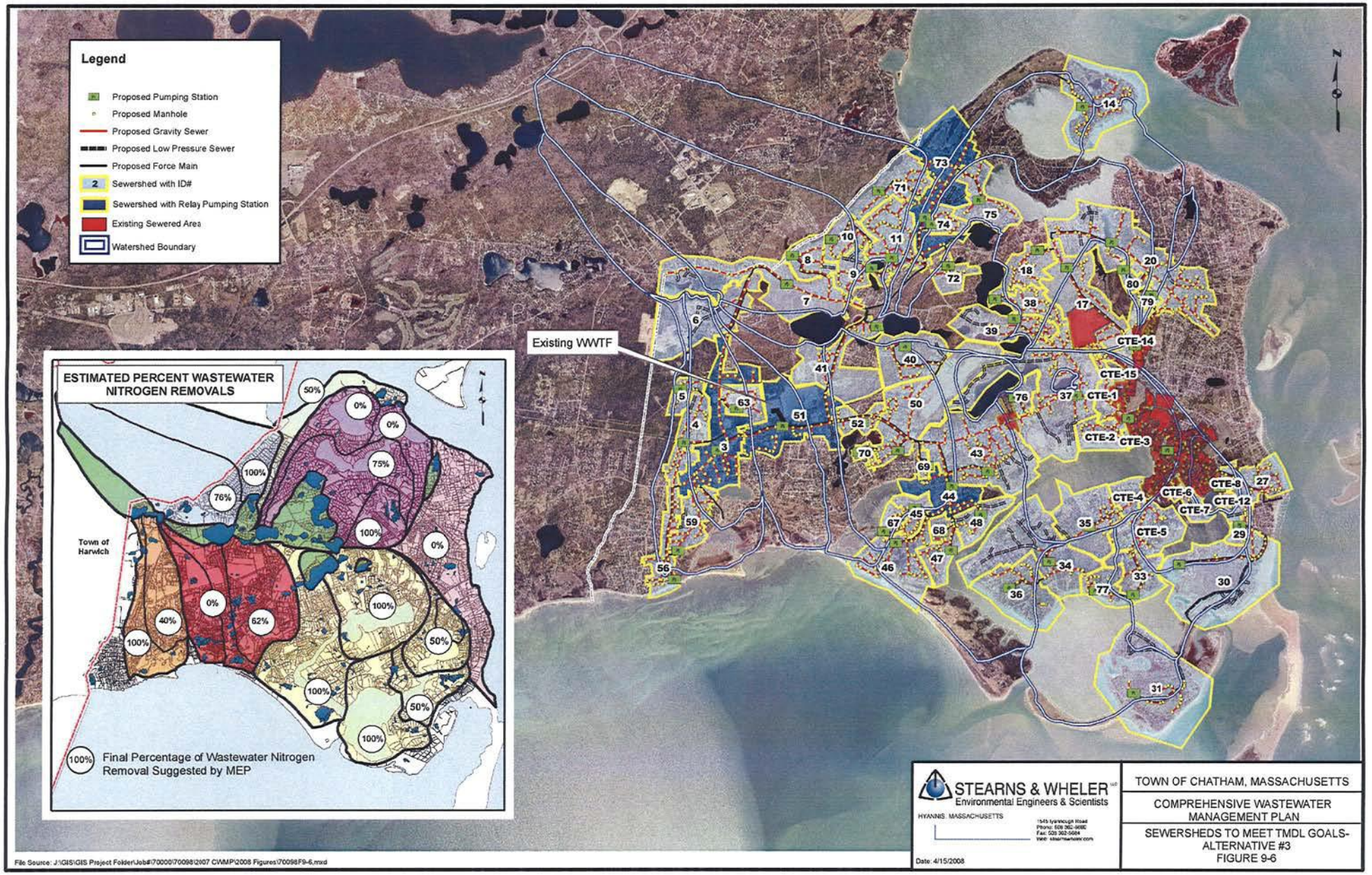
DATE: 04/21/08

TOWN OF CHATHAM, MASSACHUSETTS

COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

WWTF PRELIMINARY DESIGN WITH POTENTIAL TREATED WATER RECHARGE AREA
FIGURE 9-3


Legend
Proposed Pumping Station
Proposed Manhole
Proposed Gravity Sewer
Proposed Low Pressure Sewer
Proposed Force Main
2 Sewershed with ID#
Sewershed with Relay Pumping Station
Existing Sewered Area
Watershed Boundary
Existing WWTF
ESTIMATED PERCENT WASTEWATER NITROGEN REMOVALS
Town of Harwich
100% Final Percentage of Wastewater Nitrogen Removal Suggested by MEP
STEARNS & WHELER
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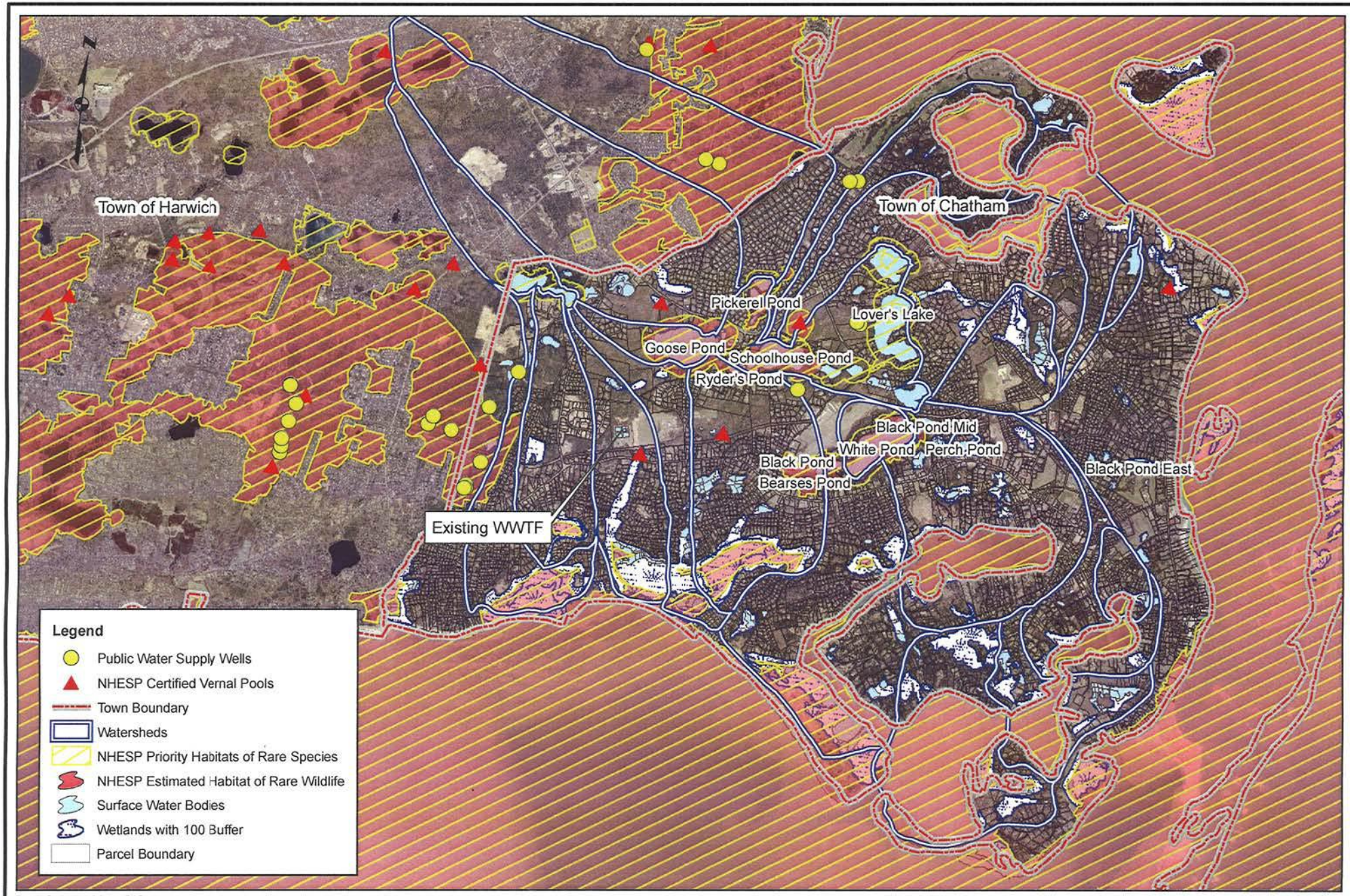
HYANNIS, MASSACHUSETTS
TOWN OF CHATHAM, MASSACHUSETTS
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
SEWERSHEDS TO MEET TMDL GOALS-ALTERNATIVE #3
FIGURE 9-6
Date: 4/15/2008
File Source: J:\GIS\GIS Project Folder\Job#\70000\70098\2007 CWMP\2008 Figures\70098F9-6.mxd




Data Source: MassGIS

0 0.375 0.75 1.5 Miles

GIS File Location: J:\GIS\Job#\70000\70098\2007 CWMP\70098F10-3.mxd

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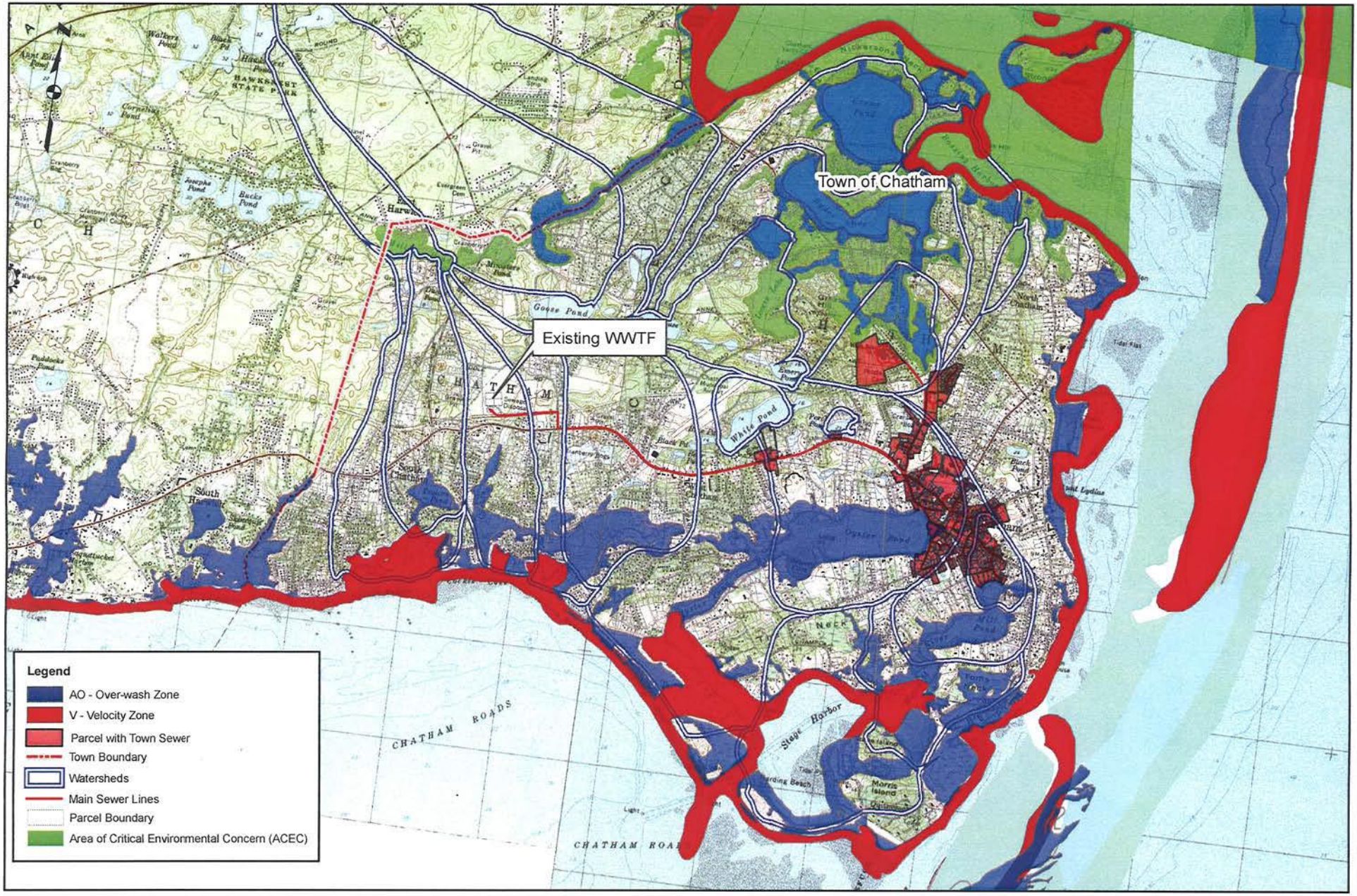
DATE: 5/28/09

TOWN OF CHATHAM, MASSACHUSETTS

COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

WATER RESOURCES AND NATURAL HABITATS
FIGURE 10-3




Data Source: MassGIS/Town of Chatham.
Note: USGS Quadrangle modified to reflect current coastal conditions (2008).

0 2,200 4,400 8,800 Feet

1 inch = 4,000 feet

GIS File Location: J:\GIS\GIS ProjectFolder\Job#\70000\70098\2007 CWMP\2008 Figures\70098F10-4.mxd

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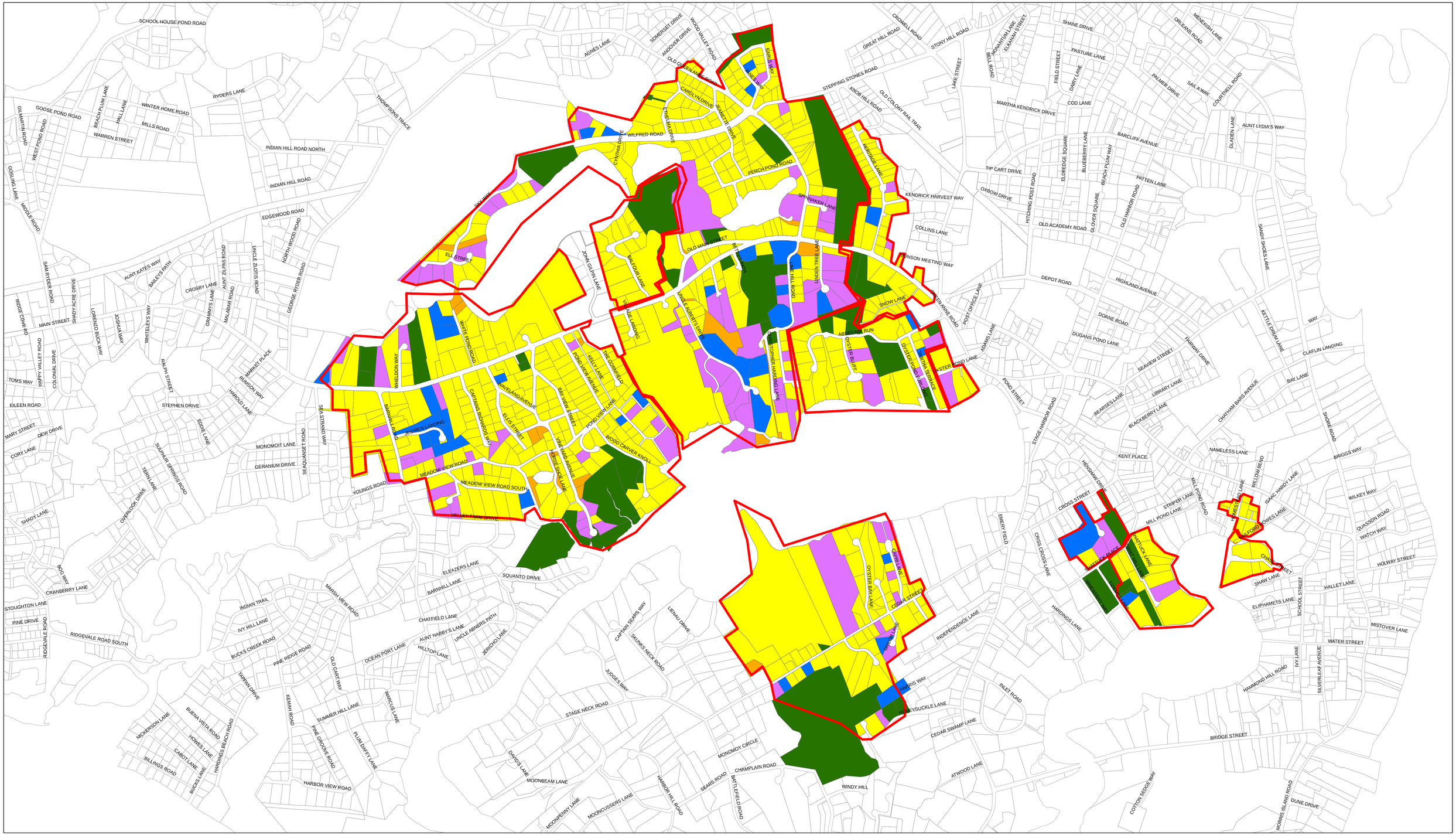
TOWN OF CHATHAM, MASSACHUSETTS

COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

COASTAL ISSUE AREAS
FIGURE 10-4

# Appendix B

## Parcel Development Before and After 1995


SCHOOL HOUSE POND ROAD
GOOSE POND ROAD
BEACH PLUM LANE
HALL LANE
WINTER HOME ROAD
MILLS ROAD
WARREN STREET
RYDERS LANE
THOMPSONS TRACE
INDIAN HILL ROAD NORTH
INDIAN HILL ROAD
EDGEWOOD ROAD
NORTH WOOD ROAD
GILMARTIN ROAD
WEST POND ROAD
GOSLING LANE
MIDDLE ROAD
SAM RYDER ROAD
AUNT KATES WAY
BAILEYS PATH
CROSBY LANE
AUNT ZILPAS ROAD
UNCLE ELOTS ROAD
GEORGE RYDER ROAD
MALABAR ROAD
GRAMMYS LANE
RIDGE COVE RD
SHADY ACRE DRIVE
MAIN STREET
LORENZO BUCK WAY
WHITELEYS WAY
VAN BRUNT WAY
HAPPY VALLEY ROAD
COLONIAL DRIVE
TOMS WAY
EILEEN ROAD
MARY STREET
DEW DRIVE
CORY LANE
RALPH STREET
STEPHEN DRIVE
MARKET PLACE
RUMSON WAY
HAROLD LANE
EDDIE LANE
MONOMOIT LANE
GERANIUM DRIVE
SEA STRAND WAY
SEAQUANSET ROAD
SEA QUANSET ROAD
YOUNGS ROAD
VALLEY FARM DRIVE
MEADOW VIEW ROAD
MEADOW VIEW ROAD SOUTH
SHADY LANE
OVERLOOK DRIVE
TERN LANE
SUNKHAZE MEADOW ROAD
SUNKHAZE MEADOWS ROAD
SUNKHAZE MEADOWS ROAD
BOG WAY
CRANBERRY LANE
STOUGHTON LANE
PINE DRIVE
RIDGEVALE ROAD
RIDGEVALE ROAD SOUTH
INDIAN TRAIL
IVY HILL LANE
BUCKS CREEK ROAD
PINE RIDGE ROAD
TARPAUN DRIVE
OLD DART WAY
OCEAN PORT LANE
MARSH VIEW ROAD
ELEAZERS LANE
BARNHILL LANE
CHATFIELD LANE
AUNT NABBY'S LANE
UNCLE ABNERS PATH
JERICHO LANE
HILLTOP LANE
SQUANTO DRIVE
KENIAH ROAD
SUMMER HILL LANE
PINE GROOVE ROAD
PLUM DAFFY LANE
MARCUS LANE
HARBOR VIEW ROAD
NICKERSON LANE
BUENA VISTA ROAD
HOWES LANE
CABOT LANE
BILLINGS ROAD
BUCKS LANE
HARDINGS BEACH ROAD
AGNES LANE
SOMERSET DRIVE
ANDOVER DRIVE
WOOD VALLEY ROAD
OLD QUEEN ANNE ROAD
CAROLYN DRIVE
PETHELMA DRIVE
JEANETTE DRIVE
CYNTHIA DRIVE
WILFRED ROAD
PERCH POND ROAD
SKYWAY
ELL STREET
JOHN GLEN LANE
BALFOUR LANE
VILLAGE LANDING
WHITE POND ROAD
WHELDON WAY
BARNHILL ROAD
JESSIES LANDING
CAPTAINS RICHARDS WAY
LAKELAND AVENUE
ELLIS STREET
BAYVIEW STREET
POND VIEW AVENUE
POND VIEW LANE
KELLY LANE
THE CORNFIELD
WOOD CARVER KNOLL
ROSE SHORE LANE
VINE MEDLAVENUE
EARLS WAY
LANE WAY
STEPPING STONES ROAD
KNOB HILL ROAD
OLD COLONY RAIL TRAIL
GREAT HILL ROAD
CROWELL ROAD
STONY HILL ROAD
LAKE STREET
ROMATOMA LANE
ELMANAH STREET
BELL ROAD
SHANE DRIVE
PASTURE LANE
FIELD STREET
DAIRY LANE
PALMER DRIVE
SAILS WAY
COURTNELL ROAD
ORLEANS ROAD
MENEMSHA LANE
MARTHA KENDRICK DRIVE
COD LANE
AUNT LYDIA'S WAY
GLADEN LANE
BARCLIFF AVENUE
BLUEBERRY LANE
BEACH PLUM WAY
PATTEN LANE
TIP CART DRIVE
OXBOW DRIVE
HITCHING POST ROAD
ELDREDGE SQUARE
CLOVER SQUARE
OLD HARBOR ROAD
OLD ACADEMY ROAD
SANDY SHORES LANE
KENDRICK HARVEST WAY
COLLINS LANE
SPINNAKER LANE
HERITAGE LANE
OLD MAIN STREET
BEE TREE LANE
LINDEN TREE LANE
LIME HILL ROAD
JOHNSON MEETING WAY
DEPOT ROAD
HIGHLAND AVENUE
SNOW LANE
ANNE ROAD
POST OFFICE LANE
ADAMS LANE
DOANE ROAD
DUGANS POND LANE
SEAVIEW STREET
PURVIAL DRIVE
KETTLE PRAM LANE
CLAFLIN LANDING
BAY LANE
LIBRARY LANE
BLACKBERRY LANE
BEARSES LANE
CHATHAM BARS AVENUE
SHORE ROAD
BRIGGS WAY
NAMELESS LANE
KENT PLACE
WILLOW BEND
ISAAC HARDY LANE
WILKEY WAY
QUASSON ROAD
WATCH WAY
HOLWAY STREET
HALLET LANE
ELIPHAMETS LANE
SCHOOL STREET
MISTOVER LANE
WATER STREET
IVY LANE
SILVERLEAF AVENUE
HAMMOND HILL ROAD
BRIDGE STREET
DUNE DRIVE
MORRIS ISLAND ROAD
COTTON SEDGE WAY
ATWOOD LANE
CHAMPLAIN ROAD
MONOMOY CIRCLE
SEARS ROAD
BATTLEFIELD ROAD
HARBOR HILL ROAD
MOONCUSSERS LANE
MOONPENNY LANE
MOONBEAM LANE
DAVIDS LANE
STAGE NECK ROAD
JUDGES WAY
CAPTAIN SEARS WAY
SKUNKS NECK ROAD
LEMAU DRIVE
WINDY HILL
HARDINGS LANE
INDEPENDENCE LANE
HONEYSUCKLE LANE
CEDAR SWAMP LANE
INLET ROAD
HARRIS WAY
CEDAR STREET
OYSTER BAY LANE
OSPREY LANE
TAYLOR LANE
CROSS STREET
CRISS CROSS LANE
EMERY FIELD
MILL POND ROAD
MILL POND LANE
STRIPER LANE
HATTUCK LANE
SHELTICK PLACE
SHAW LANE
CHASE STREET
WILLOWCREST LANE
JAMES LAND LANE
OYSTER POND LANE
OYSTER POND BLVD
MARTHA TERRACE
OYSTER BLUFF
ABBEGOOM RUN
CLIFF FORTHER HARDING LANE
POND STREET
STAGE HARBOR ROAD
HENSHAW DRIVE
Legend
Vacant Developable (42)
Undevelopable (22)
Developed > 1995 (102)
Municipal Private Conservation (38)
Developed <= 1995 (672)
Sewershed: 35,37,43,76,CT-1,CTE-2,CTE-3,CTE-6,CTE-7,CTE-8,CTE-12
0
750
1,500
3,000 Feet
N
W
E
S

Developed <= 1995

| NEW_TAXMAP | LOCATION | ST_NAME | ST_NUMBER |
|---|---|---|---|
| 10D-101-R12 | 60 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 60 |
| 10D-12-S4 | 150 MEADOW VIEW RD | MEADOW VIEW RD | 150 |
| 10D-22-S12 | 55 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 55 |
| 10D-23-S13 | 69 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 69 |
| 10D-45-D81 | 64 ELLIS ST | ELLIS ST | 64 |
| 10D-46-D96 | 5 SMITH ST | SMITH ST | 5 |
| 10D-83-34 | 60 SMITH ST | SMITH ST | 60 |
| 10D-CAPT-RIC | 49 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 49 |
| 10D-CAPT-RIC | 19 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 19 |
| 10D-CAPT-RIC | 27 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 27 |
| 10D-CAPT-RIC | 41 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 41 |
| 10D-CAPT-RIC | 33 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 33 |
| 10E-13-2 | 1359 MAIN ST | MAIN ST | 1359 |
| 10E-21-B5 | 30 VINEYARD AVE | VINEYARD AVE | 30 |
| 10E-34-24 | 1470 MAIN ST | MAIN ST | 1470 |
| 10E-35-33 | 60 WHITE POND RD | WHITE POND RD | 60 |
| 10E-36-32 | 50 WHITE POND RD | WHITE POND RD | 50 |
| 10E-42-23 | 1448 MAIN ST | MAIN ST | 1448 |
| 10E-7-11 | 51 POND VIEW AVE | POND VIEW AVE | 51 |
| 11D-18-D6 | 117 KELLEY LN | KELLEY LN | 117 |
| 11D-21-D10 | 157 KELLEY LN | KELLEY LN | 157 |
| 11E-27-11 | 22 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 22 |
| 11E-33C-V4 | 32 VILLAGE LNDG | VILLAGE LNDG | 32 |
| 11E-51-D12 | 39 THE CORNFIELD | THE CORNFIELD | 39 |
| 11E-7-32 | 1238 MAIN ST | MAIN ST | 1238 |
| 11F-1-6 | 1148 MAIN ST | MAIN ST | 1148 |
| 11F-9G-B8 | 115 BALFOUR LN | BALFOUR LN | 115 |
| 11G-13-G50 | 16 CAROLYN DR | CAROLYN DR | 16 |
| 12B-1D-B5 | 42 BLACK DUCK LNDG | BLACK DUCK LNDG | 42 |
| 12B-23-6 | 330 CEDAR ST | CEDAR ST | 330 |
| 12C-4-3 | 268 CEDAR ST | CEDAR ST | 268 |
| 12E-12-RB | 9 BETTYS PATH | BETTYS PATH | 9 |
| 12E-14-SM3 | 55 LIME HILL RD | LIME HILL RD | 55 |
| 12E-21-B4 | 169 LIME HILL RD | LIME HILL RD | 169 |
| 12E-23H-A16 | 125 ABSEGAMI RUN | ABSEGAMI RUN | 125 |
| 12F-17-G6 | 41 PERCH POND RD | PERCH POND RD | 41 |
| 12F-27-G24 | 112 PERCH POND RD | PERCH POND RD | 112 |
| 12F-44-14 | 22 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 22 |
| 12F-5-5 | 36 OLD MAIN ST | OLD MAIN ST | 36 |
| 12F-6-4A | 1086 MAIN ST | MAIN ST | 1086 |
| 12G-25-BA | 205 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 205 |
| 12G-48-M13 | 16 JANES WAY | JANES WAY | 16 |
| 12G-57-M24 | 8 EARLES WAY | EARLES WAY | 8 |
| 12G-8-2A | 158 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 158 |

| | | | |
|---|---|---|---|
| 13C-19-3B | 63 OYSTER BAY LN | OYSTER BAY LN | 63 |
| 13C-22A-W1 | 186 CEDAR ST | CEDAR ST | 186 |
| 13C-37-8A | 134 CEDAR ST | CEDAR ST | 134 |
| 13C-9-H3 | 20 ROBINSON CT | ROBINSON CT | 20 |
| 13E-30-11 | 100 OYSTER POND FURLONG | OYSTER POND FURLONG | 100 |
| 13E-39-4 | 859 MAIN ST | MAIN ST | 859 |
| 13E-42-5A | 35 SNOW LN | SNOW LN | 35 |
| 13F-38-TH22 | 89 HERITAGE LN | HERITAGE LN | 89 |
| 13F-42-TH26 | 123 HERITAGE LN | HERITAGE LN | 123 |
| 13F-47-TH15 | 130 HERITAGE LN | HERITAGE LN | 130 |
| 13G-27-TH45 | 164 HERITAGE LN | HERITAGE LN | 164 |
| 15C-16-3 | 75 GRIST MILL LN | GRIST MILL LN | 75 |
| 10D-104-R15 | 30 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 30 |
| 10D-105-R16 | 20 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 20 |
| 10D-68-D40 | 89 VINEYARD AVE | VINEYARD AVE | 89 |
| 10D-86-D26 | 125 VINEYARD AVE | VINEYARD AVE | 125 |
| 10E-18-SW1 | 1388 MAIN ST | MAIN ST | 1388 |
| 10E-31-D59 | 35 WAVELAND AVE | WAVELAND AVE | 35 |
| 10E-46-21 | 1424 MAIN ST | MAIN ST | 1424 |
| 11D-28-6B | 20 POND VIEW LN | POND VIEW LN | 20 |
| 11E-1-15 | 73 POND VIEW AVE | POND VIEW AVE | 73 |
| 11E-18-20 | 1173 MAIN ST | MAIN ST | 1173 |
| 11E-19-19 | 1181 MAIN ST | MAIN ST | 1181 |
| 11E-21-17 | 27 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 27 |
| 11E-26-12 | 38 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 38 |
| 11E-33E-V7 | 26 VILLAGE LNDG | VILLAGE LNDG | 26 |
| 11F-3-7 | 1134 MAIN ST | MAIN ST | 1134 |
| 11F-7-2 | 64 OLD MAIN ST | OLD MAIN ST | 64 |
| 11G-26-B1 | 184 WILFRED RD | WILFRED RD | 184 |
| 12E-6-L3 | 55 CHRISTOPHER HARDING LN | CHRISTOPHER HARDING LN | 55 |
| 12F-22-G11 | 99 PERCH POND RD | PERCH POND RD | 99 |
| 12F-8-8 | 1054 MAIN ST | MAIN ST | 1054 |
| 12G-10A-3A | 148 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 148 |
| 12G-46-M15 | 63 EARLES WAY | EARLES WAY | 63 |
| 13C-14-20 | 195 CEDAR ST | CEDAR ST | 195 |
| 13C-28-C10 | 67 CAPRI LN | CAPRI LN | 67 |
| 13E-49B-1B | 935 MAIN ST | MAIN ST | 935 |
| 13F-46-TH14 | 138 HERITAGE LN | HERITAGE LN | 138 |
| 13F-48-TH16 | 124 HERITAGE LN | HERITAGE LN | 124 |
| 11E-OYST-PON | 1233 MAIN ST | MAIN ST | 1233 |
| 15C-15A-3C | 53 GRIST MILL LN | GRIST MILL LN | 53 |
| 15C-18-H2 | 10 GRIST MILL LN | GRIST MILL LN | 10 |
| 15C-20A-F28 | 117 SHATTUCK PL | SHATTUCK PL | 117 |
| 11E-OYST-PON | 1241 MAIN ST | MAIN ST | 1241 |
| 11E-OYST-PON | 1241 MAIN ST | MAIN ST | 1241 |
| 11E-OYST-PON | 1241 MAIN ST | MAIN ST | 1241 |
| 9D-45-14B | 1615 MAIN ST | MAIN ST | 1615 |

| | | | |
|---|---|---|---|
| 9D-7B-19B | 31 BARN HILL RD | BARN HILL RD | 31 |
| 10D-25-S21 | 126 MEADOW VIEW RD | MEADOW VIEW RD | 126 |
| 10D-66-D46 | 63 VINEYARD AVE | VINEYARD AVE | 63 |
| 10D-79-D23 | 85 BAYVIEW ST | BAYVIEW ST | 85 |
| 10D-89-D122 | 159 VINEYARD AVE | VINEYARD AVE | 159 |
| 10E-12-3 | 20 POND VIEW AVE | POND VIEW AVE | 20 |
| 11D-14-D4 | 140 KELLEY LN | KELLEY LN | 140 |
| 11D-8-C17A | 91 POND VIEW AVE | POND VIEW AVE | 91 |
| 11E-43-D4 | 66 THE CORNFIELD | THE CORNFIELD | 66 |
| 11E-49-D10 | 59 THE CORNFIELD | THE CORNFIELD | 59 |
| 11E-50-D11 | 47 THE CORNFIELD | THE CORNFIELD | 47 |
| 11E-BALF-COU | 7 BALFOUR CT | BALFOUR CT | 7 |
| 11E-BALF-COU | 17 BALFOUR CT | BALFOUR CT | 17 |
| 11E-BALF-COU | 28 BALFOUR CT | BALFOUR CT | 28 |
| 11E-BALF-COU | 16 BALFOUR CT | BALFOUR CT | 16 |
| 11E-BALF-COU | 29 BALFOUR CT | BALFOUR CT | 29 |
| 11E-BALF-COU | 6 BALFOUR CT | BALFOUR CT | 6 |
| 11G-10-G42 | 14 JEANETTE DR | JEANETTE DR | 14 |
| 12D-3-L6 | 127 CHRISTOPHER HARDING LN | CHRISTOPHER HARDING LN | 127 |
| 12E-23A-A9 | 138 ABSEGAMI RUN | ABSEGAMI RUN | 138 |
| 12E-23B-A10 | 130 ABSEGAMI RUN | ABSEGAMI RUN | 130 |
| 12E-23C-A11 | 124 ABSEGAMI RUN | ABSEGAMI RUN | 124 |
| 12F-18-G7 | 53 PERCH POND RD | PERCH POND RD | 53 |
| 12F-20-G9 | 73 PERCH POND RD | PERCH POND RD | 73 |
| 12F-34-G29 | 50 PERCH POND RD | PERCH POND RD | 50 |
| 12F-35-G28 | 26 PERCH POND RD | PERCH POND RD | 26 |
| 12F-44B-14B | 7 SPINNAKER LN | SPINNAKER LN | 7 |
| 12G-20-G62 | 11 JEANETTE DR | JEANETTE DR | 11 |
| 12G-51-M18 | 84 EARLES WAY | EARLES WAY | 84 |
| 12G-58-M4 | 21 STEPPING STONES RD | STEPPING STONES RD | 21 |
| 13B-12-I9 | 139 HONEYSUCKLE LN | HONEYSUCKLE LN | 139 |
| 13C-20-3C | 107 OYSTER BAY LN | OYSTER BAY LN | 107 |
| 13C-22D-W4 | 15 WINDSONG LNDG | WINDSONG LNDG | 15 |
| 13E-45B-3BB | 48 SNOW LN | SNOW LN | 48 |
| 13E-62-H13 | 59 ABSEGAMI RUN | ABSEGAMI RUN | 59 |
| 13F-40-TH24 | 107 HERITAGE LN | HERITAGE LN | 107 |
| 13F-52-TH20 | 94 HERITAGE LN | HERITAGE LN | 94 |
| 11E-OYST-PON | 1241 MAIN ST | MAIN ST | 1241 |
| 15C-12-6 | 21 SHATTUCK LN | SHATTUCK LN | 21 |
| 11E-OYST-PON | 1239 MAIN ST | MAIN ST | 1239 |
| 11E-OYST-PON | 1237 MAIN ST | MAIN ST | 1237 |
| 11E-OYST-PON | 1241 MAIN ST | MAIN ST | 1241 |
| 9D-11-24 | 71 BARN HILL RD | BARN HILL RD | 71 |
| 9D-12-25 | 79 BARN HILL RD | BARN HILL RD | 79 |
| 9D-24-S3 | 8 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 8 |
| 9E-11-3 | 1486 MAIN ST | MAIN ST | 1486 |
| 9E-13-2A | 37 WHITE POND RD | WHITE POND RD | 37 |

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| 9E-7A-6 | 36 WHELDON WAY | WHELDON WAY | 36 |
| 11E-OYST-PON | 1241 MAIN ST | MAIN ST | 1241 |
| 10D-44-D84 | 74 ELLIS ST | ELLIS ST | 74 |
| 10D-74-19A | 70 POND VIEW AVE | POND VIEW AVE | 70 |
| 10D-99-R10 | 74 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 74 |
| 10E-17-D7 | 19 BAYVIEW ST | BAYVIEW ST | 19 |
| 10E-3-8A | 7 POND VIEW AVE | POND VIEW AVE | 7 |
| 10E-33-M1 | 1445 MAIN ST | MAIN ST | 1445 |
| 10E-37-27 | 40 WHITE POND RD | WHITE POND RD | 40 |
| 10E-44-38 | 1430 MAIN ST | MAIN ST | 1430 |
| 10F-16-R10 | 18 ELL ST | ELL ST | 18 |
| 11D-5-18B | 96 POND VIEW AVE | POND VIEW AVE | 96 |
| 11D-7-16 | 79 POND VIEW AVE | POND VIEW AVE | 79 |
| 11E-15-23 | 20 CHATHAM HEIGHTS RD | CHATHAM HEIGHTS RD | 20 |
| 11E-33B-V3 | 16 VILLAGE LNDG | VILLAGE LNDG | 16 |
| 11E-45-D6 | 80 THE CORNFIELD | THE CORNFIELD | 80 |
| 11F-27-T4 | 63 WILFRED RD | WILFRED RD | 63 |
| 11F-WHIT-PON | 185 BALFOUR LN | BALFOUR LN | 185 |
| 11G-11-G54 | 47 BARBARA DR | BARBARA DR | 47 |
| 11G-21-G59 | 46 BARBARA DR | BARBARA DR | 46 |
| 12E-3-RC | 91 UNCLE ALBERTS DR EXT | UNCLE ALBERTS DR EXT | 91 |
| 12E-4-B6 | 202 LIME HILL RD | LIME HILL RD | 202 |
| 12F-21-G10 | 85 PERCH POND RD | PERCH POND RD | 85 |
| 12F-30-G34 | 25 JEANETTE RD | JEANETTE RD | 25 |
| 12F-31-G33 | 33 JEANETTE RD | JEANETTE RD | 33 |
| 12G-13-4 | 136 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 136 |
| 12G-18A-GA | 29 WILFRED RD | WILFRED RD | 29 |
| 12G-41-M9 | 27 JANES WAY | JANES WAY | 27 |
| 12G-59-M5 | 29 STEPPING STONES RD | STEPPING STONES RD | 29 |
| 13B-34-T4 | 33 TAYLOR LN | TAYLOR LN | 33 |
| 13C-22I-W9 | 26 WINDSONG LNDG | WINDSONG LNDG | 26 |
| 13C-26-C6 | 47 CAPRI LN | CAPRI LN | 47 |
| 13F-37-B5 | 75 HERITAGE LN | HERITAGE LN | 75 |
| 15C-13-5 | 31 SHATTUCK LN | SHATTUCK LN | 31 |
| 16C-89-71 | 4 HOMESTEAD LANE EAST | HOMESTEAD LANE EAST | 4 |
| 9D-9-21 | 47 BARN HILL RD | BARN HILL RD | 47 |
| 10D-30-3 | 95 MEADOW VIEW RD | MEADOW VIEW RD | 95 |
| 10D-52-DR3 | 64 WAVELAND AVE | WAVELAND AVE | 64 |
| 10D-85-D27 | 119 VINEYARD AVE | VINEYARD AVE | 119 |
| 10D-97A-R6 | 65 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 65 |
| 10E-15-D3&D4 | 13 VINEYARD AVE | VINEYARD AVE | 13 |
| 10E-16-D5A | 27 VINEYARD AVE | VINEYARD AVE | 27 |
| 10F-23-R17 | 150 SKY WAY | SKY WAY | 150 |
| 11D-13A-D12 | 162 KELLEY LN | KELLEY LN | 162 |
| 11D-32-4A | 23 WOOD CARVER KNOLL | WOOD CARVER KNOLL | 23 |
| 11D-9-C17B | 99 POND VIEW AVE | POND VIEW AVE | 99 |
| 11E-20-16 | 17 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 17 |

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| 11E-28-2 | 1221 MAIN ST | MAIN ST | 1221 |
| 11E-3-14A | 61 POND VIEW AVE | POND VIEW AVE | 61 |
| 11E-32-V1 | 27 VILLAGE LNDG | VILLAGE LNDG | 27 |
| 11F-9C-B4 | 85 BALFOUR LN | BALFOUR LN | 85 |
| 11G-3-G39A | 255 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 255 |
| 11G-7-G44 | 21 CAROLYN DR | CAROLYN DR | 21 |
| 12E-16-SM5 | 73 LIME HILL RD | LIME HILL RD | 73 |
| 12E-23F-A14 | 92 ABSEGAMI RUN | ABSEGAMI RUN | 92 |
| 12F-2-2 | 1077 MAIN ST | MAIN ST | 1077 |
| 12F-25-G27 | 76 PERCH POND RD | PERCH POND RD | 76 |
| 12G-16-5 | 126 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 126 |
| 13C-10-16A | 139 CEDAR ST | CEDAR ST | 139 |
| 13C-17-2 | 198 CEDAR ST | CEDAR ST | 198 |
| 10D-17-S16 | 56 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 56 |
| 10D-18-S17 | 38 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 38 |
| 10D-53-C | 44 WAVELAND AVE | WAVELAND AVE | 44 |
| 10D-6-D109 | 142 VINEYARD AVE | VINEYARD AVE | 142 |
| 10D-78-D18 | 72 SMITH ST | SMITH ST | 72 |
| 10E-10-5 | 38 POND VIEW AVE | POND VIEW AVE | 38 |
| 10E-26-B9 | 1409 MAIN ST | MAIN ST | 1409 |
| 10E-45-21A | 1426 MAIN ST | MAIN ST | 1426 |
| 10F-17-R11 | 16 ELL ST | ELL ST | 16 |
| 10F-22-R16 | 156 SKY WAY | SKY WAY | 156 |
| 11D-36-F6 | 52 POND VIEW WEST | POND VIEW WEST | 52 |
| 11E-22-18 | 45 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 45 |
| 11F-28-T5 | 55 WILFRED RD | WILFRED RD | 55 |
| 11G-32-G31 | 44 ETHELMA DR | ETHELMA DR | 44 |
| 12B-1E-B6 | 30 BLACK DUCK LNDG | BLACK DUCK LNDG | 30 |
| 12B-29-10 | 274 CEDAR ST | CEDAR ST | 274 |
| 12B-2B-17B | 317 CEDAR ST | CEDAR ST | 317 |
| 12F-29-G18 | 16 JEANETTE RD | JEANETTE RD | 16 |
| 12F-43-19A | 9 SPINNAKER LN | SPINNAKER LN | 9 |
| 12G-12-4A | 56 STEPPING STONES RD | STEPPING STONES RD | 56 |
| 12G-15-5A | 130 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 130 |
| 12G-24-B1 | 193 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 193 |
| 13C-22C-W3 | 7 WINDSONG LNDG | WINDSONG LNDG | 7 |
| 13C-22E-W5 | 27 WINDSONG LNDG | WINDSONG LNDG | 27 |
| 13C-22J-W10 | 14 WINDSONG LNDG | WINDSONG LNDG | 14 |
| 13C-22H-W8 | 40 WINDSONG LNDG | WINDSONG LNDG | 40 |
| 13C-35-C3 | 28 CAPRI LN | CAPRI LN | 28 |
| 16C-86-70 | 13 HOMESTEAD LANE EAST | HOMESTEAD LANE EAST | 13 |
| 13E-17-R10 | 33 OYSTER POND FURLONG | OYSTER POND FURLONG | 33 |
| 13E-21-R14 | 20 TABITHA TER | TABITHA TER | 20 |
| 13E-45C-3BC | 54 SNOW LN | SNOW LN | 54 |
| 9D-18-33 | 73 MEADOW VIEW RD | MEADOW VIEW RD | 73 |
| 9D-20-S6 | 11 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 11 |
| 10D-100-R11 | 66 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 66 |

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| 10D-103-R14 | 44 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 44 |
| 10D-35-S2 | 175 MEADOW VIEW RD | MEADOW VIEW RD | 175 |
| 10D-65-D52 | 64 VINEYARD AVE | VINEYARD AVE | 64 |
| 10D-72-D45 | 42 BAYVIEW ST | BAYVIEW ST | 42 |
| 10D-94-F2 | 5 POND VIEW WEST | POND VIEW WEST | 5 |
| 10E-11-4 | 30 POND VIEW AVE | POND VIEW AVE | 30 |
| 10E-2-12 | 1323 MAIN ST | MAIN ST | 1323 |
| 10E-43-22 | 1440 MAIN ST | MAIN ST | 1440 |
| 10E-6-10 | 37 POND VIEW AVE | POND VIEW AVE | 37 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
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| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
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| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
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| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 10E-WAT-COL | 1340 MAIN ST | MAIN ST | 1340 |
| 11E-48-D9 | 67 THE CORNFIELD | THE CORNFIELD | 67 |
| 11F-25-T8 | 83 WILFRED RD | WILFRED RD | 83 |
| 11F-9-B1A | 61 BALFOUR LN | BALFOUR LN | 61 |
| 11G-30-G33 | 66 ETHELMA DR | ETHELMA DR | 66 |
| 12E-23D-A12 | 118 ABSEGAMI RUN | ABSEGAMI RUN | 118 |
| 12E-23E-A13 | 106 ABSEGAMI RUN | ABSEGAMI RUN | 106 |
| 12E-23G-A15 | 103 ABSEGAMI RUN | ABSEGAMI RUN | 103 |
| 12E-7-L2 | 43 CHRISTOPHER HARDING LN | CHRISTOPHER HARDING LN | 43 |
| 12F-13I-51 | 1005 MAIN ST | MAIN ST | 1005 |
| 12F-32A-G42 | 19 WILFRED RD | WILFRED RD | 19 |
| 12F-36-G2 | 6 PERCH POND RD | PERCH POND RD | 6 |
| 12F-9-9 | 1050 MAIN ST | MAIN ST | 1050 |
| 13F-44-TH28 | 139 HERITAGE LN | HERITAGE LN | 139 |
| 13B-35-14 | 213 CEDAR ST | CEDAR ST | 213 |
| 13C-11-17 | 171 CEDAR ST | CEDAR ST | 171 |

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| 13E-12-B2 | 28 OYSTER POND LN | OYSTER POND LN | 28 |
| 13E-64-H11 | 37 OYSTER BLF | OYSTER BLF | 37 |
| 13F-41-TH25 | 115 HERITAGE LN | HERITAGE LN | 115 |
| 13F-49-TH17 | 116 HERITAGE LN | HERITAGE LN | 116 |
| 15D-63-31 | 50 HOMESTEAD LN | HOMESTEAD LN | 50 |
| 16D-5-2 | 46 HOMESTEAD LN | HOMESTEAD LN | 46 |
| 9D-8-20 | 37 BARN HILL RD | BARN HILL RD | 37 |
| 9E-15C-3AR | 73 WHITE POND RD | WHITE POND RD | 73 |
| 10D-62-D72 | 10 ELLIS ST | ELLIS ST | 10 |
| 10D-67-D42 | 75 VINEYARD AVE | VINEYARD AVE | 75 |
| 10D-95-F3 | 26 POND VIEW WEST | POND VIEW WEST | 26 |
| 10E-18-D10 | 31 BAYVIEW ST | BAYVIEW ST | 31 |
| 11C-11-D131 | 227 VINEYARD AVE | VINEYARD AVE | 227 |
| 11D-31-4 | 2 POND VIEW LN | POND VIEW LN | 2 |
| 11D-4-18C | 104 POND VIEW AVE | POND VIEW AVE | 104 |
| 11D-40-F10 | 111 WOOD CARVER KNOLL | WOOD CARVER KNOLL | 111 |
| 13F-58-B3 | 54 HERITAGE LN | HERITAGE LN | 54 |
| 11D-41-F11 | 105 WOOD CARVER KNOLL | WOOD CARVER KNOLL | 105 |
| 11E-16-22 | 14 CHATHAM HEIGHTS RD | CHATHAM HEIGHTS RD | 14 |
| 11E-24-13 | 68 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 68 |
| 11E-32A-V1A | 1245 MAIN ST | MAIN ST | 1245 |
| 11E-41-D2 | 46 THE CORNFIELD | THE CORNFIELD | 46 |
| 11E-6-33 | 1260 MAIN ST | MAIN ST | 1260 |
| 11F-10-G13 | 105 PERCH POND RD | PERCH POND RD | 105 |
| 11F-9E-B6 | 103 BALFOUR LN | BALFOUR LN | 103 |
| 11F-9H-B9 | 110 BALFOUR LN | BALFOUR LN | 110 |
| 11G-18-G51 | 27 BARBARA DR | BARBARA DR | 27 |
| 12B-1-19 | 7 BLACK DUCK LNDG | BLACK DUCK LNDG | 7 |
| 12F-7-7 | 1062 MAIN ST | MAIN ST | 1062 |
| 12G-38-M1 | 7 EARLES WAY | EARLES WAY | 7 |
| 12G-40-M8 | 15 JANES WAY | JANES WAY | 15 |
| 13C-6-H2 | 17 ROBINSON CT | ROBINSON CT | 17 |
| 13F-33-8 | 958 MAIN ST | MAIN ST | 958 |
| 13F-36-4B | 63 HERITAGE LN | HERITAGE LN | 63 |
| 13F-59-9 | 44 HERITAGE LN | HERITAGE LN | 44 |
| 13G-22-TH13 | 148 HERITAGE LN | HERITAGE LN | 148 |
| 13G-23-TH30 | 155 HERITAGE LN | HERITAGE LN | 155 |
| 15D-63A-32 | 48 HOMESTEAD LN | HOMESTEAD LN | 48 |
| 16C-51-C3 | 29 CHASE ST | CHASE ST | 29 |
| 16C-53-C5 | 59 CHASE ST | CHASE ST | 59 |
| 16C-88-28 | 14 HOMESTEAD LANE EAST | HOMESTEAD LANE EAST | 14 |
| 9D-44-12A | 1603 MAIN ST | MAIN ST | 1603 |
| 9E-7-6A | 1532 MAIN ST | MAIN ST | 1532 |
| 10D-1-D134 | 200 VINEYARD AVE | VINEYARD AVE | 200 |
| 10D-33-S23A | 133 MEADOW VIEW RD | MEADOW VIEW RD | 133 |
| 10D-34-S1 | 159 MEADOW VIEW RD | MEADOW VIEW RD | 159 |
| 10D-37-D103 | 116 VINEYARD AVE | VINEYARD AVE | 116 |

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| 10D-59-D76 | 30 ELLIS ST | ELLIS ST | 30 |
| 10D-64-D53 | 55 WAVELAND AVE | WAVELAND AVE | 55 |
| 10D-75-19B | 80 POND VIEW AVE | POND VIEW AVE | 80 |
| 10D-9-S7A | 50 HORSESHOE LN | HORSESHOE LN | 50 |
| 10E-38-R2 | 1455 MAIN ST | MAIN ST | 1455 |
| 10E-48-19 | 1402 MAIN ST | MAIN ST | 1402 |
| 10E-50-16 | 1344 MAIN ST | MAIN ST | 1344 |
| 11D-38-F8 | 112 WOOD CARVER KNOLL | WOOD CARVER KNOLL | 112 |
| 11E-10-31 | 1218 MAIN ST | MAIN ST | 1218 |
| 11E-VILL-LAN | 35 VILLAGE LNDG | VILLAGE LNDG | 35 |
| 11E-VILL-LAN | 37 VILLAGE LNDG | VILLAGE LNDG | 37 |
| 11F-21-N4 | 12 CYNTHIA DR | CYNTHIA DR | 12 |
| 11F-9B-B3 | 73 BALFOUR LN | BALFOUR LN | 73 |
| 11G-22-G58 | 40 BARBARA DR | BARBARA DR | 40 |
| 12B-1C-B4 | 56 BLACK DUCK LNDG | BLACK DUCK LNDG | 56 |
| 12B-24-7A | 308 CEDAR ST | CEDAR ST | 308 |
| 12B-24A-7B | 306 CEDAR ST | CEDAR ST | 306 |
| 12B-28-9 | 284 CEDAR ST | CEDAR ST | 284 |
| 12E-15-SM4 | 67 LIME HILL RD | LIME HILL RD | 67 |
| 12E-18-B1 | 135 LIME HILL RD | LIME HILL RD | 135 |
| 12F-12-12 | 65 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 65 |
| 12F-33-G30 | 60 PERCH POND RD | PERCH POND RD | 60 |
| 12F-39-MC2 | 100 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 100 |
| 12F-41-MC5 | 80 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 80 |
| 12G-45-M16 | 73 EARLES WAY | EARLES WAY | 73 |
| 12G-50-M11 | 44 JANES WAY | JANES WAY | 44 |
| 13B-13-I8 | 138 HONEYSUCKLE LN | HONEYSUCKLE LN | 138 |
| 13C-31-C11 | 68 CAPRI LN | CAPRI LN | 68 |
| 13E-27-R26 | 77 OYSTER POND FURLONG | OYSTER POND FURLONG | 77 |
| 13E-35-8 | 58 OYSTER POND FURLONG | OYSTER POND FURLONG | 58 |
| 13E-45-3B | 66 SNOW LN | SNOW LN | 66 |
| 13E-49-1A | 907 MAIN ST | MAIN ST | 907 |
| 16D-3-5 | 15 HOMESTEAD LANE EAST | HOMESTEAD LANE EAST | 15 |
| 9D-36-6A | 58 BARN HILL RD | BARN HILL RD | 58 |
| 9D-34A-L1 | 80 BARN HILL RD | BARN HILL RD | 80 |
| 9E-6-7 | 1550 MAIN ST | MAIN ST | 1550 |
| 10D-15-S14 | 86 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 86 |
| 10D-56-D89 | 43 ELLIS ST | ELLIS ST | 43 |
| 10D-61-D73 | 16 ELLIS ST | ELLIS ST | 16 |
| 10D-77-D20 | 80 SMITH ST | SMITH ST | 80 |
| 10D-90-D124 | 169 VINEYARD AVE | VINEYARD AVE | 169 |
| 10D-94-R5 | 57 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 57 |
| 10E-32-69 | 24 WAVELAND AVE | WAVELAND AVE | 24 |
| 10F-15-R9 | 20 ELL ST | ELL ST | 20 |
| 11D-17-D1 | 110 KELLEY LN | KELLEY LN | 110 |
| 11E-42-D3 | 58 THE CORNFIELD | THE CORNFIELD | 58 |
| 11G-33-G30 | 24 ETHELMA DR | ETHELMA DR | 24 |

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| 12D-23-1 | 72 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 72 |
| 12E-1-3 | 23 CHATHAM HEIGHTS RD | CHATHAM HEIGHTS RD | 23 |
| 12F-32-G31 | 43 JEANETTE RD | JEANETTE RD | 43 |
| 12F-40-MC3 | 94 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 94 |
| 12G-22-G64 | 41 JEANETTE DR | JEANETTE DR | 41 |
| 12G-35-EM4 | 137 WOOD VALLEY RD | WOOD VALLEY RD | 137 |
| 12G-56-M23 | 30 EARLES WAY | EARLES WAY | 30 |
| 13C-15-21 | 207 CEDAR ST | CEDAR ST | 207 |
| 13C-22K-W11 | 162 CEDAR ST | CEDAR ST | 162 |
| 13C-38-8 | 122 CEDAR ST | CEDAR ST | 122 |
| 13E-19-R12 | 38 TABITHA TER | TABITHA TER | 38 |
| 13E-23A-R17 | 127 OYSTER POND FURLONG | OYSTER POND FURLONG | 127 |
| 13E-28-12 | 104 OYSTER POND FURLONG | OYSTER POND FURLONG | 104 |
| 13E-33-22 | 62 OYSTER POND FURLONG | OYSTER POND FURLONG | 62 |
| 13E-36-R28 | 48 OYSTER POND FURLONG | OYSTER POND FURLONG | 48 |
| 13E-41-5 | 27 SNOW LN | SNOW LN | 27 |
| 13E-47-3 | 875 MAIN ST | MAIN ST | 875 |
| 13F-61-11 | 20 HERITAGE LN | HERITAGE LN | 20 |
| 9D-1-34 | 1487 MAIN ST | MAIN ST | 1487 |
| 9D-4-18 | 1533 MAIN ST | MAIN ST | 1533 |
| 9E-2-10 | 1610 MAIN ST | MAIN ST | 1610 |
| 10D-2-D133 | 188 VINEYARD AVE | VINEYARD AVE | 188 |
| 10D-27-S10 | 106 MEADOW VIEW RD | MEADOW VIEW RD | 106 |
| 10D-55-D86 | 31 ELLIS ST | ELLIS ST | 31 |
| 10D-58-D78 | 42 ELLIS ST | ELLIS ST | 42 |
| 10D-97B-R7 | 73 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 73 |
| 10E-20-D54 | 44 VINEYARD AVE | VINEYARD AVE | 44 |
| 10E-23-D1 | 10 VINEYARD AVE | VINEYARD AVE | 10 |
| 10E-5-9 | 29 POND VIEW AVE | POND VIEW AVE | 29 |
| 10F-24-R18 | 136 SKY WAY | SKY WAY | 136 |
| 10F-7-R1 | 33 SKY WAY | SKY WAY | 33 |
| 11D-39-F9 | 128 WOOD CARVER KNOLL | WOOD CARVER KNOLL | 128 |
| 11E-12-27 | 1137 MAIN ST | MAIN ST | 1137 |
| 11E-OYST-PON | 1235 MAIN ST | MAIN ST | 1235 |
| 11E-OYST-PON | 1241 MAIN ST | MAIN ST | 1241 |
| 11E-OYST-PON | 1239 MAIN ST | MAIN ST | 1239 |
| 11E-OYST-PON | 1237 MAIN ST | MAIN ST | 1237 |
| 11E-OYST-PON | 1237 MAIN ST | MAIN ST | 1237 |
| 11E-OYST-PON | 1237 MAIN ST | MAIN ST | 1237 |
| 11E-OYST-PON | 1235 MAIN ST | MAIN ST | 1235 |
| 11E-OYST-PON | 1235 MAIN ST | MAIN ST | 1235 |
| 11E-OYST-PON | 1235 MAIN ST | MAIN ST | 1235 |
| 11E-OYST-PON | 1239 MAIN ST | MAIN ST | 1239 |
| 11E-OYST-PON | 1241 MAIN ST | MAIN ST | 1241 |
| 11E-OYST-PON | 1239 MAIN ST | MAIN ST | 1239 |
| 11E-OYST-PON | 1237 MAIN ST | MAIN ST | 1237 |
| 11E-OYST-PON | 1235 MAIN ST | MAIN ST | 1235 |

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| 11E-OYST-PON | 1239 MAIN ST | MAIN ST | 1239 |
| 11E-OYST-PON | 1237 MAIN ST | MAIN ST | 1237 |
| 11E-OYST-PON | 1239 MAIN ST | MAIN ST | 1239 |
| 11E-OYST-PON | 1235 MAIN ST | MAIN ST | 1235 |
| 11E-OYST-PON | 1235 MAIN ST | MAIN ST | 1235 |
| 11E-OYST-PON | 1239 MAIN ST | MAIN ST | 1239 |
| 11E-OYST-PON | 1239 MAIN ST | MAIN ST | 1239 |
| 11F-17-N8 | 159 WILFRED RD | WILFRED RD | 159 |
| 11F-23-N2 | 183 WILFRED RD | WILFRED RD | 183 |
| 11F-26-T9 | 77 WILFRED RD | WILFRED RD | 77 |
| 11F-5A1-5A1 | 122 BALFOUR LN | BALFOUR LN | 122 |
| 11G-25-G55 | 10 BARBARA DR | BARBARA DR | 10 |
| 11G-4-38A | 263 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 263 |
| 12B-27-8 | 296 CEDAR ST | CEDAR ST | 296 |
| 12F-26-G25 | 34 JEANETTE RD | JEANETTE RD | 34 |
| 12F-28-G17 | 137 PERCH POND RD | PERCH POND RD | 137 |
| 12F-KEN-CORN | 1040 MAIN ST | MAIN ST | 1040 |
| 12F-KEN-CORN | 1040 MAIN ST | MAIN ST | 1040 |
| 12F-KEN-CORN | 1038 MAIN ST | MAIN ST | 1038 |
| 12F-KEN-CORN | 1036 MAIN ST | MAIN ST | 1036 |
| 12F-KEN-CORN | 1038 MAIN ST | MAIN ST | 1038 |
| 12F-KEN-CORN | 1040 MAIN ST | MAIN ST | 1040 |
| 12F-KEN-CORN | 1036 MAIN ST | MAIN ST | 1036 |
| 12F-KEN-CORN | 1038 MAIN ST | MAIN ST | 1038 |
| 12F-KEN-CORN | 1038 MAIN ST | MAIN ST | 1038 |
| 12F-KEN-CORN | 1038 MAIN ST | MAIN ST | 1038 |
| 12F-KEN-CORN | 1036 MAIN ST | MAIN ST | 1036 |
| 12G-14-T6 | 6 JEANETTE RD | JEANETTE RD | 6 |
| 12G-18B-G43 | 11 WILFRED RD | WILFRED RD | 11 |
| 12G-34-EM5 | 125 WOOD VALLEY RD EXT | WOOD VALLEY RD EXT | 125 |
| 12G-54-M21 | 52 EARLES WAY | EARLES WAY | 52 |
| 13C-12-18 | 183 CEDAR ST | CEDAR ST | 183 |
| 13C-34-C5 | 36 CAPRI LN | CAPRI LN | 36 |
| 13E-45A-3BA | 42 SNOW LN | SNOW LN | 42 |
| 13F-43-TH27 | 131 HERITAGE LN | HERITAGE LN | 131 |
| 13F-45-TH29 | 145 HERITAGE LN | HERITAGE LN | 145 |
| 9D-16-28 | 33 MEADOW VIEW RD | MEADOW VIEW RD | 33 |
| 9D-17-29 | 59 MEADOW VIEW RD | MEADOW VIEW RD | 59 |
| 9D-34-2 | 92 BARN HILL RD | BARN HILL RD | 92 |
| 9E-1-11 | 1620 MAIN ST | MAIN ST | 1620 |
| 9E-12-1A | 1475 MAIN ST | MAIN ST | 1475 |
| 10D-11-S3 | 172 MEADOW VIEW RD | MEADOW VIEW RD | 172 |
| 10D-36-D106 | 124 VINEYARD AVE | VINEYARD AVE | 124 |
| 10D-43-D97 | 10 SMITH ST | SMITH ST | 10 |

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|---|---|---|---|
| 10D-82-D25 | 86 BAYVIEW ST | BAYVIEW ST | 86 |
| 10E-40-25 | 30 WHITE POND RD | WHITE POND RD | 30 |
| 10F-12-R6 | 103 SKY WAY | SKY WAY | 103 |
| 10F-25-R19 | 112 SKY WAY | SKY WAY | 112 |
| 10G-17A-B5 | 210 WILFRED RD | WILFRED RD | 210 |
| 11D-33-6A | 33 WOOD CARVER KNOLL | WOOD CARVER KNOLL | 33 |
| 11D-35-F5 | 44 POND VIEW WEST | POND VIEW WEST | 44 |
| 11E-17-21 | 1161 MAIN ST | MAIN ST | 1161 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 15 BALFOUR LN | BALFOUR LN | 15 |
| 11E-COUR-YAR | 15 BALFOUR LN #S | BALFOUR LN | 15 |
| 11E-COUR-YAR | 15 BALFOUR LN | BALFOUR LN | 15 |
| 11E-COUR-YAR | 15 BALFOUR LN | BALFOUR LN | 15 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 17 BALFOUR LN | BALFOUR LN | 17 |
| 11E-COUR-YAR | 15 BALFOUR LN #T | BALFOUR LN | 15 |
| 11E-COUR-YAR | 15 BALFOUR LN #R | BALFOUR LN | 15 |
| 11E-COUR-YAR | 15 BALFOUR LN #Q | BALFOUR LN | 15 |
| 11F-5-5 | 88 OLD MAIN ST | OLD MAIN ST | 88 |
| 11F-9J-B11 | 62 BALFOUR LN | BALFOUR LN | 62 |
| 11G-1-G41A | 6 JEANETTE DR | JEANETTE DR | 6 |
| 11G-20-G60 | 58 BARBARA DR | BARBARA DR | 58 |
| 11G-23-G57 | 30 BARBARA DR | BARBARA DR | 30 |
| 12E-13-SM2 | 47 LIME HILL RD | LIME HILL RD | 47 |
| 12E-29-H8 | 52 OYSTER BLF | OYSTER BLF | 52 |
| 12F-1-3 | 989 MAIN ST | MAIN ST | 989 |
| 13C-21-3D | 106 OYSTER BAY LN | OYSTER BAY LN | 106 |
| 13C-22B-W2 | 3 WINDSONG LNDG | WINDSONG LNDG | 3 |
| 13C-22F-W6 | 39 WINDSONG LNDG | WINDSONG LNDG | 39 |
| 13E-26-R25 | 85 OYSTER POND FURLONG | OYSTER POND FURLONG | 85 |
| 13E-29-11A | 98 OYSTER POND FURLONG | OYSTER POND FURLONG | 98 |
| 13E-48-2 | 895 MAIN ST | MAIN ST | 895 |
| 13F-39-TH23 | 99 HERITAGE LN | HERITAGE LN | 99 |
| 13F-62-11A | 938 MAIN ST | MAIN ST | 938 |
| 14C-36-F10 | 136 SHATTUCK PL | SHATTUCK PL | 136 |
| 15C-17-H1 | 36 GRIST MILL LN | GRIST MILL LN | 36 |
| 16C-55-C8 | 50 CHASE ST | CHASE ST | 50 |
| 9D-37A-7A | 40 BARN HILL RD | BARN HILL RD | 40 |
| 10D-16-S15 | 70 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 70 |
| 10D-71-41 | 52 BAYVIEW ST | BAYVIEW ST | 52 |

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|---|---|---|---|
| 10D-84-D31 | 105 VINEYARD AVE | VINEYARD AVE | 105 |
| 10D-87-D118 | 139 VINEYARD AVE | VINEYARD AVE | 139 |
| 10D-88-D120 | 149 VINEYARD AVE | VINEYARD AVE | 149 |
| 10E-28-D62 | 11 WAVELAND AVE | WAVELAND AVE | 11 |
| 10E-8-7 | 60 POND VIEW AVE | POND VIEW AVE | 60 |
| 10F-8-R2 | 71 SKY WAY | SKY WAY | 71 |
| 10G-17-BIA | 216 WILFRED RD | WILFRED RD | 216 |
| 11D-15-D3 | 126 KELLEY LN | KELLEY LN | 126 |
| 11F-1A-6A | 1142 MAIN ST | MAIN ST | 1142 |
| 11G-24-56 | 20 BARBARA DR | BARBARA DR | 20 |
| 11G-28-G35 | 128 WILFRED RD | WILFRED RD | 128 |
| 11G-31-G32 | 54 ETHELMA DR | ETHELMA DR | 54 |
| 12B-1A-20 | 267 CEDAR ST | CEDAR ST | 267 |
| 12B-1F-B7 | 16 BLACK DUCK LNDG | BLACK DUCK LNDG | 16 |
| 12C-5-4 | 230 CEDAR ST | CEDAR ST | 230 |
| 12E-23I-0A21 | 87 ABSEGAMI RUN | ABSEGAMI RUN | 87 |
| 12F-19-G8 | 65 PERCH POND RD | PERCH POND RD | 65 |
| 12F-23-G12 | 101 PERCH POND RD | PERCH POND RD | 101 |
| 12G-19-G61 | 40 JEANETTE DR | JEANETTE DR | 40 |
| 12G-36-EM3 | 149 WOOD VALLEY RD | WOOD VALLEY RD | 149 |
| 12G-37-M2 | 200 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 200 |
| 12G-8B-C3 | 58 STEPPING STONES RD | STEPPING STONES RD | 58 |
| 13C-18-3A | 51 OYSTER BAY LN | OYSTER BAY LN | 51 |
| 13C-36-C1 | 14 CAPRI LN | CAPRI LN | 14 |
| 13C-5-H1 | 129 CEDAR ST | CEDAR ST | 129 |
| 13E-27A-R27 | 67 OYSTER POND FURLONG | OYSTER POND FURLONG | 67 |
| 13E-45D-3BD | 60 SNOW LN | SNOW LN | 60 |
| 13E-878-MAIN | 878 MAIN ST | MAIN ST | 878 |
| 13F-34-B8 | 946 MAIN ST | MAIN ST | 946 |
| 13F-55-B7 | 68 HERITAGE LN | HERITAGE LN | 68 |
| 13F-65W-W1 | 902 MAIN ST | MAIN ST | 902 |
| 15C-14-4 | 43 SHATTUCK LN | SHATTUCK LN | 43 |
| 16C-54-C7 | 62 CHASE ST | CHASE ST | 62 |
| 9D-15A-27A | 21 MEADOW VIEW RD | MEADOW VIEW RD | 21 |
| 9D-21-S5 | 18 MEADOW VIEW EXT | MEADOW VIEW EXT | 18 |
| 9D-35-6 | 70 BARN HILL RD | BARN HILL RD | 70 |
| 9D-40-11 | 28 BARN HILL RD | BARN HILL RD | 28 |
| 9D-42-11A | 24 BARN HILL RD | BARN HILL RD | 24 |
| 9D-5-17 | 1547 MAIN ST | MAIN ST | 1547 |
| 9D-6-16 | 1563 MAIN ST | MAIN ST | 1563 |
| 10D-70-36 | 57 SMITH ST | SMITH ST | 57 |
| 10D-73-D13 | 49 BAYVIEW ST | BAYVIEW ST | 49 |
| 10E-14-D2 | 1369 MAIN ST | MAIN ST | 1369 |
| 10E-18A-SW2 | 1370 MAIN ST | MAIN ST | 1370 |
| 10E-1A-14 | 24 THE CORNFIELD | THE CORNFIELD | 24 |
| 10F-11-R5 | 95 SKY WAY | SKY WAY | 95 |
| 11D-34-F1 | 3 POND VIEW WEST | POND VIEW WEST | 3 |

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|---|---|---|---|
| 11E-40-D1 | 38 THE CORNFIELD | THE CORNFIELD | 38 |
| 11E-46-D7 | 88 THE CORNFIELD | THE CORNFIELD | 88 |
| 11F-9A-B2 | 65 BALFOUR LN | BALFOUR LN | 65 |
| 11F-9D-B5 | 91 BALFOUR LN | BALFOUR LN | 91 |
| 11G-5-G37 | 9 ETHELMA DR | ETHELMA DR | 9 |
| 11G-6-G45 | 25 ETHELMA DR | ETHELMA DR | 25 |
| 11G-86-H21 | 262 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 262 |
| 12E-24-H3 | 76 ABSEGAMI RUN | ABSEGAMI RUN | 76 |
| 12F-24-G26 | 88 PERCH POND RD | PERCH POND RD | 88 |
| 12G-10-3 | 152 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 152 |
| 12G-18C-G37 | 13 JEANETTE RD | JEANETTE RD | 13 |
| 13E-22-R15 | 8 TABITHA TER | TABITHA TER | 8 |
| 13E-66-H9 | 58 OYSTER BLF | OYSTER BLF | 58 |
| 13E-8-13A | 9 OYSTER POND LN | OYSTER POND LN | 9 |
| 13E-9-JB1 | 23 OYSTER POND LN | OYSTER POND LN | 23 |
| 13F-50-TH18 | 108 HERITAGE LN | HERITAGE LN | 108 |
| 13F-53-TH21 | 86 HERITAGE LN | HERITAGE LN | 86 |
| 15C-21-F26 | 61 TIDE MILL LN | TIDE MILL LN | 61 |
| 16C-52-C4 | 47 CHASE ST | CHASE ST | 47 |
| 9D-15-27 | 107 BARN HILL RD | BARN HILL RD | 107 |
| 9D-33-5 | 66 YOUNGS RD | YOUNGS RD | 66 |
| 9E-70-6AA | 20 WHELDON WAY | WHELDON WAY | 20 |
| 10D-102-R13 | 52 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 52 |
| 10D-26-S11 | 118 MEADOW VIEW RD | MEADOW VIEW RD | 118 |
| 10D-4-D114 | 170 VINEYARD AVE | VINEYARD AVE | 170 |
| 10D-5-D111 | 154 VINEYARD AVE | VINEYARD AVE | 154 |
| 10E-27-D63 | 1423 MAIN ST | MAIN ST | 1423 |
| 10E-9-6 | 50 POND VIEW AVE | POND VIEW AVE | 50 |
| 11D-10A-12A | 55 POND VIEW LN | POND VIEW LN | 55 |
| 11D-25-B | 41 WOOD CARVER KNOLL | WOOD CARVER KNOLL | 41 |
| 11D-30-5 | 14 POND VIEW LN | POND VIEW LN | 14 |
| 11D-6-18 | 88 POND VIEW AVE | POND VIEW AVE | 88 |
| 11E-47-D8 | 79 THE CORNFIELD | THE CORNFIELD | 79 |
| 11F-12-G15 | 127 PERCH POND RD | PERCH POND RD | 127 |
| 11F-24-T7 | 95 WILFRED RD | WILFRED RD | 95 |
| 11F-6-3 | 74 OLD MAIN ST | OLD MAIN ST | 74 |
| 11F-9I-B10 | 102 BALFOUR LN | BALFOUR LN | 102 |
| 11G-16-G48 | 63 ETHELMA DR | ETHELMA DR | 63 |
| 12B-22-4 | 314 CEDAR ST | CEDAR ST | 314 |
| 12E-13H-50 | 34 LINDEN TREE LN | LINDEN TREE LN | 34 |
| 12E-19-B2 | 147 LIME HILL RD | LIME HILL RD | 147 |
| 12E-23-A20 | 141 ABSEGAMI RUN | ABSEGAMI RUN | 141 |
| 12E-26-H5 | 83 ABSEGAMI RUN | ABSEGAMI RUN | 83 |
| 12E-28-H7 | 40 OYSTER BLF | OYSTER BLF | 40 |
| 12F-38-MC1 | 106 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 106 |
| 12F-4-6A | 1118 MAIN ST | MAIN ST | 1118 |
| 12F-42-MC6 | 70 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 70 |

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| 12F-46-13 | 1010 MAIN ST | MAIN ST | 1010 |
| 12F-47-20 | 1000 MAIN ST | MAIN ST | 1000 |
| 12G-21-G63 | 23 JEANETTE DR | JEANETTE DR | 23 |
| 12G-23-B2 | 20 WILFRED RD | WILFRED RD | 20 |
| 12G-42-M10 | 39 JANES WAY | JANES WAY | 39 |
| 12G-44-M17 | 81 EARLES WAY | EARLES WAY | 81 |
| 12G-52-M19 | 76 EARLES WAY | EARLES WAY | 76 |
| 12G-55-M22 | 44 EARLES WAY | EARLES WAY | 44 |
| 12G-60-M6 | 37 STEPPING STONES RD | STEPPING STONES RD | 37 |
| 13C-16-1 | 208 CEDAR ST | CEDAR ST | 208 |
| 13E-18-R11 | 41 OYSTER POND FURLONG | OYSTER POND FURLONG | 41 |
| 13E-23-R16 | 2 TABITHA TER | TABITHA TER | 2 |
| 9D-38-10 | 36 BARN HILL RD | BARN HILL RD | 36 |
| 9D-7-19 | 29 BARN HILL RD | BARN HILL RD | 29 |
| 9E-10-4A | 1492 MAIN ST | MAIN ST | 1492 |
| 10D-10-S6 | 42 HORSESHOE LN | HORSESHOE LN | 42 |
| 10D-19-S18 | 25 MEADOW VIEW EXT | MEADOW VIEW EXT | 25 |
| 10D-20-S7 | 39 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 39 |
| 10D-21-S9 | 45 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 45 |
| 10D-24-S20 | 93 MEADOW VIEW RD SO | MEADOW VIEW RD SO | 93 |
| 10D-32-S22 | 113 MEADOW VIEW RD | MEADOW VIEW RD | 113 |
| 10D-49-D92 | 86 VINEYARD AVE | VINEYARD AVE | 86 |
| 10D-51-DR3B | 74 WAVELAND AVE | WAVELAND AVE | 74 |
| 10D-76-D16 | 61 SMITH ST | SMITH ST | 61 |
| 10D-8-S8 | 58 HORSESHOE LN | HORSESHOE LN | 58 |
| 10D-81-D21 | 49 WATTS ST | WATTS ST | 49 |
| 10D-98-R9 | 80 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 80 |
| 10E-19-D51 | 45 VINEYARD AVE | VINEYARD AVE | 45 |
| 10E-47-20 | 1414 MAIN ST | MAIN ST | 1414 |
| 11D-14A-D5 | 150 KELLEY LN | KELLEY LN | 150 |
| 11D-20-D8 | 137 KELLEY LN | KELLEY LN | 137 |
| 11E-10A-31A | 1200 MAIN ST | MAIN ST | 1200 |
| 11E-33A-V2 | 1281 MAIN ST | MAIN ST | 1281 |
| 11E-44-D5 | 78 THE CORNFIELD | THE CORNFIELD | 78 |
| 11F-9F-B7 | 109 BALFOUR LN | BALFOUR LN | 109 |
| 11G-15-G47 | 43 ETHELMA DR | ETHELMA DR | 43 |
| 11G-2-G40A | 245 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 245 |
| 11G-29-G36 | 118 WILFRED RD | WILFRED RD | 118 |
| 11G-85-H20 | 12 WINTERSET DR | WINTERSET DR | 12 |
| 12B-1A-B2 | 35 BLACK DUCK LNDG | BLACK DUCK LNDG | 35 |
| 12B-2C-17C | 303 CEDAR ST | CEDAR ST | 303 |
| 12E-27-H6 | 18 OYSTER BLF | OYSTER BLF | 18 |
| 12F-37-17 | 116 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 116 |
| 12G-17-6 | 161 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 161 |
| 13B-40-B3 | 49 BLACK DUCK LNDG | BLACK DUCK LNDG | 49 |
| 13C-24-C2 | 27 CAPRI LN | CAPRI LN | 27 |
| 13E-25-R24 | 101 OYSTER POND FURLONG | OYSTER POND FURLONG | 101 |

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|---|---|---|---|
| 13F-51-TH19 | 100 HERITAGE LN | HERITAGE LN | 100 |
| 13F-60-10 | 32 HERITAGE LN | HERITAGE LN | 32 |
| 13F-63-20 | 922 MAIN ST | MAIN ST | 922 |
| 13G-24-TH31 | 165 HERITAGE LN | HERITAGE LN | 165 |
| 15C-11-6A | 75 SHATTUCK PL | SHATTUCK PL | 75 |
| 16C-87-65 | 19 HOMESTEAD LANE EAST | HOMESTEAD LANE EAST | 19 |
| 16D-3A-7 | 29 HOMESTEAD LN | HOMESTEAD LN | 29 |
| 16D-4A-3A | 25 HOMESTEAD LN | HOMESTEAD LN | 25 |
| 9D-43-12 | 1589 MAIN ST | MAIN ST | 1589 |
| 9E-9-4 | 1500 MAIN ST | MAIN ST | 1500 |
| 11F-11-G14 | | | |
| 11F-13-G16 | | | |
| 12E-12-3 | 4 BETTYS PATH | BETTYS PATH | 4 |
| 11G-12-G52 | | | |
| 10F-4-H13 | | | |
| 11D-39A-F9B | WOOD CARVER KNOLL | WOOD CARVER KNOLL | 0 |
| 11D-10-12 | | | |

Undevelopable

| NEW_TAXMAP | AV_PID | LOCATION | ST_NAME | ST_NUMBER |
|---|---|---|---|---|
| 12B-22A-4A | 1074 | CEDAR ST | CEDAR ST | 0 |
| 10D-92-D128 | 203 | VINEYARD AVE | VINEYARD AVE | 0 |
| 16C-82A-66A | 3794 | HOMESTEAD LANE EAST | HOMESTEAD LANE EAST | 0 |
| 10F-12A-RA | 7993 | SKY WAY | SKY WAY | 0 |
| 16C-88A-G2 | 7879 | MULFORD HOWES LN | MULFORD HOWES LN | 0 |
| 12F-45D-19D | 1211 | SPINNAKER LN | SPINNAKER LN | 0 |
| 12D-CA-L7 | 8114 | CHRISTOPHER HARDING LN | CHRISTOPHER HARDING LN | 0 |
| 12F-13-42 | 1166 | MAIN ST | MAIN ST | 0 |
| 10D-91-D126 | 202 | VINEYARD AVE | VINEYARD AVE | 0 |
| 9E-17-35 | 7840 | WHITE POND RD | WHITE POND RD | 0 |
| 11E-22A-26 | 621 | UNCLE ALBERTS DR | UNCLE ALBERTS DR | 0 |
| 10D-CA-S5 | 8026 | MEADOW VIEW RD | MEADOW VIEW RD | 0 |
| 11E-19A-19A | 617 | UNCLE ALBERTS DR | UNCLE ALBERTS DR | 0 |
| 10D-40-D100 | 156 | SMITH ST | SMITH ST | 0 |
| 13E-CA-H11A | 8056 | OYSTER BLF | OYSTER BLF | 0 |
| 9E-16-1 | 7463 | WHITE POND RD | WHITE POND RD | 0 |
| 12F-11A-10A | 1164 | OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 0 |
| 10D-42-D98 | 157 | SMITH ST | SMITH ST | 0 |
| 10D-CA-S9A | 8025 | HORSESHOE LN | HORSESHOE LN | 0 |
| 12E-ISLE-RC3 | 8210 | RICHARDS LN | RICHARDS LN | 0 |
| 10E-1-13 | 215 | THE CORNFIELD | THE CORNFIELD | 0 |
| 11F-5A3-5A3 | 732 | EMILYS WAY | EMILYS WAY | 0 |

Vacant Developable

| NEW_TAXMAP | LOCATION | ST_NAME | ST_NUMBER |
|---|---|---|---|
| 9D-12C-3 | JESSIES LNDG | JESSIES LNDG | 0 |
| 14C-35A-43 | OLD TURKEY FARM LN | OLD TURKEY FARM LN | 0 |
| 9D-12A-1 | JESSIES LNDG | JESSIES LNDG | 0 |
| 9D-12E-5 | JESSIES LNDG | JESSIES LNDG | 0 |
| 12E-13E-47 | 78 LINDEN TREE LN | LINDEN TREE LN | 78 |
| 12G-49-M12 | 30 JANES WAY | JANES WAY | 30 |
| 13F-35-B8A | HERITAGE LN | HERITAGE LN | 0 |
| 10E-30-D60 | WAVELAND AVE | WAVELAND AVE | 0 |
| 9D-12D-4 | JESSIES LNDG | JESSIES LNDG | 0 |
| 12B-2A-17A | CEDAR ST | CEDAR ST | 0 |
| 9D-12B-2 | JESSIES LNDG | JESSIES LNDG | 0 |
| 9D-12F-6 | JESSIES LNDG | JESSIES LNDG | 0 |
| 10D-14-S19A | MEADOW VIEW RD | MEADOW VIEW RD | 0 |
| 13C-27-C8 | CAPRI LN | CAPRI LN | 0 |
| 11D-11-11 | POND VIEW LN | POND VIEW LN | 0 |
| 13B-17-18 | HARRIS WAY | HARRIS WAY | 0 |
| 9D-3-18A | MAIN ST | MAIN ST | 0 |
| 11G-27-B2 | WILFRED RD | WILFRED RD | 0 |
| 12B-2D-17D | CEDAR ST | CEDAR ST | 0 |
| 8E-1-H3 | MAIN ST, LOT 3 | MAIN ST, LOT 3 | 0 |
| 11D-16-D2 | KELLEY LN | KELLEY LN | 0 |
| 13E-37-C29 | OYSTER POND FURLONG | OYSTER POND FURLONG | 0 |
| 15C-21A-F34 | TIDE MILL LN | TIDE MILL LN | 0 |
| 11E-14-24 | 26 CHATHAM HEIGHTS RD | CHATHAM HEIGHTS RD | 26 |
| 13B-34B-T2 | 30 TAYLOR LN | TAYLOR LN | 30 |
| 13E-20-R13 | TABITHA TER | TABITHA TER | 0 |
| 9D-12G-7 | JESSIES LNDG | JESSIES LNDG | 0 |
| 10G-17B-B4 | WILFRED RD | WILFRED RD | 0 |
| 12E-3B-A | RICHARDS LN | RICHARDS LN | 0 |
| 12G-39-M7 | JANES WAY | JANES WAY | 0 |
| 12E-8-P31 | LIME HILL RD | LIME HILL RD | 0 |
| 12F-3-1 | MAIN ST | MAIN ST | 0 |
| 12F-2A-P22 | 1055 MAIN ST | MAIN ST | 1055 |
| 9E-15B-2AR | WHITE POND RD | WHITE POND RD | 0 |
| 12F-2A-2A | MAIN ST | MAIN ST | 0 |
| 9E-15A-1AR | WHITE POND RD | WHITE POND RD | 0 |
| 12E-3C-A1 | 81 UNCLE ALBERTS DR EXT | UNCLE ALBERTS DR EXT | 81 |
| 12E-31-B2 | | | |
| 11E-23A-R5 | 67 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 67 |
| 9D-14A-26B | BARN HILL RD | BARN HILL RD | 0 |
| 12F-13J-52 | LIME HILL RD | LIME HILL RD | 0 |
| 12E-10-S2 | LIME HILL RD | LIME HILL RD | 0 |

Developed > 1995

| NEW_TAXMAP | LOCATION | ST_NAME | ST_NUMBER |
|---|---|---|---|
| 10C-46-D136 | 228 VINEYARD AVE | VINEYARD AVE | 228 |
| 11C-12-D132 | 235 VINEYARD AVE | VINEYARD AVE | 235 |
| 11D-19-D7 | 125 KELLEY LN | KELLEY LN | 125 |
| 14C-35-43A | 22 OLD TURKEY FARM LN | OLD TURKEY FARM LN | 22 |
| 9D-16A-28A | 45 MEADOW VIEW RD | MEADOW VIEW RD | 45 |
| 11D-12-9 | 161 KELLEY LN | KELLEY LN | 161 |
| 12D-4-B8 | 206 LIME HILL RD | LIME HILL RD | 206 |
| 12E-5-L4 | 63 CHRISTOPHER HARDING LN | CHRISTOPHER HARDING LN | 63 |
| 13E-11-B1 | 40 OYSTER POND LN | OYSTER POND LN | 40 |
| 9D-21A-S25 | 21 MEADOW VIEW EXT | MEADOW VIEW EXT | 21 |
| 10F-26-R20 | 64 SKY WAY | SKY WAY | 64 |
| 12G-8A-C2 | 38 STEPPING STONES RD | STEPPING STONES RD | 38 |
| 13C-30-C13 | 86 CAPRI LN | CAPRI LN | 86 |
| 13E-10-JB2 | 35 OYSTER POND LN | OYSTER POND LN | 35 |
| 13E-63-H12 | 23 OYSTER BLF | OYSTER BLF | 23 |
| 10F-9-R3 | 83 SKY WAY | SKY WAY | 83 |
| 11E-13-K2 | 30 CHATHAM HEIGHTS RD | CHATHAM HEIGHTS RD | 30 |
| 11E-24A-13B | 54 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 54 |
| 11F-8-4 | 52 OLD MAIN ST | OLD MAIN ST | 52 |
| 11F-WHIT-PON | 175 BALFOUR LN | BALFOUR LN | 175 |
| 12E-2B-R6B | 82 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 82 |
| 12F-13A-43 | 15 LINDEN TREE LN | LINDEN TREE LN | 15 |
| 13B-14-17 | 90 HONEYSUCKLE LN | HONEYSUCKLE LN | 90 |
| 9D-13-26A | 95 BARN HILL RD | BARN HILL RD | 95 |
| 10D-57-D80 | 50 ELLIS ST | ELLIS ST | 50 |
| 11E-25-12A | 46 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 46 |
| 12E-2A-R6 | 80 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 80 |
| 12F-14-G1 | 91 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 91 |
| 13B-34A-T3 | 41 TAYLOR LN | TAYLOR LN | 41 |
| 11E-23-28 | 70 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 70 |
| 12E-13G-49 | 42 LINDEN TREE LN | LINDEN TREE LN | 42 |
| 10D-96-F4 | 38 POND VIEW WEST | POND VIEW WEST | 38 |
| 10F-20-R14 | 151 SKY WAY | SKY WAY | 151 |
| 12F-44A-14A | 3 SPINNAKER LN | SPINNAKER LN | 3 |
| 12F-45C-19C | 22 SPINNAKER LN | SPINNAKER LN | 22 |
| 13E-24-R22 | 121 OYSTER POND FURLONG | OYSTER POND FURLONG | 121 |
| 13E-25A-R23 | 107 OYSTER POND FURLONG | OYSTER POND FURLONG | 107 |
| 9E-5-8 | 1566 MAIN ST | MAIN ST | 1566 |
| 10D-28-S8A | 90 MEADOW VIEW RD | MEADOW VIEW RD | 90 |
| 10E-4-8 | 17 POND VIEW AVE | POND VIEW AVE | 17 |
| 10F-13-R7 | 141 SKY WAY | SKY WAY | 141 |
| 10F-3-H14 | 11 SKY WAY | SKY WAY | 11 |
| 10G-17C-B6 | 196 WILFRED RD | WILFRED RD | 196 |
| 11E-11-29 | 75 OLD MAIN ST | OLD MAIN ST | 75 |

| | | | |
|---|---|---|---|
| 11E-28A-2A | 14 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 14 |
| 12E-13D-46 | 85 LINDEN TREE LN | LINDEN TREE LN | 85 |
| 9D-14-26 | 85 BARN HILL RD | BARN HILL RD | 85 |
| 9D-37-7 | 46 BARN HILL RD | BARN HILL RD | 46 |
| 11D-23-2 | 159 KELLEY LN | KELLEY LN | 159 |
| 12B-2-17 | 335 CEDAR ST | CEDAR ST | 335 |
| 12F-11-11 | 51 OLD QUEEN ANNE RD | OLD QUEEN ANNE RD | 51 |
| 13C-33-C7 | 48 CAPRI LN | CAPRI LN | 48 |
| 13E-65-H10 | 55 OYSTER BLF | OYSTER BLF | 55 |
| 9D-21B-S26 | 23 MEADOW VIEW EXT | MEADOW VIEW EXT | 23 |
| 10C-45-D137 | 238 VINEYARD AVE | VINEYARD AVE | 238 |
| 10F-18-R12 | 145 SKY WAY | SKY WAY | 145 |
| 12C-6-5 | 226 CEDAR ST | CEDAR ST | 226 |
| 12E-3B-RC2 | 1 RICHARDS LN | RICHARDS LN | 1 |
| 12G-53-M20 | 64 EARLES WAY | EARLES WAY | 64 |
| 13C-32-C9 | 56 CAPRI LN | CAPRI LN | 56 |
| 9D-23-S4 | 12 MEADOW VIEW EXT | MEADOW VIEW EXT | 12 |
| 10C-47-D135 | 220 VINEYARD AVE | VINEYARD AVE | 220 |
| 10D-29-3B | 85 MEADOW VIEW RD | MEADOW VIEW RD | 85 |
| 10F-19-R13 | 149 SKY WAY | SKY WAY | 149 |
| 12F-45-19 | 11 SPINNAKER LN | SPINNAKER LN | 11 |
| 13C-12A-T1 | 20 TAYLOR LN | TAYLOR LN | 20 |
| 13C-13-19 | 189 CEDAR ST | CEDAR ST | 189 |
| 9E-1A-H2 | 1624 MAIN ST | MAIN ST | 1624 |
| 12E-11-S1 | 52 LIME HILL RD | LIME HILL RD | 52 |
| 12E-22-B5 | 181 LIME HILL RD | LIME HILL RD | 181 |
| 12F-45B-19B | 14 SPINNAKER LN | SPINNAKER LN | 14 |
| 13C-23-6 | 5 CAPRI LN | CAPRI LN | 5 |
| 13F-54-B6 | 74 HERITAGE LN | HERITAGE LN | 74 |
| 14C-35A1-43A1 | 23 OLD TURKEY FARM LN | OLD TURKEY FARM LN | 23 |
| 15C-15-3B | 69 GRIST MILL LN | GRIST MILL LN | 69 |
| 10D-97-R8 | 83 CAPTAIN RICHARDS WAY | CAPTAIN RICHARDS WAY | 83 |
| 10F-14-R8 | 24 ELL ST | ELL ST | 24 |
| 12E-20-B3 | 155 LIME HILL RD | LIME HILL RD | 155 |
| 13E-878-MAIN | 880 MAIN ST | MAIN ST | 880 |
| 13E-878-MAIN | 880 MAIN ST | MAIN ST | 880 |
| 13E-878-MAIN | 880 MAIN ST | MAIN ST | 880 |
| 13E-878-MAIN | 880 MAIN ST | MAIN ST | 880 |
| 13E-878-MAIN | 880 MAIN ST | MAIN ST | 880 |
| 13E-878-MAIN | 878 MAIN ST | MAIN ST | 878 |
| 13F-63A-2 | 920 MAIN ST | MAIN ST | 920 |
| 9D-2-31 | 1501 MAIN ST | MAIN ST | 1501 |
| 10F-10-R4 | 89 SKY WAY | SKY WAY | 89 |
| 12D-2-L5 | 97 CHRISTOPHER HARDING LN | CHRISTOPHER HARDING LN | 97 |
| 12E-13C-45 | 73 LINDEN TREE LN | LINDEN TREE LN | 73 |
| 12E-2-1 | 94 UNCLE ALBERTS DR | UNCLE ALBERTS DR | 94 |
| 12G-47-M14 | 41 EARLES WAY | EARLES WAY | 41 |

| | | | |
|---|---|---|---|
| 10D-93-D129 | 211 VINEYARD AVE | VINEYARD AVE | 211 |
| 12E-13B-44 | 55 LINDEN TREE LN | LINDEN TREE LN | 55 |
| 12E-13F-48 | 64 LINDEN TREE LN | LINDEN TREE LN | 64 |
| 12E-2B-7B | 102 UNCLE ALBERTS DR EXT | UNCLE ALBERTS DR EXT | 102 |
| 13C-29-C12 | 85 CAPRI LN | CAPRI LN | 85 |
| 9D-34B-L3 | 4 YOUNGS RD | YOUNGS RD | 4 |
| 10F-21-R15 | 157 SKY WAY | SKY WAY | 157 |
| 12E-1A-K1 | 43 CHATHAM HEIGHTS RD | CHATHAM HEIGHTS RD | 43 |
| 12E-9-S3 | 70 LIME HILL RD | LIME HILL RD | 70 |
| 13C-26A-C4 | 35 CAPRI LN | CAPRI LN | 35 |
| 9E-7C-6C | 52 WHELDON WAY | WHELDON WAY | 52 |

# Appendix C

# Lovers Lake and Stillwater Pond Eutrophication Mitigation Plan Executive Summary

Prepared for:
**Town of Chatham**
**Chatham, MA**



# Lovers Lake and Stillwater Pond Eutrophication Mitigation Plan Report
## Final Report

ENSR Corporation
August 2008
**12249-001-500**

ENSR | AECOM

Prepared for:
**Town of Chatham**
**Chatham, MA**

# Lovers Lake and Stillwater Pond Eutrophication Mitigation Plan Report Final Report

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Prepared By

Kenneth J. Wagner
Reviewed By

ENSR Corporation
August 2008
Document No.: **12249-001-500**

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# Executive Summary

## PROJECT BACKGROUND

Lovers Lake and Stillwater Pond are two deep kettlehole ponds located in the Town of Chatham (the "Town") on Cape Cod in Massachusetts (Figure 1-1). These state-designated "Great Ponds" are recreational and ecological resources for the Town of Chatham; featuring one of the two remaining alewife runs in the Pleasant Bay watershed (MA, DEP, 2007).

Currently, the two ponds suffer from poor water quality due to eutrophication (i.e., overabundant nutrient levels) and do not fully support the desired water uses including contact recreation and aquatic life support. Symptoms include low water transparency, frequent and dense algal blooms, loss of oxygen in bottom waters, and degraded ecological habitat. These ponds have been characterized as "highly impacted" and "eutrophic," based on recent assessment studies (CCC, 2003; EcoLogic and S&W, 2003).

In 2006, the Town commissioned an *Eutrophication Mitigation Plan* study of Lovers Lake and Stillwater Pond to identify, design and permit appropriate pond restoration treatments to:

- Eliminate, reduce or mitigate the release of phosphorus from the sediments of Lovers Lake and Stillwater Pond, thus reducing the amount of nutrients available for phytoplankton growth in the two ponds;
- Improve the ecological health of Lovers Lake and Stillwater Pond, including water clarity and dissolved oxygen levels in deeper waters of the pond; and
- Enhance the recreational and aesthetic qualities of the ponds.

ENSR Corporation ("ENSR") of Westford, MA was selected to evaluate four potentially applicable pond restoration methods (dredging, aeration, circulation, and nutrient inactivation) to reduce or eliminate the phosphorus recycling from the sediments. The recommended pond treatment is to be further refined for preparation of bid specifications and the appropriate environmental permit (MA Wetland Protection Act Notice of Intent (NOI)) application prepared.

## DIAGNOSTIC PHASE

As the first task of the Eutrophication Mitigation Plan Study, ENSR reviewed the existing data and information on Lovers Lake and Stillwater Pond. Sources of existing information for Lovers Lake and Stillwater Pond and their watersheds were gathered from the Town files and staff (data, GIS files. maps), regional agencies (Cape Cod Commission), state agencies (EOEA, MA DEP, MA DFW), federal agencies (USGS, NOAA), scientific literature, watershed stakeholders, and other sources (e.g., newspapers, internet). Bathymetry in the ponds was measured in 2001 as part of a six pond survey conducted by the Town and the Chatham Department of Health and Environment (CDH&E) provided GIS files of these maps for Lovers Lake and Stillwater Pond.

Lovers Lake (37.7 acres) and Stillwater Pond (18.7 acres) are two hydrologically connected kettlehole ponds located in Chatham, MA that outlet to coastal Ryder's Cove (Section 2.2.1). Lovers Lake (maximum depth = 11 m (36 ft); average depth = 4.6 m (15 ft)) has two deep basins located at ends of an approximate "L"-shaped configuration, while Stillwater Pond (maximum depth = 15.5 m (51 ft); average depth = 7.4 m (22 ft)) has a simple central deep basin. Water volume for Lovers Lake is about 695,000 $m^3$ and that for Stillwater pond is just slightly below 500,000 $m^3$.

Both ponds are characterized by small watersheds (Lovers Lake = 86 acres; Stillwater Pond = 128.3 acres). Land use in both watersheds is largely forested, low density residential, and open or protected land, with some

cranberry production (Lovers Lake) and public drinking water wells (Stillwater Pond). There are approximately 21 upgradient residences and septic systems within 300 ft of Lovers Lake and 11 residences for Stillwater Pond (Section 2.2.2).

Both ponds are part of the Pleasant Bay Area of Critical Environmental Concern (ACEC), are classified as Outstanding Resource Waters (ORWs), and have species of special concern identified along shoreline areas and within the watersheds (H&W, 2003). Public use of both ponds includes swimming, fishing, and non-motorized boating. There is informal public access to Lovers Lake and undeveloped access to Stillwater Pond but there are no public swimming beaches or boat launches.

Both ponds support a warmwater fishery community and seasonal runs of anadromous alewife. The herring run is actively managed by water elevation manipulations through outlet structures and pipe conveyances maintained by the Chatham Herring Warden. Herring populations may be declining in these ponds, as elsewhere on the Cape (Section 2.4.1).

The ponds have diverse riparian shoreline vegetation which includes several protected or sensitive species. Emergent reeds, water lilies, and pickerelweed are reported. Submergent aquatic vegetation was not surveyed, but may be limited due to the sandy substrate, rapid depth dropoff, and low summer transparency of the lakes (Section 2.4.3).

Lovers Lake flows into Stillwater Pond which then flows into Ryder's Cover (marine environment); otherwise there are no surface tributaries to either pond (Section 4.2). Precipitation and groundwater in-seepage are the dominant sources of water for both ponds, with a negligible amount of runoff from the very sandy watershed. Most water leaves Lovers Lake as surface overflow into Stillwater Pond. Water exits Stillwater Pond by a combination of outflow and groundwater out-seepage. Total hydrologic through-flow was estimated for both ponds, suggesting an average annual detention time of 1.4 to 1.6 years for Lovers Lake and 1.3 years for Stillwater Pond; both ponds will flush more slowly in the summer (Section 4.3).

As part of characterization of the current conditions of Lovers Lake and Stillwater Pond, periodic observations of water column profiles of temperature and dissolved oxygen (DO) were made, along with discrete water quality sampling at two depths at two locations within the pond. Field surveys were conducted at Lovers Lake and Stillwater Pond during spring through fall 2007 and included sixteen visits, with water quality samples collected on five of those visits. In addition, ENSR conducted a sediment survey to collect sediment samples for testing of physical and chemical properties.

Recent water quality data were available to provide the evaluation of recent trophic conditions and the ability of the Ponds to meet designated uses. Inspection of the Pond and Lakes Stewards (PALS) monitoring database (2000-2006) (Section 2.3), pond assessments (CCC, 2003; EcoLogic, 2003) (Section 2.5), and additional investigation by ENSR and CDH&E in 2007 (Section 3.1) have documented consistent patterns of elevated nutrient conditions and poor transparency in summer and deep water anoxia with regeneration of phosphorus from bottom sediments in >20 ft of water depth.

Bottom sediments were collected and analyzed from both ponds. Most sediment samples were highly organic and contained large amounts of total phosphorus (Section 3.2). It appears that phosphorus has accumulated in the deep organic sediments of both ponds over an extended time period, although the exact nature of the sources contributing to this nutrient reserve was not determined. Analysis of the phosphorus fractions indicated that large amounts were contained in the iron-bound phosphorus fraction that would be susceptible to release under low redox conditions that occur each summer.

Examination of the conditions that promote phosphorus release included assessment of oxygen demand (Section 5.1). Average areal oxygen demand in Lovers Lake is estimated at a predicted range of approximately 386 to 486 mg $O_2/m^2$/day. This demand causes strong anoxia as soon as stratification sets in

and bottom waters are denied further atmospheric oxygen inputs. Stillwater Pond loses hypolimnetic DO quickly over the season with a maximal oxygen demand between 1482 and 2370 mg/m$^2$/day.

Estimates of the levels of internal recycling were made on the basis of observations of the accumulation of hypolimnetic phosphorus and by modeling (Section 5.2). The hypolimnion of Stillwater Pond accumulated phosphorus with an overall increase of 75.8 kg over the period between May 3 and August 29; with a large proportion present as dissolved inorganic phosphorus (Table 3-3). These values translate into benthic release rates ranging from 5.8 to 30 mg P/m$^2$/day; with an average of 18.1 mg P/m$^2$/day. Redox reactions promoting the release of this phosphorus with only 10-20% reaching the epilimnion could still raise the phosphorus concentration sufficient to support the observed algal blooms in the pond.

Estimation of sediment phosphorus release from Lovers Lake sediments was not calculated from water quality data since little accumulation occurred in the hypolimnion. However, release from the sediments is assumed to have resulted in a transfer of phosphorus to upper waters via diffusion and vertical mixing. The contribution for internal loading was estimated through modeling (Section 5.2.2).

Phosphorus budgets were prepared for both lakes showing an estimated load of 42 kg/yr for Lovers Lake (Table 5-7) and 48 kg/yr for Stillwater Pond (Table 5-8) (Section 5.2.3). There are many assumptions in these budgets and further adjustments are possible (e.g., the runoff contribution may be lower and the ground water contribution might be higher), but it is apparent that the annual input from the watershed is not the dominant influence at this time. The potential influence of the herring run on the ponds' nutrient dynamics was noted but little or no data exist to evaluate this influence (Section 5.2.5). Clearly the internal load is the controlling factor in both ponds' phosphorus dynamics. This trend is unlikely to reverse itself without human intervention.

Overall, the diagnostic summaries show that both ponds are eutrophic with poor water quality due to enrichment by nutrients. Phosphorus levels are at excessive concentrations and nutrient ratios favor the development of undesirable blue-green algae These basins are slowly flushed due to the small watershed and dependency on groundwater discharge; with summer circulation being particularly poor due to increased evapotranspiration, the installation of flashboards at the outlets of both Ponds to store water, and the increased pumping of groundwater in the Stillwater Pond watershed. Due to very strong oxygen demand, the Ponds' bottom waters quickly become anoxic. Internal phosphorus recycling from the sediments forms an important but treatable portion of the phosphorus budget.

## FEASIBILITY EVALUATION

In terms of the restoration of desirable water quality, the primary goal is to eliminate nuisance algae blooms, or at least to reduce their frequency and severity. Linked objectives include reducing the internal loading of phosphorus and improving the oxygen level in the hypolimnion of both Lovers Lake and Stillwater Pond. As a secondary goal, the watershed should be managed to minimize future pollutant inputs.

While the *Eutrophication Mitigation Plan* study evaluated four potentially applicable pond restoration methods (dredging, aeration, circulation, and nutrient inactivation), there are other potential pond management options available to control in-lake populations of nuisance algal blooms. These alternative in-lake options that were not selected were identified and the reasons why these are not appropriate for restoration of Lovers Lake and Stillwater Pond (Section 7.2)

### Dredging Evaluation

The applicability of dredging for restoration of Lovers Lake and Stillwater Pond was evaluated (Section 7.3), specifically the potential for dredging to reduce internal recycling. The factors used for this evaluation were technical feasibility, expected water quality improvement, longevity, cost-effectiveness, and permitting issues.

The technical feasibility review indicates that removal of sediments provides a very direct way of removing a significant amount of phosphorus mass from the pond. However, if removal of the top sediment simply exposes a new layer of phosphorus-enriched sediments then there will be little reduction in the phosphorus regeneration. This technique is not well suited for either pond due to the depth involved, the lack of readily accessible dewatering and disposal areas, and residential setting.

Dredging could reduce the phosphorus loading but only modest improvements in water quality would be expected. Longevity is expected to be lower than average in these ponds due to lack of knowledge of underlying sediment structure and potential refilling of dredged areas If both ponds were dredged, costs would approach $1.5M or more. These high costs reflect the technical difficulties described earlier. As noted earlier, environmental permitting will be extensive and there may be a large set of conditions and extensive monitoring costs. Taking these factors together, ENSR does not recommend dredging for restoration of Lovers Lake and Stillwater Pond.

Artificial Circulation Evaluation

The second of the four in-lake methods for reduction of nutrients and algal blooms selected for evaluation in the *Eutrophication Mitigation Study* is artificial circulation (Section 7.4). Whole lake circulation, like hypolimnetic aeration discussed next, involves the introduction of more oxygen into the bottom waters of ponds to limit the amount of phosphorus recycling, thereby controlling phytoplankton blooms.

The technical feasibility review indicates that artificial circulation or destratification would be a potential option for restoring deep water oxygen levels in Lovers Lake and Stillwater Pond and reducing internal phosphorus recycling. However, based on the morphometry, depth, and thermal structure of the two ponds, it was judged that the conditions of Lovers Lake make it much more conducive to mixing by aeration than Stillwater Pond.

Review of the literature indicates some uncertainty as to how well the water chemistry and ecosystem would respond to this unnatural limnological state and whether it would be beneficial. However, this treatment provides the additional benefit of greatly increasing the amount of habitat for fish and other aquatic organisms and likely shifting the ponds away from dominance by blue-green algae. There is no substantial longevity associated with this technique since the positive benefits start to decline as soon as the diffuser is taken off-line.

Costs are relatively low compared to other restoration techniques, ranging between $180,000 for Lovers Lake and about $78,000 for Stillwater Pond for operation over a 15 year period. Environmental permitting is expected to be relatively simple and straight-forward. ENSR recommended further consideration of artificial circulation for restoration of Lovers Lake and this is discussed further in Section 8.0 but does not recommend application of this technique in Stillwater Pond.

Hypolimnetic Aeration Evaluation

The third of the four in-lake methods for reduction of nutrients and algal blooms selected for evaluation in the *Eutrophication Mitigation Study* is hypolimnetic aeration (Section 7.5). In general, aeration puts air into the aquatic system, increasing oxygen concentration by transfer from gas to liquid and generating a controlled mixing force. Aeration is commonly used to mix shallow lakes, and is sometimes used as a mixing force for artificial circulation and desertification.

The technical feasibility review indicates that hypolimnetic aeration would be a good potential option to reduce internal phosphorus recycling in Stillwater Pond. The characteristics of this basin and thermal structure are conducive to reduction of the amount of phosphorus generated there. The depth of the hypolimnion and the stability of the thermocline would also provide a better transfer of oxygen and little risk of destratification. On the other hand, it was judged that Lovers Lake would not be a good candidate as it is shallower and lacks significant hypolimnetic volume during summer.

An estimate of 70% reduction of the internal phosphorus load in Stillwater Pond was made by comparison to the range of reduction noted in the literature and best professional judgment (BPJ). This was based on the simple morphometry, adequate depth for oxygen transfer, and very stable thermal structure. It appears to be a good setting for this type of device. In addition, this treatment provides the additional benefit of providing an additional amount of habitat for fish and other aquatic organisms. There is no real longevity associated with this technique since the positive benefits start to decline as soon as the aerating device is taken off-line.

The cost for operation of a hypolimnetic aerator for Stillwater Pond over a 15 year period was estimated at $165,000, but this assumes that a site near the basins for installing the compressors and ancillary power requirements be secured. Environmental permitting is expected to be relatively simple and straight-forward. Taken these factors together, ENSR recommends further consideration of hypolimnetic aeration for restoration of Stillwater Pond but not for application in Lovers Lake.

Nutrient Inactivation Evaluation

The last of the four in-lake methods for reduction of nutrients and algal blooms selected for evaluation in the *Eutrophication Mitigation Study* is nutrient inactivation (Section 7.6). Phosphorus inactivation typically involves some amount of short-term phosphorus precipitation (flocculation) during or just after application, but mainly aims to achieve long-term control of phosphorus release from lake sediments. This technique is most effective after other nutrient loadings from the watershed are sufficiently reduced, as it acts only on existing phosphorus reserves, not new ones added post-treatment.

The technical feasibility review indicates that nutrient inactivation by alum treatment would be a very effective option to reduce internal phosphorus recycling in both Lovers Lake and Stillwater Pond. Application of alum should provide a rapid short-term clearing of the water column and a long-term reduction in sediment recycling. An estimate of 75% reduction of the internal phosphorus load was made by comparison to the range of reduction (60-90%) noted in the literature and BPJ. Increases in the secchi disk transparency (SDT) depth and the amount of DO with depth have been noted at both Hamblin and Ashumet Pond following alum treatment. Longevity associated with this technique was conservatively estimated at 15 years but could be longer.

The cost for nutrient inactivation at Lovers Lake was approximately $122,500-$141,000, with a rounded median of $132, 000. Estimated costs for hypolimnetic alum treatment of Stillwater Pond were approximately $76,000-$87,500, with a rounded median of $82,000. Environmental permitting is critical but not complex (WPA NOI and chemical application permits). Of particular concern for the NOI Order of Conditions will be a detailed list of monitoring requirements, both for activities during and after applications. In summary, ENSR recommends further consideration of nutrient inactivation for restoration of Lovers Lake and Stillwater Pond. The treatment is highly appropriate and should be very effective for both lakes.

Selection of Recommended Pond Restoration Option

ENSR developed a series of potential pond restoration options for Lovers Lake and Stillwater Pond (see Section 8.2; Tables 8-1 to 8-3). These options encompass a variety of approaches, management strategies and costs:

- Option #1, the No Action Alternative, describes the current management of the ponds;
- Option #2, termed the "Maintenance Approach," calls for installation of an artificial circulation system in Lovers Lake. This option provides modest levels of water quality improvement but does not call for active pond restoration in Stillwater Pond;
- Options #3a and #3b, termed "Phased Approach" describes two alternatives in which there is early management effort in Lovers Lake (alum treatment in about half of the bottom area) followed by an assessment period of 2-3 years and then, as needed, implementation of pond restoration to Stillwater

Pond. If the desired level of water quality is not attained, then two alternatives are suggested. In Option #3a, the second phase will be to conduct an alum treatment of Stillwater Pond. For Option #3b, the second phase would be to install a hypolimnetic aerator in the bottom of that pond; and

- Option (#4) ("Aggressive Approach") includes alum treatment for both ponds as well as the installation of a circulation system in Lovers Lake. This incorporates options for reduction of historic phosphorus stored in the sediment and management of any residual phosphorus entering Lovers Lake.

It should be noted that relevant watershed source control (Section 7.8) best management practices (BMPs) are included as part of all restoration options.

ENSR evaluated the four candidate pond restoration scenarios as to which is most likely to be both technically and fiscally feasible, given the environmental setting and financial circumstances of the watershed and Town (Section 8.4). Based on this evaluation, ENSR recommended that the Town select Option #3a as the appropriate restoration course of action. Option #3a has these advantages:

- It provides sufficient phosphorus reduction to significantly improve water quality and reduce the frequency and magnitude of nuisance algal blooms in both ponds. The additional investment represented by Options #3b or #4 do not provide a commensurate amount of improvement (e.g., mean SDT depth would increase by a few inches);
- Option #3a will improve the ecological health of the ponds, increase the amount of dissolved oxygen in lower depths, and be protective of the herring fishery;
- Nutrient inactivation, if conducted correctly, provides a simple and dependable treatment which can be finished in one season and has good longevity of 15-20 years or more;
- Aeration options, while technically viable, represent a long-term commitment of personnel and labor for the foreseeable future. This has been successfully pursued in situations where institutional staff e.g., water supply staff) are available to operate, maintain, and repair equipment, but would likely be less successful in the case of Lovers Lake or Stillwater Pond due to limits of Town or watershed stakeholders resources;
- Installation of anchored aeration devices could lead to potential impairments of fishing or boating due to snagging or fouling of anchors or fishing gear. Power supply (both accessibility and rising costs) are also a concern. Nutrient inactivation would lead to a short-term disruption to recreational activities but would not leave a tangible obstacle;
- Option #3a represents a single expenditure for a Town budget or applicable grant rather than a continuing operations and maintenance expenditure to be considered annually. Failure to pass such an item would set the ponds back to the current, unimproved conditions. Alternative financial arrangements can be made but may also be complicated; and
- Nutrient inactivation appears to be an acceptable option with regard to some potential funding grants (see below).

There are possible concerns regarding Option #3a namely, access for treatment vessels, the accelerating cost of alum and aluminate, and the potential for lay public fears regarding introduction of "chemicals" to the waterbodies. However, none of these appears insurmountable and the advantages greatly outweigh these concerns.

While recommending Option #3a, ENSR also firmly believes that watershed protection measures should also be implemented, as this will be the best means to prevent future eutrophication of the ponds. ENSR recommends incorporating the selected pond restoration and watershed management into a comprehensive watershed eutrophication mitigation plan to address nutrients in the two ponds and downstream resources

(e.g., Ryder's Cove) as well as related outcomes of cultural eutrophication (e.g., increased pathogens) in Ryder's Cove and Frost Fish Creek.

Pond restoration is imperative to improve the water quality and recreational usage of Lovers Lake and Stillwater Pond, but such activities are expensive and may be beyond the resources of the Town and local stakeholders. Therefore, potential funding sources for pond restoration were identified (Section 8.5), including: Town Budget; Legislative Budget funding; MA DCR Water Quality Grants; Clean Water Act Section 319 Watershed Grants; Coastal Zone Management Grants; and Other grants or funding sources. Each of these funding sources is described and potential applicability to the Lovers Lake and Stillwater Pond restoration evaluated.

# Appendix D

## Administrative Consent Order

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION
SOUTHEAST REGIONAL OFFICE

ARGEO PAUL CELLUCCI
Governor

TRUDY COXE
Secretary

DAVID B. STRUHS
Commissioner

COPY



September 29, 1998

Mr. Reginald L. Nickerson, Chairman
Board of Selectmen
Town of Chatham
549 Main Street
Chatham, MA 02633

RE: CHATHAM--Administrative Consent Order No. ACO-SE98-1002

Dear Mr. Nickerson:

Enclosed please find an executed copy of the Chatham Administrative Consent Order regarding the Chatham Wastewater Treatment Facility. The effective date of the Order is September 29, 1998.

The Department appreciates your willingness to resolve this matter, and wishes to remind you of the applicable time frames for the required actions, which are contained in the Order.

If you have any questions or concerns, please contact John O'Brien at (508) 946-2740 or at the letterhead address.

Sincerely,

Paul Taurasi
Regional Director

T/JO

Attachment

CERTIFIED MAIL #P808 783 142
RETURN RECEIPT REQUESTED

COMMONWEALTH OF MASSACHUSETTS
EXECUTIVE OFFICE OF ENVIRONMENTAL AFFAIRS
DEPARTMENT OF ENVIRONMENTAL PROTECTION

| | | |
|---|---|---|
| IN THE MATTER OF<br><br>The Town of Chatham<br>Chatham Wastewater Disposal | ) | RE: ADMINISTRATIVE CONSENT ORDER<br>CONSENT NO. ACO-SE98-1002 |

## I. PARTIES

1. The Department of Environmental Protection (the "Department"), is a duly constituted agency of the Commonwealth of Massachusetts. The Department is responsible for implementing the provisions of the Massachusetts Clean Waters Act, M.G.L. c.21, Section 26-53, and regulations promulgated thereunder, including 310 CMR 5.00 and 6.00. The Department maintains a regional office at 20 Riverside Drive, Lakeville, Massachusetts 02347.

2. The Town of Chatham (``the Town'') is a body politic and corporate and a political subdivision of the Commonwealth, which maintains offices at the Chatham Town Hall, Chatham, Massachusetts 02554.

## II. PURPOSE

The purpose of this Administrative Consent Order is to supersede Administrative Order, #700, dated November 24, 1987, issued to the Town of Chatham. This Consent Order replaces and supersedes, in its entirety, the Order #700. This Consent Order provides a mechanism to effect the timely completion of Chatham's Comprehensive Wastewater Management Planning (CWMP) effort and to implement the recommended wastewater treatment and disposal needs from the CWMP, and to bring the Town into compliance with laws and regulations cited in Section I.1 of this document.

## III. STATEMENT OF FACTS AND LAW

1. The Town owns, operates and maintains a sewerage system and treatment facility consisting of a facility and a common sewer system which collects and transports sewage and other wastes from approximately 408 connections. The Wastewater Treatment Facility (``the WWTF'') which treats the sewage and other wastes, is located off Sam Ryders Road in Chatham.

2. On or about November 11, 1987, the Department issued to the Town an Administrative Order #700 (hereinafter, the ``1987 Order'' or the ``Order''), which required the Town to plan, design and construct a wastewater treatment facility to adequately treat and dispose of all wastewater's collected by the Town's sewer system. The Order contained a schedule which required compliance with the Order by a specific date. The Order limited the WWTF to an annual average discharge of 100,000 gallons per day. The Town did not appeal the 1987 Order.

3. The Department, pursuant to 314 CMR 5.00 and 6.00 administers a regulatory program within the Commonwealth of Massachusetts. This program requires that all discharges of sanitary sewage to the ground in excess of 10,000 gallons per day, obtain and comply with a groundwater discharge permit issued by the Department. These permits prescribe effluent limitations and monitoring requirements.

4. Previous studies conducted by engineering consultants for the Town have indicated that the wastewater effluent discharge from the Chatham WWTF poses a potential hydraulic impact to Zone II's of existing public water supplies in Chatham.

5. The Town's permit to discharge up to 100,000 gallons per day of treated wastewater from the facility to the ground water, Groundwater Discharge Permit No. 044, expired on August 3, 1987.

6. The Town applied to the Department for a renewal of its Groundwater Discharge Permit No. 044 on May 24, 1994.

7. In 1992, the Town completed the construction of and put into operation new mechanical sludge dewatering facilities at the existing Chatham WWTF.

8. The Town of Chatham submitted a letter dated May 16, 1995 requesting that the Department revise the 1987 Order (Order #700) to allow an increase in Chatham's Wastewater Treatment Facility's annual average discharge flow from 100,000 to 150,000 gallons per day on an annual average basis.

9. On or about October 31, 1996 the Town initiated operations of the interim modifications approved by the Department at the Chatham WWTF to provide further treatment of the wastewater. Nutrient removal and grit handling were added to the treatment process. The addition of a nutrient removal process was required at the WWTF to comply with the Class 1 Groundwater Standards of 10 Mg/1 $NO_3$. Since October 31, 1996 when the system was put into operation effluent discharges from the WWTF have been in substantial compliance with the Class 1 Groundwater Standards.

10. Monitoring reports for the WWTF indicate that the annual average flow in June of 1997 exceeded 100,000 gallons per day. During July of 1997, the WWTF annual average discharge flows also exceeded 100,000 gallons per day.

11. The Town has completed the following studies: Whitman & Howard's ``Revised Zone II Delineation's, Indian Hill Well'' (February 1995); ``Zone II Delineation, Indian Hill Well, Chatham, Massachusetts'' (November 1994); ``Report on Zone II Delineation Municipal Wells 1, 2, 3, 6 and 7, Chatham Water Department, Chatham, Massachusetts (December 1993); and Metcalf & Eddy's ``Groundwater Modeling Study at the Wastewater Pollution Control Facility, Chatham, Massachusetts'' (February 1995). All of these reports are on file at DEP's Southeast Regional Office.

12. The Town has engaged Metcalf & Eddy, Inc. to perform and submit to DEP quarterly groundwater monitoring studies as required by the 1987 Order, (Order #700).

13. Town has met certain conditions of the 1987 Order by submitting Metcalf & Eddy's ``Report to the Water and Sewer Departments, Chatham, Massachusetts on Alternative Effluent Disposal Sites (July 1988).''

14. The Town and DEP agree that DEP revised its ``Guide to Comprehensive Wastewater Management Planning'' in January of 1996.

15. The Town has entered into an agreement dated December 26, 1997 with Stearns & Wheeler, LLC for professional engineering services with regard to Chatham Comprehensive Wastewater Management Plan (CWMP), designed to meet the requirements of 310 CMR 41.25; the requirements of 301 CMR 11.12 for major and complicated projects; and the guide to Comprehensive Wastewater Management Planning (January 1996). DEP received the scope of services for the Town of Chatham's Comprehensive Wastewater Management Plan (CWMP) on February 28, 1998.

16. Based upon the foregoing, and pursuant to the authority of M.G.L. c.21, Section 26 through 43, and 314 CMR 5.00 and 6.00 the Department hereby issues this Order, and the Town agrees to perform to the actions required hereunder.

## IV. DISPOSITION

1. This Consent Order supersedes the 1987 Order upon execution by the Town and the 1987 Order is withdrawn by the Department upon signature by the Town. The Department reasserts and realleges the facts set forth in the 1987 Order.

2. In addition to being an Order, this is also a Notice of Noncompliance pursuant to M.G.L. c.21A, §16. specifying the requirements which the Town is currently violating and the actions required for the Town to come into compliance.

3. The Town shall take all necessary steps to plan, design and construct a wastewater treatment and disposal facility to serve the Town's wastewater needs and enable the Town to comply with the effluent limitations set in 314 CMR 5.00 and the ground water quality standards in 314 CMR 6.00 within the timelines set forth below.

4. Unless otherwise provided by the Department, as of the date of entry of this Order and until such time as the Town has a valid groundwater discharge permit, the Town shall comply with the sampling, reporting, monitoring and effluent limitations as set forth in Groundwater Discharge Permit No. 044; and the following additional conditions: 1.) Effluent discharge limitation for Total Nitrogen ($NO_2$+$NO_3$+TKN) of 10 mg/l for maximum day; 2.) Monitoring and reporting of a new parameter, Total Nitrogen, on a minimum frequency of monthly and as a 24-hour composite sample type, and 3.) Replace sample types listed in permit as 8-hour composite with new sample type of 24-hour composite. Until such time as a new permit is issued, during each calendar year, the Town shall not discharge to the ground and thereby to the groundwater a total annual quantity of wastewater exceeding 54,750,000 gallons (an average annual daily flow not to exceed 150,000 gallons).

5. Until the Town has complied with the requirements of Paragraph IV-13, in addition to performing the sampling and reporting required by Permit #0-44 and the requirements of Paragraph IV-4, the Town shall sample and analyze the groundwater monitoring wells at the Chatham wastewater facility for nitrate nitrogen and total nitrogen as N on a monthly basis. The Town shall submit to the Department by the 30th day of each month a report which contains the results of analyses and sampling conducted during the previous calendar month.

6. The Town shall continue to submit to the Department quarterly groundwater monitoring reports on the wastewater treatment facility's discharge.

7. Analyses of samples taken pursuant to this Consent Order shall be performed by a laboratory certified by the Commonwealth for the parameters specified and shall be conducted in accordance with EPA-approved methods.

8. The Town shall continue to submit to the Department the monthly quantity of wastewater it discharges from its wastewater treatment facility.

9. Within sixty (60) days of the issuance of this Consent Order the Town shall submit for approval to the Department a proposed sewerage flow bank plan identifying which properties the Town will allocate additional flow to and how the bank will be managed, including a schedule for flow connection.

10. By May 30, 1998, The Town shall submit to the Executive Office of Environmental Affairs (MEPA Division) an Environmental Notification Form which notices the actions the Town plans to take, including the scope of services for the CWMP and describes the areas of town where the Town proposes to take action to address Chatham's wastewater disposal needs to fulfill the requirements of this Consent Order.

EIR REQUIRED APRIL 10, 1998 APRIL 10, 2000

11. Should MEPA determine that an Environmental Impact Report (EIR) is required for this project, then within (24) months of a MEPA determination that an EIR is required for the proposed Chatham wastewater treatment and disposal solution, the Town shall submit a Draft Wastewater Management Plan and a Draft EIR to MEPA and the Department which addresses the scope of work required by MEPA.

12. Within six (6) months of MEPA's approval of the DRAFT EIR, the Town shall submit a final Wastewater Management Plan and Final EIR to MEPA and the Department which addresses comments received on both documents.

13. Within (15) months of the Secretary of the Executive Office of Environmental Affair's certification of the final EIR, the Town shall submit Final Design Plans and permit applications to the Department for the selected wastewater treatment and disposal option.

14. Within One Hundred and Twenty (120) days of the Departments approval of final plans, submitted as required in Paragraph IV-13, the Town shall advertise for bids for the construction of the approved facility.

15. Within four (4) months of advertisement for bids, but in no event later than June, 2003, the Town shall commence construction of the approved facility. The Town shall notify the Department in writing of the commencement date.

16. Within (18) months of the date construction commences, but in no event later than December, 2004, the Town shall complete the approved facility and the facility shall be fully operational. In the event that the CWMP should recommend the design and construction of totally new wastewater treatment facilities that would require more than eighteen months to construct, then the provisions of Paragraph IV-25 shall apply.

17. If the Department requests modifications to the final design plans and specifications submitted pursuant to Paragraph IV-13 of this Order, the Town shall make such modifications and submit the modified plans to the Department within (8) eight weeks of receipt of the modification request.

18. The Town shall timely apply for, and shall use its best efforts to expedite, all local and any other governmental approvals required to construct and install the approved facility or facility modifications. In their monthly progress reports required by this Consent Order, the Town shall inform the Department of the status of all such efforts and approvals.

19. Beginning thirty (30) days from the date of issuance of this Consent Order, the Town shall submit monthly progress reports to the Department by the 30th day of each month stating what has been done during the previous calendar month to comply with the requirements of this Consent Order. The reports shall also contain the information required by Paragraph IV-4 and 5. The Town's obligation to submit monthly reports shall continue until compliance with all the provisions of this Consent Order is certified by the Department.

20. Within 12 months of the date construction of a new or modification of the existing facility commences the Town shall submit a Draft Operation and Maintenance Manual for the proposed new or modified facility. The manual shall comply with the provisions of 314 CMR 12.00. Within forty-five (45) days after the commencement of operation of the new or modified facility, a final Operation and Maintenance Manual, which complies with 314 CMR 12.00 and reflects the Department's comments on the draft shall be issued provided that comments were mailed by the Department at least seven days prior to commencement of operation of the facility, shall be submitted to the Department.

21. Within Thirty (30) days of the completed construction of the new Chatham wastewater facility or of approved modifications, the Town shall: i) submit to the Department a statement, stamped and signed by a Massachusetts Registered Professional Engineer, certifying that the facility has been constructed in accordance with the final design plans and specifications and final design criteria or performance standards that were approved by the Department; and ii) contact the Department and schedule a hydraulic test of the facility, and iii) The Town shall initiate a one year post-construction certification process and submit to the Department a draft of the Scope of Work required for review and approval.

22. All plans, specifications and engineering reports required by this Consent Order shall be stamped and signed by a Massachusetts Registered Professional Engineer.

23. This Consent Order allows for the continued operation of the existing Chatham Wastewater Treatment Facility under the conditions stated in Permit #0-44 and Paragraph IV-4 and 5 of the Order. No additional flows shall be permitted to the existing Chatham wastewater treatment facility (except as stated in Paragraph IV-4 of the Order) without express written Departmental permission. Permit #0-44 shall remain in effect until the conditions and all other terms and conditions of this Consent Order have been met and a new discharge permit is issued by the Department for the modified or new treatment facility.

24. This Consent Order shall apply to and be binding upon the Town and upon their officers, agents, successors and assigns.

25. The compliance dates set forth in Section IV reflects the time frames for compliance in the Order. These time frames for compliance set forth may be amended by the Department to allow for time extensions to the Town for good cause shown which shall not be unreasonably withheld by the Department. The Town shall provide the Department with a written notice of expected or potential delays in construction or progress as soon as the Town knows of any significant cause for delay. The Town's notice shall include: a statement as to the length of the delay and the reasons for the delay. The Town shall request a specific time extension in days and provide a justification for the length of the requested extension. Reasons for seeking an extension may include delays in obtaining necessary approvals from the Department or other approving authorities and Acts of God or War.

26. Each submission required by this Consent Order shall be submitted to:

Alan Slater, Groundwater Section Chief
Division of Watershed Management
Department of Environmental Protection
One Winter Street - 6th Floor
Boston, MA 02108

and

Dave DeLorenzo ,Deputy Regional Director, BRP
Department of Environmental Protection
Southeast Regional Office
20 Riverside Drive
Lakeville, MA 02347

## V. PENALTIES

1. For Noncompliance with the terms and conditions of the 1987 Order, the Department herewith assesses a Civil Administrative penalty in the amount of $10,000 pursuant to the authority of M.G.L. c. 21A, sec 16 ) and 310 CMR 5.000. This penalty amount is suspended and shall not become due and owing to the Department until or unless there is noncompliance with the terms and conditions of Paragraphs 15 or 16 of Section IV of this Consent Order.

2. For any noncompliance with the terms and conditions of Paragraphs IV-8, 9, 10, 11, 12, 13, 14, 15, 16, 19, 20 or 23 of this Consent Order, the Town shall pay stipulated penalties in the amount of $250 dollars per day. Each separate day of noncompliance shall constitute a separate violation. Stipulated and Suspended penalties shall be paid, without demand, by certified or business check to:

Commonwealth of Massachusetts
Master Lock Box
P.O. Box 3584
Boston, MA 02241-3584

Department of Environmental Protection

By: _____ 9/29/98
Paul A. Taurasi, Regional Director — Date

Town Of Chatham Board of Selectmen

By: _____ Sept. 8, 1998
(Name & Title) — Date

# Appendix E

## Chatham CWMP Approval Decision by Cape Cod Commission Dated October 29, 2009

# CAPE COD COMMISSION

3225 MAIN STREET
P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630
(508) 362-3828
FAX (508) 362-3136
E-mail: frontdesk@capecodcommission.org

DATE: October 29, 2009

TO: William Hinchey
Town Manager
549 Main Street
Chatham, MA 02633

Robert A. Duncanson, Ph.D.
Director of Health & Environment
Director, Water Quality Laboratory
Program Manager, Comprehensive Wastewater Management Plan
549 Main Street
Chatham, MA 02633

FROM: Cape Cod Commission

RE: Development of Regional Impact
Cape Cod Commission Act, Sections 12 & 13

APPLICANT: Town of Chatham
Town Manager's Office
549 Main Street
Chatham, MA 02633

PROJECT #: ENF98004

PROJECT: Town of Chatham Comprehensive Wastewater Management Plan

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## DECISION OF THE CAPE COD COMMISSION

### SUMMARY

The Cape Cod Commission (Commission), hereby approves with conditions the application of the Town of Chatham for the Chatham Comprehensive Wastewater Management Plan (CWMP) as a Development of Regional Impact (DRI) in accordance with Sections 12 and 13 of the Cape Cod Commission Act (Act). This decision is rendered pursuant to a vote of the Cape Cod Commission on October 29, 2009.

## PROCEDURAL HISTORY

Chatham's CWMP has undergone regulatory review pursuant to section 11.26 (7)(h)(6) of the Massachusetts Environmental Policy Act (MEPA) regulations beginning when the Secretary of Environmental Affairs scoped a Certificate on the initial Environmental Notification Form (ENF) in 1998. The Comprehensive Wastewater Management Plan (CWMP)/Final Environmental Impact Report (FEIR) meets a number of categorical MEPA thresholds that required a mandatory Environmental Impact Report (EIR) for the project. The Town of Chatham filed a joint MEPA/Cape Cod Commission Development of Regional Impact (DRI) Environmental Notification Form (ENF) in March 1998. Over the last 11 years the Commission has received and reviewed 5 major MEPA submittals from the Town of Chatham as indicated in the Table below. For each submittal, the document was reviewed, staff comments were prepared, some involving significant technical data and resource analysis, a joint public hearing was held, and Commission subcommittee comments were sent to the MEPA Office.

| Report | Submittal | Public Hearing | Comment Letter |
|---|---|---|---|
| ENF | March 11, 1998 | NA | March 27, 1998 |
| Needs Analysis | September 8, 1999 | Sept 23, 1999 | October 5, 1999 |
| NPC | March 10 1994 | NA | March 29, 2004 |
| DEIR | May 7, 2008 | May 22, 2008 | June 5, 2008 |
| FEIR | June 1, 2009 | June 30, 2009 | July 6, 2009 |

The Town opted to exercise a joint MEPA regulatory review with the Cape Cod Commission. The Town completed its Final Environmental Impact Report (FEIR) (EOEEA #11510) on June 1, 2009. The Secretary of the Executive Office of Energy and Environmental Affairs (EOEEA), in his certificate dated July 17, 2009, found that the Town's project adequately and properly complies with the Massachusetts Environmental Policy Act (M.G.L. c. 30, ss. 61-62I) and with its implementing regulations (301 CMR 11.00).

On Tuesday, August 18, 2009 at 7:00 p.m. at the Chatham Community Center, 702 Main Street, Chatham, MA, a Cape Cod Commission hearing officer procedurally opened the DRI public hearing. No testimony was taken and no substantive action was taken and the public hearing was continued to Thursday, September 24, 2009. A public hearing of the Cape Cod Commission subcommittee took place at 7:00 p.m. on September 24, 2009 at 549 Main Street, Chatham Town Hall, in the Selectman's Meeting Room, in Chatham to obtain public comment. The Commission subcommittee reviewing the project held a subcommittee meeting immediately following the September 24, 2009 public hearing. At this meeting, the subcommittee deliberated on the project and voted unanimously to approve the project with conditions and directed staff to draft a decision. On October 15, 2009 a Cape Cod Commission hearing officer procedurally continued the public hearing; no testimony was taken and no substantive action was taken and the public hearing was continued to Thursday, October 22, 2009.

A subsequent public hearing was held on October 22, 2009 at 1:00 p.m. at the Cape Cod Commission office on Route 6A in Barnstable. At this hearing, the subcommittee reviewed the draft decision and voted unanimously to forward the draft decision to the full Commission for consideration. On October 29, 2009, the final public hearing was held before the full Cape Cod Commission. The Commission voted unanimously to approve the project with conditions.

## PROJECT DESCRIPTION

The Comprehensive Wastewater Management Plan (CWMP)/Final Environmental Impact Report (FEIR) provides a strategy for wastewater management and reductions of nitrogen loading to restore and protect Chatham's marine embayments, addresses other Areas of Concern (areas experiencing: high groundwater, failing systems, industrial/commercial areas) and includes a topical Adaptive Management Plan for its implementation. The CWMP/FEIR proposes a 20 year implementation schedule for Phase 1 to construct wastewater facilities for the immediate wastewater and nitrogen management needs of the Town. The extension of sewers to the remaining part of the Town will take another 10 years with an estimated completion date of 2040. The estimated Phase 1 costs are $210 million dollars (in 2007 dollars) over the initial 20 years. The Town has adopted a number of innovative approaches for funding the project. The Town set-up has established a Capital Facilities Plan with the goal of not having to raise the tax-rate as major capital needs are addressed. However, it is acknowledged that modest tax increases will be necessary to meet the costs of the proposed plan. Expected homeowner charges are estimated at $3,000 to $10,000 for hook-up and $400 for annual operation and maintenance.

The four volume CWMP/FEIR is a significant document that articulates Chatham's wastewater needs and proposes a comprehensive facilities management program to address those needs. The Chatham CWMP has been underway since 1996, in response to an Administrative Consent Order from the Massachusetts Department of Environmental Protection (DEP) in 1987 as revised in 1998. A Needs Assessment Report was completed and reviewed by a Commission subcommittee on September 23, 1999. As part of the joint Massachusetts Environmental Policy Act (MEPA)/DRI review process, the Draft CWMP/ Draft Environmental Impact Report (DEIR) was reviewed by a Commission subcommittee in May of 2008. The Final Environmental Impact Report (FEIR)is substantially the same as the DEIR with responses to comments and updated implementation status and was reviewed by a Commission subcommittee in June of 2009.

The CWMP/FEIR details a two phased implementation program to meet nitrogen Total Maximum Daily Loads (TMDLs) in the Stage Harbor, Pleasant Bay, Sulphur Springs and Taylors Pond systems. Phase 1 actual wastewater flows are projected to be an average annual of 0.94 million gallons per day (mgd) at buildout. The actual Phase 2 wastewater flows will be 38% more than Phase 1, for an annual average flow of 1.3 mgd over thirty years at buildout. The 30-year Phase 2 design average annual flow, including Infiltration and Inflow, is 1.9 mgd, which accounts for approximately 32% of the flow.

The no-action alternative (#1) described in the CWMP/FEIR predicts that the present level of nitrogen loading would further impair coastal water quality as new development contributes additional nitrogen to these systems. Alternative (#2), which is a combination decentralized/centralized plan, was shown to be inefficient due to treatment levels, costs and necessary oversight. Alternative (3#) is centralized treatment with sewer extensions to meet nitrogen Total Maximum Daily Loads (TMDLs). Alternative (#4) is Alternative (3#) with sewer extensions to the remainder of the town. Commission staff concurs with the Town of Chatham that the CWMP/FEIR preferred Alternative (#4) of phased sewering will more cost-effectively remove nitrogen to restore coastal water quality and meet the objectives of the town.

The CWMP/FEIR describes a technology screening process leading to the selection of infrastructure that includes: the estimated length of sewer lines (110 miles), number of grinder pumps (1200), lift stations (80), and an Orbal oxidation ditch treatment system that is proposed as a major and modular component of the wastewater facility.

The CWMP/FEIR also provides a comprehensive account of mitigation measures that will be required during the construction phase, including a description of the Plan's implementation timetable, reasonable financial options for handling the significant infrastructure cost, and institutional considerations to implement the plan over the duration.

## JURISDICTION

This project comes under the jurisdiction of the Cape Cod Commission pursuant to Section 2(d)(i) of the Cape Cod Commission Enabling Regulations Governing Review of Developments of Regional Impact, which requires proposed development for which an EIR is required to be prepared under the provisions of MEPA to undergo DRI review.

## MATERIALS SUBMITTED FOR THE RECORD

From the Applicant

- Memorandum from Nathan Weeks to Sarah Korjeff, Re:Town of Chatham, Comprehensive Wastewater Management Planning Study, Regulatory Kick-off Meeting dated February 24, 1998
- DRI Joint Review Process Application Form dated February 27, 1998
- Environmental Notification Form dated March 2, 1998
- Memorandum from Nathan Weeks to Sarah Korjeff, Re:Town of Chatham, Comprehensive Wastewater Management Planning Study, dated May 11, 1998
- Memorandum from Nathan Weeks to Sarah Korjeff, Re:Town of Chatham, Comprehensive Wastewater Management Planning Study, Regulatory Progress Meeting on June 23, 1998 dated June 15, 1998
- Executive Summary of the Draft Needs Assessment Report dated July 19, 1999
- Letter to Mr. Robert A. Durand, Secretary, Executive Office of Environmental Affairs from William G. Redfield, P.E., Re: Town of Chatham, Comprehensive Wastewater Management Planning Study, Needs Assessment Report, Requested MEPA Review Extension, EOEA No. 11510 dated September 3,

1999

- Memorandum from Nathan Weeks Re:Town of Chatham, Comprehensive Wastewater Management Planning Study, Regulatory Progress Meeting on September 14, 1999 at 1:30 p.m. dated August 27, 1999
- Letter to Mr. Robert A. Durand, Secretary, Executive Office of Environmental Affairs from Fred Jensen, Chairman for the Citizen's Advisory Committee, Re: Comprehensive Wastewater Management Planning Study, Town of Chatham, Phase I Report: Needs Assessment, EOEA #11501, CCC #ENF98004 dated October 20, 1999
- Letter to Mr. Robert A. Durand, Secretary, Executive Office of Environmental Affairs from Glenn Haas, Director, Division of Watershed Management, Re: Chatham Comprehensive Wastewater Management Plan – Phase I Needs Assessment Report dated October 29, 1999
- Letter to Seth Wilkinson, Project Planner from William G. Redfield , P.E., Manager, Re: Chatham Wastewater Management Planning Study (#ENF98004) dated May 16, 2001
- Letter to Mr. David Ansel, Chair, Regulatory Committee from Robert A. Duncanson, Ph.D., Director of Health and the Environment, Re: Chatham Wastewater Management Planning Study, Chatham, MA (#ENF08004) dated November 12, 2002
- Letter to Chair, Regulatory Committee from Robert A. Duncanson, Director of Health & Environment Re: Chatham Wastewater Management Planning study, Chatham, MA (#ENF98004), Re: Development of Regional Impact Review Extension Request, Chatham Wastewater Management Planning Study, Chatham, MA, #ENF98004 dated September 23, 2004
- Letter to Chair, Regulatory Committee from Robert A. Duncanson, Ph.D., Director of Health & Environment, Director, Water Quality Laboratory, Re: Development of Regional Impact Review Extension Request, Chatham Wastewater Management Planning Study, Chatham, MA, #ENF98004 dated October 6,2006
- Executive Summary, Draft Comprehensive Wastewater Management Plan / Draft Environmental Impact Report and Notice of Project Change dated April 2008
- Draft Comprehensive Wastewater Management Plan and Draft Environmental Impact Report and Notice of Project Change Report: Volumes 1 and 2; Bound copies of the Executive Summary with CD of all 4 volumes; CD of Report all 4 volumes dated May 5, 2008
- Email to Tom Cambareri from Robert Duncanson, Re: Chatham CWMP/DEIR Staff Report dated May 21, 2008
- Letter to Chair, Regulatory Committee from Robert A. Duncanson, Ph.D., Director of Health & Environment, Director, Water Quality Laboratory, Re: Development of Regional Impact Review Extension Request, Chatham Wastewater Management Planning Study, Chatham, MA, ENF #98004 dated May 27, 2008
- Letter to Secretary Ian A. Bowles, Executive Office of Energy and Environmental Affairs from Robert A. Duncanson, Ph.D., Director of Health & Environment, Re: Town of Chatham, Environmental Impact Report for Comprehensive Wastewater

Management Planning Project (EOEA # 11510) dated June 3, 2009

- Letter to Secretary Ian A. Bowles, Executive Office of Energy and Environmental Affairs from Robert A. Duncanson, Ph.D., Director of Health & Environment, Re: Town of Chatham, Environmental Impact Report for Comprehensive Wastewater Management Planning Project (EOEA # 11510) dated June 8, 2009
- Letter to Cape Cod Commission from William G. Redfield, P.E. Re: Town of Chatham's CWMP/FEIR, Project #11510 dated July 6, 2009

From Federal, State and Local Officials and Members of the Public

- Letter to Secretary Trudy Coxe, Executive Office of Environmental Affairs from Brona Simon, State Archaeologist, Deputy State Historic Preservation Officer, Massachusetts Historical Commission, Re: Comprehensive Wastewater Management Planning Study, Chatham, EOEA# 11510, MHC #RC21171 dated March 23, 1998
- Memorandum to R.J. Lyman, Director, MEPA Unit from Margaret M. Brady, Director, MCZM, Re: EOEA # 11510 Comprehensive Wastewater Management Planning Study; Chatham dated March 27, 1998
- Letter to Ms. Trudy Coxe, Secretary, Executive Office of Environmental Affairs from Fred Jensen, Chairman, Wastwater Citizens Advisory Committee, Re: Environmental Notification Form Scope of Work for Chatham Comprehensive Wastewater Management Planning Study dated March 30, 1998
- Letter to Trudy Coxe, Secretary, Exec. Office of Environmental Affairs from Glenn Haas, Director, Division of Watershed Management, Re: Chatham Wastewater Mgmt. Plan, EOEA #11510 dated March 31, 1998
- Memorandum to Fred Jensen, Chairman, Chatham Citizens Advisory Committee, Comprehensive Wastewater Management Planning Study from Deborah Ecker, Re: Questions addressed to the consultants about the "Draft: Needs Assessment Report for Comprehensive Wastewater Management Planning Study," April 1999 dated May 28, 1999
- Letter to Fred Jensen, Chatham Board of Health from Norman H. Howes, regarding concerns about the project dated August 31, 1999
- Letter to Cape Cod Commission from Deborah S. Ecker, Re: Concerns about Buildout Projections in the Final Needs Assessment Report Chatham's Comprehensive Wastewater Management Planning Study dated September 22, 1999
- Letter to Cape Cod Commission from Paul R. Kelley regarding concerns about the project dated September 23, 1999
- Letter to Fred Jensen, Chairman of Citizen's Advisory Committee from M. Stone, Re: Comments on Wastewater Management Study dated September 23, 1999
- Letter to Seth Wilkerson, Project Planner, Cape Cod Commission from Norman Pacun regarding concerns about the project dated September 30, 1999
- Letter to Secretary Bob Durand, Executive Office of Environmental Affairs from Brona Simon, State Archaeologist, Deputy State Historic Preservation Officer, Massachusetts Historical Commission, Re: Comprehensive Wastewater

Management Plan, Chatham, EOEA #11510, MCH #RC.21117 dated October 1, 1999

- Letter to Ed Eichner, Cape Cod Commission from Martha Stone regarding concerns about the project dated October 8,1999
- Letter to Seth Wilkinson, Cape Cod Commission from Paul R. Kelley regarding concerns about the project dated October 8, 1999
- Massachusetts Historical Commission Project Notification Form dated August 3, 2006
- Letter to Secretary Ian A. Bowles, Executive Office of Energy & Environmental Affairs from Brona Simon, State Archaeologist, Deputy State Historic Preservation Officer, Massachusetts Historical Commission, Re: Draft Comprehensive Wastewater Management Plan/Draft Environmental Impact Report and Notice of Project Change, Town of Chatham, MHC #RC 21171. EEA #11510 dated May 21, 2007
- Letter from Stephen Perkins, EPA re: Approval of Pleasant Bay System TMDLs for Total Nitrogen dated October 24, 2007
- Email to Linda Smulligan and William Redfield from Terry Whalen, Re: Chatham CWMP dated May 19, 2008
- Letter to Cape Cod Commission from Fred Jensen, Chairman, Citizen's Advisory Committee in support of the project dated May 22, 2008
- Letter to Cape Cod Commission from Edward Sheehan, Chairman, Board of Health in support of the project dated May 22, 2008
- Letter to the Cape Cod Commission from the Summer Residents Advisory Committee in support of the project dated May 22, 2008
- Email to Heather McElroy from John Payson, Re: My comments on the Draft Chatham CWMP at the Public Hearing on 22 May 2008 dated May 28, 2008
- Letter to Secretary Ian A. Bowles, Executive Office of Energy & Environmental Affairs from Brona Simon, State Historic Preservation Officer, Executive Director, State Archaeologist, Massachusetts Historical Commission, Re: Comprehensive Wastewater Management Plan/ Final Environmental Impact Report, Town of Chatham, MHC #RC21171, EEA #11510 dated June 16, 2009
- Letter from Ken Moraff, EPA re: Approval of Chatham Southern Embayments Total Maximum Daily Load Re-Evaluations for Total Nitrogen, dated June 22, 2009
- Letter to the Cape Cod Commission from Jill Nickerson MacDonald, Chair, Summer Residents Advisory Committee in support of the project dated June 30,2009
- Letter from Ken Moraff, EPA re: Approval of the Pathogen TMDL for Cape Cod Watershed, dated August 28, 2009

From the Cape Cod Commission

- ENF Comment letter to Secretary Trudy Coxe, Massachusetts Executive Office of Environmental Affairs from David Ernst, Subcommittee Chair dated March 27, 1998

- Staff Report dated September 15, 1999
- Letter to Mr. Robert A. Durand, Secretary, Executive Office of Environmental Affairs from David H. Ernst, Chair , EIR Review Subcommittee, Re: Town of Chatham, Chatham Comprehensive Wastewater Management Planning Study, Needs Assessment Report Comment Letter, EOEA #11501, CCC #ENF98004 dated October 5, 1999
- Letter to William Redfield, Chatham Water and Sewer Departments from Seth Wilkinson, Project Planner, Re: Chatham Wastewater Management Planning Study (#ENF98004) dated May 7, 2001
- Letter to Dr. Robert A. Duncanson, Ph.D., Director, Health & Environment from Andrea Adams, Planner, Hazardous Waste Specialist, Re: Chatham Wastewater Management Planning Study, Chatham, MA (#ENF98004) dated November 18, 2002
- Letter to Dr. Robert A. Duncanson, Ph.D., Director, Health & Environment from Andrea Adams, Planner, Hazardous Waste Specialist, Re: Chatham Wastewater Management Planning Study, Chatham, MA (#ENF98004) dated December 31, 2002
- Letter to Secretary Ellen Roy Herzfelder, Executive Office of Environmental Affairs from Margo L. Fenn, Executive Director, Re: Town of Chatham, Notice of Project Change, Comprehensive Wastewater Management Planning Project/EIR, EOEA #11510, MEPA Analyst – Nicholas Zavolas dated March 29, 2004
- Letter to Robert A. Duncanson, Ph.D., Director of Health & Environment from Andrea Adams, Planner, Hazardous Waste Specialist Re: Chatham Wastewater Management Planning Study, Chatham, MA, #ENF98004
- Staff Report dated September 29, 2004
- Email to Robert Duncanson from Andrea Adams, Re: Chatham Wastewater Management Planning Study dated October 4, 2006
- Email to Robert Duncanson from Andrea Adams, Re: Chatham Wastewater Management Planning Study dated October 12, 2006
- Email to Robert Duncanson from Andrea Adams, Re: Chatham's Comprehensive Wastewater Management Plan dated February 20, 2008
- Email to Robert Duncanson from Tom Cambareri, Re: Chatham CWMP/DEIR Staff Report dated May 19, 2008
- Email to Terry Whalen from Heather McElroy, Re: Chatham CWMP dated May 19, 2008
- Staff Report dated May 22, 2008
- Letter to Robert Duncanson, Director of Health & Environment from Heather McElroy, Natural Resources Specialist, Re: Chatham Comprehensive Wastewater Management Plan, Development of Regional Impact Review, Extension Agreement dated June 3, 2008
- Subcommittee Comment Letter to Secretary Ian Bowles, Executive Office of Energy and Environmental Affairs from Ernest Virgilio, Chair, Re: Town of Chatham, Draft Comprehensive Wastewater Management Plan Draft Environmental Impact Report, and Notice of Project Change (EOEEA #11510)

dated June 5, 2008
- Staff Report dated June 25, 2009
- Letter to Secretary Ian A. Bowles, Executive Office of Energy and Environmental Affairs from Elizabeth Taylor, Re: Chatham CWMP, MEPA Project Number EOEEA #11510 dated July 6, 2009
- Staff Report dated September 18, 2009

## TESTIMONY

**Public Hearing, May 22, 2008**
Sean Summers, Chair of the Chatham Board of Selectmen, made some introductory remarks, welcoming the Cape Cod Commission, and noting that Chatham is the first town to prepare a wastewater management plan. He noted the town staff, consultant, and Citizens Advisory Committee (CAC) have been working on the plan over the past 13 years.

Ernest Virgilio opened the hearing at 7:10 p.m. and asked Mark Harding to read the hearing notice. Mr. Harding read the notice.

Mr. Virgilio introduced the Subcommittee, gave an overview of the hearing process, and asked Nathan Weeks, consultant with Stearns & Wheler, LLC, to make the Town's presentation of the plan.

Mr. Weeks reviewed the plan and planning process. He presented an image illustrating nitrogen that must be remediated by percentage for each watershed in town (the total maximum daily loads (TMDLs) as determined by the Massachusetts Estuaries Project (MEP)). He stated that the TMDLs are important regulatory targets. He stated that the CWMP used these targets, and analyzed the Town by watershed, evaluating technologies by watershed to determine the best method for removing nitrogen (N), including; Title 5 septic systems (23% N removal), individual nitrogen removal systems (50% N removal), community and cluster systems (75% N removal) and upgraded treatment plant (93% N removal). Mr. Weeks stated that several key findings resulted from the analysis: several areas in town need to remove more than 50% N to remediate problems in estuaries, that the best technology to address this problem is a cluster or centralized system, and that there is efficiency in upgrading the existing treatment plant because of the large volume of treatment needed.

Mr. Weeks stated that Town goals for the project include N removal, but also cost, fiscal fairness, fewer raised septic systems, and addressing some industrial/commercial properties where there are concerns associated with impacts to groundwater. He stated that sewering the entire town would generate 1.9 million gallons per day (mgd). He said that the team then scaled the project back to address only the TMDL concerns, to 1.3mgd. He said that the team next considered recharge of the treated water, and looked for an appropriate site. He said that the existing treatment plant, and site to the north, is best for recharge, and that the site can accommodate the entire town's 1.9 mgd with no adverse impacts.

He stated that the town looked at other alternatives, including: 1) no action alternative, which does not address the findings of the MEP; 2) address problem with individual nitrogen removal systems; 3) extend sewer to limited parts of town; 4) extend sewer to entire town. He stated that the preferred alternative is the fourth alternative, extending the sewer in phases over 30 years, and that the first phase is to address areas that need to meet the TMDLs.

Mr. Weeks stated that it is important to understand wastewater flows to design the system efficiently. He stated that the average annual flow would start at 1.3 mgd, would ramp up to 1.8 mgd, and in later phases to 2.8 mdg. He stated that the proposed plan would use an innovative process called an Orbal process which facilitates phasing of the project. He noted that the existing treatment plant is located away from residential properties, and otherwise the site minimizes impacts. He stated that part of the project would include a new administrative building. Mr. Weeks provided an overview of the costs of the project, totaling $35 million for Phase 1, and sewering the entire town would cost approximately $295 million. He reviewed the regulatory agencies reviewing the project, and time frames, including the Town's anticipation of submitting the Final EIR in September 2008, and DRI approval by December 2008. Construction would start in 2011 – 14. Mr. Weeks showed a picture of the technology proposed in operation in Wisconsin, and pictures of pump houses that fit into community character. Mr. Weeks observed that the systems to be put in place need to be designed for the long term, as they are community assets.

Mr. Virgilio introduced the Cape Cod Commission staff and asked Tom Cambareri to present the staff report. Mr. Cambareri summarized the staff report and stated that Commission staff has reviewed the CWMP, but has also been a partner in the development of the plan. He said that the plan is a response to an Administrative Consent Order from the DEP, and that staff recommends that the Town should move forward with the preparation of a Final EIR. He stated that action items in the plan include various ways to monitor and manage nitrogen loading to ground and surface waters. Mr. Cambareri noted that the review process to date has included public participation. He described the scope of the project proposed and the mitigation proposed. Mr. Cambareri described the MEP reports for Chatham, and the benefits from remediating the nitrogen problems. He said that the original Administrative Consent Order was based on assumptions that the MEP corrected resulting in a more accurate assessment of the problem. He said that the treatment proposed is 3 ppm, well below the standard set in the RPP. He said that recharge of treated wastewater is less complicated than in Barnstable, and will flow toward the coast. He noted that the draft plan addresses the potential to accept wastewater from neighboring towns, to help address shared resources, like Muddy Creek. He said that the Final EIR should have more detail to address regional solution, and noted that the plan includes an Adaptive Management Plan. He concluded that the town should proceed to preparation of a Final EIR.

Mr. Virgilio asked if the committee had any questions. William Doherty asked whether there was concern about the flow toward the coast, and if that should be attenuated.

Mr. Cambareri said that the recharge site was looked at through MEP, and that treatment level would be protective of downgradient coastal waters. Mr. Doherty asked if Stearns & Wheler was also working with Harwich? Mr. Cambareri stated that he believed Camp Dresser and McKee was working with Harwich.

Mr. Virgilio asked for public comment.

Mr. Brian Dudley, DEP Southeast Regional Office, offered congratulations to Chatham for coming to the end of a long process, and coming up with recommendations for addressing water treatment for all of its citizens. He stated that the town has been very diligent, resulting in a comprehensive plan. He stated that the DEP was glad to look at innovations, which would allow approval of higher loading rates, and may help the rest of the Cape. He stated that from an environmental standpoint, the plan is an achievement, and the DEP will continue to work with the town as diligently as they can.

Charles Bartlett, co-president of Friends of Chatham Waterways (FCW) stated that FCW have been very supportive of efforts to protect estuaries, including Water Watchers. He also sat on the Citizens Advisory Committee as ex-officio member. FCW supports the plan, but has some concern about gathering community support. He noted that technology for analyzing water is not available to the average citizen, and problems may not be apparent to the naked eye. He is also concerned that the cost of implementing the solution is expensive, greater than $45,000 per family, and no offer of assistance is in the plan. He stated that he believes it is important to tackle the biggest problem first, build public support, and move forward in small steps.

Fred Jensen, chair of the Citizens Advisory Committee (CAC), submitted a letter on behalf of the committee, stating that CAC supports the plan. He stated that the CAC was formed in 1997 to provide citizen input to the Selectmen, and met monthly with the public, and the consultant. He stated that the CAC also looked at alternative management plans, and that it supports phasing of the project, and the proposed centralized system. He noted that the phasing of the project over 20 years reduces impacts to daily life. He stated that the CAC also strongly supports ongoing monitoring.

Jill McDonald, vice chair of the Summer Residents Advisory Committee, submitted a letter. She stated that the Committee is very concerned about the health of water bodies in Chatham. She stated that the committee performed a survey of its members, and found near unanimous support of the project.

John Payson, CAC member, stated that he has been tracking data, and trying to evaluate the validity of the conclusions. He stated that his analysis discredited the MEP report, resulting in changes to the draft TMDLs. He stated that during the MEP process, it was determined that a third party was needed for validation of the findings. He stated his concern about the cost of the project, and that MEP projections are too conservative. He stated that relying on the MEP report without peer review is foolhardy.

Carol Ridley, coordinator of the Pleasant Bay Resource Alliance, may submit further comments in writing. She congratulated the Town on the effort, and noted that Town

officials and the consultant have participated in the Alliance workgroup. She noted that the draft plan addresses several regional solutions to nitrogen in Muddy Creek; this is a core issue for the alliance. She noted that the Alliance has received a grant to look at natural attenuation at Muddy Creek. She noted that the Alliance is looking at public education on fertilizer use within the watershed. She wanted to convey the Alliance's support for the project and desire to continue collaborating with the Town.

**Public Hearing, June 30, 2009**

Mr. Nathan Weeks of Stearns & Wheler, LLC presented on behalf of the Town of Chatham. He stated that he has been working with the Town of Chatham on their CWMP for twelve years. Mr. Weeks presented an alternative evaluation summary, watershed evaluations, hydrogeologic and site evaluations, alternative plan formation and evaluation, the recommended plan, and reviewed next procedural steps. He then reviewed the implementation schedule for the recommended plan, stating that from March 2009 through February 2010 will be the design, Massachusetts Department of Environmental Protection (MassDEP) review, and bidding and award phase. He said that February 2010 through July 2012 will be the construction phase. He said that phase one, which is the collection system expansion, will go from the year 2010 through 2030. He then described the collection system and said that phase two, which is the collection system and the wastewater treatment facility expansion, will take place from the year 2030 through 2040.

Mr. Tom Cambareri then made his presentation. He gave a brief overview of the joint MEPA/Commission review. He said that Commission staff recommends that the CWMP is sufficient and can proceed to the DRI review stage. He presented the Water Resources RPP goals and identified that the CWMP targets nutrient reduction through certain non-structural elements, including stormwater and fertilizer management. Mr. Cambareri reviewed the wellhead protection areas and public supply wells in Chatham and mentioned that seventeen of the 44 freshwater ponds in Chatham were sampled and indicated that the Town will continue to monitor these seventeen ponds. He spoke about marine water quality and the Environmental Protection Agency (EPA) approved TMDLs for nutrients. Mr. Cambareri explained relative nitrogen thresholds and TMDLs and reviewed the percent nitrogen removal needed for several embayments and ponds. He spoke about groundwater modeling and mentioned that groundwater mounding will pose no issues for the Town. He showed a groundwater monitoring particle tracking map and said that the effluent will flow downgradient and will be within acceptable TMDL limits. Mr. Cambareri identified regional wastewater management opportunities and stressed the importance of inter-town cooperation. He concluded by reviewing the adaptive management plan.

Ms. Taylor then asked whether there were any Subcommittee member questions.

Ms. Taylor asked whether the allotted excess flow in the wastewater treatment plant design could be a possible regional hookup for bringing in parts of Harwich.

Mr. Weeks replied that the flows that are estimated are for Chatham at the buildout conditions and that the important aspect that they have tried incorporate into the site is

that they have provided additional space at the site to be able to treat additional flows if the Town of Harwich wants to consider bringing wastewater flow to this site for treatment and possibly recharge there as well. He said that they have provided site space in the planning of the site and that Harwich is in the midst of a comprehensive wastewater management planning project and that once they have received their limits from the Massachusetts Estuaries Project they are going to be proceeding with their alternatives evaluation and that they have let the Town of Harwich know that when they get into that alternatives development to consider bringing in their flow to the Chatham facility because there is a great cost savings to both Chatham and to Harwich when that can happen.

Mr. Duncanson added that they have had almost constant conversations with Harwich, probably going back four or five years. He mentioned that they were hoping to get something more specific in the final plan as to what may happen between Chatham and Harwich, but that the difficulty they had was that there was a disagreement of the Estuaries Project between the State and the University that led to a delay, so Harwich unfortunately hasn't had the information they needed to move forward. He said they were really hoping to nail down that regional cooperation a little bit more, but that unfortunately the timing just hasn't worked out. He said that Chatham continues to have discussions with Harwich and that Chatham is committed to working with Harwich and that, as Nate indicated, they have already identified two potential areas and that it is probably more cost-effective for them to look at joining up with Chatham rather than try to do something on their own. He said that until Harwich gets to that next step and refined their numbers it is difficult to sit down and have a meaningful discussion, but as soon as they are ready to do that, Chatham will be at the table.

Ms. Taylor then said that the subcommittee has heard discussions on nitrogen tonight and relative to stormwater runoff, fertilizer and other non-structural management strategies, including phosphorus issues, where is the Town in that right now? She asked whether there are anticipated reviews of all the ponds and the abutting properties and some zoning changes?

Mr. Duncanson responded by saying that he would address the freshwater ponds aspect of the question first. He said that, as Mr. Cambareri alluded, Chatham has been participating in the PALs program since its inception and that they also had their own freshwater quality monitoring program prior to that as part of the wastewater planning process. He said that they took a look ten years ago at the initial recommendations at the time of the three hundred foot setback for septic systems for freshwater ponds. He said the difficulty they had was that Chatham for all intents and purposes has already been built out and that there isn't a lot of vacant land left. He said that the Town is really looking at relatively small lots where, in most cases, three hundred feet either puts you across the road or on someone else's property, so as part of the wastewater planning process, they took that into account. He said that since their intent is to sewer the entire Town, that is going to deal with the phosphorus issue from a wastewater perspective, no matter where the house is in relation to the freshwater pond. He said that as Mr. Cambareri mentioned, that they have been doing the monitoring and that, for the most part, the freshwater ponds in Chatham are in pretty good shape. He said

that they identified two and have done a fairly extensive feasibility analysis on those two, and that they are pursuing the recommendation, which is alum treatment to mitigate the phosphorus issue in those two ponds. He said that they are committed to doing other things, such as they have been working with a lot of the neighborhood associations on the dishwashing and laundry detergent issue, and luckily there was State legislation passed two years ago that changed that. He said that they are working right now with the Pleasant Bay Alliance, through a grant from the Water Protection Collaborative, on the fertilizer issue. He said that is a very difficult issue to deal with. He said that the Pleasant Bay Alliance just recently issued a request for proposals to look at fertilizer management techniques from around the country. He said that, hopefully, they will be working on a regional basis, through the Pleasant Bay Alliance on the whole fertilizer issue. He said that Chatham was working on stormwater for more than twenty three years. He said they have had an active stormwater management program for many years and now they are a Phase II community, so they are required to do it. He said they have identified twenty five major areas where stormwater needed to be addressed and have addressed close to fifty percent of those so far, and that they will continue to do that for both nutrient and bacteria issues.

Ms. Taylor then said that once most Towns are sewered then that takes away some of the protection that a Title 5 system might have offered in terms of where a person would be able to build. She asked whether the Town is doing any zoning to prevent additional buildout even on individual lots, since Chatham doesn't have many that aren't built on in the first place?

Mr. Duncanson responded by saying that Chatham has been working on a zoning bylaw re-write, but that it is still underway. He said that those kinds of issues are correctly zoning issues. He said it is inappropriate to manage growth in the community through wastewater. He said we've done it for many years in Massachusetts where we have used Title 5 as defacto zoning. He said that is not the way to do it, because that only regulates the number of bedrooms in the house. He said you can still have five media rooms and ten kitchens and that's what governs the size of the house. He said the Town of Chatham is not actively at this point promoting any major zoning changes because of the wastewater plan. He said that, as alluded to in the presentation, back in 2005, the Town did put in flow neutral regulation; it started out as a policy but it was ultimately adopted by Town meeting, in a near unanimous vote, into water and sewer regulations. He said that, other than that, the Town is not looking at any substantial zoning proposals coming out of the wastewater plan; the Town is letting the zoning folks deal with the zoning issues. He said that the other side of the coin is that Chatham has probably one of the strictest set of local conservation bylaws of any of the Towns on the Cape. He said that they go well beyond the State regulations in terms of the areas that they regulate, sometimes to the Town staff's detriment because that means Chatham has a lot more projects that come through their conservation office than most communities. He said that Chatham was one of the first communities in the Commonwealth to have a fifty foot no disturb zone, so those first fifty feet are pretty much sacrosanct. He said that even though we may lose some limitations on lot development with Title 5, he doesn't think they are going to significantly result in major development opportunities, because the Town has these other regulations that will

govern, and obviously, just because Title 5 may go away, zoning is still going to be there, and conservation is still going to be there.

Mr. Graham complimented the Town of Chatham on their CWMP and commended the Town on the ease with which he was able to read the document. He pointed out that the layout, the summary, and the organization of the plan made it clear and easy to read. He said the conclusions of the Commission staff are right on. He complimented the Town on being kind to the Subcommittee with large print and a readable plan.

Ms. Taylor then asked whether there were any local, state, or federal officials who had questions or would like to provide comments. There were none. She then invited the public to speak.

Mr. Fred Jensen then gave his testimony. He stated that he is the Chairman of the Citizens Advisory Committee (CAC) for the Town of Chatham's Wastewater Management Planning Study. He introduced some fellow Advisory Committee Members. He then read his statement for the record. He said, "The members of the Citizens Advisory Committee (CAC) for Chatham's Wastewater Management Planning Study have provided input, over the past 12 years, to the development of virtually every aspect of Chatham's Final Comprehensive Wastewater Management Plan (FCWMP) and Final Environmental Impact Report (FEIR), both dated May 2009. The CAC enthusiastically endorses the FCWMP and the FIER in their entirety and strongly recommends that the Cape Cod Commission and the MA Executive Office of Energy and Environmental Affairs, MEPA Unit, promptly approve Chatham's FCWMP and FEIR. Such prompt approval will facilitate Chatham's desire to proceed as expeditiously as possible with the implementation of Phase I of the plan."

Ms. Carole Ridley, the coordinator for the Pleasant Bay Resource Management Alliance, then congratulated the Town on developing the Plan. She said that the CWMP is a leader among plans, and that Chatham has been a leader to the other Alliance Towns throughout the process. She said that, in terms of regional coordination, the Pleasant Bay Alliance supports regional discussions and hopes that those continue. She said, finally, in terms of the fertilizer management, that is something that they are working on, as Mr. Duncanson mentioned, and that they look forward to continue working with the Town in support of that.

**Hearing Officer, August 18, 2009**
Marisa Mejia, Cape Cod Commission Regulatory Officer, acted as a Hearing Officer at the Chatham Community Center to open a pro-forma hearing on a Development of Regional Impact (DRI) project.

**Public Hearing, September 24, 2009**
Mr. Nathan Weeks of Stearns & Wheler, LLC presented on behalf of the Town of Chatham. He stated that he has been working with the Town of Chatham on their CWMP for twelve years. Mr. Weeks presented an alternative evaluation summary, watershed evaluations, hydrogeologic and site evaluations, alternative plan formation

and evaluation, the recommended plan, and reviewed next procedural steps. He then reviewed the implementation schedule for the recommended plan, stating that from March 2009 through February 2010 will be the design, Massachusetts Department of Environmental Protection (MassDEP) review, and bidding and award phase. He said that February 2010 through July 2012 will be the construction phase. He said that phase one, which is the collection system expansion, will go from the year 2010 through 2030. He then described the collection system and said that phase two, which is the collection system and the wastewater treatment facility expansion, will take place from the year 2030 through 2040.

Marisa Mejia and Tom Cambareri presented the Commission report. Ms. Mejia reviewed the procedural history and the Commission's involvement with the project.

She reviewed the issue area of Natural Resources. She stated that the proposed treatment plant site and discharge locations appear to have few potential conflicts with wetlands or rare species habitat at this time. She said that the disposal site components of the project also do not appear to have wetland or rare species impacts at this time. She said that as specific placement and construction phases of the sewer extensions and pumping stations occur over the 30 year project timeframe, each should be reviewed for impacts to rare species and wetlands by the local conservation commission and the Natural Heritage and Endangered Species Program (NHESP) as appropriate. She said that the Cape Cod Regional Policy Plan (RPP) prohibits activities that result in adverse impacts to rare species or their habitat and that where conflicts with rare species habitat to arise, the primary planning approach should be to avoid, and then minimize impacts. She said that whatever impacts remain unavoidable will have to be mitigated. She said that specific construction-related impacts are unknown at this time and that an additional review for impacts to rare species may be required once plans have become finalized.

In the issue area of Historic and Archaeological Resources, Ms. Mejia said that the proposed project has the potential to impact archaeological resources in the construction of pump stations and installation of underground pipes and other sewer facilities. She said that the Massachusetts Historical Commission (MHC) requested more detailed project plans to help determine if pump stations and other sewer project elements are located within or adjacent to archaeological sites and archaeologically sensitive areas. She said that if MHC finds that the proposed project will impact such sites, RPP minimum performance standard 6.1.3 requires a predevelopment investigation to serve as a guide for layout of the development. She said that development proposed on or adjacent to known archaeological sites or sites with high archaeological sensitivity must be configured to maintain and/or enhance such resources where possible. She said that any work done within or adjacent to areas listed on the National Register of Historic Places or found eligible for listing on the National Register may be impacted by above-ground structures that are proposed in conjunction with sewer facilities. She stated that to be consistent with RPP minimum performance standards 6.1.1 and 6.1.2, any work within significant historic areas must preserve distinguishing original features of historic structures and cultural landscapes, including their site and setting.

Mr. Cambareri then discussed the issue area of Water Resources. He presented the Water Resources RPP goals and identified that the CWMP targets nutrient reduction through certain non-structural elements, including stormwater and fertilizer management. Mr. Cambareri reviewed the wellhead protection areas and public supply wells in Chatham and mentioned that seventeen of the 44 freshwater ponds in Chatham were sampled and indicated that the Town will continue to monitor these seventeen ponds. He spoke about marine water quality and the Environmental Protection Agency (EPA) approved TMDLs for nutrients. Mr. Cambareri explained relative nitrogen thresholds and TMDLs and reviewed the percent nitrogen removal needed for several embayments and ponds. He spoke about groundwater modeling and mentioned that groundwater mounding will pose no issues for the Town. He showed a groundwater monitoring particle tracking map and said that the effluent will flow downgradient and will be within acceptable TMDL limits to begin the implementation of the plan. Mr. Cambareri identified regional wastewater management opportunities and stressed the importance of inter-town cooperation. He concluded by reviewing the adaptive management plan.

Ms. Mejia then concluded by saying that in order to approve the project, the Commission must find that the project meets the minimum performance standards of the RPP; that the project is consistent with the Town's Commission-certified Local Comprehensive Plan (LCP); that, if located within a DCPC, the project is consistent with said DCPC; and finally, that the project's probable benefits outweigh the probable detriments. She said that the Chatham CWMP/FEIR is sufficiently detailed to provide adequate guidance for regulatory agencies for permitting, and that Commission staff recommends approval of the project with conditions.

Ms. Taylor then asked whether there were any Subcommittee member questions.

Ms. Taylor said that she noticed a lot of large lots on the map and she wondered whether those are undeveloped or open space owned by the Town or possible future development. Mr. Robert Duncanson, Director of Health & Environment for the Town of Chatham, said that a lot of those areas are already protected areas. He said that the Town of Chatham is very fortunate in that the Town owns a fairly significant amount of open space for wellhead protection and conservation purposes and in addition to that they also have the Chatham Conservation Foundation, which is a private land trust which also has a significant amount of holdings. He said that the Town does not have a flow neutral policy, but that they have a flow neutral regulation which was adopted by Town meeting in 2005. He said that the regulation doesn't limit development per se, but that it limits the amount of flow; it's a wastewater issue. He said it is not meant to usurp zoning, which is really the way to regulate density and development. He said that this regulation says you can't have any more wastewater flow than you could have under a Title V scenario. He said while it theoretically limits the number of bedrooms, he doesn't want people to get the misconception that it will regulate the size of the house or the density of development. He said that the size of the house and the density of development is a zoning issue and needs to be addressed as such.

Ms. Taylor then said that the Town is anticipating a 30% increase in the future flow and wondered whether that includes the switch from part-time to full time in all of the housing. Mr. Duncanson said that in Chatham, it is the subdivision of existing developed parcels that is more significant. He said that, unlike other communities, Chatham doesn't have a large amount of open space, large tracts of land, but what Chatham does have is a fair number of parcels that could be subdivided to create another one or two lots. He said that is where a majority of where that buildout comes from. He said that Chatham is going to be more impacted by the redevelopment of existing parcels more than anything else.

Ms. Taylor asked whether they expect a large shift from people who are just there in the summer to deciding to be there full time, year-round? Mr. Duncanson said that they haven't seen that to date. He said that every planner you talk to will have a different answer. He said that roughly 60% of the Town is non-resident tax payers. He said that number has been roughly the same over the past 22 years. He said that, looking at past trends, so far they haven't seen a substantial shift one way or the other.

Ms. Taylor then asked whether the Town is anticipating any other zoning changes for future development requiring larger lot sizes, restricting the type of development, requiring specific types of clusters, or requiring low impact development? Mr. Duncanson answered that Chatham has been working on a zoning bylaw re-write for almost as long as they have been working on the Comprehensive Wastewater Management Plan. He said that the Town is having discussions about revisions to the current zoning bylaw to basically put further limitations on development. He said that a number of efforts have been brought forth to Town Meeting, some more successful than others in recent years. He said that he doesn't think we are going to see any real substantial changes in lot sizes in Chatham. He said that was done a number of years ago and the Town doesn't have a lot of large tracts of land.

Mr. Graham asked how long it will take the Town to assess whether or not the Town is hitting its goals for the reduction and is that going to be apparent right away or will that be after a ten year project? He asked how the Town will figure out along the way that it is making progress and hitting targets. Mr. Duncanson answered that the Town will measure progress in a number of ways. He said that there have been a lot of discussions with the DEP about TMDL compliance and exactly how that is going to be measured. He said that from the scientific side of the ledger, it is going to be a fairly lengthy period of time before we know how effective we are being. He said there is something called travel time. He said that water on the Cape tends to move a foot per day, so that if you are close to the shoreline, the cleaner water will get there fairly rapidly, but if you are quite a ways inland, it may take years or tens of years before that cleaner water reaches the embayment. He said that there is a lag time between when you sewer those parcels and when the potential benefit reaches the embayment system. He said that so far the way they are talking about measuring adaptive management is by looking at expenditures, for example, how many houses have been sewered. He said that ultimately, it will be water quality monitoring and eel grass monitoring and those things out in the environment that will really show that we are

achieving the goal. He said that some smaller watershed will reach the goal sooner than larger watersheds.

Ms. Taylor then asked whether there were any local, state, or federal officials who had questions or would like to provide comments. There were none. She then invited the public to speak.

Mr. Fred Jensen, the Chairman of the Citizens Advisory Committee (CAC) for the Town of Chatham's Wastewater Management Planning Study, read his statement for the record. He said, "The members of the Citizens Advisory Committee (CAC) for Chatham's Wastewater Management Planning Study have provided input, over the past 12 years, to the development of virtually every aspect of Chatham's Final Comprehensive Wastewater Management Plan (FCWMP) and Final Environmental Impact Report (FEIR), both dated May 2009. The CAC enthusiastically endorses the FCWMP and the FIER in their entirety and strongly recommends that the Cape Cod Commission and the MA Executive Office of Energy and Environmental Affairs, MEPA Unit, promptly approve Chatham's FCWMP and FEIR. Such prompt approval will facilitate Chatham's desire to proceed as expeditiously as possible with the implementation of Phase I of the plan."

**Hearing Officer, October 15, 2009**
Marisa Mejia, Cape Cod Commission Regulatory Officer, acted as a Hearing Officer at the Cape Cod Commission to procedurally continue the public hearing to October 22, 2009 at 1:00 pm at the Cape Cod Commission.

**Public Hearing, October 22, 2009**
Ms. Taylor noted that the purpose of the public hearing was to discuss the draft decision for the Chatham Comprehensive Wastewater Management Plan. Ms. Mejia introduced the draft decision and gave an overview of the decision. She summarized the project description, stating that the project will take place in two phases, with a 20 year implementation schedule for Phase 1. She said that the CWMP has been underway since 1996. She described the four project alternatives. Ms. Mejia then discussed the general findings from the draft decision. She stated that the Commission finds that the applicant is the Town of Chatham, that the project consists of a centralized wastewater treatment system with sewer extensions to restore water quality to its impaired coastal embayments and the remainder of the Town. She said that the Chatham CWMP involves the implementation of an adaptive management approach that includes a two-phased expansion of the existing wastewater treatment facility presently located at Sam Ryder Road in Chatham, MA. She said that the proposed project is consistent with Chatham's zoning bylaws and that the project is not located within a District of Critical Planning Concern and that the Town of Chatham does not have a Commission-certified Local Comprehensive Plan. She said that the benefits of the CWMP include: protection of public health; improvement of the water quality in the aquifer and restoration of marine water quality to meet federally adopted TMDLs for nutrients and pathogens. She said that the detriments are limited to the construction activities and the long time frame it requires to implement the plan. In the issue area of Natural Resources, Ms. Mejia stated that the Commission finds that the proposed

treatment plant site and discharge locations do not appear to have conflicts with wetlands or rare species habitat. She said that, provided that the construction impacts do not impact vegetated areas outside the road layout, installation of sewer lines should be consistent with RPP requirements to protect rare species and wetlands, as well.

Mr. Cambareri then presented the findings in the issue area of Water Resources. He discussed the protection of drinking water and the protection and restoration of the ecological integrity of fresh water ponds. He said that the project also seeks to restore and protect the ecological integrity of marine waters. Mr. Cambareri also discussed the monitoring of marine water quality at the sentinel stations. Mr. Cambareri discussed the criteria that will be used in the process of prioritizing areas for sewering. He stated that the implementation of Phase 1 (to remediate watershed nitrogen loadings) as the method to meet TMDLs will require a period of 20 years. He discussed the Adaptive Management Plan and said that the sewering of the Stage Harbor watershed is a priority subsequent to the Initial Implementation Phase. He said that the Town of Chatham has been in discussions with the Town of Harwich on their potential shared use of Chatham's wastewater facility site. He said that there is the potential for expansion, should these regional discussions move forward. He said that any potential shared use of the site would require a modification to the decision. He said that the Town of Chatham has adopted a flow-neutral policy position for the CWMP. He said that the Chatham CWMP refers to discussions to potentially accept additional wastewater from the Muddy Creek watershed portion of Harwich. He said that enhanced natural attenuation and tidal flushing will be continually evaluated as the CWMP is implemented, and that the Town continues to participate and is open to regional opportunities for shared management. He said that the Town continues to make excellent progress on its Stormwater management efforts and that it will continue to work with other towns and the region on educational efforts. He discussed the Adaptive Management Plan and the Commission staff's suggestions for the plan.

Ms. Mejia reviewed the Conclusions section of the decision and identified that the project is consistent with the minimum performance standards of the RPP; that the project is consistent with the Town's local development by-laws, that the project does not fall within a District of Critical Planning Concern (DCPC), and finally, that the project's probable benefits outweigh the probable detriments. She listed the benefits of the project. She said that the draft decision recommends approval of the project with conditions. She then reviewed the general and natural resources conditions. Ms. Mejia stated that the DRI decision is valid for 7 years. She said that the project shall be constructed in accordance with the Final Comprehensive Wastewater Management Plan/Final Environmental Impact Report. She said that the Applicant may return to the Commission to seek an extension of the decision by the Regulatory Committee of the Commission. Ms. Mejia said that failure to comply with all of the conditions stated in the decision shall be deemed cause to revoke or modify the decision. In the issue area of natural resources, Ms. Mejia stated that sewer work within the roadway or road layout that may result in impacts within the 100 foot buffer to wetlands or vernal pools shall be permitted by the Chatham Conservation Commission. She said that potential impacts to rare species should be reviewed, and permits filed as necessary; as the specific

placement and construction phase of pumping stations occurs, each should be reviewed for impacts to rare species.

Mr. Cambareri concluded the staff presentation by discussing the water resources conditions. He stated that the Town shall submit copies of Ground Water Discharge Permit monitoring and compliance reports to the Commission. He said that the Town shall submit copies of public drinking water laboratory results and Annual Statistical Reports to the Cape Cod Commission. He said that within six months of the approval of the DRI, the Town shall convene a Technical Review Committee comprised of town and DEP and Commission staff. He said that sewering of Phase 1 areas, to achieve compliance with the TMDL, shall be prioritized over Phase 2 areas, to the extent practicable. Mr. Cambareri stated that regional opportunities shall be evaluated prior to implementing the Phase 2 expansion of the wastewater treatment facility. He said that implementation of Enhanced Natural Attenuation or tidal flushing to alter the implementation of the CWMP shall require consultation with the Commission. He stated that as the Town continues to regularly evaluate, manage, and improve stormwater collection and treatment, reports on improvement of water quality and progress as it relates to the CWMP and Stormwater Phase II regulations shall be included under Non-Structural Management actions as indicated in the Adaptive Management Plan Scope. He said that implementation of Enhanced Natural Attenuation or tidal flushing to alter the implementation of the CWMP shall require consultation with the Commission. Mr. Cambareri said that the Town of Chatham shall continue to participate in a regional study that will integrate the progression of regional planned sewering in the collective Pleasant Bay watershed. He said that the Town shall submit for Commission staff approval an Adaptive Management Plan. He said that Implementation Progress Reports shall be submitted to the Commission every 2 to 3 years, along with Marine and Surface Water Monitoring Reports, which shall be filed every 2 years.

Mr. Richardson moved that the subcommittee approve the draft decision for the Chatham Comprehensive Wastewater Management Plan. The motion was seconded by Mr. Graham. The motion was approved unanimously.

Ms. Pleffner moved to continue the public hearing to October 29, 2009 at 3:00 p.m. at the Assembly of Delegates Chamber at the First District Courthouse on Route 6A in Barnstable, MA. Mr. Graham seconded the motion and it was approved unanimously.

## FINDINGS

**General**

G1. The Commission finds that the applicant is the Town of Chatham.

G2. The project is the Comprehensive Wastewater Management Plan for the town of Chatham, as described in the Final Comprehensive Wastewater Management Plan/Final Environmental Impact Report of May, 2009. The project consists of a

centralized wastewater treatment with sewer extensions to restore water quality to its impaired coastal embayments and the remainder of the Town.

G3. The Commission finds that the Chatham CWMP involves the implementation of an adaptive management approach that includes a two-phased expansion of the existing wastewater treatment facility presently located at Sam Ryder Road in Chatham, MA (Exhibit C attached to this decision in incorporated by reference). Phase 1 will treat approximately 1.3 mgd on an average annual basis to meet total nitrogen TMDL requirements. Phase 2 will expand this facility to 1.9 mgd on an average annual basis to serve the remaining areas of Chatham. Phase 1 and Phase 2 areas are identified on Exhibit B attached to this decision and incorporated by reference. The Commission finds that Phase 1 will be implemented over a 20-year period (approximately 2010 to 2030) and Phase 2 will be implemented over the following 10-year period (approximately 2030 to 2040).

G4. The Commission finds that the project will be constructed in accordance with the Final Comprehensive Wastewater Management Plan/Final Environmental Impact Report of May 2009, incorporated herein by reference. The Commission finds that any deviation from the CWMP/FEIR that affects TMDL compliance or otherwise changes or impacts the findings and/or conditions of this decision will be reviewed as a modification of this decision in accordance with the Commission's Enabling Regulations in effect at that time.

G5. Based on testimony provided by Mr. Bob Duncanson, Director of Health & Environment for the Town of Chatham, the proposed project is consistent with Chatham's zoning bylaws. The site of the proposed facility is the site of the town's existing wastewater treatment facility located on Sam Ryder Road. The project is not located in a District of Critical Planning Concern and the Town of Chatham does not have a Commission-certified Local Comprehensive Plan.

G6. The proposed project is consistent with Massachusetts State Revolving Loan regulations to provide infrastructure to existing development and provide wastewater capacity for denser development in designated areas for growth. The town has adopted a flow neutral sewer regulation for controlling development and redevelopment in existing residential areas that will be provided with new sewer services.

G7. As described in the Final EIR, the benefits of the Comprehensive Wastewater Management Plan include: protection of public health; improvement of the water quality in the aquifer and restoration of marine water quality to meet federally adopted TMDLs for nutrients and pathogens. The detriments are limited to construction activities and the long time frame it requires to implement the plan.

G8. As the first substantive public hearing on the DEIR/CWMP was held on May 22, 2008, this project was reviewed for consistency with the 2002 Regional Policy Plan.

**Natural Resources**

NR1. The RPP prohibits activities that result in adverse impacts to rare species or their habitat. Consequently, in general, where conflicts with rare species habitat do arise, the primary planning approach should be to avoid, and then to minimize the impacts. In response to an information request by the Town on the presence of rare species on the treatment plant site, the Natural Heritage and Endangered Species Program (NHESP) provided a letter in August 2006 indicating that two rare species which had recently been reported near the project site, New England bluet and Pine barrens bluet, would likely result in mapping a portion of the project site as priority habitat for rare species. Upon further review of the NHESP Habitat Atlases published in October 2006 and October 2008, NHESP determined that the Chatham Wastewater Treatment Plant Site does not occur within Estimated Habitat of Rare Wildlife or Priority Habitat according to a letter of May 18, 2009. The Commission finds that the proposed treatment plant site and discharge locations do not appear to have conflicts with wetlands or rare species habitat.

NR2. Sewer line installation within the roadway or road shoulders will likely qualify for an exemption from MESA review. Provided that the construction impacts do not impact vegetated areas outside of the road layout, installation of sewer lines should be consistent with RPP requirements to protect rare species and wetlands, as well.

**Historic and Archaeological Resources**

HR1. The Commission finds that the proposed project will not impact significant historic properties.

HR2. As noted in the Secretary's certificate, the Massachusetts Historical Commission (MHC) has requested more detailed project plans to help determine if the pump stations and other sewer project elements are located within or adjacent to archaeological sites and archaeologically sensitive areas. In order to ensure the project will not impact archaeological resources, the Applicant will need to submit final project plans to MHC for review.

**Water Resources**

WR1. The project affects the following water resources areas of the Town of Chatham as defined by the Regional Policy Plan:

- Wellhead Protection Area
- Potential Public Water Supply Area
- Fresh Water Recharge Area
- Marine Water Recharge Area
- Water Quality Improvement Area

WR2. Applicable water resources minimum performance standards are:

MPS 2.1.1.2.C.2: requires that development in estuary watersheds where critical nitrogen loads are exceeded or where there are documented water quality problems in the estuary to maintain or improve existing levels of nitrogen loading.

MPS 2.1.1.2.E.2: allows the use of public sewage treatment facilities within Water Quality improvement areas that are in Wellhead Protection Areas providing it includes the remediation of existing wastewater problems in the same Area. Requires treatment facilities to maintain hydrologic balance in the aquifer and demonstrate that there are no negative ecological impacts to surface waters. This standard also requires such facilities to be subject to MPS 2.1.2.1 through 2.1.2.7.

MPS 2.1.2.2: requires all sewage treatment facilities to be designed to achieve tertiary treatment with denitrification and meet a maximum 5-ppm total nitrogen discharge standard in the effluent or at the downgradient property line.

MPS 2.1.2.7: requires that applications for approval of public and private sewage treatment facilities shall include a plan for sludge disposal.

MPS 2.2.2.2: requires that in order to accommodate possible relative sea-level rise and possible increased storm intensity, ensure human health and safety, and protect the integrity of coastal landforms and natural resources, all new buildings, including replacements, or substantial improvements to existing structures within FEMA A-zones shall be designed to accommodate the documented relative sea-level rise rate in Massachusetts of at least one foot per 100 years, except as provided in MPS 2.2.2.13, and in V-zones shall be designed to accommodate relative sea-level rise rate of two feet per 100 years.

MPS 2.2.2.6: requires that except as provided in MPS 2.2.2.13, no new public infrastructure or expansion of existing infrastructure shall be made in flood hazard zones (FEMA A- and V-zones) unless it is shown that there is an overriding public benefit provided, and provided that such infrastructure will not promote new growth and development in flood hazard areas.

WR3. The location of the Wastewater Treatment Facility is at the town's existing treatment facility site. The Facility discharges treated effluent into the Monomoy Lens of the Cape Cod Aquifer and within the Wellhead Protection Area to the Indian Hill Well, which is not online due to pre-existing contamination. The facility is also located in the Marine Water Recharge Area to Cockle Cove Creek, Bucks Creek, Taylors Pond and Sulphur Springs.

WR4. The protection of drinking water is a major goal of the RPP (RPP Water Resources Goal 2.1.3). The town of Chatham has undertaken appropriate actions to protect its drinking water quality including the adoption of a water resource protection district overlay and bylaw, acquired open space, performed required water quality sampling, and produced consumer confidence reports. Land use controls and regulations that have been adopted and implemented

over the last 30 years have been effective in protecting Chatham's water supply. There are nine wells in Chatham. According to the 2008 water quality report Chatham supplies have low concentrations of nitrogen ranging from .5 to 2.2 ppm with an average of 0.72 ppm. These concentrations are well below state and federal drinking water regulations and the Regional Policy Plan's nitrogen loading standard of 5 ppm. The benefits of sewering the priority areas of the town for TMDL compliance and other Areas of Concern will have an additional benefit of protecting drinking water that originates in the Zone II areas by further reducing nitrogen and other contaminants from entering the Zone II areas. The town is in the process of developing new source approvals for new wells in the western part of town that are in a Potential Public Water Supply Area under the RPP. The Indian Hill Well is off-line due to concerns for pre-existing volatile organic contamination.

WR5. Protection and restoration of the ecological integrity of fresh water ponds is also a goal of the Regional Policy Plan. There are 44 fresh water ponds in Chatham. Commission finds that the Town of Chatham has undertaken significant actions concurrent with the CWMP/FEIR including an assessment of the status and management needs of its fresh water ponds. Information about Chatham Ponds was initially presented in the Commission's Cape Cod Ponds and Lakes Atlas of 2004 and more recently the CWMP included an Action Plan for the Town of Chatham Ponds, dated November, 2003 and prepared by Stearns & Wheler, LLC of Hyannis, MA and EcoLogic, LLC of Cazenovia, NY. As a result of the Ponds assessments, Chatham is in the process of conducting an Alum treatment of Stillwater and Lover Lake. The Action report indicates that the Town will continue to monitor the conditions of 17 ponds. The implementation of the Town-wide Phase 1 and 2 Plan will ultimately serve parcels in close proximity to the ponds that will have an additional benefit of removing septic system phosphorous. Continued implementation of Stormwater Management Plans will also address phosphorous and bacterial sources from runoff. Commission staff will continue to work with the town through their participation in the PALS water quality snap-shot offered by the School of Marine Science and Technology at the University of Massachusetts at Dartmouth.

WR6. The restoration and protection of the ecological integrity of marine waters is a major goal of the Regional Policy Plan (RPP Water Resources Goal 2.1.1). Section 303(d) of the Federal Clean Water Act requires each state to (1) identify waters for which effluent limitations normally required are not stringent enough to attain water quality standards and (2) to establish Total Maximum Daily Loads (TMDLs) for such waters for the pollutants of concern. The TMDL "allocation" establishes the maximum loadings (of pollutants of concern), from all contributing sources, that a water body may receive and still meet and maintain its water quality standards and designated uses, including compliance with numeric and narrative standards. The Coastal systems shown in Exhibit D, appended to this decision and incorporated by reference, and Tables 1A, below were identified by the state as impaired waters due to nitrogen loading, primarily from septic systems in their watersheds and bacteria. For the purposes of the

RPP, these embayments and their watersheds are considered impaired and water quality improvement is the goal (MPS 2.1.1.2.C.2).

**TABLE 1 a. Chatham Embayments Listed in the Proposed Massachusetts 2008 Integrated List[1]**

| Name | Segment ID | Description | Size | Pollutant Listed |
|---|---|---|---|---|
| Stage Harbor | | | | |
| Oyster Pond | MA96-45_2008 | Including Stetson Cove | 0.21 sq mi | Nutrients & Pathogens |
| Oyster Pond River | MA96-46_2008 | Outlet of Oyster Pd to confluence with Stage harbor, Chatham | 0.14 sq mi | Nutrients & Pathogens |
| Stage Harbor | MA96-11_2008 | From the outlet of Mill Pd (including Mitchell River) to the Confluence with Nantucket Sound at a line from the southernmost point of Harding Beach southeast to the Harding Beach Point, Chatham | 0.58 sq mi | Nutrients & Pathogens |
| Mill Pond | MA96-52_2008 | Including Little Mill Pond (PALIS #96174), Chatham | 0.06 sq mi | Nutrients |
| Sulphur Springs | | | | |
| Harding Beach Pond | MA96-43_2008 | Locally known as Sulphur Springs (northeast of Bucks Cr), Chatham | 0.07 sq mi | Pathogens & Nutrients |
| Bucks Creek | MA96-44_2008 | Outlet from Harding Beach Pond (locally known as Sulphur Springs) to confluence with Cockle Cove, Chatham | 0.02 sq mi | Pathogens & Nutrients |
| Taylors Pond | | | | |
| Mill Creek | MA96-41_2008 | Outlet of Taylors Pond to confluence with Cockle Cove, Chatham | 0.03 sq mi | Pathogens & Nutrients |
| Taylors Pond | MA96-42_2008 | Chatham | 0.02 sq mi | Pathogens & Nutrients |

[1] All segments are in Category 5, with the exception of Mill Pond, which is in Category 4 a.

**Table 1A. The Pleasant Bay System Waterbody Segments in Category 5 of the Massachusetts 2002 and 2004 Integrated List[1]**

| NAME | WATERBODY SEGMENT | DESCRIPTION | SIZE | POLLUTANT LISTED |
|---|---|---|---|---|
| **Pleasant Bay System** | | | | |
| Crows Pond | MA96-47_2002 | To Bassing Harbor, Chatham | 0.19 sq mi | -Nutrients |
| Frostfish Creek | MA96-49_2002 | Outlet from cranberry bog northwest of Stony Hill Road to confluence with Ryder Cove, Chatham | 0.02 sq mi | -Nutrients<br>-Pathogens |
| Ryder Cove | MA96-50_2002 | Chatham | 0.17 sq mi | -Nutrients<br>-Pathogens |
| Muddy Creek | MA96-51_2002 | Outlet of small unnamed pond south of Countryside Drive and north-northeast of Old Queen Anne Road to mouth at Pleasant Bay, Chatham | 0.05 sq mi | -Pathogens |

[1] These segments are also classified as Category 5 on the Draft 2006 Integrated List.

WR7. The Town of Chatham was one of the first Cape towns to engage the Massachusetts Estuary Project to better document the health and critical nitrogen loads for its marine waters. The MEP was developed by the Commonwealth in response to the need of coastal communities for scientific evidence on the nature of their marine waters by using a more detailed approach to these assessments. This effort took a substantial period of time, in part, due

to the many organizational and institutional matters that were required to be tested and resolved in this multi-million dollar, multiple-year project for Southeast Massachusetts. The MEP through the use of the "Linked Water Quality Model" and several years of citizen water quality monitoring results, determined the nitrogen thresholds for Chatham's marine waters in a series of technical reports, listed in the CMWP. These thresholds were then codified into TMDLs by EPA under the Federal Clean Water Act. Shown below are target percentages of nitrogen to be removed through wastewater management according to a scenario listed in the MEP Technical Report "as one possible restoration scenario" to achieve compliance with the Final Total Maximum Daily Load. These target percentages are referenced in the EPA letters of approval of the South Coastal and Pleasant Bay TMDLs (included in the materials list of this decision) and are required for compliance with MPS 2.1.1.2.C.2.

Percent of Septic System Derived Wastewater to be Removed from Watershed

**Stage Harbor**
Oyster Pond 100%
Oyster River 100%
Stage Harbor 100%
Mitchell River 50%
Mill Pond 50%
Little Mill Pond 50%

**Sulphur Springs**
Buck Creek 62%
Cockle Cove 0%

**Taylor's Pond**
Taylor's Pond 60%
Mill Creek 100%

**Pleasant Bay**
Crows Pond 0%
Pleasant Bay 50%
Ryders Cove 75%
Frost Fish Creek 100%
Bassing Harbor 0%
Upper Muddy Creek 100%
Lower Muddy Creek 76%

WR8. Efforts to comply with the TMDL by reducing nitrogen loading are expected to result in: 1) restoration of natural distribution of eelgrass as a habitat for shell and finfish, 2) prevent algae blooms, 3) protect benthic communities from impairment or loss, and 4) maintain dissolved oxygen concentrations that are protective of estuarine environments.

WR9. The TMDL requires monitoring of marine water quality at sentinel stations as shown on Exhibit B, appended to this decision and incorporated by reference, to provide for a primary measure of success of the CWMP goal to restore water quality. The TMDL provides nitrogen water quality targets for those embayments in comparison to present observed nitrogen concentrations, as shown in the Tables 2 excerpted below from the TMDLs for Chatham's South-coastal and Pleasant Bay embayment systems.

**TABLE 2. "Existing" Total Nitrogen Concentrations (Observed and Modeled) and Calculated Target Threshold Nitrogen Concentrations Derived for the Southern Chatham Embayment Systems.** Concentrations appear as ranges when two or more segments of the water body were sampled.

| Embayment Systems and Sub-Embayments | Observed Total Nitrogen Concentration [1] (mg/L) | System Threshold Nitrogen Concentration (mg/L) |
|---|---|---|
| **Stage Harbor** | | |
| Oyster Pond | 0.51-0.74 | 0.38 (near sta CM1-A) |
| Oyster Pond River | 0.49 | |
| Stage Harbor | 0.39-0.50 | |
| Mitchell River | 0.46 | 0.38 (near sta CM5-A) |
| Mill Pond | 0.49 | |
| Little Mill Pond | 0.74 | |
| **Sulphur Springs** | | |
| Sulphur Springs | 0.58 | 0.38 (sta CM 8) |
| Bucks Cr | 0.52 | |
| Cockle Cove Cr | 0.73-1.86 | |
| Taylors Pond | | |
| Mill Cr | 0.52 | |
| Taylors Pond | 0.53 | 0.38 (sta CM 10) |

[1] Based on annual means from 1999 – 2005. Individual yearly means and standard deviations of the average are presented in Tables A of Appendix A

**Table 2. Observed present nitrogen concentrations and target threshold nitrogen concentrations derived for the Pleasant Bay System**

| Subembayments (Sentinel Stations are in bold) | Sub-embayment Observed Total Nitrogen Concentration [1] (mg/L) | Sub-embayment Observed Bioactive Nitrogen Concentration (mg/L) | Target Threshold Bioactive Nitrogen Concentrations (mg/L) |
|---|---|---|---|
| Muddy Creek-upper (PBA-05a) | 1.26 | 0.70 | 0.41 |
| Muddy Creek-lower (PBA-05) | 0.57 | 0.24 | 0.21 |
| Pleasant Bay | 0.44-0.73[2] | 0.14-0.19[2] | 0.16 |
| Ryders Cove (PBA-03) | 0.42-0.72[2] | 0.16-0.25[2] | 0.16 |
| Frost Fish Creek-lower (M-14) | 1.16 | 0.35 | 0.17 |
| Crows Pond (PBA-04) | 0.84 | 0.21 | 0.15 |
| Bassing Harbor (PBA-022) | 0.49 | 0.12 | 0.12 |
| Chatham Hbr – upper (PBA-01) | 0.35-0.43[2] | 0.10-0.11[2] | 0.10 |
| Atlantic Ocean (Boundary Condition) | | 0.09 | |

[1] calculated as the average of the separate yearly means of 2000-2005 data. Overall means and standard deviations of the average are presented in Tables A-1 Appendix A
[2]listed as a range since it was sampled as several segments (see Table A-1 Appendix A)

WR10. The observed concentration values of Table 2 above are at approximate mid-ebb tide and the threshold values of Table 2 above are the tidal average. The Commission finds that based on MEP Technical Reports included in the materials submitted for the record, that it is generally true that the mid-ebb tide concentration is very close to the tidally averaged concentration, except in areas where there are wide swings like in the channels of tidal rivers that are connected to a high quality open water.

WR11. The FEIR has identified 80 sewersheds including 14 commercial areas that will ultimately be hooked-up to the treatment facility at the end of Phase 2, as shown on Exhibits E and F, appended to this decision and incorporated by reference. Phase 1 includes 57 of the 88 sewersheds and will hook-up 72% of the town. Completion of the Phase 1 sewersheds has been designed to provide compliance with the percent removal of septic system wastewater as specified in the TMDL.

WR12. The CWMP demonstrates compliance with the TMDLs through a commitment to the 20 year Phase 1 sewer plan to remove appropriate levels of nitrogen to comply with TMDL target removal percentages. Chatham Town meeting (2009) has voted for 59.5 million dollars for the "Initial Implementation Phase" of Phase 1, as shown on Exhibit G, as appended to this decision and incorporated by reference. The "Initial Implementation Phase" includes the upgrade to the Treatment facility and installation of the main sewer line that crosses through a number of sewersheds to hook-up areas along Route 28. The Initial Implementation Phase will provide the backbone structure for the subsequent sewer expansions into the Phase 1 and 2 sewersheds. Chatham intends to expedite this initial work using federal Stimulus funds under the American Recovery and Reinvestment Act.

WR13. The town of Chatham has established several criteria that will be used in the process of prioritizing areas for sewering including:

High priority watersheds based on TMDLS;
Related capital projects where projects can be completed with mutual advantage;
Coordination with other infrastructure projects (roads, water, etc.) including Mass Highway Route 28 work;
Coordination with private development and redevelopment that offsets some public expense for infrastructure;
Coordination with regional efforts, and;
Prioritization recommendations of the town's Technical Advisory Group and Water and Sewer Committee.

WR14. The CWMP indicates that "the implementation of Phase 1 (to remediate watershed nitrogen loadings) as the method to meet the TMDLs will require a

period of 20 years. The positive response of water quality and benthic habitat will require several more years, given the lag of groundwater travel time from the watersheds to the estuaries, and the release and flushing of the stored benthic nitrogen loads."

WR15. The CWMP proposes a system of adaptive management to gauge the overall success of meeting the water quality goals.

WR16. The scope of an Adaptive Management Plan, Exhibit A of this decision, with monitoring conditions has been reviewed and agreed upon by the town and Cape Cod Commission.

WR17. The Stage Harbor watershed requires a 100% removal of wastewater nitrogen sources for most of the watershed to achieve TMDL compliance and restore water quality. It is totally contained with in the town boundaries and is adjacent to the Initial Implementation Area.

WR18. Completing the sewering of the Stage Harbor watershed as a priority subsequent to the Initial Implementation Phase will provide for a shorter period of restoration of water quality for this specific system. Completion of sewering within this watershed will also provide a best case for demonstrating the achievement of the CWMP goals through the evaluation and review of project's implementation and monitoring data under the proposed Adaptive Management Plan.

WR19. The CWMP/FEIR provided sufficient documentation to demonstrate that the existing wastewater treatment facility and effluent recharge site could be expanded to provide infiltration capacity to handle the average annual flows of the Phase 2 town-wide plan of 1.9 mgd. The June 2008 Modeling Tech Memo in the CWMP/FEIR Appendix G indicates that at 30 gpm/ft2 an infiltration area of 140,000 to 200,000 ft2 would be needed for Phase 1 and 2 and provide a 100 % redundancy.

WR20. The proposed Orbal treatment will achieve nitrogen concentrations of 3 ppm. The TMDL concentration for Cockle Cove is 3 ppm. Although the Orbal technology is new to Cape Cod, the technology is well founded with there being over 658 installed applications throughout the US with two presently in Massachusetts. The draft groundwater discharge permit application is specifying 3 ppm total nitrogen in the effluent for compliance.

WR21. According to the June 2009 Groundwater Monitoring Report, associated with the Groundwater Discharge Permit, groundwater monitoring of the existing facility consists of measuring water levels at 50 locations and taking groundwater samples from 8 wells at 6 locations three time a year, as shown on Exhibit H, as appended to this decision and incorporated by reference. Samples are analyzed for nitrate, total nitrogen, sodium, temperature, Specific Conductance and pH. Since 2007 analysis also included Total Organic Carbon. Results from the

monitoring program are consistent, indicating treated effluent flow is constrained to the upper aquifer and migrates towards Cockle Cove Creek.

WR22. Groundwater modeling as described in the Technical Memorandum of the CWMP, Appendix G, was performed by the town's consultant and several Linked Water Quality Modeling scenarios conducted by SMAST, as described in the MEP Technical Memorandum of the CWMP, Appendix L, was undertaken by the Town to better gauge the influence of the use of the site relative to receiving downgradient waters of Cockle Cove, Sulphur Springs and Taylor's Pond. The FEIR states that the results show that TMDL will be met at the Sentinel station in Bucks Creek and result in an acceptable nitrogen concentration in Cockle Cove. The modeling also showed compliance with the Taylor's Pond TMDL concentration. The results indicated the TMDL threshold of 0.38 mg/l total nitrogen would be exceeded in Sulphur Springs by 0.02 mg/l to 0.04 mg/l for Phase 1 and 2 conditions. DEP has recommended that the town proceed with the initial Phases of the sewer plan, but undertake further investigations to determine the maximum nitrogen load which can be assimilated in the Buck's Creek/Cockle Cove/Sulfur Springs system.

WR23. Commission finds that it concurs with DEP's recommendation to proceed with the initial Phases of the sewer plan. The resolution of the potential for substantial groundwater underflow, as one component to clarify the assimilative capacity of the system, as discussed in the CWMP, can be addressed by conducting a hydrogeologic investigation of the watershed specific hydrogeological conditions near the mouth of the system.

WR24. A portion of the selected Chatham effluent recharge site is in a Zone II to Chatham's Indian Hill water supply well. The location of such sites in the Zone II is not prohibited by either state or county RPP regulations, when the objective of the facility is to improve water quality. However, recently revised Groundwater Discharge Permit Regulations adopted by the MassDEP includes stringent treatment standards for discharges in Zone IIs. One aspect of these regulations is meant to address the issue of pharmaceuticals and personal care products in wastewater by adopting a very low Total Organic Carbon (TOC) treatment level. The treatment of wastewater as proposed in the CWMP/FEIR will result in an effluent nitrogen concentration of 3 ppm, but to meet the new TOC standard would affect a significant cost to the town. The FEIR included a technical assessment on alternatives to meet this standard including the abandonment or wellhead treatment of the Indian Hill Well as described in the Technical Memorandum contained in the CWMP Appendix Y-1. The provision of high quality untreated drinking water is a goal of the Regional Policy Plan (RPP Water Resources Goal 2.1.1). Commission staff worked with the Cape Cod Water Protection Collaborative and DEP staff to further consider the ramifications and benefits of this new regulation on all Cape Cod Communities. Some relief in the regulations was subsequently adopted by DEP. During the course of the CWMP implementation and bringing new wells online, the town and regulatory agencies

will continue to monitor drinking water and potential changes in aquifer conditions.

WR25. A portion of the discharge site is located in the Zone II and it is unlikely that the pumping conditions of the Zone II delineation will be met over the next 30 years of this project's implementation with the Indian Hill well off-line. Current groundwater modeling indicates that the predominant groundwater flow pattern from the loaded site will be towards the coast, not the interior where the wells are located. The Commission concurs with the resolution that the Town reached with DEP on this matter as described in the meeting notes of February 11, 2009 in the CWMP Appendix Y-2, that the treatment plant can proceed as designed without substantial changes for TOC removal or treatment at the).

WR26. The Commission finds that it concurred with the Draft-CWMP/DEIR proposal that disinfection may not be warranted for treated effluent recharge at this site, given that there is essentially natural pathogen removal through the proposed sand beds and that the predominate groundwater flow direction is towards the coast, not into Water Supply areas. MassDEP has required disinfection and the chosen method is UV radiation.

WR27. The CWMP/FEIR includes a map of the present groundwater monitoring program for the effluent recharge site. The groundwater monitoring program is a component of the DEP Groundwater Discharge Permit which the town recently submitted to DEP. Commission staff will provide input on the monitoring program through that process. The Commission recommends that the program include groundwater monitoring program for water levels, stream flow and water quality, based upon a review of the existing data. Additional parameters such as ammonia, alkalinity should be added and occasional monitoring of TOC and PCPP should be considered by the Technical Review Committee as described in the Adaptive Management Plan scope attached to this decision as Exhibit A.

WR28. The Town of Chatham has been in discussions with the Town of Harwich on their potential shared use of Chatham's wastewater facility site. Because the Harwich CWMP has been delayed, fundamental information on which to base decisions is presently not available. Prior to proceeding with the potential shared use of the site, additional site characterization would need to be conducted to determine 1) if the treatment capacity could be expanded, 2) if the site has the capacity for expanded subsurface disposal and 3) if the assimilative capacity of the downgradient waters can receive the increase of nitrogen load. The Commission finds that allowing for the Town of Harwich to share Chatham's wastewater facility site could be advantageous. Potential shared use of the site would require a modification of this decision in accordance with the Commission's Enabling Regulations Governing Review of DRI.

WR29. The Town of Chatham has adopted a flow-neutral policy position for the CWMP. This policy addresses potential undesired growth that can accompany the installation of sewers. The flow neutral position has been implemented by

the town as a sewer regulation which specifies that a parcel of land for development or re-development is only apportioned that amount of flow that would be allowed under Title 5 and/or other town health regulations. This does not mean that the CWMP limits all growth. The design sewer flow incorporates additional flows for buildout conditions according to zoning. The buildout conditions predict a 33% and 35% increase for commercial and residential flows respectively. This is a conservative approach to designing flow capacity for the treatment facility. The CWMP also designates additional increase of 13% of existing commercial flows for infilling, affordable housing, laundry and Chatham Bars Inn.

WR30. Commission staff is working with the DEP to develop regulatory guidelines that will be used for evaluating flow-neutral policies related to the Environmental Bond Bill and SRF applications for 0% loans. It is likely that these regulations will become effective during the course of the CWMP implementation.

WR31. The CWMP/FEIR addresses a number of regional wastewater management issues within the context of Chatham's demonstrated need. The CWMP, in response to a question from the Pleasant Bay Alliance, indicates that sewer extensions for the Phase 1 Plan would prioritize the reduction of nitrogen in the watersheds to the south coastal embayments to Stage Harbor, Sulphur Springs, and Taylor's Pond.

WR32. The Commission recommends that the town participate in a regional study that will integrate the progression of planned sewering in the collective Pleasant Bay watershed with MEP scenarios to project the progress of improved water quality in the Bay. This assessment would be done independent of the FEIR/DRI timeframe, but inform decisions about the plan's phased implementation.

WR33. The reductions of nitrogen in the shared watersheds to Pleasant Bay including Muddy Creek involve neighboring towns of Harwich, Orleans and Brewster. A substantial portion of the Muddy Creek watershed falls in the Town of Harwich. Commission staff provided a nitrogen loading breakdown by town for the Pleasant Bay Resource Management Alliance Working Group. The existing attenuated nitrogen load for Muddy Creek is comprised of 36% from Chatham and 64% from Harwich. The Chatham CWMP/FEIR refers to discussions to potentially accept additional wastewater from the Muddy Creek watershed portion of Harwich.

WR34. Enhanced natural attenuation and tidal flushing are other potential approaches for reducing nitrogen in the watershed to Muddy Creek and potentially other systems. The CWMP/FEIR indicates that the response to preliminary characterization work conducted to modify a dike on the upper portion of Muddy Creek to convert it from a brackish to freshwater system to enhance attenuation was met with citizen opposition. According to the CWMP/FEIR this regional effort is presently targeting inlet modification over stream flow modifications. A

recent draft report by Applied Coastal Engineering Resources indicates that tidal flushing of Muddy Creek can be substantially improved with a 24 ft culvert.

WR35. The CWMP/FEIR indicates the town will continue to participate and be open to potential regional opportunities for shared management, infrastructure and enhanced natural attenuation.

WR36. The Town of Chatham is a Phase II regulated community for Stormwater management CWMP, which indicates that the Town has made excellent progress on its Stormwater management efforts and that it will continue to work with other towns and the region on educational efforts, including the Pleasant Bay Alliance and Project Storm. Continued implementation of the Stormwater management will further reduce nitrogen from run sources and also address phosphorous and bacterial sources from runoff.

WR37. The Chatham CWMP/FEIR outlines an Adaptive Management Plan to help guide the implementation of the Plan and to monitor its success. Items outlined include:

- Implementation of Plan
- Documentation of capital expenditures
- Compliance with the groundwater discharge permit
- Reporting on Estuary water quality monitoring
- Summary of habitat assessments that may be completed by the Town, MassDEP, regional organizations, or others
- Continued coordination with the Pleasant Bay Alliance who is coordinating MEP model runs for the Pleasant Bay estuary
- Potential evaluations and changes as needed

WR38. Commission staff in its report to the Cape Cod Commission subcommittee indicated that it has worked with the town and its consultant to provide additional detail on the Adaptive Management Plan. A scope for the Adaptive Management Plan is included with this decision as Exhibit A. Additional items in the Adaptive Management Plan Scope include:

- Reporting of the above data and its use for demonstrating achievement of the water quality goals of the TMDL,
- Reporting progress on the status of the CWMP implementation in regards to the areas sewered and percent of nitrogen removed and comparison to targeted percent removals,
- Estimated and planned accomplishments at regular intervals through Phase 1
- Incorporation of results from MEP scenarios being performed for neighboring towns,
- As sewering increases and potential water supplies are added over the long term that additional groundwater modeling should be conducted when necessary

WR39. In conclusion, Chatham's CWMP/FEIR/DRI represents the region's first truly comprehensive management plan to address coastal water quality degradation. Cape Cod Commission staff recommends approval of the Chatham CWMP/FEIR/DRI with conditions specific to monitoring, reporting, implementation schedule and adaptive management.

## CONCLUSION

Based on the findings above, the Commission hereby concludes:

- The proposed project is consistent with the applicable Minimum Performance Standards of the Regional Policy Plan.
- The proposed project is consistent with Chatham local development by-laws.
- The project does not fall within a District of Critical Planning Concern (DCPC).
- The probable benefits of the proposed project outweigh the probable detriments resulting from the development. Project benefits include:
    - Reduction in nitrogen load
    - Reduction in wastewater flows
    - Significant stormwater improvements, including LID-measures, pre-treatment and improved quality
    - Decrease in traffic generated
    - Decrease in impervious coverage
    - Increase in naturally vegetated areas
    - Increased tax revenue
    - Reduction in quantity of hazardous materials

The Commission hereby approves with conditions the application of the Town of Chatham CWMP project as a DRI, provided the following conditions are met:

### General Conditions

G1. This DRI decision is valid for 7 years. The Town of Chatham shall seek an extension of this DRI permit prior to the expiration of this DRI in accordance with the Commission's Enabling Regulations.

G2. The proposed project shall be constructed and implemented in accordance with the Final Comprehensive Wastewater Management Plan/Final Environmental Impact Report, May 2009, prepared by Stearns and Wheler, consistent with the findings and conditions of this decision and contingent upon Town Meeting funding. Changes to the CWMP that would affect TMDL

compliance or otherwise change or impact the findings and/or conditions of this decision, shall be reviewed and evaluated through a modification to the DRI decision pursuant to the Commission's Enabling Regulations in effect at the time of the request. The applicant shall submit to the Commission any additional information deemed necessary to evaluate any modifications to the approved plan.

G3. On or before October 29, 2015, the Applicant may return to the Commission to seek an extension of this decision by the Regulatory Committee of the Commission. If said extension is approved, said extension may allow the Applicant to return to the Commission one year prior to the expiration of the extension decision to seek either a renewal or further extension of the DRI approval in accordance with the Commission's Enabling Regulations in effect at the time of the request.

G4. Failure to comply with all conditions stated herein, and with all related statutes and other regulatory measures, shall be deemed cause to revoke or modify this decision

G5. The applicant shall construct and implement the development in accordance with the Adaptive Management Plan. The Adaptive Management Plan scope (Exhibit A) is attached to and incorporated into this decision by reference.

**Natural Resources**

NR1. Sewer work within the roadway or road layout that may result in impacts within the 100 ft buffer to wetlands or vernal pools shall be permitted by the Chatham Conservation Commission. Potential impacts to rare species should be reviewed, and permits filed as necessary; as the specific placement and construction phase of pumping stations occurs, each should be reviewed for impacts to rare species.

**Historic and Archaeological Resources**

HR1. Before beginning construction of any subsurface work, the Applicant shall contact MHC for a determination of whether a review of the project is necessary in order to protect archaeologically sensitive areas, and the applicant shall conduct such review as required by MHC.

HR2. If aboveground structures necessary for the project are located near or adjacent to historic areas/structures or cultural landscapes, or both, the Applicant shall contact MHC and the Town of Chatham Historic Business District Commission, as applicable, to determine whether a review of the project is necessary by either. The applicant shall conduct such reviews as required by MHC or the Town of Chatham Historic Business District Commission, or both.

**Water Resources**

WR1. Upon approval of the Development of Regional Impact, the Town of Chatham shall submit on-going copies of Ground Water Discharge Permit monitoring and compliance reports, as identified in the Adaptive Management Plan scope attached to this decision as Exhibit A, simultaneously with submission to DEP to the Cape Cod Commission.

WR2. Upon approval of the Development of Regional Impact, the Town of Chatham shall submit copies of public drinking water laboratory results and Annual Statistical Reports, simultaneously with submission to DEP to the Cape Cod Commission.

WR3. Within 6 months of the approval of the DRI, the Town shall convene a Technical Review Committee comprised of town, DEP and Commission staff, as described below in the Adaptive Management Plan scope of Exhibit A of this decision.

WR4. Sewering of Phase I areas, to achieve compliance with the TMDL, shall be prioritized over Phase 2 areas, to the extent practicable. The extent of practicability, as defined in Finding WR13 shall be determined in consultation with the Commission.

WR5. After the Initial Implementation Phase is completed, sewer hook-ups for the Stage Harbor Oyster River and Oyster Pond watershed areas should be prioritized within the Phase 1 Area, to the extent practicable, so that the TMDL required percent nitrogen removals are achieved expeditiously for the Stage Harbor, Oyster River and Oyster Pond Watersheds. The extent of practicability as defined in Finding WR13, shall be determined in consultation with the Commission.

WR6. Regional opportunities to achieve TMDL compliance for Muddy Creek and infrastructure sharing with Harwich, and other opportunities for regional wastewater management, shall be evaluated prior to implementing the Phase 2 expansion of the wastewater treatment facility.

WR7. As the town continues to regularly evaluate the health of the ponds and progresses in its in-pond and watershed protection efforts according to the Action Report contained in the CWMP, reporting on improvements in water quality or new efforts as it may relate to the CWMP implementation shall be included under Non-Structural Management actions as indicated in the Adaptive Management Plan Scope, Exhibit A of this decision.

WR8. As the town continues to regularly evaluate, manage and improve stormwater

collection and treatment, as indicated in the CWMP, reports on improvement of water quality and progress as it relates to the CWMP and Stormwater Phase II regulations shall be included under Non-Structural Management actions as indicated in the Adaptive Management Plan Scope, Exhibit A of this decision.

WR9. As the town continues to assess opportunities for Enhanced Natural Attenuation or tidal flushing to reduce watershed nitrogen loads and improve stormwater collection and treatment, as indicated in the CWMP, reports on improvement of water quality and progress as it relates to the CWMP shall be included under Non-Structural Management actions as indicated in the Adaptive Management Plan Scope, Exhibit A of this decision.

WR10. Implementation of Enhanced Natural Attenuation or tidal flushing to alter the implementation of the CWMP shall require consultation with the Commission.

WR11. Modeling by SMAST indicates that the nitrogen loads from the proposed sewage treatment plant at future flows will not meet the nitrogen threshold at the sentinel stations at Buck's Creek. DEP's has recommended that the town proceed with the initial Phases of the sewer plan, but undertake further investigation to clarify the maximum nitrogen load which can be assimilated in the Buck's Creek/Cockle Cove/Sulfur Springs system. The resolution of the potential for substantial groundwater underflow, as one component to clarify the maximum nitrogen load, as discussed in the CWMP, shall be addressed by conducting a hydrogeologic investigation of the watershed specific hydrogeological conditions near the mouth of the system, unless the town is able to demonstrate to the satisfaction of the Commission that the assimilative capacity of the system can otherwise be achieved or mitigated to achieve the TMDL.

WR12. The Town of Chatham shall continue to participate in a regional study that will integrate the progression of regional planned sewering in the collective Pleasant Bay watershed with MEP scenarios to evaluate the progress of improved water quality in the Bay. This assessment would be done independent of the FEIR/DRI timeframe, but may inform decisions about the plan's phased implementation.

WR13. The Town shall submit for Commission staff approval an Adaptive Management Plan that incorporates the scoping items for monitoring, evaluation and reporting as described in Exhibit A, attached to this decision, of the approval of the DRI according to the timetable below. The AMP shall detail the resources necessary to implement the aspects of the Plan.

a. Initial Meeting with staff within 6 months of the decision
b. Submit initial draft within one year of the decision.
c. Submit Final Adaptive Management Plan for approval within 2 years of the decision.

WR14. Implementation Progress Reports described in the Adaptive Management Plan scope, Exhibit A of this decision, shall be submitted to Commission staff for review and approval every 2 to 3 years or simultaneously with a Project Evaluation Form submitted to DEP as part of the State Revolving Loan Application.

WR15. Marine and Surface Water Monitoring Reports of the Adaptive Management Plan Scope, Exhibit A of this decision shall be filed every 2 years. The Technical Review Committee comprised of Cape Cod Commission staff, DEP and the Town shall review the monitoring reports not less than every 5 years for modifications or changes to the monitoring program.

The Cape Cod Commission hereby approves with conditions the application of the Town of Chatham for the Development of Regional Impact as outlined in this decision pursuant to Sections 12 and 13 of the Act, c 716 of the Acts of 1989, as amended for the proposed Chatham Comprehensive Wastewater Management Plan.

29 Oct 2009

John D. Harris
Commission Chair

Date

COMMONWEALTH OF MASSACHUSETTS

Barnstable, ss Oct 29, 2009

Before me, the undersigned notary public, personally appeared _____, in his/her capacity as Chairman of the Cape Cod Commission, whose name is signed on the preceding document, and such person acknowledged to me that he/she signed such document voluntarily for its stated purpose. The identity of such person was proved to me through satisfactory evidence of identification, which was [ ] photographic identification with signature issued by a federal or state governmental agency, [ ] oath or affirmation of a credible witness, or [✓] personal knowledge of the undersigned.

Notary Public

My Commission Expires:
10, 13, 11

**Exhibit A - Adaptive Management Plan Scope**

The Decisions for Adaptive Management of the plan's implementation shall be based upon the review and evaluation of the monitoring and implementation conditions outlined above. The town shall establish a technical review committee comprised of representatives including, but not limited to, the town, DEP and Cape Cod Commission. The TRC shall meet as required to review the plan's implementation status and monitoring components and provide input to the town's decisions for next steps. Items to be considered as part of the Adaptive Management Plan include but are not limited to:

- Implementation of Plan
- Documentation of capital expenditures
- Compliance with the groundwater discharge permit
- Reporting on Estuary water quality monitoring
- Summary of habitat assessments that may be completed by the Town, MassDEP, regional organizations, or others
- Continued coordination with the Pleasant Bay Alliance
- Potential evaluations and changes as needed

The primary purpose of the AMP is to insure the cost-effective achievement of the Town's CWMP goal to restore impaired marine water quality and habitat. The CWMP will achieve this goal by sewering in the Phase 1 Area over the course of the next 20 years. There are several types of monitoring and evaluation components of the AMP:

**Implementation Progress Reports– measuring progress**
Monitoring and reporting on the progress of the plan is one component of the type of review that the Commission and DEP will require to ensure that the CWMP is implemented. Major milestones for the project as described in the CWMP are:

- Initial Sewer Area to be completed in 2012
- Phase I sewer areas shall be prioritized over Phase II Areas
- Regional opportunities to achieve TMDL compliance for Muddy Creek and infrastructure sharing with Harwich, and other opportunities for regional wastewater management, shall be evaluated prior to implementing the Phase II wastewater facility expansion.

The following items shall be included for measuring progress on the plan's implementation including milestones where appropriate. Implementation Progress Reports shall be submitted to the Commission together with any Project Evaluation Form also submitted to DEP or every 2 to 3 years and include the following:

1) Capital Expenditures to date
2) Amount sewered
3) Percent removed from Phase I watersheds

4) Comparison to TMDL target amounts
5) Planned Capital Expenditures
6) Projected Expansion areas to be serviced in the next two years
7) Status of Regional watershed management opportunities

**Groundwater Discharge Permit**
Monitoring according to the GWDP is another component of review that will ensure the treatment facility is complying with its treatment goals and compliance with the Regional Policy Plan and TMDLs of the receiving waters. Monitoring in the receiving waters downgradient of the facility will ensure that the reconfiguration of nitrogen loads in those watersheds (sewering to remove loads in the watersheds vs. additional loads from outside of the watersheds) will be protective of those resources.

- Convene Technical Review Committee to review Permit
  Evaluate past monitoring
  Identify wells, parameters and frequency of monitoring
  Identify stream monitoring locations for flow and quality
  Identify marine water monitoring locations and frequency
- Provide for baseline measurements and phased in monitoring in adjacent receiving watersheds based upon phased in increases of discharge from the facility.
- Reporting to the Commission Simultaneous with DEP submission
  WWTP –Flow Rate – measured daily & monthly with averages
  WWTF - Quality-influent/effluent monthly
  Monitoring Wells - Annually
  Groundwater quality -parameters such as ammonia, alkalinity should be added TOC and PCPPs should be monitored every five years
  Water Table Elevations to evaluate mounding
  Stream flow – continuous stage recorder should be deployed
  Marine Water quality at Sentinel Stations - seasonally

**Marine Water Quality and Habitat**
Monitoring of marine waters in the targeted Phase 1 watersheds which presently exceed nitrogen-TMDLs will provide confirmation that the project's goals are ultimately met.

- Surface Water Quality– Seasonally with Report submitted at a frequency to be decided by the TRC but no less than every 5 years
  Marine –
  Sentinel Stations
  Others to be determined by the TRC (Streams, tributaries…)
  Eelgrass – to be conducted by Mass DEP

Benthic - to be decided by the TRC but no less than every 5 years

**Non Structural Management,** (as appropriate for demonstrating achievement of related CWMP goals)

Stormwater management
Freshwater ponds – sewering in watersheds, in-pond restoration, monitoring
Enhance Natural Attenuation and/or tidal flushing

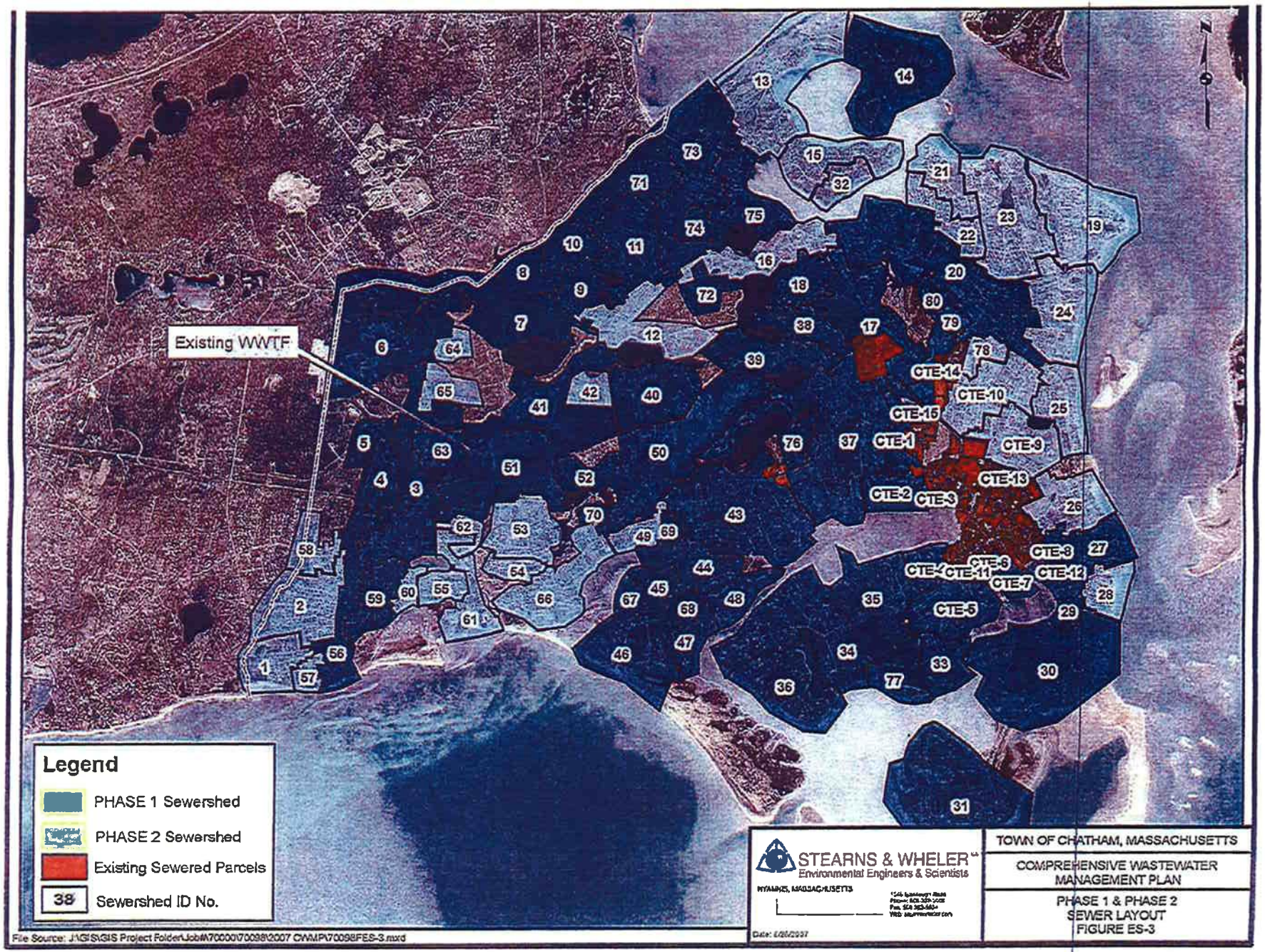

Existing WWTF
Legend
PHASE 1 Sewershed
PHASE 2 Sewershed
Existing Sewered Parcels
38 Sewershed ID No.
STEARNS & WHELER
Environmental Engineers & Scientists
HYANNIS, MASSACHUSETTS
TOWN OF CHATHAM, MASSACHUSETTS
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
PHASE 1 & PHASE 2 SEWER LAYOUT
FIGURE ES-3
File Source: J:\GIS\GIS Project Folder\Job#\70000\70098\2007 CWMP\70098FES-3.mxd

Exhibit B

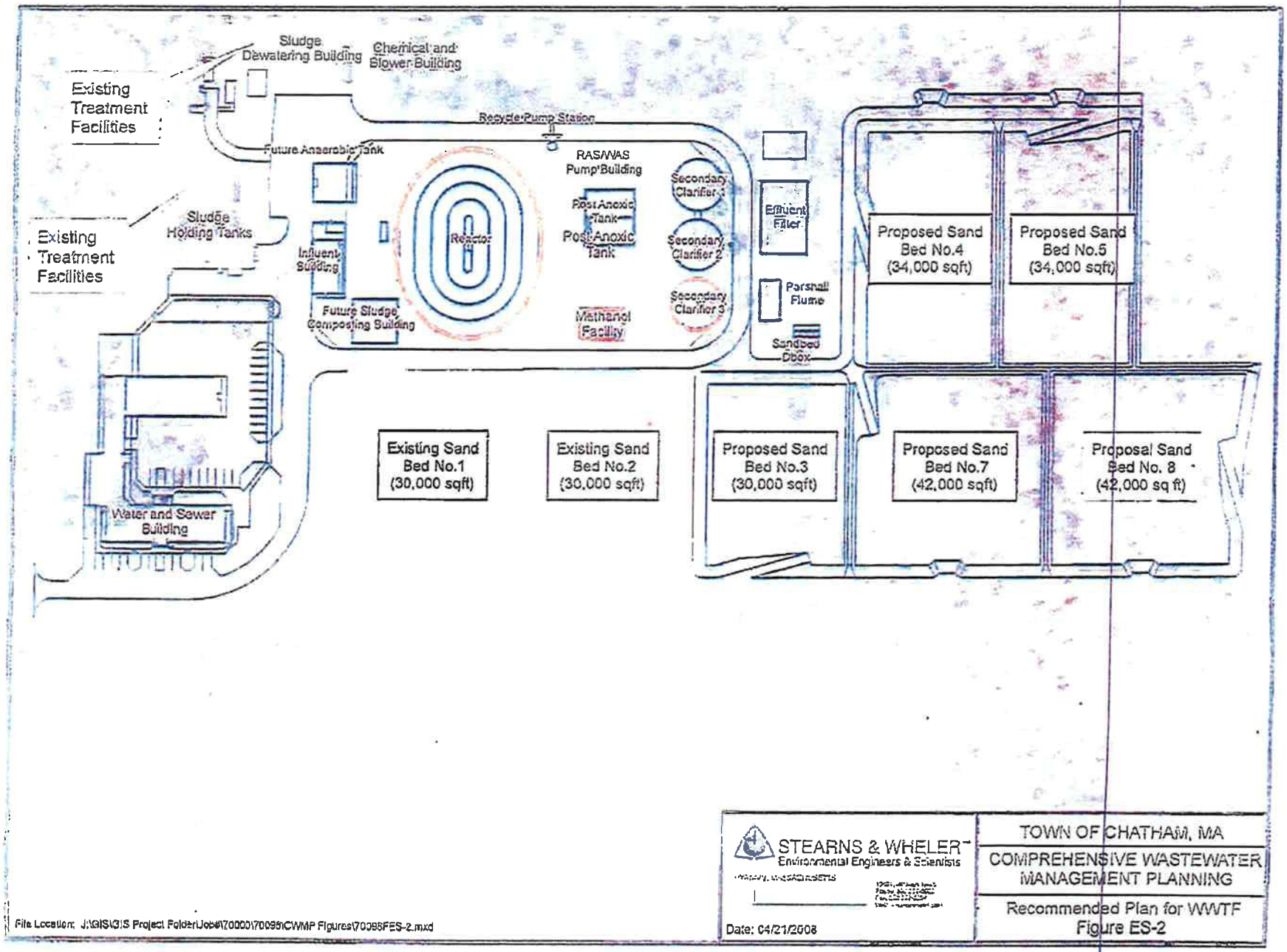

Sludge Dewatering Building
Chemical and Blower Building
Existing Treatment Facilities
Recycle Pump Station
Future Anaerobic Tank
RAS/WAS Pump Building
Secondary Clarifier 1
Post Anoxic Tank
Post-Anoxic Tank
Secondary Clarifier 2
Effluent Filter
Sludge Holding Tanks
Existing Treatment Facilities
Influent Building
Reactor
Secondary Clarifier 3
Parshall Flume
Future Sludge Composting Building
Methanol Facility
Sandbed Dbox
Proposed Sand Bed No.4 (34,000 sqft)
Proposed Sand Bed No.5 (34,000 sqft)
Existing Sand Bed No.1 (30,000 sqft)
Existing Sand Bed No.2 (30,000 sqft)
Proposed Sand Bed No.3 (30,000 sqft)
Proposed Sand Bed No.7 (42,000 sqft)
Proposal Sand Bed No. 8 (42,000 sq ft)
Water and Sewer Building
STEARNS & WHELER
Environmental Engineers & Scientists
TOWN OF CHATHAM, MA
COMPREHENSIVE WASTEWATER MANAGEMENT PLANNING
Recommended Plan for WWTF
Figure ES-2
Date: 04/21/2008
File Location: J:\GIS\GIS Project Folder\Jobs\70000\70095\CWMP Figures\70095FES-2.mxd

**Exhibit C**

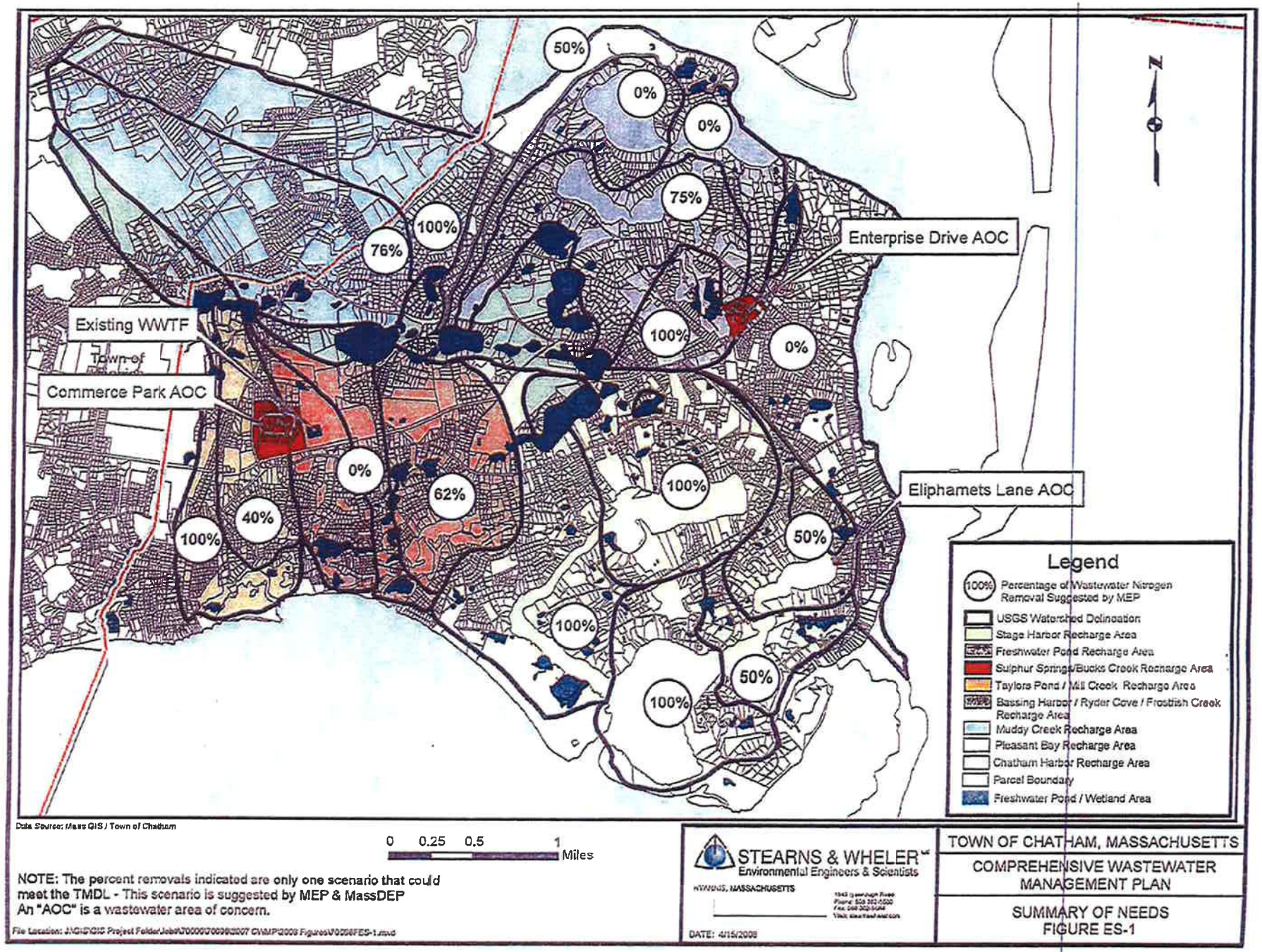
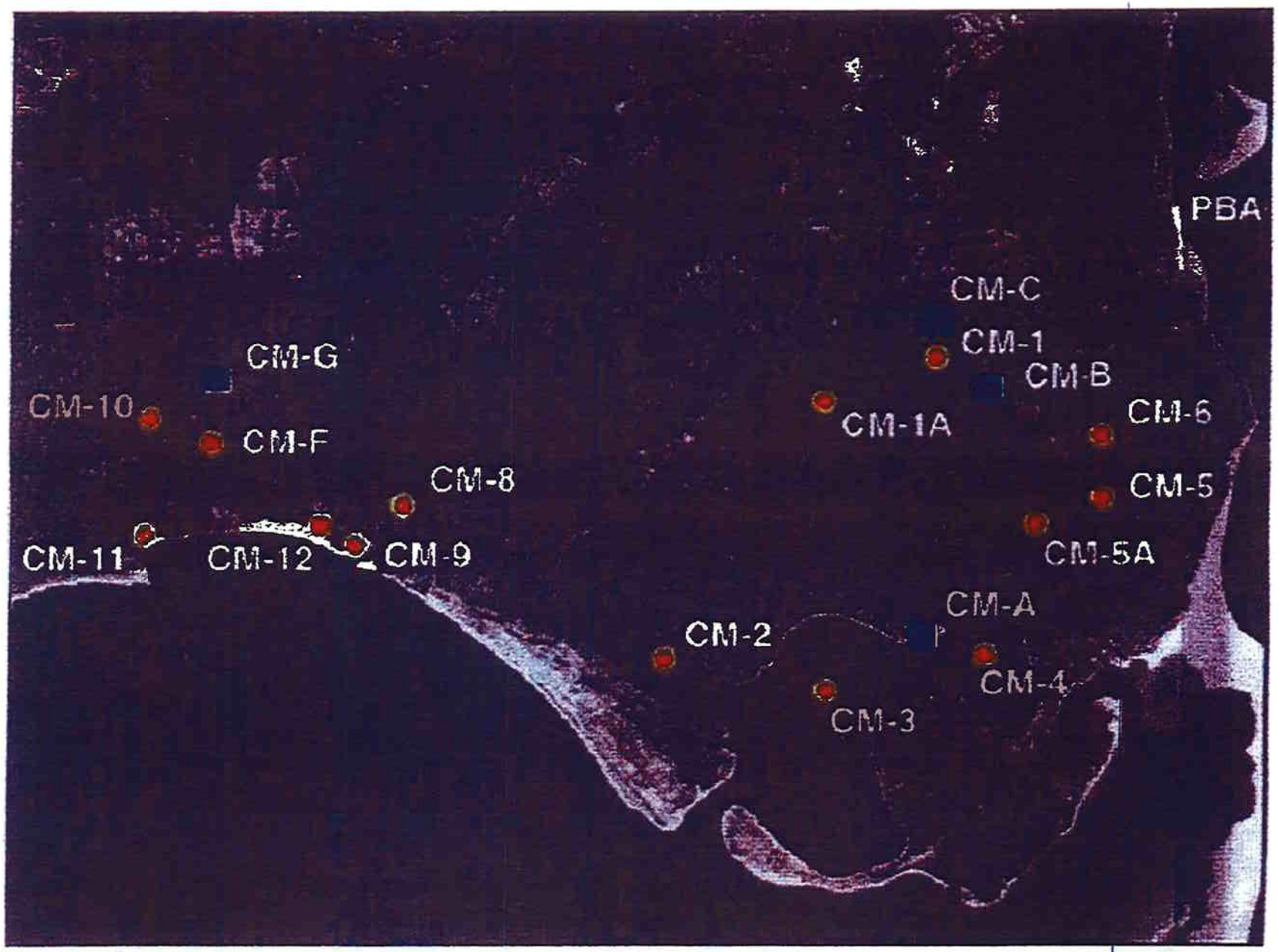

50%
0%
0%
75%
100%
76%
Enterprise Drive AOC
Existing WWTF
Town of
Commerce Park AOC
100%
0%
0%
62%
40%
100%
100%
50%
Eliphamets Lane AOC
100%
50%
100%
N
Legend
100% Percentage of Wastewater Nitrogen Removal Suggested by MEP
USGS Watershed Delineation
Stage Harbor Recharge Area
Freshwater Pond Recharge Area
Sulphur Springs/Bucks Creek Recharge Area
Taylors Pond / Mill Creek Recharge Area
Bassing Harbor / Ryder Cove / Frostfish Creek Recharge Area
Muddy Creek Recharge Area
Pleasant Bay Recharge Area
Chatham Harbor Recharge Area
Parcel Boundary
Freshwater Pond / Wetland Area
Data Source: Mass GIS / Town of Chatham
0 0.25 0.5 1 Miles
NOTE: The percent removals indicated are only one scenario that could meet the TMDL - This scenario is suggested by MEP & MassDEP
An "AOC" is a wastewater area of concern.
STEARNS & WHELER
Environmental Engineers & Scientists
HYANNIS, MASSACHUSETTS
DATE: 4/15/2008
TOWN OF CHATHAM, MASSACHUSETTS
COMPREHENSIVE WASTEWATER MANAGEMENT PLAN
SUMMARY OF NEEDS
FIGURE ES-1

**Exhibit D**




Map of freshwater discharge (blue squares) and estuarine (red circles) water quality monitoring stations within the Town of Chatam's southern three estuaries.


I-1. Estuarine water quality monitoring station locations in the Pleasant Bay system. Station labels correspond to those provided in Table VI-1.

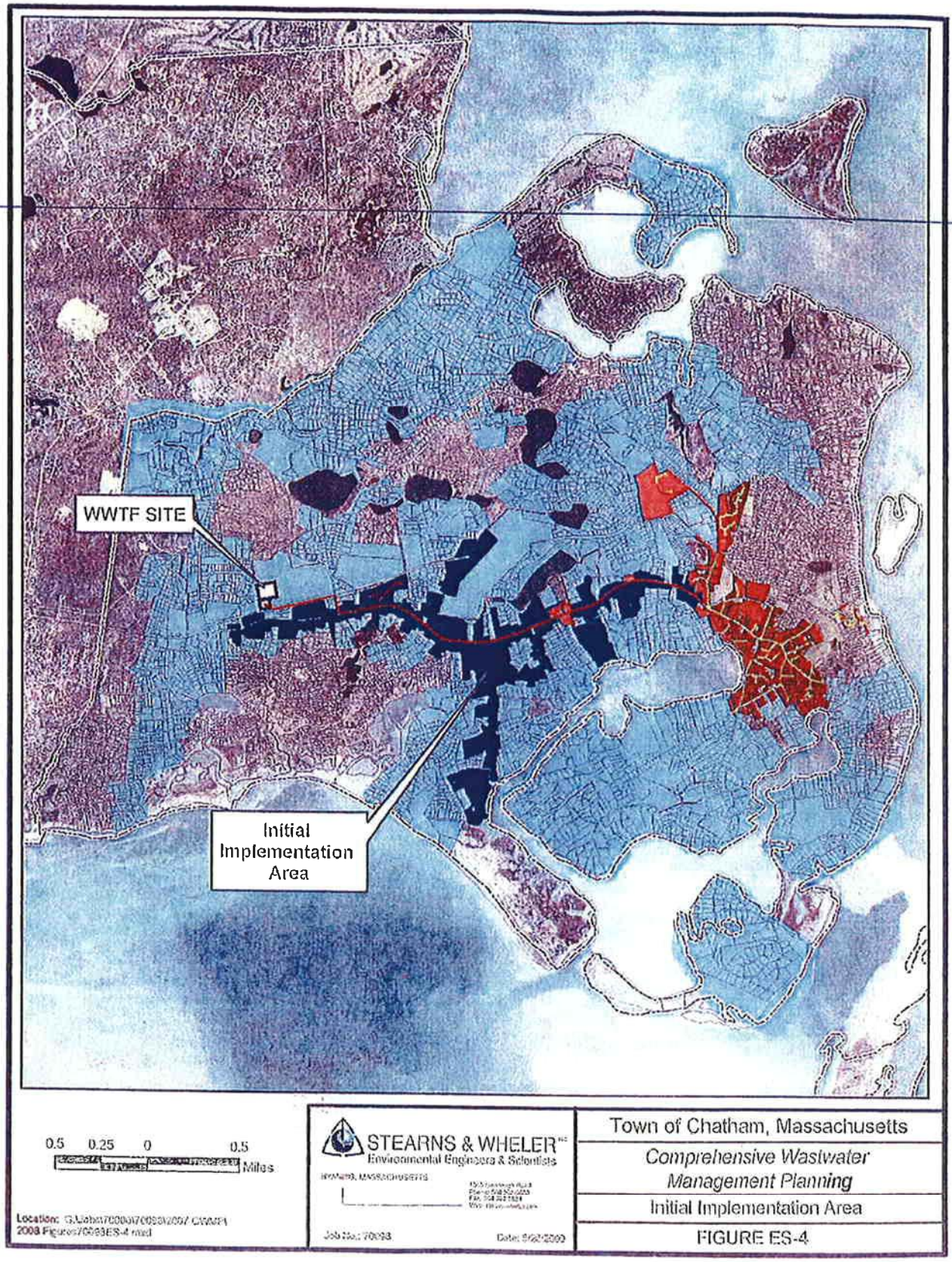

WWTF SITE
Initial Implementation Area
0.5 0.25 0 0.5
Miles
STEARNS & WHELER
Environmental Engineers & Scientists
Town of Chatham, Massachusetts
Comprehensive Wastwater Management Planning
Initial Implementation Area
FIGURE ES-4

Exhibit G

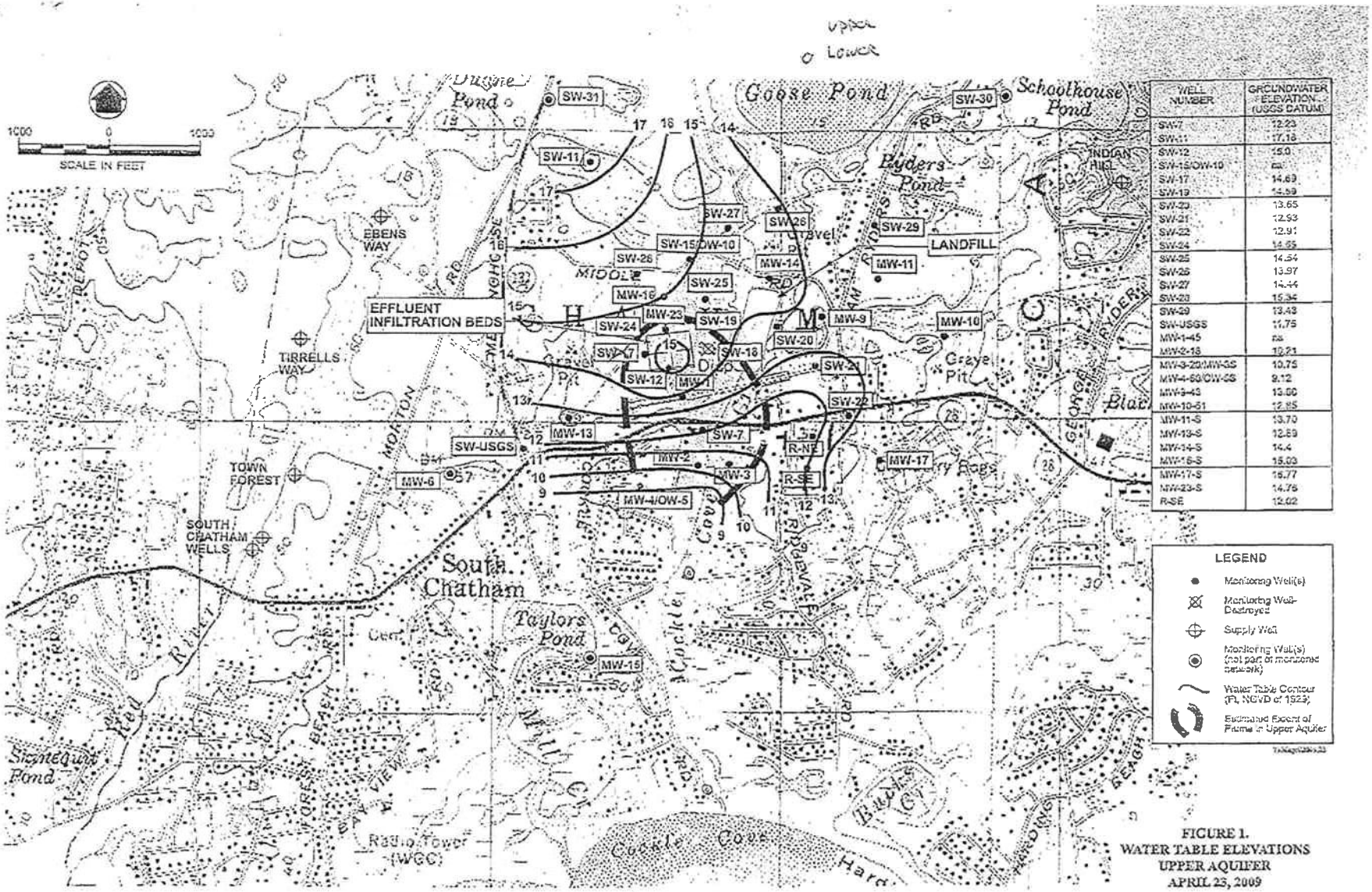



FIGURE 1.
WATER TABLE ELEVATIONS
UPPER AQUIFER
APRIL 23, 2009

DEP Ground Water Discharge Permit data point and water table map

**Exhibit H**

# Appendix F

## Rules and Regulations of the Sewer Department (Flow Neutral Regulation)

**Town of Chatham**
**Rules and Regulations of the Sewer Department**

**Adopted by Town Meeting on May 9, 2005**

## ARTICLE II
## Regulation of Sewer Flow

**Section 1. Existing Structures.**

Any structure in existence on May 10, 2005 regardless of its flow, may maintain that flow. No person shall modify an existing structure or change its use so as to increase its sewage flow. Design criteria contained in 310 CMR 15.203, and any local Board of Health Regulation modifying such shall be used to determine whether a proposed modification or change in use shall constitute an increase in sewage flow. Expansion or modification of existing structures, which may result in increased flow, shall not be allowed unless the increase is in compliance with the Board of Health's Regulations in effect on May 10, 2005 or a variance pursuant to Section 5 below is first obtained; except as currently allowed under part #1 of the Town of Chatham "Sewer Bank" Allocation & Permit Policy for properties connected to the sewer as of May 10, 2005.

**Section 2. Determination of Sewage Flow.**

Sewage flow to the municipal sewer shall be determined using provisions set forth in 310 CMR 15.203: System Sewage Flow Design Criteria and any local Board of Health Regulation modifying such in effect on May 10, 2005. The owner of any property shall, upon reasonable notice and request, allow an inspection of a property for a determination of flow by an agent of the Board of Health, except that in lieu of this inspection, the owner of the property may submit a floor plan with sufficient detail to account for all outside structure dimensions. This floor plan must bear the signature of approval of a Certified Septic System Inspector.

**Section 3. Undeveloped Parcels.**

For the purpose of determining sewer flow, any existing lot, otherwise qualified, may be permitted for that sewage flow as determined under the Board of Health's Regulations in effect on May 10, 2005 or 310 CMR 15.000 et seq, whichever is less.

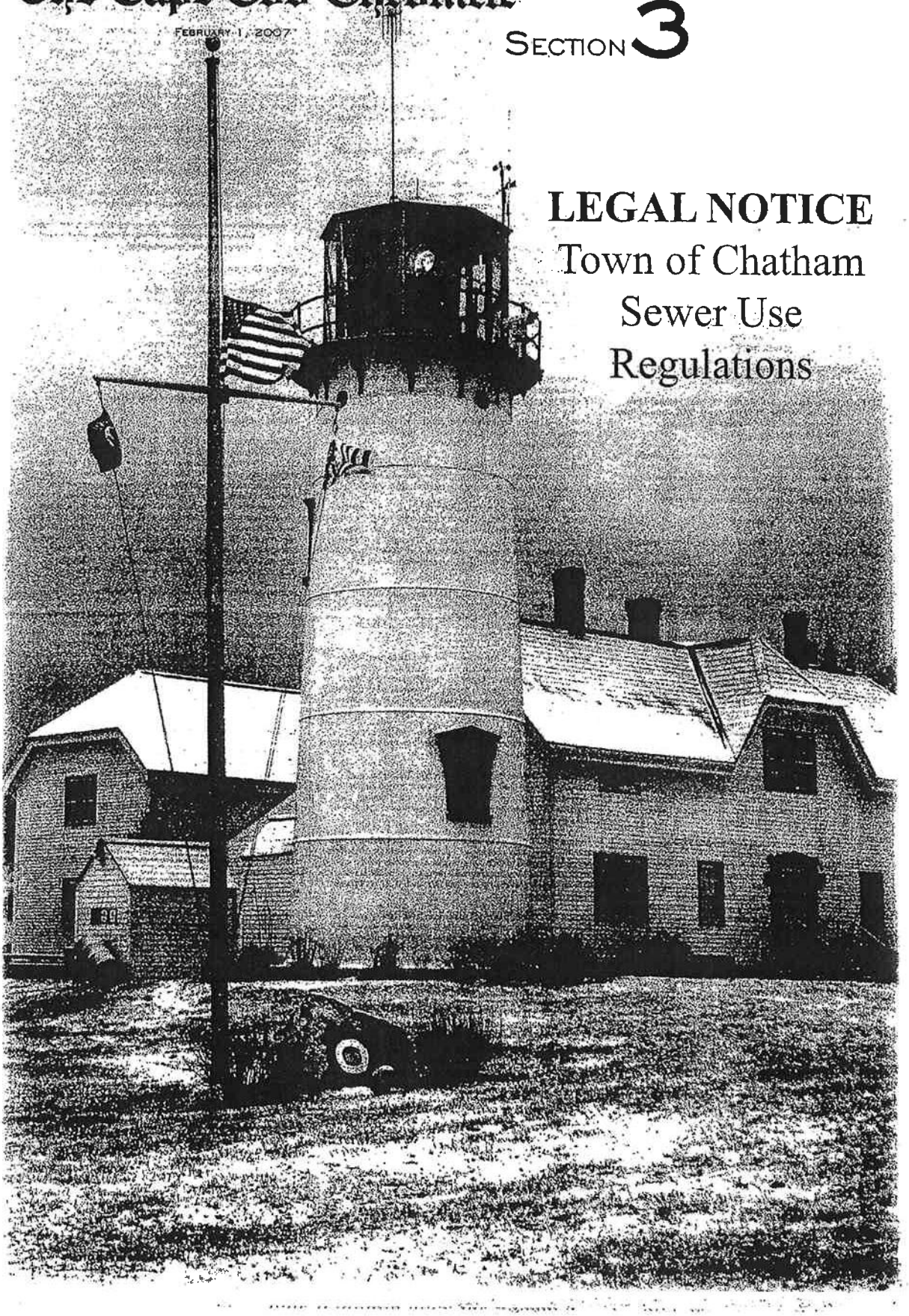
**Section 4. Rebuilding because of fire, flood, storm or other acts of nature.**

A property owner may rebuild a structure destroyed by fire, flood, storm or other acts of nature as a matter of right provided that the new structure does not exceed the sewage flow of the structure being replaced.

**Section 5. Variances**

In the case of unusual and substantial hardship, not the result of acts or omissions of the landowner, the Board of Water and Sewer Commissioners, after a public hearing of which notice has been given by publication and posting for a minimum of two weeks, may grant a variance to this part of the regulation, provided that sufficient capacity exists and such relief may be granted without substantially derogating from the intent or purpose of this regulation.

The Cape Cod Chronicle
February 1, 2007
Section 3



# LEGAL NOTICE
## Town of Chatham
## Sewer Use
## Regulations

# LEGAL ADVERTISING

LEGAL NOTICE

Town of Chatham
Sewer Use Regulations

The Town of Chatham Board of Selectmen at their Water and Sewer Commissioners' meeting will hold a Public Hearing for the purpose of reviewing the following Annual Town Meeting Article that would revise the Rules and Regulations of the Sewer Department. The Public Hearing is scheduled for 4:15 p.m. on Tuesday, February 20, 2007, in the Selectmen's meeting room, 549 Main Street Chatham, Massachusetts. The public, Chatham sewer customers, and all interested parties are encouraged to attend and comment on the proposed Article.

Article ___ Town of Chatham Rules and Regulations for the Sewer Department

To see if the Town will vote to amend the "Town of Chatham Rules and Regulations of the Sewer Department" adopted under Article 57 of the March 15, 1972 Annual Town Meeting and revised under Article 33 of the May 11, 2004, Annual Town Meeting, and Article 21 of the May 9, 2005, Annual Town Meeting, as set forth below:

A line through words indicate deletions "~~word~~"

*Word typed in italics indicate additions.*

TOWN OF CHATHAM
RULES AND REGULATIONS
OF THE
SEWER DEPARTMENT

ADOPTED: Under Article 57 of the March 15, 1972, Annual Town Meeting

REVISED: Under Article 33 of the May 11, 2004, Annual Town Meeting, Article 21 of the May 9, 2005, Annual Town Meeting, *and Article Number and Annual Town Meeting Date to be Inserted*

An ordinance regulating: the use of public and private sewers and drains; the installation and connection of building sewers; the discharge of water and wastes into the public sewer system(s); and providing penalties for violations thereof, in the Town of Chatham, County of Barnstable, Commonwealth of Massachusetts.

*Purpose*

*The purpose of the Rules and Regulations of the Sewer Department of the Town of Chatham are:*

- *a) To establish the technical and administrative procedures for making connections to the sanitary sewer system including standards of materials and design.*
- *b) To establish requirements, restrictions, and controls on the quantities and quality of what may be discharged to the sanitary sewer system; such as discharges that may:*
  1. *Interfere with the operation of the sewer system, pump station or publicly owned treatment works (POTW) in any way;*
  2. *Pass through the POTW, to the groundwaters, inadequately treated effluent that may cause contravention of standards for these waters or surface waters or cause violation of the POTW's Groundwater Discharge Permit (GWDP) or negatively impact the watershed into which treated effluent is discharged;*
  3. *Reduce the opportunity to reclaim or recycle treated wastewater and/or sludge from the system;*
  4. *Increase the cost or otherwise hamper or limit the disposal of sludges and other residuals;*
  5. *Endanger municipal employees or the public;*
  6. *Cause, directly or indirectly, any public nuisance condition;*
- *c) To prevent new sources of inflow and infiltration and eliminate private source inflow;*
- *d) To provide for equitable distribution to all users of the POTW, all costs associated with the collection, transmission, treatment, and residuals disposal, and to provide for the collection of such costs; and*
- *e) To provide for the orderly planning of sewer systems' and treatment systems' components to improve the health and environmental quality of the Town of Chatham and its people and resources.*

The following rules and regulations are a part of the contract with every person who discharges water and waste into the Town of Chatham Sewer System, and governs the relationship between the Sewer Department and its consumers, contractors and/or developers, and all other persons who install sewers, discharges wastewater, is connected into the sewer system or applies for a connection to the sewer system.

Modifications

Modifications, additions to or rescinding of these rules and regulations may take place from time to time as authorized by a Town Meeting as required by Massachusetts General Laws, Chapter 83, Section 10.

ARTICLE I
DEFINITIONS

Unless the context specifically indicates otherwise, the meaning of terms used in this ordinance shall be as follows:

Section 1. Act" or "the "Act" shall mean the Federal Water Pollution Control Act, also known as the Clean Water Act, as amended, 33 U.S.C. 1251, et seq, and the regulations promulgated thereunder, as amended from time to time.

Section 2. "Board" shall mean the Board of Sewer Commissioners (Board of Selectmen) of the Town of Chatham.

Section 3. "BOD" (Biochemical Oxygen Demand) shall mean the quantity of oxygen utilized in the biochemical oxidation of organic matter under standard laboratory procedures in five (5) days at 20 degrees celsius, expressed in milligrams per liter.

Section 4. "Building Drain" shall mean that part of the lowest horizontal piping of a drainage system which receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer. The building drain ends at the building sewer which begins five (5) feet or (1.5) meters outside the inner face of the building's wall.

Section 5. "Building Sewer" shall mean the extension from the building drain, five feet (5') or one and one half (1.5) meters outside the inner face of the building's wall, to the public sewer or other place of disposal.

Section 6. "Combined Sewer" shall mean a sewer receiving both surface runoff water and sanitary sewage.

Section 7. "Department of Environmental Protection", or "DEP" shall mean the Massachusetts Department of Environmental Protection, established pursuant to M.G.L. Chapter 21, Section 26 or, where appropriate, the Administrator, Director or other duly authorized official of said agency.

Section 8. "Director" shall mean the person appointed by the Town of Chatham Town Manager as the Director of the Water and Sewer Departments of the Town of Chatham, who is vested with the authority and responsibility for the implementation and enforcement of these rules and regulations or his authorized deputy, agent, or representative.

Section 9. "Environmental Protection Agency", or "EPA" shall mean the United States Environmental Protection Agency, or, where appropriate, the Administrator or other duly authorized official of said Agency.

Section 10. "Garbage" shall mean solid wastes from the domestic or commercial handling, storage, preparation, cooking, and dispensing or sale of produce.

* Included among the definitions of a particular ordinance should be those for such terms as "City", "Village", and various officials as are locally applicable.

Section 11. "Industrial Wastes" shall mean any water carried or liquid wastes resulting from any process or industrial manufacturing processes, trade, business, or activity listed in 310 CMR 15.004.

Section 12. "Licensed Utility Installer" or "L.U.I." shall mean a person, as defined in Section 15, who upon submitting a License and Permit Bond, Certificate of Insurance, and pays the Utility Installer's License fee, as stated in Article II, Section 12, all of which are approved by the Director of the Water and Sewer Departments, is permitted to perform the installation of sanitary sewers or building sewers.

Section 13. "Natural Outlet" shall mean any outlet into a watercourse, pond, lake, or other body of surface ground water.

Section 14. "NPDES" shall mean National Pollutant Discharge Elimination System.

Section 15. "Person" shall mean any individual, partnership, co-partnership, firm, company, corporation, association, joint venture, joint stock company, trust, estate, governmental entity, or their legal representatives, agents or assigns. The masculine gender shall include the feminine, the singular shall include the plural where indicated by the context.

Section 16. "pH" shall mean the logarithm (base 10) of the reciprocal of the concentration of hydrogen ions expressed in grams per liter of solution.

Section 17. "Private Wastewater Collection, Treatment, and Disposal Facilities" shall mean any system, not owned and/or controlled by the Town of Chatham Sewer Department, used for the collection, treatment, and disposal of wastewater from one or more properties.

Section 18. "Properly Shredded Garbage" shall mean the wastes from the preparation, cooking, and dispensing and sale of food that has been shredded to such a degree that all particles will be carried freely under the conditions normally prevailing in public sewers, with no particle greater than one-half (1/2) inch (1.27 centimeters) in any dimension.

Section 19. "Public property" shall mean land, right-of way, or easement owned or controlled by the Town, or other Town, the Commonwealth of Massachusetts, United States government, or any department, political subdivision, or governmental entity.

Section 20. "Public Sewer" shall mean a sewer in which all owners of abutting properties have equal rights and is controlled by the Town of Chatham Sewer Department.

Section 21. "Sanitary Sewer" shall mean a sewer which carries sewage from residential dwellings or commercial facilities without industrial waters or waste and to which stormwaters, surface waters, and groundwaters are not intentionally admitted.

Section 22. "Sewage" shall mean a combination of the water-carrying wastes from residences, business buildings, institutions, and industrial establishments, together with such materials, surface waters, and storm waters as may be present.

Section 23. "Sewage Treatment Facility" shall mean any arrangement of devices and structures used for treating sewage.

Section 24. "Sewage Works" shall mean all facilities for collecting, pumping, treating, and disposing of sewage.

Section 25. "Sewer" shall mean a pipe or conduit for carrying sewage.

Section 26. "Sewer Department" shall mean the Town of Chatham's wastewater collection, treatment, and disposal system(s) owned and operated by the Town of Chatham.

Section 27. "Shall" is mandatory; "May" is permissive.

Section 28. "Slug" shall mean any discharge of water, sewage, or industrial waste which in concentration of any given constituent or in quantity of flow exceeds, for any period of duration, longer than fifteen (15) minutes, more than five (5) times the average twenty-four (24) hour concentration or flows during normal operation.

Section 29. "Storm Drain" (sometimes termed "Storm Sewer") shall mean a sewer which carries storm, surface, and drainage waters, but excludes sewage and industrial wastes, other than unpolluted cooling water.

Section 30. "Suspended Solids" shall mean solids that either float on the surface of, or are in suspension in water, sewage, or other liquids, and which are removable by laboratory filtering.

Section 31. "Town" shall mean the Town of Chatham, Massachusetts or its legal representative, agent, or assign.

Section 32. "Town Manager" shall mean the Town of Chatham Board of Selectmen's appointed Town Manager.

Section 33. "Watercourse" shall mean a channel in which a flow of water occurs, either continuously or intermittently.

* ~~Included among the definitions of a particular ordinance should be those for such terms as "City", "Village" and various officials as are locally applicable.~~

Section 34. Abbreviations:

| | |
|---|---|
| *ANSI* | *American National Standards Institute* |
| *ASTM* | *American Society for testing and Materials* |
| *AWWA* | *American Water Works Association* |
| *BOD* | *Biochemical Oxygen Demand* |
| *CFR* | *Code of Federal Regulations* |
| *COD* | *Carbonaceous Oxygen Demand* |
| *EPA* | *Environmental Protection Agency* |
| *TSS* | *Total Suspended Solids* |

Article II
Regulation of Sewer Flow

Section 1. Existing Structures.

Any structure in existence on May 10, 2005, regardless of its flow, may maintain that flow. No person shall modify an existing structure or change its use so as to increase its sewage flow. Design criteria contained in 310 CMR 15.203, and any Board of Health Regulation modifying such, shall be used to determine whether a proposed modification or change in use shall constitute an increase in sewage flow. Expansion or modification of existing structures, which may result in increased flow, shall not be allowed unless the increase is in compliance with the Board of Health's Regulations in effect on May 10, 2005, or a variance pursuant to Section 5 below is first obtained; except as currently allowed under Part #1 of the Town of Chatham "Sewer Bank" Allocation & Permit Policy for properties connected to the sewer as of May 10, 2005.

Section 2. Determination of Present Sewage Flow.

Sewage flow to the municipal sewer shall be determined using provisions set forth in 310 CMR 15.203: System Sewage Flow Design Criteria, and any local Board of Health Regulation modifying such in effect on May 10, 2005. The owner of any property shall, upon reasonable notice and request, allow an inspection of a property for a determination of flow by an agent of the Board of Health, except that in lieu of this inspection, the owner of the property may submit a floor plan with sufficient detail to account for all outside structure dimensions. This floor plan must bear the signature of approval of a Certified Septic System Inspector.

Section 3. Underdeveloped Parcels.

For the purpose of determining sewer flow, any existing lot, otherwise qualified, may be permitted for that sewage flow as determined under the Board of Health's Regulations in effect on May 10, 2005, or 310 CMR 15,000 et. Seq, whichever is less.

Section 4. Rebuilding because of fire, flood, storm or other acts of nature.

A property owner may rebuild a structure destroyed by fire, flood, storm or other acts of nature as a matter of right provided that the new structure does not exceed the sewage flow of the structure being replaced.

Section 5. Variances.

In the case of unusual and substantial hardship, not the result of acts or omissions of the landowner, the Board of the Water and Sewer Commissioners, after a public hearing of which notice has been given by publication and posting for a minimum of two weeks, may grant a variance to this part of the regulation, provided that sufficient capacity exists and such relief may be granted without substantially derogating from the intent or purpose of this regulation.

ARTICLE III

BUILDING SEWERS AND CONNECTIONS

Section 1. No unauthorized person shall uncover, make any connections with or opening into, use, alter or disturb any public sewer or appurtenance thereof without first obtaining a written permit from the Director. Any person proposing a new discharge into the system or a substantial change in the volume or character of pollutants that are being discharged into the system shall notify the Director, in writing, and receive the Director's written approval at least ninety (90) days prior to the proposed change in discharge or sewer connection.

No person shall construct, uncover, make any connections with or opening into, use, alter or disturb any public wastewater collection, treatment, and disposal facilities or appurtenance thereof without first obtaining a written permit from the Director.

Section 2. There shall be two (2) classes of building sewer permits for: (a) residential and commercial service and (b)

service to establishments producing industrial wastes. In either case, the owner or his agent shall make application on a special form furnished by the Town of Chatham Sewer Departments. The permit application shall be supplemented by any plans, specifications, or other information considered pertinent in the judgment of the Director. A permit and inspection fees connection charges, and inspection fee shall be paid at the time the application is filed.

Section 3. All costs and expense incident to the installation and connection of the building sewer to the sewer works shall be borne by the owner. The owner
shall indemnify the Town from any loss or damage that may occur either directly or indirectly by occasioned by the installation or repair of the building sewer. Construction of all building sewers shall be performed only by a Licensed Utility Installer

Section 4. A separate and independent building sewer shall be provided for every building; except where one building stands at the rear of another on an interior lot and no private or public sewer is available or can be constructed to the rear building through either: an adjoining alley, courtyard, driveway, or easement. If these conditions exist, the building sewer from the front building may be extended to the rear building and the whole considered as one building sewer.

Section 5. Old building sewers may be used to connect new buildings only when they are found, on examination and test, to meet all requirements of these rules and regulations and are approved by the Director.

*Properties with building sewers that will be connected to the sewer system from a septic system, a portion of the existing pipe may be used as part of the building lateral to a public sewer or to a pumping system only if it meets the requirements in the previous paragraph.*

Section 6. Building sewers shall be constructed of such materials and shall be ~~of such size (minimum six (6)~~ *a minimum five (5)* inches diameter pipe or as the Director may determine. Sewer pipe shall be made from: ductile iron with the outside coated with extra heavy bituminous coating approved for buried utilities and the inside cement lined, minimum schedule 35 P.V.C. ~~minimum class 2000 thickness~~ or acceptable substitute approved by the Director. The building sewer shall be laid straight in line and grade, and where an angle is necessary, the owner must construct a manhole or cleanout of approved watertight precast concrete and fitted with a suitable metal cover. All building sewers must have a cleanout manhole at the property line.

*Pressure Sewer Laterals:*

*If building is to be connected to a low pressure sewer or requires a pump to lift sewage to a gravity sewer, the gravity portion of the installation shall meet the requirements of the previous paragraph. The pressure pipe shall be minimum 1-1/4 inch diameter if a grinder pump is used and 2-inch diameter if a grinder pump is not used or other such larger size if the sewage flow and characteristics differ from a single-family residence.*

*Materials*

*Polyethylene for 1-1/4 –inch pipe through 4 inch pressure pipe with material conforming to ASTM D3350, Type PE-4710 HDPE pressure Class PC 200, SDR-11. Fittings for use with polyethylene pipe and tubing shall be manufactured and furnished by the pipe supplier and in conformance with AWWA C901 requirements. Joints for polyethylene pipe shall be jointed by the butt fusion method in a manner recommended by the pipe manufacturer.*

*Polyvinyl Chloride (PVC) Pipe- ASTM D2241 PVC pressure pipe material conforming to ASTM D1784, minimum class SDR-21 for pipe 1-1/4-inch through 4-inch, push-on joint conforming to ASTM D3139 with flexible elastomeric gaskets conforming to ASTM F477.*

*A Ball valve with curb stop and check valve shall be installed on all low pressure and force mains, as close as feasible to a property line. Ball valves for low pressure sewers shall be true union type constructed from PVC Type I cell classification with EPDM O-rings. All valve components shall be replaceable. Ball valves 2 inch and smaller shall be pressure rated to 235 psi; while valves larger than 2 inches shall be rated to 150 psi. Ball valves shall have a Safe-T-Block seal carrier to stop flow in either direction, allowing safe removal of the downstream union nut for system service or modification. Ball valves shall be true union ball valves as manufactured by Spears Manufacturing Company, or equal. Check valves for low pressure sewer laterals shall be made of stainless steel or fabric-reinforced synthetic elastomer to allow for a positive seal with minimum backpressure. Check valves shall be true union ball check valves;*

*Curb stop valves shall be of brass or bronze construction and two rubberized O-ring seals to provide pressure-tight seal. Curb stop valves shall be figure H-15204 as manufactured by Mueller-Oriseal, B22 as manufactured by Ford Meter Box Company, Hayes, Nuseal, or equal. Curb boxes shall be 2-1/2 inch shaft size two-piece screw-type. They shall be adjustable from 48-inch to 72-inch. Curb boxes shall be constructed of cast iron and thoroughly coated with two coats of asphaltum varnish. Curb box shall be stainless steel supplied with a hole in the "U" portion for the insertion of a stainless steel pin. Pins shall be supplied and shall be made of stainless steel. Curb boxes shall be as manufactured by Ford Meter Box Company, Mueller Company, or equal.*

*Gravity or low pressure pipe shall have magnetic marking tape 2 inches wide with the words "SANITARY SEWER BELOW," installed not more than two (2') feet below finished grade on all mainline and service laterals.*

Section 7. Whenever possible, the building sewer shall be brought to the building at an elevation below the basement floor. All buildings in which any building drain is too low to permit gravity flow to the public sewer, sanitary sewage carried by such building drain shall be lifted by an approved means and discharged to the building sewer or public sanitary sewer, as specified by the Director.

*Low Pressure Grinder Pumps or Lift Pumps:*

*Each property serviced by a low pressure sewer shall have a dedicated pre-manufactured pump station suitable for the flow, pressure and other conditions defined by the property and the public sanitary sewer. The station shall include an in-ground self contained unit with submersible motor, level controls, sensors, alarms, and an emergency generator pulg-in connection. Properties whose sewage quantities and characteristics are equivalent to four or more families shall install a duplex pump. Refer to further requirements in Article IV-Design of Sewers, Section 11- Grinder Pump Systems.*

Section 8. No person shall make connection of roof downspouts, exterior foundation drains, areaway drains, or other sources of surface runoff or ground water to a building sewer or building drain which is connected directly or indirectly to a public sanitary sewer.

Section 9. Exhaust from engines, blowoff from boilers, drainage of gasoline or any explosive liquor, liquids, or other flammable substances shall not be permitted to be discharged into any building sewer which is connected directly or indirectly to a public sanitary sewer.

*At the time a connection is made to the Town's sanitary sewer system, the interior plumbing shall be inspected to ensure that no connections to roof drains, yard drains, foundation drains, sump pumps, or other sources of drainage water is connected to the sanitary sewer.*

Section 10. The connection of the building drain into the building sewer shall conform to the requirements of the building and plumbing code or other applicable rules and regulations of the Town.

Section 11. The Licensed Utility Installer, listed on the approved sewer connection permit, shall notify the Water and Sewer Departments, a minimum of 72 hours, before the building sewer will be ready for connection to the public sewer. The Director will schedule the time and date when he or his representative will be available to perform an inspection of the building sewer's connection to the public sewer, connection shall be made only under the supervision of the Director or his representative.

Section 12. All excavations for building sewer installation shall be adequately guarded with barricades and lights so as to protect the public from hazard. Streets, sidewalks, parkways, and other public property and/or private property disturbed in the course of the work shall be restored in a manner satisfactory to the Director.

Section 13a. Plumbers and private contractors, of established reputation and experience, who have paid the required filing fees, as stated in Section 13b, and have provided the required license and permit bonds, as stated in Section 13c, and have submitted a Certificate of Insurance with required coverage, as stated in Section 13d, may be approved by the Director as a Licensed Utility Installer (L.U.I.).

*Applicants for licenses for installing sewer main and sewer services shall attend a training seminar on the installation of low pressure pumps that is conducted by the manufacturer, and the applicant shall show evidence of course completion.*

*Note: The installation of grinder pumps may require other permits such as, but not limited to: electrical and plumbing.*

Section 13b. Applicants for licenses as sewer main and sewer service installers (Licensed Utility Installer) are required to pay a filing fee. As set by the Board (see rates and fees schedule).

Section 13c. Applicants for licenses as sanitary sewer and building sewer installers (Licensed Utility Installer) shall obtain a License and Permit Bond in the amount of Five Thousand ($5,000.00) Dollars or an amount equal to 100% of the construction cost of any proposed sewer connection located within or on public property or an amount approved by the Director, whichever is greater. Said license and permit bond shall remain in full force and effect for a period of one (1) year from date of acceptance by the Town of the L.U.I.'s last sewer connection. This bond will guarantee that the Licensed Utility Installers (L.U.I.) will comply with the statutes, regulations, or ordinances of the Town of Chatham. The license and permit bond shall be duly executed by the Principal of the L.U.I. and by a Surety Company qualified to do business under the laws of the Commonwealth of Massachusetts and satisfactory to the Director.

Section 13d. Before any Licensed Utility Installer performs any work in, on, under or around streets, sidewalks and property belonging to the Town of Chatham, it will be necessary for him to furnish, simultaneously with the submittal of the License and Permit Bond, a Certificate of Insurance showing that the contractor has the following coverage:

1. General Liability - $500,000 Property Damage
   $500,000-$1,000,000 Bodily Injury
2. Automotive Liability- $500,000 Property Damage
   $500,000-$1,000,000 Bodily Injury
3. Workmen's Compensation and Employer's Liability as required under Massachusetts General Laws.
4. Insurance shall include coverage for collapse of underground structures.
5. Insurance shall include coverage for projects completed operations.

All above insurance coverage shall remain in full force and effect for a period of at least one (1) year from the date of acceptance by the Town of the last sewer connection installed by the L.U.I. The L.U.I. shall take all responsibility for the work, and take all precaution for preventing injuries to persons and property in or about the work.

Section 13e. The L.U.I. shall pay all debts for labor and materials contracted for or by him on account of the work and shall assume the defense of and indemnify and save harmless the Town of Chatham and its Officers and Agents from all claims relating to labor and or alleged infringement of inventions, patents, or from injuries to any person or corporation caused by the acts of negligence of the L.U.I. any of his agents or employees, or any subcontractor, in doing the work or in consequence of any improper materials, implements, or labor used therein.

Section 13f. Before the L.U.I.'s License and Permit Bond or any coverage listed in the L.U.I.'s Certificate of Insurance expires, the L.U.I.'s shall send a revised License and Permit Bond or Certificate of Insurance to the Water and Sewer Department showing that the bond or insurance coverage, is still in place. The Licensed Utility Installer shall NOT perform any work in, on, under or around streets, sidewalks and property belonging to the Town of Chatham or any other public property if their License and Permit Bond or any coverage listed in their Certificate of Insurance has elapsed.

Section 13g. Approved Licensed Utility Installers will renew their Utility Installers Licenses by submitting a revised License and Permit Bond, Certificate of Insurance, and License Fee by January 1st of each year. All Utility Installers' Licenses expire at Midnight, December 31st of each year.

Section 14. All sanitary sewer extensions shall require ~~supervision~~ *inspection* by a qualified inspector or the Director may determine that a building sewer installation or repair will require full time ~~supervision~~ inspection by a qualified inspector. In either case the Director will designate a private inspector as Town Inspector who shall represent the interest of the Town of Chatham during construction of any sanitary sewer extension or building sewer installation or repair, and will monitor and inspect the ongoing progress of the work, full-time observation is required. The costs for the services performed by said Town Inspector shall be paid by the developer or owner, through the Water and Sewer Departments. Flows will not be permitted to be discharged from any service connection until a Certificate of Compliance is submitted by the Town Inspector and the report is approved by the Director.

Section 15. After the completion of any building sewer's repairs or connection to the municipal sewer, the L.U.I. shall fill out a sewer connection tie card, on the forms provided at the Water and Sewer Departments' office, for each building sewer the L.U.I. has performed work on. The tie-card shall be completed before the inspection of the L.U.I.'s work, and before the L.U.I. backfills the building sewer and connection to the municipal sewer.

Section 16. After completion and before the final inspection of any sanitary sewer connection or building sewer connection for residential dwellings with four (4) or more dwelling units, industrial connections, commercial connections with five (5) or more water closets, commercial connection with industrial water or waste, connections of private sewer system or whenever the Director requires, the Licensed Utility Installer, developer or owner will furnish a reproducible mylar "as-built" drawing (1" = 20') to the Director. The as-built drawing(s) shall contain a plot plan(s) with building(s) and highway layouts, sewer layouts with profiles, force mains, force main gates, pump station(s), pump station(s) details, and descriptions of each building sewer showing the depth of all connections, pipes, and manholes, using buildings or other permanent markers as reference points. The as-built drawing (s) shall contain any other information deemed necessary by the Director.

*Section 17. A property that is generating wastewater shall be connected to the sanitary sewer within 120 days of notification or when a property is sold or when a building permit is requested, unless a hardship is requested and granted: Any property that gains access to the sewer once a sewer extension is constructed and the owner is notified in writing at the time a sewer connection is available, the property shall be connected within 12 months or sooner as defined in the notice if public health or environmental issues warrant; and any newly constructed or renovated building with access to a sanitary sewer shall be connected before a Certificate of Occupancy is issued.*

## ARTICLE IV
## DESIGN OF SEWERS

Section 1, General:

Sewage collection systems shall be designed separately from stormwater systems. Sewage collection systems shall not allow for the introduction of rain water, noncontract cooling water, and groundwater from foundation drains, sump pumps, surface drainage or any other source of inflow. Overflows from wastewater collection systems shall also not be permitted.

*New sanitary sewers and all extensions to sanitary sewers owned and operated by the Town of Chatham shall be either gravity sewers or low pressure sewers in accordance with the Town's approved wastewater treatment facility plan, and shall be designed by a professional engineer licensed to practice in the Commonwealth of Massachusetts, in accordance with the Guides for the Design of Wastewater Treatment Works (TR-16), and in strict accordance with appropriate Massachusetts codes and the Town of Chatham Rules and Regulations of the Sewer Department. Plans and specifications shall be submitted to and approved by the Director before initiating any construction. The design shall anticipate and allow for flows from all possible future extensions or development within the immediate drainage area in conformance with Town planning documents.*

Alternative Sewer Collection Systems:

Sewer collection systems not stated in these Rules and Regulations of the Sewer Department shall only be permitted with the Director's conditional approval:

Section 2, Design Capacity and Design Flow:

Design Factors:

- Peak hourly sewage flow
- Additional peak flows of industrial and commercial wastes
- Maximum groundwater infiltration
- Topography of the immediate area
- Difficulty of installation

Design Period:
Sewage collection systems shall be designed for a life span of 50 years, and interceptor sewers shall be designed to handle the maximum capacity of uses in the drainage area as determined by the Director.

Design Flow:

Submit a detailed description of the procedures used for calculating sewer design flow to the Director.

The Massachusetts 310 CMR 15.000, the State Environmental Code, Title 5, shall be used for calculating the design flow for sewers. If the Massachusetts 310 CMR 15.000, the State Environmental Code, Title 5, does not have a flow rate for the proposed use, the following methods may be used with

the approval of the Director:

Flow Related to Water Consumption;

When available, use existing sewage flow and/or consumption data as a basis for sewer design. If such data are not available, using flow data from a similar community or users;

Per Capita Flow;

Where actual flow data cannot be obtained, base residential flows from new collection systems on an average daily per capita flow of not less than 70 gallons per day (0.27 m3/day). Add an appropriate allowance for infiltration to this flow;

In all cases, add a minimum allowance of 250-500 gpd/in. diam/mile of sewer (0.24-0.48 m3/cm of pipe diam/km/day) for infiltration to the water consumption, per capita flow or any other calculation method required by the Director.

Section 3, Details of *Gravity* Sewer Pipe Design and Construction

Minimum Sewer Pipe Size:

No gravity sewer shall be less than 8 inches in diameter (20 cm).

Depth:

In general, sewers shall be deep enough to drain basement fixtures and to prevent freezing. Water tight insulation shall be provided for sewers that cannot be placed deep enough to prevent freezing.

For house connections chimneys (vertical pipe ~~encased in concrete~~) *preformed block units* shall be used when the sewer main is greater than or equal to 12 feet deep.

Buoyancy:

Where high groundwater conditions are anticipated, the buoyancy of sewers shall be considered, and the floatation of pipe shall be prevented with appropriate design and construction of the sewer.

Slope:

Minimum Slopes:

All sewers shall be designed and constructed to give a velocity (when flowing full) of not less than 2.0 feet per second (0.61 m/s) based on Manning's formula using an "n" value of 0.013. The Director may permit the use of other "n" values if deemed justified on the basis of research or field data. The following minimum slopes shall only be used if absolutely necessary because of grade restrictions; however, greater slopes are desirable.

| Sewer Size | Minimum Slope in Feet per 100 Feet (m/100m) |
|---|---|
| 8 inches (203 mm) | 0.40 |
| 10 inches (254 mm) | 0.28 |
| 12 inches (305 mm) | 0.22 |
| 14 inches (356 mm) | 0.17 |
| 15 inches (381 mm) | 0.15 |
| 16 inches (406 mm) | 0.14 |
| 18 inches (457 mm) | 0.12 |
| 21 inches (533 mm) | 0.10 |
| 24 inches (610 mm) | 0.08 |
| 27 inches (686 mm) | 0.067 |
| 30 inches (762 mm) | 0.058 |
| 36 inches (914 mm) | 0.046 |
| 42 inches (1067 mm) | 0.037 |

The use of oversized sewers in order to justify flatter slopes is not permitted.

Slope Between Manholes:

Sewers shall be laid out with uniform slope between manholes.

High Velocity Protection:

Velocities greater than 12 feet per second (3.7 m/s) shall not be permitted under any flow conditions, unless the Director approves special provisions that will protect against pipe erosion and impact.

Steep Slope Protection:

Securely anchor sewers on 15 percent slopes, or greater, to prevent displacement.

Impervious Dams:

Impervious dams shall be installed every 300 feet to control the flow of groundwater within the pipe bedding material, when:

- The surrounding native material is considerably less impervious than the pipe bedding material;
- The pipe bedding could produce a hydraulic head of 25 feet on the pipe gaskets and joints during periods of high groundwater flow; and/or
- The sewer is constructed downstream of a waterway or wetland crossings.

Alignment:

Sewers shall be laid out in a straight line and alignment, and shall be checked with a laser beam.

Sewer Pipe Material:

Sewer pipe material shall be as specified in Article V, Construction Technical Specifications, Section 12:

Sewer Pipe Inspection and Testing:

The specifications shall include deflection and leakage testing of sewer pipes, as stated in Article V, Construction Technical Specifications, Sections 17 and 18

Section 4, Details of Sewer Manhole and Cleanout Design and Construction

Manholes and cleanouts shall be as specified in Article V, Construction, Technical Specifications, Section 13:

Manhole Inspection And Testing:

The specifications shall include a requirement for the inspection and testing of manholes for leaks or damage as specified in Article V, Construction Technical Specifications, Section 21.

Section 5, Inverted Siphons (Depressed Sewers)

Inverted siphons shall only be allowed if there is no other option and it is approved by the Director. Depressed sewers shall have no less than two barrels with a minimum pipe size of 6 inches (15 cm) and shall be provided with necessary appurtenances for convenient flushing and maintenance. Manholes shall have adequate clearances for cleaning equipment and for inspection and flushing. The design shall provide for sufficient heads and pipe sizes to secure velocities of at least 3.0 feet per second (0.92 m/s) for average flows under initial conditions. The inlet and outlet details shall be arranged so that the normal flow is diverted to one barrel and so that either barrel may be taken out of service for maintenance. A hose connection shall be provided to the siphon for flushing purposes.

Section 6, Aerial Crossings

Aerial crossings shall only be allowed if there is no other option, and it is approved by the Director. All aerial crossings shall provide appropriate support for all joints and pipes used for aerial crossing. The supports shall withstand frost heaves as well as overturning, settlement, flooding, thermal expansion, vibrations, and other loads that may act against the piping. Precautions against freezing shall be provided (e.g., insulation and increased slope). Expansion joints between above-ground and below-ground sewers shall be provided. Where buried sewers change to aerial sewers, special construction techniques to minimize damage from frost heaves shall be used. Ductile iron pipe with restrained mechanical joints are required. The bottom of the pipe shall be no lower than one (1') foot above the 100 year flood elevation level.

Section 7, Location of Sewers in Streams

Sewers shall be designed to minimize the number of stream crossings.

Cover Depth:

The top of all sewers entering or crossing a stream shall be sufficiently below the natural bottom of the stream bed to protect the sewer line. The following cover requirements shall be met:

- 1 foot (305 mm) of cover where the sewer is located in rock.
- 3 feet (914 mm) of cover in other material. In major streams, more than 3 feet (914 mm) of cover shall be required.
- In paved stream channels, the top of the sewer line shall be at least 1 foot (305 mm) below the channel pavement.

Horizontal Location:

Sewers located along streams shall be located sufficiently outside of the stream bed to allow for stream widening in the future and for the prevention of siltation during construction.

Structures:

Locate sewer manholes or other structures outside of streams whenever possible. Where structures must be located in a stream, they shall not interfere with the free discharge of flood flows or navigation in the stream. The manholes' covers shall be no lower than one (1') above the 100 year flood elevation level.

Alignment:

Sewers shall cross streams perpendicular to the flow without a change in grade.

Materials:

Sewers entering or crossing streams shall be watertight and free from changes in alignment or grade. Joints shall be restrained in order to prevent movement from stream forces. Ball-and-socket or restrained joints designed for hard service applications shall be provided.

Backfill materials shall be stone, coarse aggregate, washed gravel, or other materials that will not readily erode, cause siltation, damage pipe during backfill, or corrode the pipe and shall be approved by the Director. In large stream crossings, where required by the Director, place riprap over the sewer pipe for stability and to prevent erosion.

Siltation and Erosion:

The design engineer or L.U.I. shall include construction methods that will minimize siltation and erosion in the project specifications the construction methods for sewers in or near streams. Such methods shall control siltation and erosion by limiting unnecessary excavation, including disturbing or uprooting of trees and vegetation, dumping of soil or debris, or pumping silt-laden water into the stream. Specifications shall require cleanup, grading, planting, and restoration of all work areas to begin immediately.

Section 8, Protection of Water Supplies

Cross Connections:

No physical connection shall exist between a public or private potable water supply system and a sewer or any appurtenance that would permit the passage of wastewater or polluted water into the potable supply. No sewer shall come into contact with a water pipe and no water pipe shall pass through any part of a sewer manhole or any part of the sewer system.

Relation To Water Works Structures:

Sewers shall be located as far as possible from public water supply wells or other potable water supply sources and structures.

Engineering plans shall show all existing waterworks units, such as treatment facilities, basins, pipes, wells, or other waterworks units that are within 50 feet of the proposed sewer or to within the minimum distances required by the Director.

Water Mains' Relation:

Horizontal Separation:

Whenever possible, lay out sewers at least 10 feet (3.0 m) from any Existing or proposed water main. If local conditions prevent a lateral Separation of 10 feet, the Director may make an exception on a case-by-case basis when supported by data from the design engineer. Such an exception may allow the sewer to be installed closer than 10 feet to a water main, provided that it is laid out in a separate trench with the top (crown) of the sewer at least 18 inches (46 cm) below the bottom (invert) of the water main or is encased in a water tight sleeve.

Vertical Separation:

Whenever sewers must cross water mains, lay out the sewer so that the top of the sewer is at least 18 inches (46 cm) below the bottom of the water main. The sewer joints should be equidistant and located as far away as possible from the water main joints. When the sewer cannot meet the above requirements, relocate the water main to provide for this separation or reconstruct it with mechanical-joint pipe for a distance of 10 feet (3.0 m) on each side of the sewer. One full-length (twenty feet) water main pipe shall be centered over the sewer so that both joints will be as far from the sewer as possible.

Where a water main crosses under a sewer, adequate structural support shall be provided for the sewer to maintain line and grade.

When it is impossible to achieve horizontal and/or vertical separation as stipulated above, both the water main and sewer shall be constructed of mechanical-joint cement-lined ductile iron pipe or another equivalent that is watertight and structurally sound. Both pipes shall be pressure tested to 150 psi to ensure that they are watertight, and one of the pipes shall be installed in a water tight sleeve for a horizontal perpendicular distance of 10 feet (3.0) on each side of the other pipe. Any joints in the watertight sleeve shall be as far as possible from the water main's intersection with the sewer.

Section 9, *Details of Low* Pressure Sewer ~~Main~~ *Design and Construction*

Layout: The branched configuration of a pressure sewer is required. Looped piping shall not be permitted. Pipe routing shall include long radius sweeps no less than those recommended by the pipe manufacturer.

Pressure pipes shall be designed and installed so that a minimum of five (5) feet of cover material exists over the crown of the pipe at all times. Appurtenances such as isolation valves, air release valves, and clean-outs shall be provided as required by the Director.

Pipe Size: The diameter of the pressure sewer shall be calculated so that it provides a cleansing velocity based on the average daily flow of the system. *Force Mains shall have a minimum velocity of three feet per second, 3ft/sec.*

*Minimum low pressure sewer pipe sizes shall be as follows (unless there is a significant change in grade):*

| *NUMBER OF HOMES OR EQUIVALENT* | *MINIMUM PIPE SIZE* |
|---|---|
| *1-3* | *1.5* |
| *4-9* | *2* |
| *10-18* | *2.5* |
| *19-30* | *3 (model recommended)* |
| *>30* | *Must be modeled* |

~~Pipe Material: Use only the equivalent of Class 200, SDR 21 PVC piping or greater in pressure sewers to provide the necessary working pressure rating for the system, and to provide durability during installation.~~

*Pipe Material:*

*Low Pressure Mains and Services*

*Polyethylene for 1-1/4-inch pressure pipe with material conforming to ASTM D3350, Type PE-4710 HDPE pressure Class PC 200,*

*SDR-11. Fittings for use with polyethylene pipe and tubing shall be manufactured and furnished by the pipe supplier and in conformance with AWWA C901 requirements. Joints for polyethylene pipe shall be jointed by the butt fusion method in a manner recommended by the pipe manufacturer.*

*Polyvinyl Chloride (PVC) Pipe – ASTM D2241 PVC pressure pipe material conforming to ASTM D1784, minimum class SDR 21 for pipe 1-1/4-inch through 4-inch, push-on joint conforming to ASTM D 3139 with flexible elastomeric gaskets conforming to ASTM F477.*

*Fittings for use on PVC pressure pipe of 4-inch nominal inside diameter or greater shall be ductile iron with mechanical joints as described in ANSI 21.10/AWWA C110. The coatings and linings of the fittings shall be as specified for ductile iron pipe. Mechanical joints for fittings shall be supplied with rubber gasket joints and retainer glands in conformance with ANSI 21.11/AWWA C111.*

*Low Pressure Mains – In Manholes*

*PVC pipe – Less than 4 inches in diameter ASTM D1785, Type 1, Grade 1, (PVC 1120) PVC pressure pipe material conforming to ADTM D1784 Class Schedule 40 inside nominal diameter; solvent cement socket weld type joints shall be used on pipe runs, and fittings to be PVC. Joint sockets for belled PVC pressure pipe to conform to ASTM 2672 and ASTM D2564 (solvent cements). Socket-type fittings for Schedule 40 PVC pressure pipe to conform to ASTM D2467.*

Isolation Valves:

Isolation valves shall be required to allow isolation of individual girder units, system expansion, and at key locations such as at the property line.

*Ball valves for low pressure sewer manholes shall be true union type constructed from PVC Type I cell CLASSIFICATION WITH EPDM O-RINGS. All valve components shall be replaceable. Ball valves 2 inches and smaller shall be pressure rated to 235 psi, while valves larger than 2 inches shall be rated to 150 psi. Ball valves shall have a Safe-T-Block seal carrier to stop flow in either direction, allowing safe removal of the downstream union nut for system service or modification. Ball valve ends shall be as needed to connect to Schedule 40 PVC pipe in low pressure sewer manholes. Ball valves shall be true union ball valves as manufactured by Spears Manufacturing.*

*Curb Stop Valve*

*Curb stop valves shall be located at the property line of the street or easement of the sewer main. Curb stop valves shall be of brass or bronze construction and two rubberized O-ring seals to provide pressure-tight seal. Curb stop valves shall be figure H-15204 as manufactured by Mueller-Oriseal, B22 as manufactured by Ford Meter Box Company, Hayes, Nuseal, or equal. Curb boxes shall be 2-1/2-inch shaft size two-piece screw type. They shall be adjustable from 48-inch to 72-inch. Curb boxes shall be constructed of cast iron and thoroughly coated with two coats of asphaltum varnish. Curb box rods shall be stainless steel supplied with a hole in the "U" portion for the insertion of a stainless steel pin. Pins shall be supplied and shall be made of stainless steel. Curb boxes shall be as manufactured by Ford Meter Box Company, Mueller Company, or equal.*

Air Release Valves:

~~To release air trapped in the pressure lines, air release valves shall be installed at high points in the piping system. Air release valves shall be located in a manhole or structure to allow access for repair and maintenance. Automatic air release valves shall be used to reduce the system's operating and maintenance costs.~~

~~Air release manholes shall be located at least 14 pipe diameters downstream of the locations where hydraulic jumps occur. Hydraulic jumps form in sections where the pipeline intersects with hydraulic grade line. Air bubbles formed by hydraulic jump conditions are carried downstream with the wastewater flow.~~

*Air and vacuum valves shall be installed on low pressure mains. The air and vacuum valves shall be designed to release air from the main when the main is being filled and/or air becomes entrapped in the main, and to admit air into the sewer main when pumps are stopped and the main is being drained by gravity. The body and cover of air and vacuum valve shall be cast iron, floats of stainless steel, protective hood of steel, seats of Buna-N, and miscellaneous internal parts of stainless steel, Manufacturer-Crispin, or equal. Air and vacuum valves shall be located in a manhole or structure with a diameter of 60 inches to allow access for repairs and maintenance.*

Cleanout Connections:

Cleanouts shall be installed on the pressure mains at sags and other locations where debris can accumulate and clog the lines, and proper valving to conduct required maintenance shall be provided.

*Miscellaneous.*

*Magnetic marking tape two (2) inches wide with the words "SANITARY SEWER BELOW," shall be installed not more than 2 feet below finished grade on all mainline and service laterals.*

Section 10, Force Mains

Minimum Size:

Force mains shall ~~measure a minimum of four inches (4") inside diameter~~ *have a minimum velocity of three feet per second, 3ft/sec.*

Force Main Pipe Material:

Force main pipe material shall as specified in Article IV, Construction Technical Specification, Section 14.

Velocity:

At design average flow, velocity in excess of 3 feet per second (0.91m/s) shall be maintained.

When the daily average design detention time, in the force main, exceeds 20 minutes, the manhole and sewer line receiving the force main discharge or the sewage shall be treated so that corrosion of the manhole and the exiting line are prevented. The corrosion is caused by sulfuric acid biochemically produced from hydrogen sulfide anaerobically produced in the force main.

Variable Terrain:

As far as possible, the alignment and depth of a force main should provide a constant upgrade profile. All force mains shall be designed and installed so that a minimum of five (5') feet of cover material is over the crown (top) of the pipe at all times.

Air Relief Valve:

An automatic air relief valve shall be placed at all relative high points in the force main and at 400 feet intervals on level force main runs. All air relief valves shall be protected from freezing.

Drain Valves:

Drain valves at all relative low points in the force main shall be provided. These valves shall be connected to gravity sewers or provided with connections for vacuum pumper trucks. All drain valves shall be protected from freezing.

Termination:

Force mains shall enter the gravity sewer at a point not more than 2 feet (0.61 m) above the flow line of the receiving manhole.

Testing:

Leakage Testing shall be as specified in Article V, Construction Technical Specifications, Sections 17 and 18:

Section 11, Grinder Pump Systems:

Pumping equipment shall include an integral grinder capable of handling a reasonable quantity of foreign objects that may find their way into a building's sewerage system. The grinder pump shall be capable of processing foreign objects without jamming, stalling, or overloading, and without making undue noise. The grinder shall provide a positive flow of solids into the grinding zone. Grinder pump stations shall be of the wetwell type.

*A list of suitable manufacturers will be available from the Director. Properties whose sewage quantities and characteristics are equivalent to four or more dwelling units shall install a duplex pump.*

Design of Pump Station:

Access: Outside installation shall be designed with the service manhole constructed of the same material, and at least as thick as the tank. The manhole shall have an opening at the surface with a minimum inside diameter of 30 inches (76 cm); its cover shall be securely lockable. The size of the manhole shall allow for the performance of maintenance and repair functions.

Tank: Construct each tank of concrete or custom-molded, fiberglass reinforced polyester resin using a filament wound process, layup and spray technique, or other approved process that will ensure a smooth and resin rich interior surface that is designed for two times the maximum loading.

The basin shall be concrete, fiberglass-reinforced polyester resin, or other material meeting the minimum strength specifications herein. The basin shall be furnished with one PVC closet flange or one flexible inlet flange suitable for connection to the household gravity line. At a minimum, the basin wall and bottom shall withstand two times the anticipated maximum pressure exerted on the basin, either from soil loadings or buoyancy forces. All station components must function normally when exposed to these loadings. All seals and joints shall pass factory tests to ensure that they are water tight.

Electrical Equipment: Wiring and electrical connections shall be NEMA rated for the environment in which they are to be placed. *System shall include an emergency generator plug-in connection.*

Pumps:

Pump Removal: The grinder pump shall be readily removable without the need for manual disconnection of piping.

Grinder: The grinder shall be positioned immediately below the pumping elements, securely fastened to the pump motor shaft, and driven directly by the same motor. The grinder shall be a rotating type with a stationary hardened and ground stainless steel shredding ring that carries stainless steel cutter bars. This assembly shall be dynamically balanced and run without objectionable noises or vibrations over the entire range of recommended operating pressures.

Pump Opening: The grinder shall be capable of reducing all components in normal domestic sewage or the sewage to be discharged from the building drain, including a reasonable amount of foreign objects (e.g., paper, wood, plastic, glass, and rubber). Objects shall be reduced to finely divided particles that will pass through the passages of the pump and a minimum 1.25 inch (3.2 cm) diameter discharging pipe.

Intake: The grinder shall be positioned so that solids are fed into it from the bottom in an upward flow, reducing the possibility of overloading or jamming. In addition, sufficient turbulence shall be created to keep the tank bottom free of permanent deposits or sludge banks.

Check Valve:

The grinder pump shall be equipped with a check valve that is installed in a horizontal position on the discharge pipe. This valve shall provide a full ported passageway when open.

Ventilation:

Adequate ventilation shall be provided in accordance with local and national codes.

Controls:

Sensing devices to detect wastewater levels for initiating pump operation and to detect high water levels shall be installed. Level sensing devices shall only be used and shall not be located near flows entering the well.

Section 12, Pumping Station:

Design Capacity:

*A sewage pumping station shall handle the projected peak sewage flows of its tributary sewer collection system. As recommended by TR-16, Guides for the Design of Wastewater Treatment Works (Technical Report #16) and the Hydraulic Institute's Recommended Standards for Pumping Stations.* This information may be included in the Comprehensive Management Plan or other engineering report and any applicable updates or amendments. Pumping stations shall accommodate future expansion, when in the opinion of the Director it is appropriate.

Site Layout:

Stations shall be readily accessible to personnel and service vehicles during all weather conditions.

Flood Protection:

Wastewater pumping stations shall be protected from physical damage by the 100-year flood elevation and shall remain fully operational and accessible during the 100-year flood. All entrances and/or unsealable openings of the station shall be a minimum of one (1') foot above the 100-year flood elevation. These flood elevations shall be determined from the Federal Emergency Management Agency, and U.S. Army Corps of Engineers, and from the local regulations and ordinances.

Environmental Considerations:

Wastewater pumping stations shall be sensitive to the environmental conditions of the site. Visual impacts, architectural style, security, noise levels, odor control, and landscaping shall be considered carefully in station design and shall be reviewed and approved by the Director.

Types of Stations:

Wastewater pumping stations fall into three categories: wetwell/drywell, submersible, or suction lift. The preferred type of station is the ~~wetwell/dry well~~ *Suction Lift* type. The Director may approve other types under certain circumstances.

Structural Design:

Earthquake Loads and Uplift Forces:

Stations shall withstand earthquake loads and uplift forces from high groundwater conditions.

Separation:

Wet and drywells, including their superstructure, shall be completely separated. Common walls shall be sealed against gas leaks.

Equipment Removal;

Provisions shall be made for removing all equipment (i.e., pumps, motors, mechanical screens, motor control centers, etc.) from the station. Access openings, hatches, and/or skylights shall be sized accordingly. Permanent hoisting devices shall be provided as necessary.

Substructure:

Station substructures shall be constructed of reinforced concrete, either cast-inplace or precast. Small, prefabricated stations may be constructed of steel plate or fiberglass with the approval of the Director.

Access:

*The designer shall minimize the confined spaces and shall indicate which spaces meet the definition of confined space on the drawings.* Suitable, safe, and separate means of access shall be provided for dry and wetwells. Stairways and/or steps are required for drywells and wetwells containing either bar screens or mechanical equipment that requires inspection or maintenance. A landing with railings shall be provided for stairways or laddes for every 10 vertical feet. Local, state and federal safety codes shall govern in all cases.

Pumps:

Number of Pumps:

As a minimum, two pumps shall be provided, with each pump being capable of handling peak design flows. Where three or more pumps are provided, the overall station capacity shall be capable of handling peak design flow when any one pump is out of service.

Design:

Pumps shall be designed specifically for wastewater use *and shall be non-clogging and as allowed by the Director.* ~~They shall be non-clogging, and capable of passing a 3-inch diameter sphere as a minimum.~~

Incoming Wastewater and Rate Discharge:

Pumping stations shall balance the rate of incoming wastewater with the rate discharged.

Each pump shall have an individual intake valve.

Pump suction and discharge openings shall be a minimum of 4 inches in diameter.

Centrifugal Pumps:

Centrifugal pumps shall be used in the drywell/wetwell pumping stations. The pump casing and suction elbow shall be provided with a clean-out access port. Impellers shall be enclosed or semi-open. To ensure primed pump conditions, the wetwell level shall not drop below the centerline of the pump impeller under normal operating conditions.

Submersible Pumps:

Submersible pumping stations may be used when, in the opinion of the Director, circumstances warrant. It shall be possible to remove and replace the submersible pumps without dewatering the wetwell or disconnecting the piping. Pumps shall be of the pull-up design, using a lifting cable and guides for pump removal. The pump shall be connected to the fixed discharge piping with a self-locking coupling. Shaft seal failure or potential seal failure detection alarms shall be provided. Submersible pumps may also be used in a wetwell/drywell configuration, with the Director's approval.

Suction Lift Pumps:

Suction pumps shall be self- or vacuum-priming.

Location: The pump equipment compartment shall be above grade or offset, and shall be isolated from the wetwell to prevent humid and corrosive sewer atmospheres form entering the equipment compartment. Access to the wetwell shall not be located in the equipment compartment. Valves shall not be located in the wetwell.

Self-priming Pumps: Self –priming pumps shall be capable of rapid priming at the lead pump-on elevation. Such self-priming and repriming shall be accomplished automatically under design operating conditions. Suction piping shall not exceed the size of the pump suction and shall not exceed 25 feet (7.6 meters) in total length. Priming lift at the lead pump on elevation shall include a safety factor of at least 4 feet (1.2 meters) from the maximum allowable priming lift for the specific equipment at design operating conditions. The combined total of dynamic suction lift at the pump-off elevation and required net positive suction head at design operating conditions shall not exceed 22 feet (6.7meters).

Vacuum-priming Pumps: Vacuum-priming pump stations shall be equipped with dual vacuum pumps capable of automatically removing all air from the suction lift pump. The vacuum pumps shall be adequately protected from sewage damage. The combined total of dynamic suction lift at the pump-off elevation and required net positive suction head at design operating conditions shall not exceed 22 feet (6.7 meters).

Wetwells:

Divided Wells:

The wetwell shall be divided into two sections that are properly interconnected and gated to facilitate repair and cleaning.

Storage Capacity:

The effective storage capacity of the wetwell shall be based upon the recommended number of pump starts per hour and the design filling time. The effective volume of the wetwell shall be based on a filling time of 30 minutes under design average-daily-flow rates. To determine the frequency of starts used for design, refer to the pump manufacturer's warranty.

Where tributary wastewater flows are anticipated to be significantly less than the design average flow, provisions should be made so that the filling time under initial conditions does not exceed 30 minutes (i.e., providing a divided wetwell or shortening the wetwell operation range) and the duration of storage in the pump station and force main does not result in septic conditions in the system or the release of objectionable odors to the environment.

Pump Protection:

Pumps shall be protected from large solids by readily accessible mechanically cleaned bar racks (screen) or combination device located at the wetwell influent. Bar racks should have clear opening not exceeding 1.25 inches (3.1 cm) unless pneumatic ejectors are used or special devices are installed to protect the pumps from clogging or damage.

Floor Slope:

The wetwell floor shall have a minimum slope of 1-to-1 to the hopper bottom. The horizontal area of the hopper bottom shall be no greater than is needed for proper installation and function of the wetwell inlet.

Vortexes:

The wetwell and suction inlets of dry-pit pumps shall eliminate the possibility of vortexes. The required submergence of the intake valves shall be determined for the day-pit pump's location. Intake valves should be flared, with the inlet opening facing down. Every effort shall be made to minimize flow rotation in the wetwell.

Sewage Channels:

Sewage channels located in wetwells shall be covered with nonskid, corrosion-resistant grating. They shall be installed flush with a floor, and capable of supporting anticipated loads. All channels shall be drained when not in use. Where the side meets the floor of the channel, fillets shall be provided.

Inlet Sewers:

Sewer piping entering the wetwell shall not have air in the pump suction line.

Drywells:

Automatic heating and dehumidification equipment shall be provided in all drywells. The electrical requirements shall meet those outlined in subsequent paragraphs of this section.

A sump pump shall be provided in the drywell to remove extraneous water. The discharge pipe of the sump pump shall be equipped with dual check valves and shall be pumped from the drywell into the wetwell above the high water level. Water ejectors connected to a potable water supply shall not be permitted. All floor and walkway surfaces shall slope to a point of drainage. Pump seal leakage shall be piped or channeled directly to the sump.

Valves:

Suitable shutoff valves shall be placed on the suction lines and on the discharge lines of each pump (except on submersible and vacuum-primed pumps). A suitable check valve shall be placed on a horizontal section of each discharge line between the shutoff valve and the pump.

~~Valves shall not be located in wetwells.~~

*Unless adequate space is available in a dry pit pump room, valves on the discharge piping (including flow meters, if required) shall be in a separate underground precast concrete vault.;*

*Every pump station shall include appropriate valves and quick disconnects to allow the Town to bypass the existing pumping equipment and valves. The piping shall allow the Town to install temporary piping into the wet well, and discharge to a location downstream of the check and shutoff valves.*

Valves shall not be located in wetwells.

Section 13, Controls:

All pump stations, grinder pump stations, vacuum sewer stations, and other sewer handling facilities required by the Director shall be connected to the Water and Sewer Departments' Supervisory Control and Data Acquisition (SCADA) System:

All sensing, alarm, and SCADA system devices shall be of the same type, configuration, and function as that used by the Water and Sewer Departments. Each pumping station shall have its own screen display, processor logic controller (PLC), and communications equipment for the SCADA system and shall also display the required monitoring controls and alarm on the all SCADA system screens of the water and/or sewer systems.

Level Sensing Devices:

Level sensing devices shall not be affected by flows entering the wetwell or by the suction of the pumps. All wall penetrations between the wet and drywells shall withstand gas leaks and be located as high as possible to prevent overflow from the wetwell to the drywell. The pumps shall be automatically alternated. Running-time meters shall be installed at all pumping stations for each pump.

Alarm Systems:

Alarm systems shall be provided for all pumping stations. At a minimum, the alarm system shall be activated in any one of the following cases:

- High water in the wetwell;
- Low water in the wetwell;
- Loss of one or more phases of power supply;
- High water level in the pump room sump;
- Loss of the alarm transmission or communications;
- Loss of air pressure in the bubbler tube system/level sensing trouble or failure;
- Standby power failure or malfunction of the pump;
- Flooding of building or drywell;
- Smoke/fire alarms;
- Low temperature;
- Surge suppressor failure;
- PLC processor failed;
- PLC low battery;
- Intrusion; and
- Three spare connections

Section 14, Pump Station Ventilation

General:

Adequate ventilation shall be provided for all pumping stations. Where the pump pit is below the ground surface, mechanical ventilation is required, especially when screens or mechanical equipment requiring maintenance or inspection are located in the wetwell. The wet and dry well ventilation systems shall not be connected. In pits more than 15 feet (4.6 m) deep, multiple inlets and outlets shall be installed. Switches for the operation of ventilation equipment shall be marked and located conveniently. If odors are a problem, an odor control system shall be installed.

Wetwells:

Ventilation may be either continuous or intermittent. For continuous ventilation, at least 12 air changes per hour shall be provided. For intermittent ventilation, at least 30 air changed per hour shall be provided. Heating shall be installed where needed.

Drywells:

Ventilation shall be continuous. Heating and dehumidification is required. At least 6 complete air changes per hour shall be provided.

Section 15, Flow Measurement:

Suitable devices, as approved by the director, for measuring wastewater flow and power consumption shall be installed in all pump stations.

Section 16, Pump Station Water Supply:

Water under pressure shall be provided for cleanup at the pumping station. If a public water supply is used, a Reduced Pressure Zone (RPZ) backflow preventer or other approved device shall be installed on the water service entering the station. No other potable water supply and other piping systems or fixtures shall be connected to the systems supplied by the public water supply.

Section 17, Electrical:

Electric Equipment

Electrical systems shall be designed and installed in strict conformance with the latest edition of the National Electrical Code. Electrical equipment in enclosed places where gas may accumulate shall be noncorrosive and in compliance with the National Electrical Code requirements for Class I Group D, Division I locations.

Submersible Pump Motors

Electrical supply and control circuits shall allow disconnection at a junction box located at or accessible from outside the wetwell. Terminals and connectors shall have watertight seals located outside of the wetwell and shall be protected by separate strain relief.

The motor control center shall be located outside of the wetwell and protected by a conduit seal or other appropriate sealing method meeting the requirements of the National Electrical Code for Class 1. Division 2 locations.

The pump motor shall meet the requirements or the National Electrical Code for Class 1. Division 2 locations.

Submersible pump motors that are totally submerged during the pumping cycle are not required to protect against explosions.

Power cords for pump motor shall be flexible and serviceable under conditions of extra hard use. Ground fault interruption protection shall deenergize the circuit in the event of any failure in the electrical integrity of the cable.

Power cord terminal fittings shall be provided with strain relief appurtenances, and shall facilitate field connecting.

Section 18. Emergency Operations:

When the Director deems it is necessary, an independent natural gas or propane engine-generator type source of electric power shall be provided for electrically driven pumps. This source shall be automatically activated when or if any phase of the power supply fails or upon any fluctuation in voltage. Installation shall comply with all applicable requirements of the National Electrical Code.

Small Pumping Stations: When the Director agrees that a small pump station does not require a permanent alternative power supply, electrical connections for portable standby generator or pneumatic connection for portable air compressor shall be installed as approved by the Director.

Controls:

Provisions shall be made for automatic and manual startup and cut-in. The controls shall be such that upon automatic startup under emergency conditions, shutdown can be accomplished only manually, except in conditions that would damage the generator or engine.

Size:

Unit size shall be sufficient to start up and run all pumps needed to handle peak flows as well as lighting,

ventilation, pump controls, and the sump pump.

**Exerciser:**

The engine controls shall be equipped with an automatic exerciser that may be set on any selected schedule to start the generator, to run it under no-load conditions, and to shut it off without activating the alarm system.

**Noise Attenuation:**

~~Critical grade silencers for noise attenuation shall be provided.~~

*Noise attenuation components must be incorporated in the design to produce no more than 60 decibles (db) of noise at the property line.*

**Section 19, Safety**

Adequate provisions shall be made to protect the operator and visitors from hazards. The design and construction of pumping stations shall meet all prescribed local, state, and federal safety laws and codes. Safety provisions shall include the following:

- Handrails at openings, stairways, and other hazardous areas;
- Guards around the belt drives, gears, rotating shafts, and moving equipment;
- Warning signs as appropriate;
- Provisions for power lockout controls at all pumps and equipment;
- Eye wash stations where chemicals are used;
- Adequate lighting in all areas of the pumping station;
- Provisions for confined space entry in accordance with OSHA and regulatory agency requirements;
- First aid equipment; and
- Fire extinguisher.

**Section 20, Overflows and Bypasses**

Overflows and bypasses shall not be allowed on pumping stations serving sanitary sewage collection systems.

***Section 21, Site Protection and Aesthetics:***

*The Director will review the design and location of the pump stations and may determine that fencing, aesthetics vegetation plantings, intrusion alarms, and aesthetics superstructures style or any other site conditions may warrant site protection and/or aesthetics.*

***Section 22. Odor Control:***

*Odor control equipment may be required by the Director, depending on the sitting of the pumping station and force main discharge point.*

ARTICLE V
CONSTRUCTION TECHNICAL SPECIFICATIONS

The owner of the property, the developer, and/or Licensed Utility Installer, shall construct and install all sanitary sewers and all building sewers in accordance with the following rules and regulations:

**Section 1.** The owner, developer, or LUI shall submit to the Director (for his approval) plans and profiles of the proposed public sewer extensions and/or building sewer connections.

**Section 2.** The owner, developer or L.U.I. of a subdivision shall submit to the Director, a subdivision plan approved by the Chatham Planning Board along with the plans and profiles of the proposed public sewer extension.

**Section 3.** The Contractor doing all the work shall be approved by the Director as a Licensed Utility Installer (L.U.I.) as described in Article II-Building Sewers and Connections, Sections 13a through 13g.

**Section 4.** All materials, including pipe and manhole structures, shall be of the same make and quality used by the Chatham Sewer Department and approved by the Director.

**Section 5.** ~~All laying of~~ Public sewers and building sewers shall be ~~done~~ *layed using* a transit or laser level. All sewer pipes shall be laid on a bed of crushed stone of at least six inches (6") in depth under the pipe and crushed stone shall extend at least halfway up the side of the pipe. Approved gravel, with no stones larger than two inches (2") in any dimension, shall be used to cover pipe to one foot above pipe. The rest of the backfill material must be approved by the Director, Massachusetts Highway Department or Town of Chatham Surveyor of Highways. The approved backfill material shall be placed in mechanically compacted lifts of no more than six inches (6") deep or as specified by the Chatham Surveyor of Highways, Massachusetts Highway Department, or other specifications more stringent than the above. *The approved backfill material above the gravel shall contain no stones greater than 6 inches in any dimension.*

**Section 6,** Impervious dams shall be considered every 300 feet to control the flow of groundwater within the pipe bedding material when:

- The surrounding native material is considerably less impervious than the pipe bedding material;
- The pipe bedding could produce a hydraulic head of 25 feet on the pipe gaskets and joints during periods of high groundwater flow; and/or
- The sewer being constructed is downstream of any waterway and wetland crossings.

**Section 7,** Sewers may be deep enough to drain basement fixtures, and shall be deep enough to prevent freezing. Watertight insulation shall be provided for sewers that cannot be placed deep enough to prevent freezing.

~~For~~ House connections chimneys (vertical pipe ~~encased in concrete~~) *preformed block* shall be used when the sewer main is greater than or equal to 12 feet deep.

**Section 8,** Where high groundwater conditions are anticipated, the buoyancy of sewers shall be considered, and the floatation pipe of pipe shall be prevented with appropriate design and construction of the sewer.

**Section 9.** No mud, gravel or debris shall be allowed to enter the sewer pipes at any time. All pipes shall be capped at end of day's laying and water shall be pumped out of excavation prior to removing the cap.

**Section 10.** Building sewer connection to the public sewer shall have a wye branch fitting, as approved by the Director, made of the same type of materials as the sewer main being tapped.

~~Section 11. Minimum size of public sewer pipe shall be eight (8) inch and building sewer pipes shall not be less than six (6") inches in diameter.~~

*Section 11. Minimum size of gravity public sewer pipe diameter shall be eight (8") inches and building sewer pipes shall not be less than five (5") inches in diameter. Minimum sizes of low pressure sewer mains shall be in accordance with Article IV-Design of Sewers, Section 9. Details of Low Pressure Sewer Design and Construction.*

**Section 12.** Sewer pipe and building sewer pipe material shall be:

**(a) Reinforced Concrete Pipe shall meet the following specification:**

Portland cement shall conform to ASTM C-150 Type II;
The pipe and its appurtenances shall conform to ASTM Specification C-76;
The reinforcing wire cage shall conform to ASTM Specification A 15, A 82, or A 185, as appropriate;
Entrained air shall be 5.0% to 9.0% by ASTM C-890;
Water absorption and three-edge bearing tests shall conform to ASTM Specification C-497; and
Gaskets shall conform to Sections 3.3 and 3.4 of AWWA Specification C-302.

**Note: ~~non-reinforced concrete pipe shall not be used.~~**

**(b)** Extra Heavy Cast Iron Pipe shall meet the following specifications:

Pipe, fittings, and appurtenances shall conform to the requirements of ASTM Specification A-74 or ANSI A-21.11 and gaskets shall conform to ASTM Specification C-564.

**(c)** Heavy Wall Polyvinyl Chloride (PVC) Pipe shall meet the following specifications:

Pipe shall be made from Class 12454-B materials or better in accordance with ANSI/ASTM Specification D-1784, and shall ultraviolet light (UV) protected.

The pipe and accessories shall conform to the requirements of the following, with a minimum pipe stiffness of 46 PSI at a maximum deflection of five percent (5%):

| | | |
|---|---|---|
| ANSI/ASTM | D 3034 | (4" – 15") |
| ASTM | F 679 Type I | (18" – 27"). |

**(d) Ductile Iron Pipe shall meet the following specifications:**

Pipe, fittings, and appurtenances shall be manufactured in accordance with ASTM Specification A-746; Pipe shall have a minimum thickness of Class 50; Fittings shall conform to ANSI Specification A-21.11 and have a minimum pressure class rating of 150 PSI;

All pipe and fittings shall be cement mortar lined in accordance with ANSI Specification A-21.4 at twice the specified thickness, and have an internal and external bituminous seal coating and closure pieces shall be jointed by means of a mechanical coupling of the cast sleeve type.

**(e)** Extra Strength Vitrified Clay Pipe shall meet the following specifications:

Pipe shall conform to the current requirements of NCPI Specification ER 3300 – 67 and meet the requirements of ASTM Specification C 700.

Note: standard strength vitrified clay pipe shall not be used).

**(f)** Acrylonitrile – Butadiene – Styrnee (ABS) Pipe shall meet the following specifications:

Pipe and fittings shall conform to the requirements of ASTM Specification D 2661.

*(g) Plastic Pipe, sizes 4 inches through 12 inches, shall be ANSI/ASTM D3034, SDR-35 Type PSM Poly (Vinyl Chloride) (PVC) material; minimum pipe stiffness (F/^Y) is 46 psi; bell and spigot style and rubber gasket conforming to ASTM F477.*

*(h) Low Pressure Mains and Services for 1-1/4-inch pipe through 4-inch pressure pipe shall be polyethylene pipe with material conforming to ASTM D3350, Type PE-3408 pressure Class PC 160, SDR-11. Fittings for use with polyethylene pipe and tubing shall be manufactured and furnished by the pipe supplier and in conformance with AWWA C901 requirements. Joints for polyethylene pipe shall be jointed by the butt fusion method in a manner recommended by the pipe manufacturer.*

*Pipe sizes 1-1/4 inches through 4 inches shall be Polyvinyl Chloride (PVC) pipe ASTM D2241 PVC pressure pipe material conforming to ASTM D1784, minimum class SDR 21 for pipe 1-1/4-inch, push-on joint conforming to ASTM D3139 with flexible elastomeric gaskets conforming to ASTM F477.*

*Fittings for use on PVC pressure pipe of 4-inch nominal inside diameter or greater shall be ductile iron with mechanical joints as described in ANSI 21.10/AWWAC110. The coatings and linings of the fittings shall be as specified for ductile iron pipe.*

~~(g)~~ **(i)** Other pipe materials:

Other pipe materials shall requires prior written approval of the Director before being installed.

Materials for sewer construction shall be appropriate for local conditions, including the character of industrial wastes, septicity, soil characteristics, external loadings, and problems such as abrasion and corrosion.

All sewers shall be able to withstand damage from superimposed loads. Proper allowances for soil and potential groundwater conditions, as well as the width and depth of the trench shall be used. Where necessary, special bedding, haunching and initial backfill, concrete cradles, or other special construction elements shall be used.

The minimum internal pipe diameter shall be eight (8) inches for gravity sewers. ~~and three (3) inches for low pressure sewers.~~

Joints for the selected pipe shall be designed and manufactured such that "O" ring gaskets of the "snap-on" type are used.

Gaskets shall be continuous, solid, natural or synthetic rubber, and shall provide a positive compression seal in the assembled joint.

Joint preparation and assembly shall be in accordance with the manufacturer's recommendations.

Wye branch fittings, as approved by the Director, shall be installed for connection of laterals.

Bedding, Haunching, and Initial Backfill:

Based on the bedding support of the type of soil and potential groundwater conditions, use the following for the anticipated loads:

- Bedding classes A, B, and C, or crushed stone as described in the American Society of Testing Materials standard ASTM C 12, should be used for all rigid pipe, or
- Materials for bedding, haunching, and initial backfill, or classes I, II, or III as described in ASTM D 2321, should be used for all flexible pipe.

**Safety and Load Factors:**

**Selection of pipe class shall be predicated on the following criteria:**

| | | |
|---|---|---|
| Safety factor | - | 1.5 |
| Load factor | - | 1.7 |
| Weight of soil | - | 120 lbs/cu.ft. |
| Wheel loading | - | H-20 |

**Section 13, Manholes and Cleanouts:**

**Manhole and Cleanout Size:**

Building sewers must have a manhole or cleanout, acceptable to the Director, at the property line. Residential building sewers that are less than six (6) feet deep shall have a cleanout with a minimum diameter of twenty-four (24) inches, cleanout manholes greater than six (6) feet deep, or for commercial or industrial connections' shall be a minimum of four (4') feet in diameter. Larger or smaller diameter cleanouts may be required by the Director. *A minimum drop of 0.10 foot shall be used between entrance and exit inverts.*

**Location:**

Manholes and cleanouts shall be installed at the end of each line; at all changes in grade, size, or alignment; and at all intersections. Distances shall not be greater than 300 feet for sewers measuring 15 inches (38 cm) or less in diameter, or 400 feet for sewers 18-30 inches (46-76 cm) in diameter. Greater distances may be permitted for larger sewers or for those carrying a settled effluent, but only with prior approval of the Director. The top of the manhole cover shall be no lower than one (1') foot above the 100 year flood elevation level. *Junction manholes on low pressure sewers shall be*

*installed at all intersections*

Drop Type:

A drop pipe for a sewer pipe with an invert entering a manhole of more than 24 inches (61 cm) above the manhole invert shall be provided. Where the difference in elevation between the incoming sewer and the manhole invert is less than 24 inches (61 cm), the invert shall be filleted to prevent solids deposition.

Drop manholes shall be constructed with an outside drop connection. Outside drop connections shall be encased in concrete, and shall provide access for cleaning as the sewer enters the manhole at the top of the drop connection.

Inside drop connections shall only be used with an existing manholes that has the area to facilitate safe access into the manhole with the inside drop in place, and shall be approved by the Director. The inside drop connection shall be secured to the interior wall of the manhole, and shall provide access for cleaning as it enters the manhole at the top. Internal drop pipes and fittings shall be PVC plastic sewer pipe in compliance with ASTM D2241. Corrosion resistant anchors shall be used to attach the drop pipe to the inside surface of the manhole barrel.

Structural Base:

Manhole bases shall be constructed or placed on a minimum of twelve (12) inches of crusher run with a maximum stone diameter in all directions of one half ½ inch and free of organic materials.

Diameter:

The manhole's minimum diameter shall be 48 inches (122 cm) for standard manholes and 60 inches (153 cm) for inside drop manholes. A minimum access diameter of 30 inches (76 cm) shall be provided. Larger openings shall be provided for manholes that house equipment, as specified by the Director.

Materials:

Manholes shall be precast concrete with barrel sections, cones, and bases, manufactured in compliance with ASTM C 478, and shall have an O-ring or bituminous-based gasketed joints. "Precast concrete walls shall be made up using straight, circular barrel sections and eccentric cone sections if manhole steps are required, and concentric cone sections where no steps are require Manholes can also be poured-in-place concrete. Other types are allowed subject to the approval of the Director.

*All tongue-and-grove (or male and female) joints in the precast wall, including the joint at the top of the base, shall be made up using the "Snap-On" type O-ring gasket, and shall conform to ASTM C443, except that joint taper shall not exceed 3-1/2 degrees. The precast sections shall be provided with a special groove (cast into the male end) to receive and hold the gasket in position during joint assembly. After joint assembly, the gap between sections shall be packed on the inside and outside with Anti-Hydro "Azpandcretes," Masterflow 713 by Master Builders; or Five Star Grout by U.S. Grout Corp., and shall be troweled smooth so that no projections remain on the inside*

Manhole bases shall be constructed of 4,000 psi (28 day) concrete 8 inches thick, or shall be precast bases properly bedded in the excavation. Field constructed bases shall be monolithic, properly reinforced, and extend at least 6 inches beyond the outside walls of lower manhole sections. Precast manhole bases shall extend at least 6 inches beyond the outside walls of lower manhole sections.

Manholes shall be constructed using minimum 4 foot diameter, precast concrete manhole barrel sections, and an eccentric top section, conforming to ASTM Specification C-478, with the following exceptions on wall thickness:

| Manhole Diameter Feet | Wall Thickness Inches |
|---|---|
| 4 | 5 |
| 5 | 6 |
| 6 | 7 |
| 6-1/2 | 7-1/2 |
| 7 | 8 |
| 8 | 9 |

All Sections shall be cast solid, without lifting holes. Flat top slabs shall be a minimum of 8 inches thick and shall be capable of supporting a H-20 wheel loading

All joints between sections shall be sealed with "O" ring rubber gasket, meeting the same specifications as pipe joint gaskets, or butyl joint sealant completely filling the joint.

All joints shall be sealed against infiltration. All metal parts shall be thickly coated with bitumastic or elastomeric compound to prevent corrosion.

No holes shall be cut into the manhole sections closer than 6 inches from joint surfaces.

Manholes which extend above grade shall not have an eccentric top section. The top plate shall be large enough to accommodate the cover lifting device and the cover.

Manhole and Cleanout Covers:

The elevation of the top section shall be such that the cover frame top elevation is one (1) foot above the 100-year flood elevation (in a field), 0.5 foot above a lawn elevation, or at finished road or sidewalk grade.

When located in a traveled area (road or sidewalk), the manhole frame and cover shall be heavy duty cast iron. When located in a lawn or in a field, the manhole frame and cover may be light duty cast iron. The cover shall be 36 inches, minimum, in diameter. The minimum combined weight of the heavy duty frame and 36 inch cover shall be 735 +/-5% lbs. The minimum combined weight of the light duty frame and 36 inch cover shall be 420 +/-5% lbs. The mating surfaces shall be machined, and painted with tar pitch varnish. The cover shall not rock in the frame. Infiltration between the cover and frame shall be prevented by proper design and construction. Covers shall have "Sewer" cast into them. Covers shall have be designed so that infiltration is prevented.

Manhole frames, installed at grade, shall be set in a full bed of mortar with no less than two nor more than four courses of brick underneath to allow for later elevation adjustment. In lieu of brick, grade rings may be used for elevation adjustment. Grade rings shall not exceed 6 inches in depth. The total number of grade rings shall not exceed 12 inches in height, however, in no event shall more than 3 grade rings be used.

Manholes which extend above grade, shall have the frames cast into the manhole top plate. The top plate shall be securely anchored to the manhole barrel, by a minimum of six, ¼ inch diameter, corrosion resistant anchor bolts, to prevent overturning when the cover is remover. The anchor bolts shall be electrically isolated from the manhole frame and cover.

Ladders:

~~Aluminum alloy ladder rungs, or other rungs made of materials approved by the Director, shall be cast into the wall sections of the manhole when the manhole depth is four (4) or greater from the top of the cover rim to the bench or shelf.~~

*Manhole steps are to be provided in manholes. Steps are to be cast in or grouted solid into the precast units at intervals of 12 inches. Steps shall be in conformance with OSHA requirements having drop front or equivalent. Bolted-on type is not acceptable. Manhole steps to be M.A. Industries, Inc. copylymer polypropylene reinforced with ½-inch steel rod or equal.*

Flow Channel or Invert:

The flow channel through the manholes shall conform in shape and slope to that of the sewers entering and leaving the manholes. Construct the top of the flow channel so that the flow will remain in the channel under peak conditions. Form or shape the channel walls to the full height of the crown of the outlet sewer and so as not to obstruct maintenance, inspection, or flow in the sewers. When curved flow channels are required, including branch inlets, increase minimum slopes to maintain acceptable velocities. Provide a minimum 0.1-foot drop through the manhole.

Bench or Shelf:

Provide a bench on each side of every manhole channel. The bench should have a slope of no less than 0.1 inch per foot or no greater than 0.5 inch per foot. No lateral sewer, service connection, or drop manhole pipe should discharge onto the surface of the bench.

Manhole Inverts:

Manhole inverts shall be constructed by laying sewer bricks on their long side with their water structured face up, in straight line or sweeping arch to from the bottom of the invert, from pipe to pipe. Additional sewer bricks will fan out with their water structure facing towards the center of the invert from the invert brick. The invert's width will be the same diameter of the effluent pipe of the manhole. The minimum height of the shelf shall be equal to the crown of the manhole's effluent pipe and it shall be constructed from sewer brick with their water structured face up.

Buoyancy:

Where high groundwater conditions are anticipated, the manholes shall be designed and constructed to prevent floatation.

Watertightness:

Solid or watertight manhole covers shall be used in areas subject to flooding. All manhole lift holes and grade adjustment rings shall be sealed with a nonshrinking mortar or other material approved by the Director. A bituminous coating shall also be used on the exterior. Inlet and outlet pipes shall be joined to the manhole with a gasketed, flexible watertight connection or with another watertight connection arrangement that allows for differential settlement of the pipe and the manhole.

*The Contractor shall furnish manholes waterproofed over the entire exterior surface that will be below finished grade. The water proofing shall not mar or interfere with the specified exterior finish for these structures. Waterproofing shall be accomplished prior to structure installation for precast sections, and shall be applied to dry surfaces under proper weather conditions.*

*Waterproofing shall consist of a two-coat application of coal tar compound as manufactured by Koppers Bitumastic Super Service Black; Tnemec Heavy Duty Black 46-449; Preco Nitroproof 600; or equal, and shall be applied according to manufacturer's specification. Total thickness of the two-coat application shall no be less than 16 mils.*

*Pipe Connections:*

*Pipes being connected to new manholes shall be connected to the manhole with cast-in-place rubber boot with clamp around gasket. Pipes being connected to existing manholes shall be core drill opening and seal with link seal water stop between pipe and manhole wall*

Section 14. Force main pipe shall be either:

(a) Ductile Iron Pipe:

Pipe shall conform to ANSI A21.51;
The minimum wall thickness shall be Class 52 (ANSI A21.50);
The pipe shall be clearly marked with either "D" or "DUCTILE";
Fittings shall conform to ANSI A21.10;
Pipe shall be furnished with push-on joints and fittings shall be furnished with mechanical joints. Both conforming to ANSI A21.11; and Pipe and fittings shall be cement mortar lined and have an internal and external bituminous seal coating.

(b) Polyvinyl Chloride (PVC) Plastic Pipe:

Pipe shall conform to ASTM D2241;
Materials used in the manufacturer of PVC pipe shall meet ASTM C1784; and be ultraviolet light (UV) protected;
The minimum wall thickness shall be SDR-21;
Fittings shall conform to ASTM D2241, and Joints and gaskets shall conform to ASTM D2241, D1869, and F477.

(c) Other pipe materials:

Other pipe materials shall require prior written approval of the Director before being installed.

Trenching, bedding, and backfilling shall be as approved by the authority having jurisdiction over the property, such as but not limited to: the Massachusetts Highway Department, Town of Chatham Surveyor of Highways or Director of the Water and Sewer Departments.

Joint preparation and assembly shall be in accordance with the manufacturer's written instructions.

Anchorages, concrete blocking, and/or mechanical restraint shall be provided when there is a change of direction of 7-1/2 degrees or greater.

When the daily average design detention time, in the force main, exceeds 20 minutes, the manhole and sewer line receiving the force main discharge or the sewage shall be treated so that corrosion of the manhole and the exiting line are prevented. The corrosion is caused by sulfuric acid biochemically produced from hydrogen sulfide anaerobically produced in the force main.

The force main shall terminate, in the receiving manhole, at a PVC plastic sewer pipe "T". The vertical arms of the "T" shall be twice the diameter of the force main. The upper arm shall be at least 4 feet long; the lower arm shall terminate in a PVC plastic sewer pipe 90 degree elbow in a flow channel directed to the manhole exit pipe. The "T" and its arms shall be securely fastened to the inside surface of the manhole wall using corrosion resistant anchors.

*Force mains shall have a minimum velocity of three feet per second, 3ft/Sec.*

Section 15. No sanitary sewer pipe shall be left open into an unfinished house or cellar hole. All pipes must be capped to prevent the flow of surface water or debris from entering the sanitary sewer.

Section 16. All sewer works located in the flood plain district area, established under the zoning by-law, shall require that new and replacement sewer works be designed and constructed to minimize or eliminate infiltration of flood waters into the system or discharge sewerage from the system into the floodwater.

Section 17. Sewer Pipe Testing:

A. General

The L.U.I. shall test the first section of pipeline as soon as it is installed to demonstrate that the work conforms to these specifications. The initial section shall not be less than five hundred (500) feet and not more than one thousand (1000) feet of pipeline. Testing of pipe shall closely follow pipe laying. ~~The L.U.I. shall have no more than one thousand (1000) feet of unlested sewer constructed at any time.~~

For all sewer pipe tests, the L.U.I. shall furnish an air or water test pump, an air or water meter, and suitable pressure gauge. The L.U.I. shall also furnish all labor and materials required to install suitable temporary testing plugs or caps for the pipeline and perform the test. The meter and gauge shall be installed by the L.U.I. in such a manner that all air or water entering the section under the test will be measured and the pressure in the section indicated and they shall be kept in use throughout all tests.

The scheduling of deflection and pressure and leakage tests shall be as approved and attended by the Town of Chatham's Sewer Department or Town Inspector.

*Before accepting any sewer segment, the L.U.I. shall provide a television tape of the entire sewer including point of connection an existing sewer or pumping station. Television inspection shall be performed by a firm specializing in this work and shall produce the following information:*

1. *A continuous videotape recording of the entire length of pipe being inspected. The tape shall include location of each section, direction of camera travel, a commentary of the pipe's condition, and various irregularities found and lateral connections.*
2. *The section of pipe being televised shall be identified at least once every 50 ft.*
3. *Documentation on television logs and voice recorded on tape shall consist of the following information:*
   a. *Distance from the numbered manhole point of beginning on each sewer section to the location of the specific condition being inspected.*
   b. *Angular orientation of all above conditions inside pipe (i.e., leak at 10:00, service connection at 3:00).*
   c. *Sewer size, material, and joint spacing.*

B. Deflection

Deflection tests shall be performed on all flexible pipes. The tests shall be conducted after the final backfill has been in place at least 30 days to permit stabilization of the pipe system.

No pipe shall exceed a deflection of 5 percent. If deflection exceeds 5 percent , the pipe shall be replaced.

The rigid ball or mandrel used for the deflection test shall have a diameter of not less than 95 percent of the base inside diameter or the average inside diameter of the pipe as specified by ASTM D 2122 Standard Test Method of Determining Dimensions of Thermoplastic Pipe and Fittings The tests shall be performed without mechanical pulling devices.

C. Air Testing:

The Town requires air testing in lieu of the exfiltration or infiltration tests. The L.U.I. shall submit his proposed method of air testing to the Director for approval. All air testing shall be performed in accordance with the procedures described in ASTM C828-86 for Clay Pipe or ASTM C924 for or Concrete Pipe or those procedures approved by the Director, and shall be specifically designed and manufactured for testing pipelines with low-pressure air and shall be provided with an air regulator valve or air safety valve set to prevent the air pressure in the pipeline from exceeding ten (10) psi. If the results of the air test are unsatisfactory, the L.U.I. shall repair the sewer pipe and perform the air tests until the sewer pipe passes the air test. If site conditions are not conducive to air test, as determined by the Director, the L.U.I. will be required to perform an exfiltration and/or an infiltration test as outlined below.

Low pressure air tests shall conform to ASTM Specification C 828. All sections to be tested shall be cleaned and flushed, and shall have been backfilled, prior to testing. Air shall be added until the internal pressure of the test section is raised to approximately 4.0 PSIG. The air pressure test shall be based on the time, measured in seconds, for the air pressure to drop from 3.5 PSIG. Acceptance is based on limits tabulated in the "Specification Time Required for a 1.0 PSIG Pressure Drop" in the Uni-Bell PVC Pipe Association "Recommended Practice For Low-Pressure Air Testing of Installed Sewer Pipe".

Before pressure is applied to the line all connections shall be firmly plugged. Before the test period starts, the air shall be given sufficient time to cool to ambient temperature in the test section.

If the test section is below groundwater, the test pressure shall be increased by an amount sufficient to compensate for groundwater hydrostatic pressure, however, the test pressure shall not exceed 10 PSI.

The pressure test gauge shall have been recently calibrated, and a copy of the calibration results shall be made available to the Director prior to testing.

Exfiltration Test:

If for any reason, approved by the Director, air testing can not be performed, the Director shall require exfiltration testing. Leakage tests by exfiltration shall be made before or after backfilling at the discretion and under the supervision of the Town Inspector. The length of pipe to be tested shall not exceed 1,000 feet and be such that the head over the crown at the upstream pipe is not less than two (2) feet and the head over the downstream pipe crown is not more than six (6) feet. The pipe shall be plugged, by pneumatic bags or mechanical plugs, in such a manner that the air can be released from the pipe while it is being filled with water. Before any measurements are made, the pipe shall be kept full of water long enough to allow absorption of water and the escape of any trapped air. Following this, a test period of at least two hours shall begin. Provisions shall be made for measuring the amount of water required to maintain the water at a constant level during the minimum two (2) hours test period. If any joint shows an appreciable amount of leakage, the joining material shall be removed and replaced. If the water required to maintain a constant level in the pipe does not exceed twenty-five (25) gallons per nominal diameter, in inches, per 24 hours per mile of pipe and if all leakage is not confined to a few joints, workmanship shall be considered satisfactory. If the amount of leakage indicates defective joints or broken pipes, they shall be corrected or replaced.

Infiltration Test:

If for any reason, approved by the Director, air testing and exfiltration testing can not be performed, the Director shall require infiltration testing be performed. Pipe shall be tested for infiltration after backfill has been placed and the ground water allowed to return to normal elevation. Infiltration tests shall be made only under the supervision of the Town Inspector, and the length of line to be tested shall be not less than the length between adjacent manholes and not more than the total length or each size pipe and shall not exceed 1000 feet. The allowable infiltration shall be twenty-five (25) gallons per nominal diameter, in inches, per 24 hours per mile of pipe in each section tested as determined by means of V-Notch weirs, pipe spigots, or by plugs in the end of the pipe to be furnished and installed by the L.U.I., in an approved manner, and at such times and locations as may be directed by the Town Inspector.

There shall be no gushing or spurting leaks. If an inspection of the completed sewer or any part thereof shows pipes or joints which allow noticeable infiltration of water, the defective work or material shall be replaced or repaired.

Section 18. Sewer Force Main Testing:

The sewer force main pipe shall be given pressure and leakage tests in sections of approved length as approved by the Director. For these tests, the L.U.I. shall furnish a water test pump, water meter, and a pressure gauge. The L.U.I. shall also furnish all labor and equipment to install suitable temporary testing plugs or caps for the pipeline and to perform the tests. The meter and gauge shall be installed by the L.U.I. in such a manner that all water entering the section under the test will be measured and the pressure in the section indicated and they shall be kept in use throughout all tests.

The scheduling of pressure and leakage tests shall be as approved and attended by the Town Inspector.

The section of pipe to be tested shall be filled with water by pumping water into it and opening the air release valves and expelling all air from the pipe. If air release assemblies are not available at high points for releasing air, the L.U.I. shall perform: all excavation(s); make the necessary tap(s) at such highpoint(s); plug said holes of the tapping saddles after completion of the test with brass or bronze plug(s); and backfill the excavation(s).

The L.U.I. shall make a leakage test by metering the flow of water into the pipe while maintaining (in the section being tested) a pressure equal to 1.5 times the highest pressure to which the pipe will be subjected under normal conditions of service or 150 psi, whichever is greater. This shall be done by placing the section under pressure by pumping.

The lengths of joint to be used in determining the allowable leakage shall be based on the nominal diameter of the pipe. The allowable leakage shall be less than 11.65 gallons per inch diameter per day per mile of force main tested, maintaining a pressure within 5 psi for a minimum of two (2) hours duration. If the section shall fail to pass the pressure test, the L.U.I. shall locate and repair or replace the defective pipe, fitting, or joint, at the L.U.I.'s own expense.

If, in the judgment of the Director, it is impracticable to follow the foregoing procedure exactly, modifications in the procedures may be made if approved by the Director, but in any event the L.U.I. shall be responsible for the ultimate tightness of the line within the above leakage requirements with no allowances for leakage from valves.

Section 19. Low Pressure Sewer Testing:

The sewer low pressure pipe shall be given pressure and leakage tests in sections of approved length as approved by the Director. For these tests, the L.U.I. shall furnish a water test pump, water meter, and suitable pressure gage. The L.U.I. shall also furnish all labor and equipment required to install suitable temporary testing plugs or caps for the pipeline and perform the test. The meter and gage shall be installed by the L.U.I. in such a manner that all water entering the section under the test will be measured and the pressure in the section indicated and they shall be kept in use throughout all tests.

The scheduling of pressure and leakage tests shall be as approved and attended by the Town Inspector.

The section of pipe to be tested shall be filled with water by pumping water into it and opening the air release valves and expelling all air from the pipe. If air release assemblies are not available at high points for releasing air, the L.U.I. shall perform: all excavation(s); make necessary tap(s) at such highpoint(s); plug said holes of the tapping saddles after completion of the test with brass or bronze plug(s); and backfill the excavation(s).

The L.U.I. shall make a leakage test by metering the flow of water into the pipe while maintaining (in the section being tested) a pressure equal to 1.5 times the highest pressure to which the pipe will be subjected under normal conditions of service or 150 psi whichever is greater. This shall be done by placing the section under pressure by pumping.

The lengths of joint to be used in determining the allowable leakage shall be based on the nominal diameter or the pipe. The allowable leakage shall be less than 11.65 gallons per inch diameter per day per mile of pipe tested, maintaining a pressure within 5 psi for a minimum of two (2) hours duration. If the section shall fail to pass the pressure test, the L.U.I. shall locate and repair or replace the defective pipe, fitting, or joint at the L.U.I.'s own expense.

If, in the judgment of the Director, it is impracticable to follow the foregoing procedure exactly, modifications in the procedures may be made if approved by the Directo4, but in any event the L.U.I. shall be responsible for the ultimate tightness of the line within the above leakage requirements with no allowances for leakage from valves.

Section 20. Cleaning Sewer Lines:

At the conclusion of the work, the L.U.I. shall thoroughly clean all pipelines by washing with water or other means to remove all dirt, stones, pieces of wood, or other material which may have entered the pipes during the construction period. Debris cleaned from the lines shall be removed from the low end of the pipeline by installing a screening device that will prevent any debris from entering the public sewer system or a section of the sewer works already approved. If after this cleaning, obstructions remain, they shall be removed. After the pipelines are cleaned and if the groundwater level is above the pipe or following a heavy rain, the Town Inspector will examine the pipes for leaks. If any defective pipes or joints are discovered, they shall be repaired or replaced as directed by the Town Inspector.

Section 21. Sewer Manhole Leakage Tests:

Leakage tests shall be made and observed by the Town Inspector on each manhole. The test shall be the exfiltration test or vacuum test as described below:

For these tests, the L.U.I. shall furnish an air or water test pump, an air or water meter, and suitable pressure gage. The L.U.I. shall also furnish all labor and materials required to install suitable temporary testing plugs or caps for the pipeline, and perform the test. The meter and gage shall be installed by the L.U.I. In such a manner that all air or water entering the manhole under the test will be measured and the pressure in the manhole indicated and they shall be kept in use throughout all tests.

After the manhole has been assembled in place, all lifting holes and exterior joints surface shall be filled and pointed with an approved non-shrinking mortar. The test shall be made prior to placing the shelf and invert and before filling and pointing the interior horizontal joints. If the groundwater table has been allowed to rise above the bottom of the manhole, it shall be lowered for the duration of the test. All pipes and other openings into the manhole shall be suitable plugged and the plugs braced to prevent blow out.

Exfiltration Testing:

The manhole shall then be filled with water to the top of the cone section. If the excavation has not been backfilled and observation indicates no visible leakage that is, no water visible moving down the outside surface of the manhole, the manhole may be considered to be satisfactory water-tight. If the test, as described is unsatisfactory, as determined by the Town Inspector or if the manhole excavation has been backfilled, the test shall be continued. A period of time may be permitted, if the Contractor so wishes, to allow for absorption. At the end of this period the manhole shall be refilled to the top of the cone and the measuring time of at least two (2) hours shall begin. This amount shall be extrapolated to a 24 hour rate and the leakage determined on the basis of depth. The leakage for each manhole shall not exceed one (1) gallon per vertical foot per day, a twenty-four (24) hour period shall equal one day. If the manhole fails this requirement, but the leakage does not exceed three (3) gallons per vertical foot per day, repairs by approved methods may be directed by the Town Inspector to bring the leakage within the allowable rate of one (1) gallon per foot per day. Leakage due to a defective section or joint or exceeding the three (3) gallon vertical foot per day, shall be the cause for the rejection of the manhole. It shall be the L.U.I.'s responsibility to uncover the manhole, as necessary, and to disassemble, reconstruct, or replace it as directed by the Town Inspector. The manhole shall then be retested and, if satisfactory, interior joints shall be filled and pointed and the invert constructed.

No adjustment in the leakage allowance will be made for unknown causes such as leaking plugs, absorptions, etc., it will be assumed that all loss of water during the test is a result of leaks through the joints or through the concrete. Furthermore, the L.U.I. shall take any steps necessary to assure the Town Inspector that the water table is below the bottom of the manhole throughout the test.

If the groundwater table is above the highest joint in the manhole, and there is no leakage into the manhole, as determined by the Town Inspector, such a test can be used to evaluate the water-tightness of the manhole. However, if the Town Inspector is not satisfied, the Contractor shall lower the water table and carry out the test as described hereinbefore.

Vacuum Testing:

The vacuum test shall be based on the time, measured in seconds, for the vacuum to decrease from 10 inches of mercury to 9 inches of mercury for manholes.

Acceptance of manholes is based on the following:

| Manhole | Manhole Diameter | Time to Drop 1" Hg (10" to 9") |
|---|---|---|
| 10 ft or less | 4 ft | 120 seconds |
| 10 ft to 15 ft | 4 ft | 150 seconds |
| 15 ft to 25 ft | 4 ft | 180 seconds |

NOTE: For 5 ft diameter manholes, add 30 seconds to the times above.
For 6ft diameter manholes, add 60 seconds to the times above.

The vacuum test gauge shall have been recently calibrated, and a copy of the calibration results shall be made available to the Director prior to testing.

If the test on the manhole fails (the allowable gallons or the time is less than that tabulated above), necessary repairs shall be made and the vacuum test repeated, until the manhole passes the test.

Section 22. Manhole Cleaning

All new manholes shall be thoroughly cleaned of all silt, debris and foreign matter of any kind, prior to final inspection.

ARTICLE VI
USE OF THE PUBLIC SEWER

Section 1. No person shall discharge or cause to be discharged any stormwater, surface water, ground water, roof runoff water, subsurface drainage water, uncontaminated cooling water or unpolluted industrial waters to any sanitary sewer.

Section 2. Stormwater and all other unpolluted drainage waters shall be discharged to such systems as are specifically designated as storm sewers or to a natural outlet as approved by the Town Conservation Commission, Town of Chatham Surveyor of Highways, and/or the Commonwealth of Massachusetts DEP or EPA. Any such discharge may be subject also to an NPDES permit. It shall be the responsibility of the originator of the discharge to obtain all required permits.

Section 3. Cleaning, maintaining, and repairing of building sewers, from the building to the property line at the street, shall be done at the expense of the owner, provided there is a manhole or cleanout at the property line. If there is no manhole or cleanout at the property line, the owner shall be responsible for the building sewer from the building to the public sewer.

Section 4. No person shall discharge or cause to be discharged any of the following described waters or wastes to any public sewer or sewage works.

~~A. Any liquids, solids or gases which, by reason of their nature or quantity, are or may be sufficient, either alone or by interaction with other substances, to cause fire or explosion or be injurious in any other way to the sewage works, which will include but not limited to: gasoline, kerosene, naptha, fuel oil, paint, paint thinner, and turpine oil.~~

*A. Any liquids, solids or gases which, by reason of their nature or quantity, are or may be sufficient, either alone or by interaction with other substances, to cause fire or an explosion or be injurious, in any way to the sewage works, or to the operation of the sewage works, or to the safety and welfare of the workers and the public at large shall be prohibited from discharge to the sewage works. Prohibited materials include, but are not limited to, gasoline, kerosene, naptha, benzene, toluene, xylene, ethers, alcohols, carbides, hydrides, and sulfides, and any other substance which the Director, the Town of Chatham, the State, or EPA has determined to be a fire hazard to the sewer works.*

B. Any waters or wastes containing toxic or poisonous solids, liquids or gases in sufficient quantity, either singly or by interaction with other wastes, to injure or interfere with any sewage collection or treatment process, constitute a hazard to humans or animals and/or create a public hazard in the receiving waters of the sewage treatment facility.

C. Any water or wastes having a pH less than 5.5 or greater than 9.5 or having any other corrosive property capable of causing damage or hazard to structure, equipment, and/or personnel of the sewage works.

D. Solid or viscous substances in quantities or of such size capable of causing obstruction to the flow in sewers, or other interference with the proper operation of the sewage works, such as, but not limited to: fish scales, fish gurry, ashes, cinders, sand, mud, straw, shavings, metal, glass, rags, diapers, feathers, plastics, wood, unground garbage, whole blood, paunch manure, hair and fleshings, entrails, and paper dishes, towels, cups, milk containers, and etc.

*E. Due to the special nature and environmental needs of the Town of Chatham and the surface and groundwaters of the Town, no person shall discharge or cause to be discharged wastewater containing nitrogen and/or phosphorus compounds in a concentration greater than 50mg/L. Any non-domestic discharges having concentration greater than 50mg/L shall require a special permit from the Director. Said permit may include sampling, flow measurement, pretreatment, and/or special fees as a condition of permit issuance.*

*Any non-domestic discharge having a BOD or TSS concentration greater than 300 mg/L shall require a special permit from the Director. Said permit may include sampling, flow measurement, pretreatment, and/or special fees as a condition of permit issuance.*

*F. Any wastewater which will cause interference or pass through.*

Section 5. No person shall discharge or cause to be discharged the following described substances, materials, water, or waste if it appears likely in the opinion of the Director that such waste can harm the sewer sewage treatment process, or equipment, have an adverse effect on the receiving stream or can otherwise endanger life, limb, public or private property or cause a nuisance.

Informing his opinion as to the acceptability of these substances, the Director will give consideration to such factors as: the quantities of subject substance in relation to flows and velocities in the sewers; material use in the construction of the sewage collection and treatment facilities; nature of the sewage treatment process, capacity of the sewage collection and treatment facilities; and other factors which in his judgment are pertinent.

*The limitations on wastewater strength or mass discharge contained herein may be supplemented with more stringent limitations when, in the opinion of the Director they are warranted:*

*(1) The limitations in this set of regulations are not sufficient to protect the POTW and the sewage works;*
*(2) The limitations herein are not sufficient to enable the POTW to comply with applicable water quality standards, the effluent limitations specified in the POTW's groundwater discharge permit, or effluent reuse;*
*(3) The POTW sludge or other residuals will be rendered unacceptable for disposal or reuse a the Town of Chatham desires as the result of discharge of wastewaters at the above prescribed limitations,*
*(4) Municipal employees or the public will be endangered or otherwise affected by nuisance conditions;or*
*(5) Air or ground water impacts will be caused.*

The restricted substances are as follows:

~~A. Any substance having a temperature higher than one hundred four degrees, fahrenheit (104 F), or forty degrees Celsius (40 C.).~~

*A. Any solid, liquid, vapor, or gas having temperature higher than 65 degrees C (150 degrees F); however, such materials shall not cause the POTW influent temperature to be greater than 40 degrees (104 degrees F). The Director reserves the right to prohibit or limit the discharge of wastes whose maximum temperatures are lower than 65 degrees C.*

B. Any water or waste containing fats, wax, grease or oils, whether emulsified or not, in excess of one hundred (100) mg/l or containing substances which may solidify or become viscous at temperatures between thirty two (32) and one hundred and four (104) degrees F (0 and 40 degrees C).

C. Any garbage that has not been properly shredded to a maximum of one half of an inch (1/2"), 1.27 centimeters, in any dimension. The installation and operation of any garbage grinder equipped with a motor of three-fourths (3/4) horsepower (0.76 hp metric) or greater shall be subject to the review and approval of the Director.

D. Any waters or wastes containing strong acid iron pickling wastes, or concentrated plating solutions whether neutralized or not.

E. Any waters or wastes containing iron chromium, copper, zinc, and similar objectionable or toxic substances; or wastes exerting an excessive chlorine requirement, to such degree that any such material received in the composite sewage at the sewage works exceeds any limits established by EPA or DEP for such material.

F. Any waters or wastes containing phenols or other taste or odor producing substances in concentration exceeding limits, established by the Director, as necessary, after treatment of the composite sewage to meet the requirements of the State, Federal, or other public agencies having jurisdiction over sewage treatment facilities' discharge to receiving waters.

G. Any radioactive wastes or isotopes of such half-life or in concentration as may exceed limits, established by the Director and not in compliance with applicable State or Federal regulations.

H. Any water or wastes having a ph in excess of 9.5.

I. Materials which exert or cause:

1. Unusual concentrations of inert suspended solids, such as, but not limited to: fullers earth, lime slurries, and lime residues or of dissolved solids, such as, but not limited to: sodium chloride and sodium sulphate.

2. Excessive discoloration (such as, but not limited to: dye wastes and vegetable-tanning solutions).

3. Unusual BOD, chemical oxygen demand, or chlorine requirements in such quantities as to constitute a significant load on the sewage works.

4. Unusual volume of flow or concentration of wastes constituting "slugs" as defined herein under Article 1, Definitions.

J. Waters or wastes containing substances which are not amenable to treatment or reduction by the sewage treatment processes employed, or are amenable to treatment only to such degree that the sewage treatment facilities' effluent cannot meet the requirements of other agencies having jurisdiction over discharge to the receiving waters.

*K. Concentration and/or mass-based limits-No person shall discharge, directly or indirectly, into the sewer works, wastewater containing any of the following substances in concentrations exceeding those specified below on either a daily basis or an instantaneous basis, except by permit. Limits are applicable at the point of exit from a property to the public sewer.*

| *POLLUTANT* | *CONCENTRATION: PARTS PER MILLION (mg/L* |
|---|---|
| *Arsenic as As* | *0.05* |
| *Barium as Ba* | *5.0* |
| *Boron as B* | *5.0* |
| *Cyanides as Cn (amenable)* | *0.1* |
| *Fluroide as F* | *20* |
| *Chromium (total)* | *1.0* |
| *Chromium (Cr+6)* | *0.1* |
| *Magnesium as Mg* | *100* |
| *Manganese as Mn* | *5.0* |
| *Copper as Cu* | *1.0* |
| *Zinc as Zn* | *1.0* |
| *Cadmium* | *0.07* |
| *Lead* | *0.1* |
| *Tin* | *2.0* |
| *Silver* | *0.1* |
| *Mercury* | *0.01* |
| *Nickel* | *1.0* |

*Note: All metals are to be measured as total metals.*

Section 6. If any waters or wastes are discharged, or are proposed to be discharged to the public sewers, which contain the substances or posses the characteristics enumerated in Section 5 of this Article, and which in the judgment of the Director may have a deleterious effect upon the sewage works, processes, equipment, or receiving waters or which otherwise create a hazard to life or constitute a public nuisance, the Director may:

A. Reject the wastes.

B. Require pretreatment to an acceptable condition before discharge to the public sewers.

C. Require control over the quantities and rates of discharge and/or

D. Require payment to cover the added cost of handling and treating the wastes not covered by existing taxes or sewer charges.

If the Director permits the pretreatment or equalization of waste flows, the design and installation of the pretreatment facility and equipment shall be subject to the review and approval of the Director and subject to the requirements of all applicable codes, ordinances, and laws.

Section 7. Grease, oil, and sand interceptors shall be provided when, in the opinion of the Director they are necessary for the proper handling of liquid wastes containing grease in excessive amounts, or any flammable wastes, sand, or other harmful ingredients; Except such interceptors shall not be required for private living quarters or dwelling units. All interceptors shall be of the type and capacity approved by the Director, and shall be located as to be readily and easily accessible for cleaning and inspection. MDC Grease Interceptors shall be installed in the building sewer serving restaurants or hotels, boarding houses that prepare and serve food or business of a similar nature. Maintenance, operation, and repair of all installed interceptors shall be at the expense of the owner and subject to the inspection by the Director or his authorized representative.

Section 8. Where pretreatment or flow-equalizing facilities are provided for any waters or wastes, they shall be maintained continuously in satisfactory and effective operation by the owner, at the owner's expense.

Section 9. The owner of any property serviced by a building sewer carrying industrial wastes shall install a suitable control manhole together with such necessary meters and other appurtenances, as determined by the Director, in the building sewer to facilitate observation, sampling, and measurement of wastes. Such manhole shall be accessible and safely located, and shall be constructed in accordance with plans approved by the Director. The manhole shall be installed by the owner at the owner's expense and shall be maintained by owner so as to be safe and accessible at all times.

Section 10. All measurements, tests, and analyses of the characteristics of waters and wastes to which reference is made in this ordinance shall be determined in accordance with the latest edition of " Standard Methods for the Examination of Water and Wastewater", published by the American Public Health Association and 40CFR, Part 136, and shall be determined from suitable samples taken at the control manholes provided. In the event that no special manhole has been provided, the control manhole shall be determined by the Director. (Normally the control manhole will be the nearest downstream manhole in the public sewer to the point at which the building sewer is connected). Sampling shall be carried out by customarily accepted methods to reflect the effect of constituents upon the sewer works and to determine the existence of hazards to life, limb, and property. (The particular analyses involved will determine whether a twenty-four (24) hour composite of all outfalls of a premise is appropriate or whether a grab sample for samples should be taken. Normally, but not always, BOD and suspended solids analyses are obtained from 24 hour composites of all outfalls, whereas pH's are determined from periodic grab samples or continuous monitors).

Section 11. No statement contained in this Article shall be construed as preventing any special agreement or arrangement between the Town and any industrial concern whereby any waste of unusual strength or character may be accepted by the Town for treatment, subject to payment therefore, provided that such agreements do not contravene any requirements of existing federal, state, or local laws and are compatible with any user charge and industrial cost recovery system in effect.

ARTICLE VII
PROTECTION FROM DAMAGE

Section 1. No person shall maliciously, ~~wirfull~~ *willfully* or negligently bread, damage, destroy, uncover, deface, or tamper with any structure, appurtenance or equipment which is a part of the sewage works. Any person violating this provision shall be subject to immediate arrest under charge of disorderly conduct.

ARTICLE VIII

POWER AND AUTHORITY OF INSPECTION

Section 1. The Director and other duly authorized employees of the Town of Chatham Water and Sewer Departments, bearing proper credentials and identification, shall be permitted to enter all properties for the purpose of inspection, observation, measuring, sampling, and testing in accordance with the provisions of this ordinance. The Director, or his representatives, shall have no authority to inquire into any processes including metallurgical, chemical, oil refining, ceramic, paper, or other industries beyond that point having a direct bearing on the kind and source of discharge to the sewers or waterways or facilities for wastes treatment.

Section 2. While performing the necessary work on private properties, referred to in Article VII, Section 1., above, the Director, or duly authorized representative of the Director shall observe all safety rules applicable to the premises established by the owner or occupant person and the owner and/or occupant person shall be held harmless for injury or death to the Director's representative and the Town shall indemnify the owner and/or occupant person against loss or damage to its property by Director's representatives and against liability claims and demands for personal injury or property damage asserted against the and owner /or occupant person and growing out of the gauging and sampling operation, except as such may be caused by negligence or failure of the owner and/or occupant person to maintain safe conditions as required in Article V Section 9.

Section 3. The Director, and other duly authorized representative of the Water and Sewer Departments, bearing proper credentials and identification shall be permitted to enter all private properties through which the Town holds a duly negotiated easement for the purpose of, but not limited to: operation, inspection, observation, measuring, sampling, repairing, and maintenance of any portion of the sewage works lying within said easement. All entry and subsequent work, if any in said easement, shall be done in full accordance with the terms of the duly negotiated easement pertaining to the private property involved.

ARTICLE XI
PENALTIES

Section 1. Any person found to be violating any provisions of these Rules and Regulations except Article VI shall be served by the Town with written notice stating the nature of violation and the offender shall permanently cease all violations. The Director may immediately halt or prevent any discharge of pollutants which reasonably appears to present an imminent endangerment to the health or welfare of persons. In the event that the Director

# LEGAL ADVERTISING

determines that a discharge of pollutants reasonably appears to present an imminent endangerment to the health or welfare of persons, the Director may provide informal (oral or written) notice of such determination to the discharger. The offender shall, within the period of time stated in such notice, permanently cease all violations by immediately stopping or eliminating such discharge and shall submit written proof of the elimination of the discharge to the Director within forty-eight (48) hours of receipt of notice of the Director's determination. If said person fails to voluntary halt such discharge, the Director will take such actions as deems necessary to prevent or minimize endangerment to the health or welfare of persons. Such actions may include, but are not limited to: seeking temporary injunctive relief, entry onto private property to halt such discharge, severance of the sewer connection, suspension of wastewater disposal service, suspension or revocation of a discharge permit, and/or implementation of legal action. After such discharge has been halted, the Director may take such other and further actions as may be necessary to ensure elimination of said discharge and to ensure compliance with the terms of these Rules and Regulation and any discharge permits issued hereunder.

Section 2. Any person who shall continue any violation beyond the time limit provided for in Article VIII, Section1 shall be guilty of a misdemeanor, and on conviction thereof, shall be fined an amount not exceeding five thousand dollars ($5,000) for each day for each violation of any provisions of these Rules and Regulations. Each day in which any such violation shall continue shall be deemed a separate offense. These penalties are stated in the Massachusetts General Laws, Chapter 83, as amended by Chapter 174 of the Acts of 1987. Enforcement action shall be considered to begin immediately upon discovery of the violation for the purpose of calculating penalties, etc.

Section 3. Any person violating any of the provisions of this ordinance shall become liable to the Town for any expense, loss or damage occasioned by the Town by reason of such violation.

Section 4. Neither the Town nor any of its employees shall be liable for damages arising out of a malfunction of the system including, but not limited to, backups.

ARTICLE X
VALIDITY

Section 1. All ordinances or parts of ordinances in conflict with these Rules and Regulations of the Sewer Department are hereby repealed.

Section 2. The invalidity of any section, clause, sentence, or provision of this ordinance shall not affect the validity determined by the Board as to which of any other part of this ordinance which can be given effect without such invalid part or parts.

ARTICLE XI

COLLECTION OF SEWER AND SERVICE CHARGES:

Sewer bills are due payable within thirty (30) days from the date of issuance. All sewer bills that are outstanding after 30 days will be mailed a demand notice which shall be due within fourteen (14) days. The demand notice shall include a demand charge and interest on the outstanding balance. Interest shall accrue at the statutory rate applicable to property taxes as stated in Massachusetts General Law Chapter 59, Section 57. If the charges are still unpaid after the due date of the demand notice, a hand delivered notice will be posted on the premises being served one week before sewer service is turned off or plugged. In order to turn off or plug a sewer service without causing a health problem the water service shall also be turned off. If the water service shall be turned off for non-payment of the sewer service charges, the water service will not be turned on until all past charges are paid in full, including all expenses associated with collection of such sewer charges and the shut off of water service. Such shut off of water charges shall be as approved by the Water Commissioners as water rates and charges of the Water Department.

ARTICLE XII

GRIEVANCE AND VARIANCE PROCEDURE:

A person who seeks a variance or feels aggravated due to the interpretation of these Rules and Regulations as it affects them shall have recourse, without prejudice or retribution, to seek a response to the alleged situation, condition, problem or misunderstanding in the following manner:

Step 1. The person shall present the issue to the Director in writing using the forms available at the Water and Sewer Departments' office, documenting the time and/or dates of the circumstances and reasons for a variance request or said grievance. The person may expect a reply to the request for variance or grievance within thirty (30) days from the date of filing with the Director.

Step 2. Should the issue not be resolved with the response from the Director or not received within thirty (30) days, the person may take the issue to the Water and Sewer Advisory Committee. Such submission shall include copies of all written documentation of the variance request or said grievance, with all sequence of actions or inactions taken to date.

The Water and Sewer Advisory committee will use its best effort to hold a hearing within forty-five (45) days of receipt of an application for a abatement, variance or grievance request, and shall render a decision within forty-five (45) days after holding such hearing on the application for a abatement, variance or grievance request.

Step 3. Should the issue not be resolved with the response from the Water and Sewer Advisory Committee or not received within forty-five (45) days after the Water and Sewer Advisory Committee closes the hearing on a person's application for abatement, variance or grievance request, the person may take the issue to the Board of Selectmen. Such submission shall include copies of all written documentation of the variance request or said grievance, with all sequence of actions or inactions taken to date.

The Board of Selectmen will use their best effort to hold a hearing within sixty (60) days of receipt of an application for an abatement, variance or grievance request and shall render a decision within forty-five (45) days from date of the hearing.

ARTICLE XIII
ORDINANCE IN FORCE

Section 1. This ordinance shall be in full force and effect from and after its passage, approval, recording, and publication as provided by law.

# NOTES

# Appendix G

## Chatham CWMP Approval Certificate by Massachusetts Executive Office of Energy and Environmental Affairs Dated July 17, 2009

*The Commonwealth of Massachusetts*
*Executive Office of Energy and Environmental Affairs*
*100 Cambridge Street, Suite 900*
*Boston, MA 02114*

Deval L. Patrick
GOVERNOR

Timothy P. Murray
LIEUTENANT GOVERNOR

Ian A. Bowles
SECRETARY

Tel: (617) 626-1000
Fax: (617) 626-1181
http://www.mass.gov/envir

July 17, 2009

CERTIFICATE OF THE SECRETARY OF ENERGY AND ENVIRONMENTAL AFFAIRS
ON THE
PHASE III - FINAL EIR/COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

| | |
|---|---|
| PROJECT NAME | : Chatham Comprehensive Wastewater Management Plan |
| PROJECT MUNICIPALITY | : Chatham |
| PROJECT WATERSHED | : Cape Cod |
| EOEA NUMBER | : 11510 |
| PROJECT PROPONENT | : Town of Chatham |
| DATE NOTICED IN MONITOR | : June 10, 2009 |

As Secretary of Energy and Environmental Affairs, I hereby determine that the Phase III - Final Environmental Impact Report (FEIR) submitted on the above project **adequately and properly complies** with the Massachusetts Environmental Policy Act (M.G.L. c. 30, ss. 61-62I) and with its implementing regulations (301 CMR 11.00).

Project Overview

The Town of Chatham's comprehensive wastewater management planning process has been undertaken for the purposes of:

1) Evaluating and planning for the impacts to the Town's marine and freshwater resources from existing development and anticipated future residential and commercial growth in the Town of Chatham over the 20-year project planning period (ending in 2030);

2) Evaluating and quantifying the Town of Chatham's existing and future contributions to nitrogen loading of coastal embayments and freshwater ponds from on-site septic systems over the project planning period;

3) Evaluating the feasibility of centralized and decentralized wastewater treatment options, including the upgrade and expansion of the Chatham Wastewater Treatment Facility (Chatham WWTF) to meet the estimated 2030 nitrogen control needs and Total Maximum Daily Loads (TMDLs) established for the marine embayments surrounding Chatham;

4) Evaluating alternative methods for the disposal of treated wastewater including on-site and off-site groundwater disposal and wastewater reuse for landscape spray irrigation, with the intent of reducing groundwater discharges from the Chatham WWTF;

5) Evaluating the feasibility of non-structural and non-traditional nutrient management techniques to further reduce nutrient loading to the marine embayments surrounding Chatham; and,

6) Reviewing the long-term effectiveness of regional wastewater treatment and disposal options involving the Towns of Chatham and Harwich.

As presented in the Phase III – FEIR, the Town's comprehensive wastewater management plan (CWMP) has been designed to achieve reductions of nitrogen loading sufficient to meet nutrient TMDLs established for the Town of Chatham's coastal embayments and freshwater ponds including Stag Harbor, Pleasant Bay, Sulphur Springs and Taylor's Pond. I note that the Pleasant Bay watershed area is located within the Towns of Chatham, Harwich and Brewster. Pleasant Bay been designated an Areas of Critical Environmental Concern (ACEC) and an Outstanding Resource Waters (ORW) under the Massachusetts Surface Water Quality Standards (314 CMR 4.00). Extensive areas of Priority and Estimated Habitat of rare wildlife have been mapped by the Natural Heritage and Endangered Species Program (NHESP) within the Pleasant Bay ACEC.

MEPA History

This project involves the development of a comprehensive wastewater management plan/facilities plan for the Town of Chatham. The environmental review of the project under MEPA was defined in a Special Review Procedure established by agreement between the Town of Chatham and the MEPA Office in April 1998. The Special Review Procedure called for the filing of four documents:

- Phase I - Needs Analysis;
- Phase II - Screening of Alternatives;
- Phase III - Draft EIR/Facilities Plan; and
- Phase IV - Final EIR/Facilities Plan.

*Phase I– Needs Analysis*

The Phase I – Needs Analysis was submitted to the MEPA Office in September 1999 and was found adequate in October of 1999. The Secretary's Certificate on the Phase I - Needs Analysis required the Town to include in the Phase II submittal additional information pertaining to the Town's Needs Analysis, a discussion of the consistency of the CWMP with Executive Order 385, (Planning for Growth), and a discussion of the Town of Chatham's land use and open space goals.

*Notice of Project Change*

A Notice of Project Change (NPC) was filed with the MEPA Office on March 10, 2004 pursuant to Section 11.10(2) of the MEPA Regulations because more than three years elapsed between the publication of the Secretary's Certificate on the Phase I - Needs Analysis submittal and the Town's filing of the Phase II - Screening of Alternatives document with the MEPA Office. According to the comments received from the Department of Environmental Protection (MassDEP) and Massachusetts Coastal Zone Management (CZM) on the NPC submittal, the Town continued to demonstrate its commitment to the comprehensive wastewater management planning process and continued to work closely with MassDEP, the Cape Cod Commission (CCC), the Marine Estuaries Project (MEP) and others to develop appropriate nitrogen load limits (TMDLs) to be incorporated in the Town's CWMP for coastal embayments surrounding the Town of Chatham.

The NPC included the Town's request to modify the previously established April 1998 Special Review Procedure. The Town proposed to submit for MEPA review a Supplemental Needs Analysis, the Phase II - Screening of Alternatives document and the Phase III - Draft EIR/Facilities Plan document into one MEPA submittal entitled "Alternatives Analysis and Draft Environmental Impact Report (DEIR)/Draft Comprehensive Wastewater Management Plan". The proposed change to the Special Review Procedure allowed the MEPA review of the Town of Chatham's Comprehensive Wastewater Management Plan in three steps:

Phase I – Needs Analysis;
Phase II – Draft Environmental Impact Report/Draft CWMP; and,
Phase III - Final Environmental Impact Report /Final CWMP.

The Secretary's Certificate on the NPC submittal (April 9, 2004) found that the proposed changes to the Special Review Procedure were appropriate and acceptable. The Secretary's Certificate on the NPC required the Town to include in the Phase II document detailed responses to the issues raised in the comment letters previously submitted on the Phase I document and a discussion of the proposed project's consistency with Executive Order 385 (Planning for Growth), and the Town of Chatham's land use and open space goals.

*Draft Environmental Impact Report /Draft CWMP- 2nd Notice of Project Change*

The Town filed a Draft Environmental Impact Report (DEIR)/Draft CWMP with the MEPA Office on May 7, 2008. On June 13, 2008, I issued a Certificate on the DEIR/Draft CWMP submittal and determined that it adequately and properly complied with the Massachusetts Environmental Policy Act. The Secretary's Certificate required the Phase III - FEIR/Final CWMP submittal provide additional information and a response to comments pertaining to the Town's proposed Adaptive Management Plan, Restoration of Muddy Creek, Growth Management policies, regulations and bylaws and Mitigation.

State Permits and Jurisdiction

The project is undergoing review pursuant to Sections 11.03(5)(a)(3) and (5)(b)(2) of the MEPA regulations, because the project will likely involve the construction of sewer mains ten or more miles in length and the expansion of an existing wastewater treatment facility/disposal facility by more than 1,000,000 gallons per day (gpd). The project will require a Groundwater Discharge Permit and a 401 Water Quality Certificate from MassDEP. The project must be reviewed by the Natural Heritage Endangered Species Program (NHESP) and the Massachusetts Historical Commission (MHC) because portions of the project occur within Priority Habitat and within or adjacent to recorded archaeological sites and archaeologically sensitive areas, respectively. It may require Federal Consistency Review with the Massachusetts Coastal Zone Management (MCZM) Office. It may also require a Construction Access Permit from the Massachusetts Highway Department. The project should comply with the National Pollutant Discharge Elimination System (NPDES) General Permit for stormwater discharges from a construction site. It will also require an Order of Conditions from the Chatham Conservation Commission and, on appeal only, a Superseding Order of Conditions from MassDEP.

The Town anticipates applying for State Revolving Fund (SRF) loans for subsequent planning and construction of proposed sewer project. Therefore, MEPA jurisdiction is broad and extends to all aspects of the project that may cause Damage to the Environment, as defined in the MEPA regulations.

## REVIEW OF THE PHASE III - FINAL ENVIRONMENTAL IMAPCT REPORT and FINAL CWMP

The FEIR contains a detailed description of the Town of Chatham's recommended CWMP. Phase 1 of the Chatham CWMP involves the upgrade and expansion of the existing WWTF, located on an 80.2-acres parcel of municipally-owned property on Sam Ryder Road in Chatham, to meet Enhanced Nitrogen Removal (ENR) standards.

The proposed facility upgrades will enable the Chatham WWTF to treat and dispose approximately 1.3 million gallons per day (MGD) of additional wastewater flows. Under Phase 1, the Town also proposes to expand its existing sewer collection and conveyance system to serve 61 Areas of Concern ((AOCs) – areas experiencing high groundwater and failing septic systems, and industrial/commericial areas)) in Chatham located primarily within the watersheds for Stage Harbor, Sulphur Springs and Taylor's Pond. Construction of Phase 1 is expected to be completed in 2030.

Phase 2 sewer construction activities will involve the further expansion of the Town's sewer collection and conveyance system to serve Chatham's remaining 33 AOCs. Phase 2 will include additional upgrades to the Chatham WWTF and the construction of approximately 11 miles of gravity sewers to collect and convey approximately 0.6 MGD of additional wastewater flow (1.9 MGD total wastewater flows) for treatment and on-site disposal at the Chatham WWTF. The Phase 2 sewer construction work is expected to begin in 2030 and be completed by 2040. Proposed upgrades to the Chatham WWTF will also include the construction of a new Sewer and Water Department maintenance and administration building. As noted in the FEIR, the Chatham CWMP incorporates reserved treatment capacity at the Chatham WWTF to also accommodate the potential wastewater flows from portions of the neighboring Town of Harwich.

Chatham's CWMP incorporates an Adaptive Management Plan (AMP) that outlines a process for reporting the results of the Town's ongoing annual groundwater quality and marine habitat monitoring program to identify the need for any adjustments or mid-course corrections to the phased construction of the sewer expansion project to achieve compliance with TMDLs for the coastal embayments surrounding Chatham. The Draft CWMP also includes a number of non-structural elements designed to reduce nutrient loading including proposed programs for controlling the use of fertilizer products on lawns, gardens and agricultural areas, stormwater management and water conservation.

Wastewater Treatment and Water Quality

*Chatham Wastewater Treatment Facility*

As described in the FEIR, the previously completed (1996) improvements to the Chatham WWTF have enabled the treatment facility to achieve nitrogen effluent concentrations of 5.6 parts per million (ppm).

The existing treatment capacity of the Chatham WWTF (150,000 gpd) was established by MassDEP in a 1996 Administrative Consent Order (ACO). The Chatham CWMP proposes the phased upgrade and expansion of the Chatham WWTF that will include the Phase 1 construction of an Orbal biological nitrogen oxidation removal process system to provide treatment levels capable of achieving nitrogen effluent concentrations of 3 parts per million (ppm). The Chatham WWTF site is located upgradient of the Cockle Cove embayment and the Sulphur Springs and Taylor's Pond watersheds.

As described in the FEIR, the Town conducted a review of hydrogeological studies, hydraulic load testing and other groundwater modeling analyses pertaining to the existing Chatham WWTF site and concluded that the proposed increases to on-site disposal and groundwater recharge of treated effluent from the Chatham WWTF will not impact existing groundwater table mound heights and nutrient loading to the Cockle Cove and Taylor's Pond. Although the Town's modeling indicates that the TMDL threshold for nitrogen loading to Suphur Springs would be minimally exceeded under Phase 1 and Phase 2 of the Town's sewer expansion project, both MassDEP and CCC have agreed that the Town's modeling parameters pertaining to groundwater flows may be conservative. The Town has agreed to work closely with MassDEP, CCC and the University of Massachusetts School of marine Science and Technology (UMass SMAST) to conduct additional hydrogeologic investigations to document groundwater flow and potentially greater nitrogen attenuation of the downgradient Cockle Cove salt marsh system.

In its previous comments on the Draft EIR/Draft CWMP, MassDEP indicated that a portion of the Chatham WWTF's groundwater discharge site is located within the Zone II of the Town's Indian Hill public drinking water supply well. As a result, the facility's effluent discharge will need to include disinfection to meet Total Organic Carbon (TOC) limits of less than 3 mg/L treatment pursuant to MassDEP's Interim Guidelines on Reclaimed Water (Revised), January 3, 2000. As described in the FEIR, the Town has worked closely with MassDEP to identify TOC treatment alternatives. According to the information provided in the FEIR, MassDEP has subsequently agreed not to require the Chatham WWTF to meet MassDEP's TOC limits because the Indian Hill Well was taken out of production by the Chatham Water Department in 1999 due to the presence of trace amounts of contaminant (tetrachloroethylene (PCE)) and is not presently anticipated to be re-activated and reused as a water supply production well. MassDEP will require the Town to re-evaluate disinfection technology alternatives for the facility should the Town elect to re-activate and reuse the Indian Hill Well in the future.

The Town of Chatham's CWMP includes a commitment to conduct groundwater monitoring around the periphery and downgradient of the Chatham WWTF site to identify any impacts on groundwater resources and embayments surrounding the Town of Chatham. This groundwater monitoring program is expected to be incorporated into a MassDEP groundwater discharge permit for the Chatham WWTF. In its comments, the CCC has recommended that Town's groundwater monitoring program include monitoring for water levels, stream flow and water quality. I ask that the Town work closely with MassDEP, CCC and the Pleasant Bay Resource Management Alliance during the final design of its water quality monitoring program.

*Marine Embayments*

The Town of Chatham continues to participate in the Massachusetts Estuaries Project (MEP) to conduct water quality sampling and identify nutrient loading problems for the Town's coastal embayments. MEP was created by MassDEP, and UMass SMAST to define the nitrogen limits of coastal estuaries in southeastern Massachusetts.

The Technical Reports produced by the MEP, together with the Linked Water Quality Model and citizen water quality monitoring efforts, were used by MassDEP and the US Environmental Protection Agency (EPA) to establish Total Maximum Daily Loads (TMDLs) for nitrogen loading to Chatham's coastal emabyments and their tributaries. According to the comments received from MassDEP, CCC and others, the estimated nitrogen loading reductions resulting from the Town's proposed phased sewer expansion program are consistent with published TMDLs for Chatham's estuaries and salt marsh embayment systems including; the Stage Harbor/Oyster Pond system, the Taylor's Pond/Mill Creek system and the Pleasant Bay/Upper Muddy Creek/Lower Muddy Creek/Bassing Harbor system. According to MassDEP, the Town will need to provide MassDEP with additional information to demonstrate the maximum nitrogen load that can be assimilated in the Sulphur Springs/Bucks Creek/Cockle Cove system. The Town of Chatham's CWMP also includes a commitment to design and implement a long-term embayment monitoring program that will monitor water quality, eel grass coverage and benthic infauna habitat of Chatham's embayments to document the reductions in watershed nitrogen loads achieved from the Town's phased sewer construction program. The Town should work closely with MassDEP during permitting to ensure that the Town's embayment monitoring program includes compliance milestones to measure the CWMP's success in achieving target reductions of nitrogen loading sufficient to meet nutrient TMDLs established for the Town of Chatham's coastal embayments and freshwater ponds.

*Muddy Creek Basin Restoration*

The Muddy Creek watershed to Pleasant Bay is shared between the Towns of Chatham, Harwich and Brewster. According to the comments from CCC, sixtyfour percent of the nitrogen load to Muddy Creek originates from the Town of Harwich and thirtysix percent from the Town of Chatham. In addition to reserving capacity at the Chatham WWTF to accept a portion of the Town of Harwich's future wastewater flows, the Town of Chatham has identified the restoration of an old dyke located in the Muddy Creek basin to change the habitat of the upper portion of the creek to a freshwater body or the installation of a 8-16 foot wide culvert at the Route 28 crossing as a means of naturally removing a large amount of nitrogen from Muddy Creek and Pleasant Bay. According to the Town, the enhanced restoration of the Muddy Creek to a partial freshwater system could also reduce the extent of needed sewers currently proposed in the Town's recommended CWMP. As indicated in the FEIR, the Pleasant Bay Resource Management Alliance (Pleasant Bay Alliance) has obtained funding for additional evaluations pertaining to the potential impacts to surrounding resource areas associated with the restoration of Muddy Creek.

*Freshwater Ponds*

The Final CWMP/FEIR includes an evaluation of the impacts of phosphorous groundwater loading from residential land use on the water quality of large freshwater ponds and lakes located in Chatham.

Using water quality monitoring results collected as part of the Cape Cod Ponds and Lakes Stewardship (PALS), the Town has identified the need for restoring and protecting the water quality of two of Chatham's seven Great Ponds; Lovers Lake and Stillwater Pond. According to the Town, the proposed CWMP will significantly reduce phosphorous to groundwater and phosphorous loading to these ponds and will go a long way to meet the nutrient loading thresholds established in the Town of Chatham's *Action Plan for the Town of Chatham Ponds, November 2003.*

Adaptive Management Planning

The Chatham CWMP includes an AMP that will report to MassDEP the results of the Town's annual ground water monitoring of the Chatham WWTF site and embayment monitoring of Chatham's coastal embayments to document the reductions in watershed nitrogen loads achieved from the Town's phased sewer expansion construction program. The AMP will assist the Town to evaluate the Town's compliance with established TDMLs and identify the need for adjustments or mid-course corrections to Phase 2 of the Chatham CWMP. I strongly encourage the Town to consult with the Pleasant Bay Resource Management Alliance in designing the Town's water quality monitoring program and ask that the Town include the CCC and the Pleasant Bay Resource Management Alliance in the distribution of its annual water quality monitoring report.

Wetlands

According to the information provided in the FEIR, the Town's proposed WWTF upgrades and sewer expansion construction activities will be located primarily within existing roadway right-of-ways and will not result in any direct impacts to wetland resource areas subject to protection under the MA Wetlands Protection Act. The Town should submit a Request for a Determination of Applicability (RDA) to the Chatham Conservation Commission regarding the extent and boundaries of any jurisdictional wetland resource areas located within the project's WWTF site and sewer corridors. I am confident that the Chatham Conservation Commission's review will evaluate the Town's phased construction program and its erosion and sedimentation control plans and mitigation commitments to ensure that the project will be constructed in a manner consistent with the MassDEP Stormwater Management regulations and the Wetlands Protection Act performance standards.

Rare Species

The existing Chatham WWTF site is not located within Priority or Estimated Habitat for any state-listed rare plant and wildlife species as indicated in the current 13th Edition of the MA Natural Heritage Atlas.

The FEIR indicates that two rare species; the Pine Barrens Bluet (*Enallagma Recurvatum*) and the New England Bluet (*Enallagma Laterale*), have been located within the vicinity of the northern border of the facility which may require further review and future inclusion in the MA Natural Heritage Atlas. According to NHESP's comments on the FEIR, portions of the Town's sewer expansion project may include mapped Priority Habitat. NHESP anticipates being able to address any potential concerns associated with the Town's proposed sewer expansion project through the MESA review process. Should NHESP subsequently find that the project will require a Conservation and Management Permit pursuant to the Massachusetts Endangered Species Act (MESA), the Town will need to notify the MEPA Office to explain these impacts and discuss the Town's avoidance/mitigation strategies. I ask that the Town continue to work closely with NHESP and the Chatham Conservation Commission to identify those portions of the Town's Phase 1 and Phase 2 construction activities that that may require MESA review and to identify necessary project construction and post-construction conditions and commitments to avoid an adverse impact to the habitats of state-listed species.

Historical/Archeological Resources

In comments submitted on the FEIR, the Massachusetts Historical Commission (MHC) has requested that the Town provide the MHC with a US Geological Survey topographical map that locates the Town's phased project area and scaled project plans showing existing and proposed conditions to enable MHC to determine if pump stations and other sewer project elements are located within and/or adjacent to recorded archeological sites and archaeologically sensitive areas. These plans should be submitted to MHC as early as possible during the design phase corresponding to each project development phase. If MHC deems the project to have an "adverse effect" on historic or archaeological resources, the Town will need to notify the MEPA Office to describe the Town's commitment to work with MHC to implement appropriate avoidance/mitigation strategies.

Sewering and Growth Management

The FEIR/Final CWMP includes a discussion of the potential future build-out of the proposed Phase 1 and Phase 2 sewer areas and the consistency with Executive Order #385 which discourages unintended growth within areas planned for sewering. In May 2005, the Town passed a new section of the Town of Chatham's *Rules and Regulations of the Sewer Department* designed to limit new growth that might occur in newly sewered areas of Chatham. As described in the FEIR, the Town has adopted a 'flow-equivalent 'regulation that would limit the development or redevelopment of existing properties by restricting the number of bedrooms allowed to the number of bedrooms the property is currently allowed under Title 5 and local zoning.

I encourage the Town of Chatham to consider additional growth control by-laws, regulations, and policies and note that the Town of Orleans has recently proposed (EEA #14414, May 6, 2009) to implement a "checkerboard" sewer connection by-law that will enable the Town of Orleans to select specific lots that will be connected to the municipal sewer system and lots that do not need sewering and therefore will not be allowed to connect to the new sewer system. The Town should adopt any proposed growth by-laws, regulations, and policies prior to the construction of any new sewers extensions.

The Town of Chatham's recommended CWMP proposes to extend sewers to areas of Chatham characterized as coastal floodplains and barrier beaches. In its previous comments on the Town's Phase II - Draft CWMP/DEIR submittal, Massachusetts Coastal Zone Management (CZM) indicated that the Town successfully demonstrated that the proposed sewering project has been designed to eliminate or minimize potential storm damage risks associated with sewering barrier beach areas by locating proposed pump stations outside of the 100-year flood zone and protecting this portion of the Town's proposed sewer collection system from potential wave action. As described in the FEIR, the Town has committed to incorporate a system of check valves into the new sewer collection system for barrier beach areas to minimize impacts in the event of a storm-related breach to the collection system.

Costs to Homeowners

As described in the FEIR/Final CWMP, the Town's proposed sewer expansion program will be constructed in two phases over 30 years and will cost an estimated $340 million dollars. The estimated operation and maintenance costs for the proposed sewer expansion program total approximately $38 million dollars. Each property owner connecting to the sewer system will incur a one-time connection cost averaging between $3,000 and $10,000 depending upon the distance of their home/business from the street, and an average monthly sewer utility cost of approximately $30.00 - $40.00. The project's capital costs will be paid through property taxes. Based on an estimated average Chatham property value of $600,000, the estimated property tax increase for Fiscal Year (FY) 2012 is $102.00 and will gradually increase to $210.00 in FY 2017. The Town anticipates smaller tax increases through FY 2033 and a decline in taxes associated with the sewer project from FY 2033 - 2054. I note the comments received from the Chatham Concerned Taxpayers and others pertaining to the project's estimated cost to homeowners. The Town should continue its public participation program to ensure that the Town's residents will continue to be afforded the opportunity to provide input in the final design and cost effectiveness of the Chatham CWMP.

Future Sewer Expansion

The Town's CWMP has been designed to also accommodate potential future additional wastewater flows from portions of the neighboring town Harwich.

I commend the Town for undertaking a study of potential regional approaches to address the wastewater treatment and disposal needs for the Towns of Chatham and Harwich, and the regional issues pertaining to nutrient loading, wastewater treatment and disposal affecting the Pleasant Bay coastal embayment. I ask the Town of Orleans, together with the Town of Harwich to the west to work together with MassDEP, the Cape Cod Commission and others to continue the discussion of possible opportunities to integrate the Town of Chatham's wastewater treatment planning efforts with the planning efforts being undertaken by the Town of Harwich.

Mitigation

The FEIR provides a detailed description of the Town's proposed mitigation plan, and discusses the value of the proposed mitigation in terms of the resources it provides and the opportunities for open space protection, and active and/or passive recreation it affords.

Conclusion

After a thorough consideration of the comments received from MassDEP, the Cape Cod Commission, the Town of Chatham and others, I am satisfied that any outstanding design issues relating to sewer layout and construction phasing will be fully considered and addressed during state and local permitting. As noted elsewhere in this Certificate, the Town should continue to work closely with MassDEP, CCC and the Pleasant Bay Alliance during final project design.

July 17, 2009
DATE

Ian A. Bowles, Secretary

Comments received:

| | |
|---|---|
| 06/22/09 | Massachusetts Historical Commission (MHC) |
| 07/02/09 | Natural Heritage and Endangered Species Program (NHESP) |
| 07/10/09 | Massachusetts Department of Environmental Protection (MassDEP) – SERO |
| 07/06/09 | Town of Chatham, Water & Sewer Departments |
| 07/06/09 | Cape Cod Commission (CCC) |
| 07/09/09 | Town of Chatham, Office of the Town Manager |
| 07/10/09 | Chatham Concerned Taxpayers |
| 07/10/09 | Pio Lombardo |

EEA #11510 FEIR/FINAL CWMP
IAB/NCZ/ncz

# Appendix H

# Town of Chatham South Coastal Management Plan

# TOWN OF CHATHAM
# SOUTH COASTAL HARBOR MANAGEMENT PLAN

Prepared for
STAGE HARBOR MANAGEMENT PLAN
IMPLEMENTATION COMMITTEE

RIDLEY & ASSOCIATES, INC.

January, 2005

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# APPENDICES

# Executive Summary

## Section I: Framework of the Plan

### Introduction

The South Coastal Harbor Management Plan is an outgrowth of the original Stage Harbor Management Plan adopted by the Town of Chatham in 1994. Its purpose is to update the provisions of the original plan that apply to the Stage Harbor Complex, and to extend harbor planning to Chatham's adjoining waters of the Southway and Nantucket Sound.

The overarching goal of the plan is *to achieve balance among the various commercial and recreational uses of the harbor system and the quality and quantity of natural resources.* Achieving this goal requires the Town to consider broad community input in managing the harbor system, with priority in decision-making given to the long-term environmental health of the system and to maintaining a variety of harbor uses.

Underlying this planning goal are the following six management objectives:

- Maintaining the navigability of the harbor waterways,
- Protecting the viability of the commercial fishing and shellfishing industries,
- Maintaining a mix of recreational uses in the harbor areas,
- Protecting water quality, and the quality and quantity of shellfish, finfish and wildlife species and habitat,
- Maintaining and enhancing adequate public access to the harbor shoreline and waterways, and
- Preserving the character and scenic quality of the harbor areas.

The boundary for the South Coastal Harbor Management Plan encompasses all waterways, all filled tidelands and all shoreline within the following three planning areas:

(1) *Stage Harbor Complex* (as addressed in the original plan,) encompassing Stage Harbor, Oyster Pond, Oyster Pond River, Mill Pond, Little Mill Pond, and Mitchell River;
(2) *Southway Complex* encompassing the area between North Monomoy and South Beach, including Outermost Harbor and the Morris Island Cut; and
(3) *Nantucket Sound Complex* encompassing the near-shore waters of Nantucket Sound and Taylor's Pond, Mill Creek, Buck's Creek/Cockle Cove Creek/Sulphur Springs, Cockle Cove Beach, Forest Beach, Pleasant Street Beach, Ridgevale Beach, and Harding's Beach.

The plan includes a review of resource conditions and human use characteristics in each of the three planning areas, integration of relevant Town plans and related information pertinent to issues, identification of management issues, evaluation of management responses, and recommendations for action. Maps depicting resources, activities or other management topics are provided. The balance of this executive summary provides a brief review of major topics and recommendations found in each part of the plan.

7. Develop a dinghy storage plan appropriate to conditions at each town landing or access. Approaches to dinghy storage that should be considered include dinghy registration, racks, and use of town-owned "courtesy" dinghies.

8. Identify and evaluate opportunities to create or acquire new public access points as they may become available.

## Commercial Fishing Infrastructure

Commercial fishing and shellfishing is important to the local economy and is fundamental to Chatham's heritage. A continuing objective of the Town's management of the Stage Harbor Complex is to ensure that landside and waterside facilities needed to support commercial fishing and shellfishing are adequate to, at a minimum, safely and efficiently handle the current level of commercial fishing and shellfishing activity.

Recommended Actions and Policies

1. Evaluate options for ensuring adequate offloading, packaging and storage facilities for the commercial fleet in perpetuity, through repair and maintenance of existing facilities and potential addition of new public or private facilities. Among the options to be explored should be the potential for town purchase and operation of commercial offloading facilities, and incentives for private or cooperative purchase and operation of facilities for these uses. Whenever private waterfront property comes onto the market, the Town should evaluate the potential benefits and feasibility of purchasing the parcel.

2. Operators of commercial offloading facilities should provide adequate waste (trash, waste oil, etc.) management procedures and equipment, commensurate with the operation and services provided by the facility, in order to prevent degradation of water quality or surrounding resources.

3. Foster cooperation among town officials, commercial fishermen and local marinas and boat yards to ensure that adequate haul out facilities are available to the commercial fleet, and that they meet the most stringent applicable environmental requirements for protection of sensitive coastal resources.

4. Provide a reasonable number of public moorings to be made available to transient commercial boats needing to offload in Stage Harbor, provided the boat operators adhere to strict management protocols and all applicable regulations.

5. Continue to acquire public moorings at a reasonable rate in balance with the demand for private moorings. Public moorings could relieve demand for private moorings by commercial fishermen and seasonal boaters who only need to use a mooring for a limited period of time.

6. Protect provisions within the zoning bylaw that allow for gear storage in residential areas. Gear storage is currently provided at an area at the Chatham Airport. However misuse of the storage site has resulted in the expenditure of town resources to remove hazardous and

2. The Harbormaster and Waterways Advisory Committee should continue to evaluate the utilization of environmentally compatible mooring technologies and techniques as a means of limiting impacts on the environment and achieving the mooring layout plan. The use of alternate technologies or methods should not be pursued as a means of increasing the number of moorings in the Stage Harbor Complex. However, as noted above, changes in technology and improvements in layout could achieve efficiencies that result in no net negative impacts on congestion or natural resource impacts from the addition or relocation of moorings throughout the system, and without compromising vessel safety.

3. The Town should move forward with a proposal to designate environmentally sensitive areas and enforce the removal of concrete block moorings from those areas within five years of the designation. Specific criteria and evaluation methods for the designation of such areas should be developed.

4. Issues of insurance liability and compliance with applicable town bylaws and regulations need to be evaluated and addressed regarding instances when the Harbormaster authorizes temporary use of a mooring by a vessel other than the permit holder's.

### Regulation of Private Piers and Other Shoreline Structures

Private docks can have a variety of impacts on public access, navigation, and natural resources values addressed in this plan. Each of these impacts needs to be considered in the consistency review of specific private dock proposals. At the same time, clear permitting guidelines are needed to inform prospective dock permit applicants of the issues inherent in the consistency review and subsequent local and state reviews, and to assist them in assessing the potential for obtaining necessary local and state approvals prior to investment in application. The following actions are recommended to clearly define the purpose and process of the consistency review.

#### Recommended Actions and Policies

1. Undertake an assessment of the entire Stage Harbor Complex shoreline, focusing on the public access, navigation, and natural resource values addressed by the management plan. The assessment is necessary to determine where along the shoreline of the Complex piers may be found in compliance with the plan, and any areas where piers are not in compliance with the plan. The assessment should evaluate primary and secondary impacts on natural resources, public access, water quality, and navigation. (This recommendation applies for the Southway and Nantucket Sound complexes also.)

2. The assessment should be used to designate areas where the location of private piers may or may not be consistent with the management plan. The assessment should also be used to evaluate performance and design standards for private docks in areas where they may be consistent. Any such designations or specifications should be recommended for integration in to the local zoning bylaw governing docks, as well as wetland protection regulations. (This recommendation applies for the Southway and Nantucket Sound complexes also.)

4. The Town should ensure that funds are available to undertake regular bathymetric surveys of all navigable channels throughout the Complex to be able to track changes in depth over time.

### Boating Safety and Navigation

The Town should continue a policy of supporting a broad range of recreational and commercial activities in the Stage Harbor Complex while ensuring environmental protection and public safety.

Recommended Actions and Policies

1. Continue to use all means available to manage the number and size of boats that access the Stage Harbor Complex through town landings and access points.

2. The Harbormaster is encouraged to continue active, highly visible patrol presence during the prime boating season (Memorial Day through Labor Day), especially on weekends.

3. Appropriate town officials, as necessary, should undertake relocation of lobster pots when the location of pots poses a hazard to navigation. If such measures are not sufficient to address the problem, then regulatory steps should be considered.

4. Public education and changes in waterways regulation should be evaluated to promote safe and appropriate use of recreational equipment and activities, including but not limited to kayaks and canoes, windsurfing, kite sailing, towed tubes and water skis, and swimming.

## Commercial and Recreational Shellfishing

Commercial and recreational shellfishing is an important part of Chatham's heritage and the local economy. The plan seeks to support commercial and recreational shellfishing through regulatory enforcement, resource management and a continued high level of commitment to propagation.

Recommended Actions and Policies

1. Continue the Town's commitment to propagation of the wild shellfishery. Currently, Chatham has one of the most innovative and far reaching propagation programs among Cape Cod towns. The many years of successful propagation are no doubt largely responsible for the sustainability of commercial shellfishing in the community. The Town should explore the benefits of expanding the propagation program to encompass other species and to increase the production of seed. The adequacy of the existing upwelling facility to meet the Town's long-term propagation needs should be evaluated.

2. The number of commercial and recreational permits has increased over the past several years. The Town should ensure that increases in the number of permit holders is matched by a commensurate increase in the amount of resources spent on enforcement.

Recommended Actions and Policies

1. The Town should continue a high level of commitment to water quality monitoring throughout the Stage Harbor system. Implementation of the recommendations of the nutrient management plan should be a priority.

2. The Town should carefully consider employing DNA testing, or other feasible method of determining bacteria sources, in areas where sustained high bacteria counts have been recorded on a frequent basis. If in those areas a bacteria source is identifiable, the Town should undertake or require responsible parties to undertake remediation efforts (This recommendation applies for the Southway and Nantucket Sound complexes also.)

3. The Town should review the Coast Guard Area Committee Oil Spill Contingency Plan for Southern Massachusetts and Rhode Island and to evaluate whether it adequately addresses local emergency response needs. Recognizing that the Harbormaster must notify the Coast Guard of any fuel spill, the Town should develop a locally tailored emergency response plan to address spills that, while harmful to the area, may not trigger intervention by the Coast Guard. (This recommendation applies for the Southway and Nantucket Sound complexes also.)

4. The Town should continue to monitor research and policy developments regarding Harmful Algal Blooms (HABs). Based on information generated from regional and national institutions, and based on local conditions, the town should develop a plan to address the prevention, mitigation, and control of HABs. (This recommendation applies for the Southway and Nantucket Sound complexes also.)

SHELLFISH RESOURCES

Shellfish resources within the Stage Harbor Complex are often referred to as the "bread and butter" of the Town's shellfishing industry. Commercial and recreational harvesting of bay scallops, quahogs, soft-shell clams, and mussels occurs throughout the Stage Harbor Complex. Protection and enhancement of shellfish habitat—to ensure on-going viability of the wide variety of species native to these waters—is an important of objective of the plan.

Recommended Actions and Policies

1. The Town's shellfish propagation program should continue to be supported. The existing upwelling facility should be evaluated to determine if it is adequate to meet the Town's long-term propagation needs. To the extent that there is a desire to increase the volume or variety of species addressed by the program, increases in funding for the propagation program and a larger or additional upwelling facility may be necessary.

2. Impacts to shellfish habitat resulting from excessive nitrogen in coastal waters is being documented through the Town's wastewater planning project. Continued loss of habitat will have a dire impact on the local shellfishing industry. Implementation of wastewater management measures aimed at reducing the flow of nitrogen into coastal waters should be expedited. The potential for reclamation of degraded habitat areas also should be considered.

# Public Safety

The Southway has become an increasingly popular boating destination. The area experiences heavy boat traffic, often with vessels operated at excessive speeds. The narrow channel and strong currents pose added challenges for boaters.

Recommended Actions and Policies

1. The Town, through the Harbormaster, should continue to carefully monitor vessel traffic throughout the area and evaluate the need for further speed control measures, or other management actions aimed at keeping vessel conflicts or disturbance to nearby wildlife at a minimum.

### Natural Habitat and Resource Protection

The Southway provides important habitat to a wide variety of marine and terrestrial animals. The intrusion of boaters may be harmful to these important habitats. Special efforts must continue to ensure the area's biodiversity

Recommended Actions and Policies

1. The Town, through the Health and Environment Department and Harbormaster, should pursue the federal designation of the Southway within the three-mile limit of local jurisdiction as a No Discharge Area. The disposal of treated or untreated boat sewage is illegal within a No Discharge Area. Currently disposal of treated sewage in the area is permitted, although strongly discouraged. Disposal of untreated sewage is permissible in federal waters (beyond three miles off shore). The adequacy of pump out capacity at Old Mill Boat Yard in Stage Harbor will need to be evaluated as part of the application process. The Town should identify and secure resources necessary to ensure adequate pump out capacity and public outreach and education activities to support the designation. (This recommendation applies for the Nantucket Sound Complex also.)

2. The Town should continue to work with the appropriate governmental and non-governmental agencies involved in marine mammal protection, as well as seal tour providers to take measures to prevent harassment or injury to seals, and to report and respond to events as they occur. Measures may include monitoring and survey activities, public education efforts, enforcement of speed controls in the area, and placement of signs.

## Section IV: Nantucket Sound Complex

### Shoreline Protection

Protection of public and private shoreline from the process of erosion is a major management objective in Nantucket Sound. The Town's efforts to stabilize the shoreline should place priority on the protection of the Town's public beaches, and the safety of navigation.

consider management options and strategies for addressing demand. Any such management action, strategy or policy should strive to maintain the environmental integrity of the beaches and surrounding wetlands, respect traditional uses of the areas, and preserve the quality of beach experience provided.

2. Public safety is a concern in locations where boating activity takes place in proximity to swimmers and moored vessels. Forest Beach and Ridgevale Beach are areas where increased boating and beach activities have heightened concerns for potential conflicts. The Harbormaster and Park and Recreation Commission should address potential conflicts through public education, enforcement and, as needed, demarcation of swimming and boating areas.

1. The raking and piling of seaweed at Harding's, Cockle Cove and Ridgevale beaches has helped to stabilize dunes and reduce a public nuisance caused by excessive seaweed. The Park and Recreation Commission should adopt a plan to continue this program in a safe and effective manner.

2. The Parks and Recreation Commission should continue its policies concerning commercial activity at public beaches. The Commission currently bids out the right to provide limited mobile food and beach related sundries (except at Ridgevale Beach where such goods are sold on adjacent private property). The Commission should continue to prohibit the expansion of commercial activities at beaches.

3. Rules for pet access at public beaches should be continued and enforced. Signs indicating access rules, and "Mutt Mitt" dispensers, should be installed and maintained at all public beaches. Continued public education is needed regarding the need to pick up pet waste, especially along the shoreline where shellfishing and swimming occur.

### Protection of Habitat

The waters and associated upland of the Nantucket Sound Complex provide a variety of marine, terrestrial and avian habitat. Adequate steps must be taken to ensure that the habitat value of the Nantucket Sound Complex is preserved and, if necessary, restored.

#### Recommended Actions and Policies

1. The Town should continue a high level of commitment to water quality monitoring throughout the Nantucket Sound system. Implementation of the recommendations of the nutrient management plan should be a priority. Developments and activities that fall within the jurisdiction of health and wetland protection regulations should be held to the strictest standards applicable.

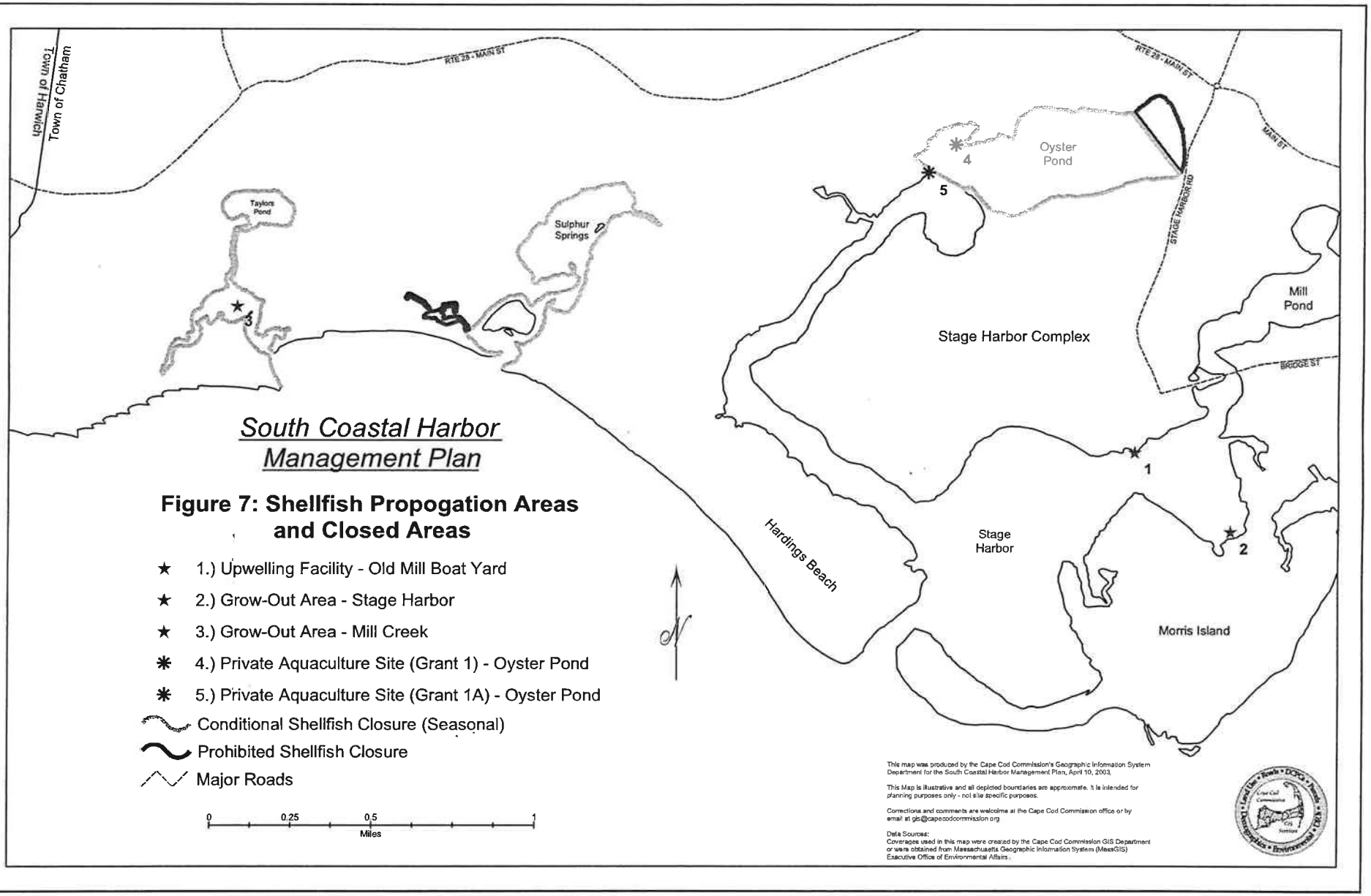
2. The Town is encouraged to continue a high level of commitment to public aquaculture projects, such as the grow-out area in Mill Creek, which seek to build the vitality of public shellfisheries. Through the Shellfish Constable the Town should seek to identify potential new grow-out locations within Nantucket Sound or elsewhere in Chatham's waters.

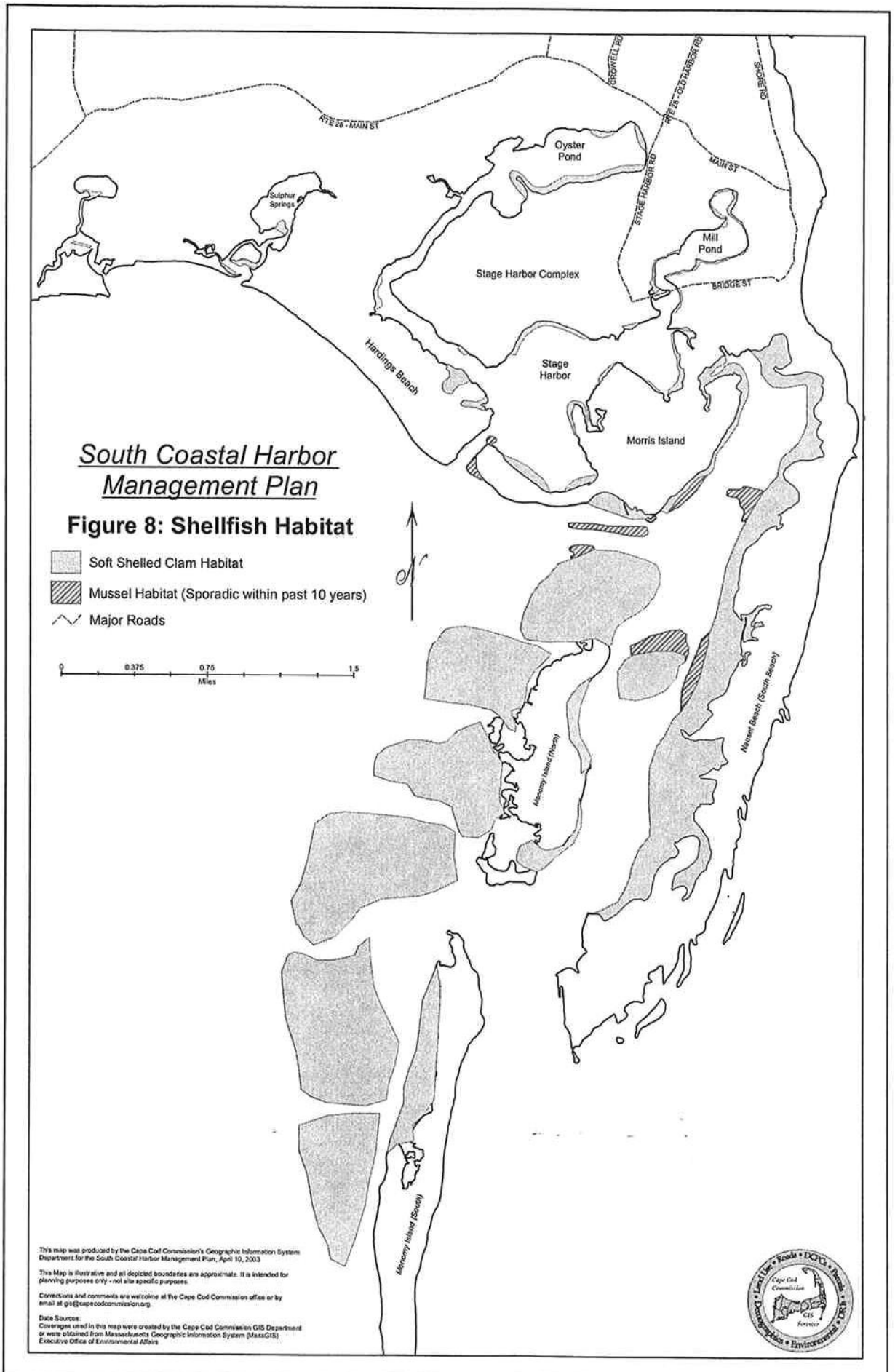
## Section V. Implementation Plan

It is recommended that the SHMPIC continue to be the organization charged with coordinating implementation activities. However the committee should be renamed, and current membership should be expanded to include representation of interests unique to the Southway and Nantucket Sound. The committee's role and responsibilities should continue to be:

- Conducting consistency reviews for Chapter 91 applicants within the planning area;
- Providing comment to the Conservation Commission and Zoning Board of Appeal regarding harbor related projects within the planning area, as needed;
- Encouraging interdepartmental cooperation in addressing and implementing recommendations;
- Encouraging public support and involvement in the development of policies and regulations called for in the plan; and
- Keeping focus on the priorities of the plan; and
- Providing a forum for new issues as they arise in the planning areas.

Chapter 5 includes matrices of specific actions called for in this plan. The matrices identify the parties that should be involved to provide full consideration to each action, and the levels of resources needed to implement each action.


Town of Harwich
Town of Chatham
RTE 28 - MAIN ST
RTE 28 - MAIN ST
MAIN ST
Taylors Pond
Sulphur Springs
Oyster Pond
4
5
3
STAGE HARBOR RD
Mill Pond
Stage Harbor Complex
BRIDGE ST
1
2
Hardings Beach
Stage Harbor
Morris Island
South Coastal Harbor Management Plan
Figure 7: Shellfish Propogation Areas and Closed Areas
★ 1.) Upwelling Facility - Old Mill Boat Yard
★ 2.) Grow-Out Area - Stage Harbor
★ 3.) Grow-Out Area - Mill Creek
✱ 4.) Private Aquaculture Site (Grant 1) - Oyster Pond
✱ 5.) Private Aquaculture Site (Grant 1A) - Oyster Pond
Conditional Shellfish Closure (Seasonal)
Prohibited Shellfish Closure
Major Roads
0 0.25 0.5 1
Miles
This map was produced by the Cape Cod Commission's Geographic Information System Department for the South Coastal Harbor Management Plan, April 10, 2003.
This Map is illustrative and all depicted boundaries are approximate. It is intended for planning purposes only - not site specific purposes.
Corrections and comments are welcome at the Cape Cod Commission office or by email at gis@capecodcommission.org
Data Sources:
Coverages used in this map were created by the Cape Cod Commission GIS Department or were obtained from Massachusetts Geographic Information System (MassGIS) Executive Office of Environmental Affairs.


Oyster Pond
Sulphur Springs
Mill Pond
Stage Harbor Complex
Hardings Beach
Stage Harbor
Morris Island
Mercony Island (North)
Nauset Beach (South Beach)
Mercony Island (South)
South Coastal Harbor Management Plan
Figure 8: Shellfish Habitat
Soft Shelled Clam Habitat
Mussel Habitat (Sporadic within past 10 years)
Major Roads
0
0.375
0.75
1.5
Miles
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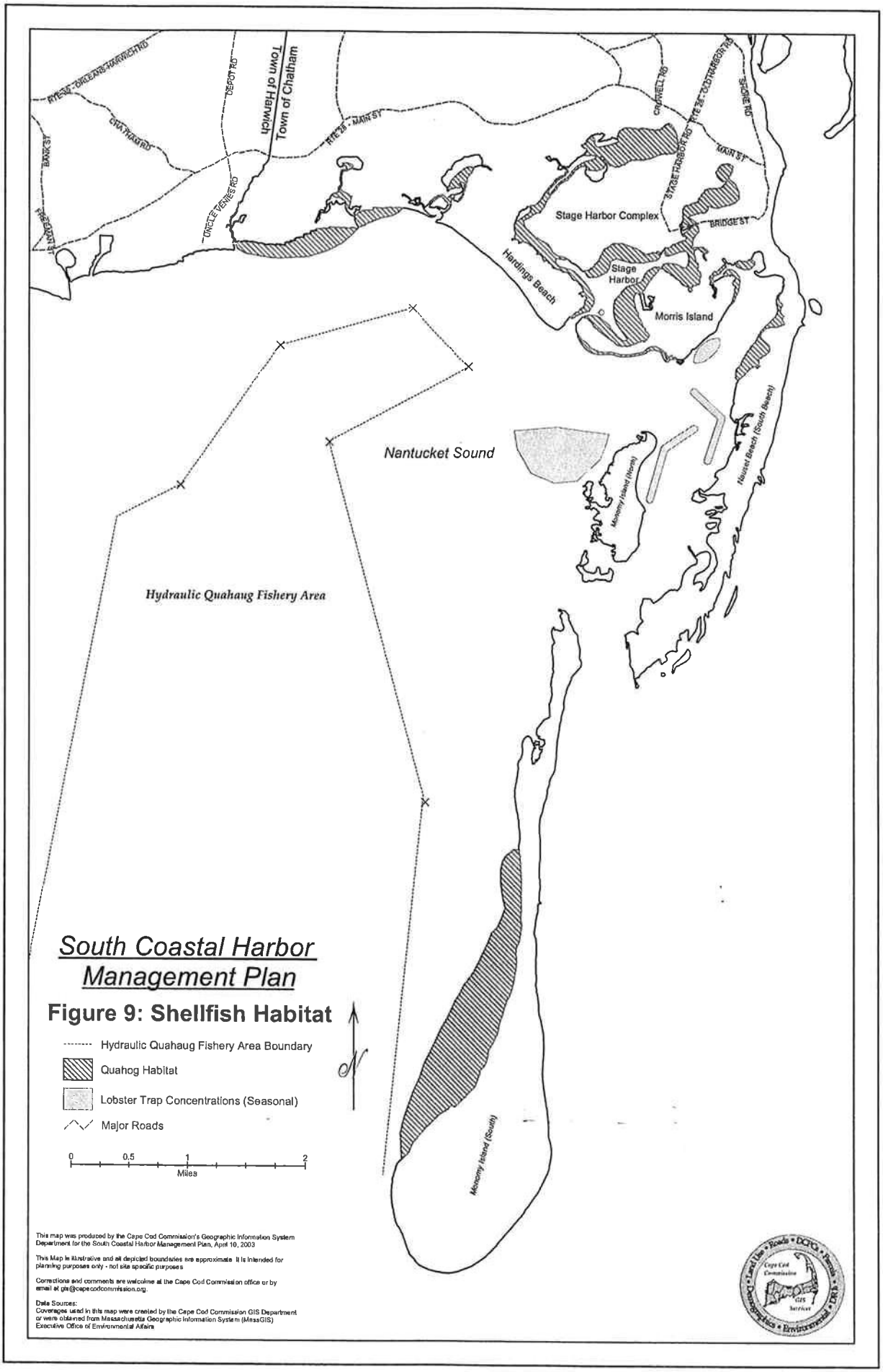
Town of Chatham
Town of Harwich
RTE 28 - ORLEANS-HARWICH RD
DEPOT RD
CHATHAM RD
BANK ST
UNCLE VENIES RD
RTE 28 - MAIN ST
CROWELL RD
RTE 28 - QUEHANNA RD
STORE RD
MAIN ST
STAGE HARBOR RD
BRIDGE ST
Stage Harbor Complex
Stage Harbor
Hardings Beach
Morris Island
Nantucket Sound
Monomoy Island (North)
Nauset Beach (South Beach)
Hydraulic Quahaug Fishery Area
Monomoy Island (South)
South Coastal Harbor Management Plan
Figure 9: Shellfish Habitat
Hydraulic Quahaug Fishery Area Boundary
Quahog Habitat
Lobster Trap Concentrations (Seasonal)
Major Roads
N
0
0.5
1
2
Miles
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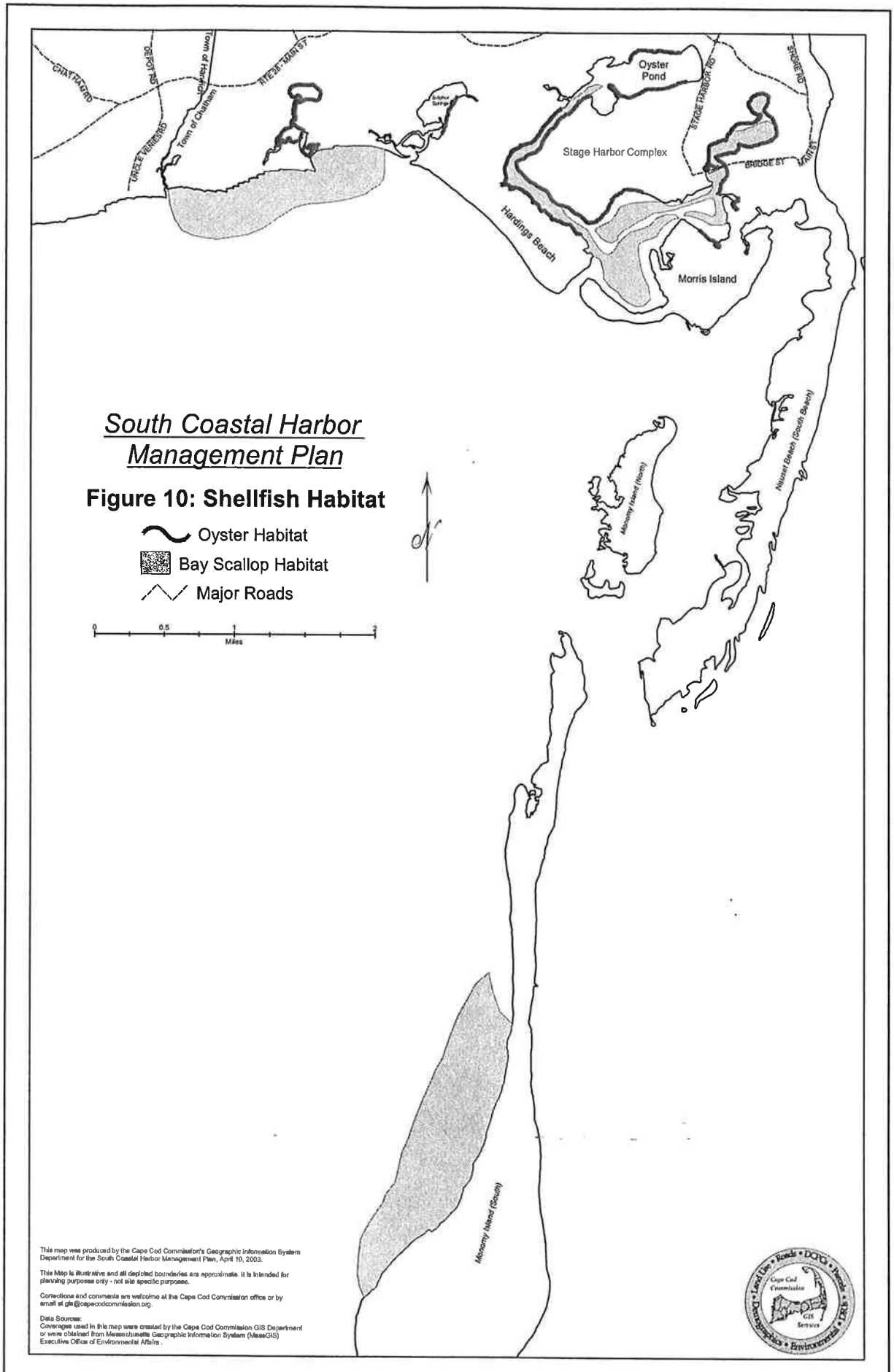
CHATHAM RD
DEPOT RD
Town of Chatham
TOWN OF HARWICH
MAIN ST
UNCLE VERNARD
Oyster Pond
STAGE HARBOR RD
STAGE RD
Stage Harbor Complex
BRIDGE ST
MAIN ST
Hardings Beach
Morris Island
Monomoy Island (North)
Nauset Beach (South Beach)
Monomoy Island (South)
South Coastal Harbor Management Plan
Figure 10: Shellfish Habitat
Oyster Habitat
Bay Scallop Habitat
Major Roads
0
0.5
1
2
Miles
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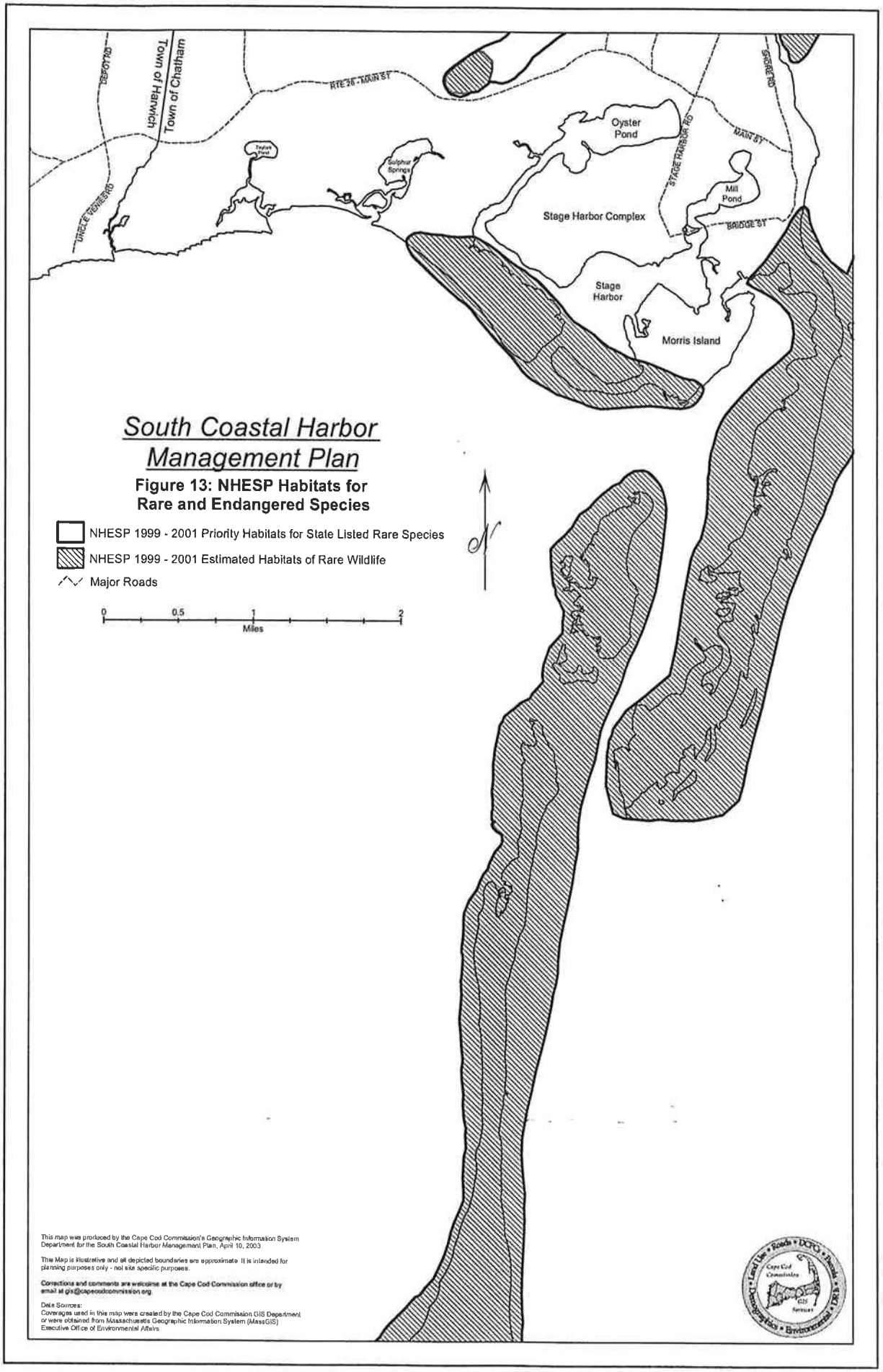
Town of Harwich
Town of Chatham
DEPOT RD
RTE 28 - MAIN ST
SCHOOL RD
Oyster Pond
MAIN ST
STAGE HARBOR RD
Trefry Pond
Sulphur Springs
UNCLE TOMS RD
Mill Pond
Stage Harbor Complex
BRIDGE ST
Stage Harbor
Morris Island
South Coastal Harbor Management Plan
Figure 13: NHESP Habitats for Rare and Endangered Species
NHESP 1999 - 2001 Priority Habitats for State Listed Rare Species
NHESP 1999 - 2001 Estimated Habitats of Rare Wildlife
Major Roads
0
0.5
1
2
Miles
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# Appendix I

## Excerpts from Town of Chatham Long Range Comprehensive Plan

Town of
CHATHAM MASSACHUSETTS
Town Offices 549 Main Street, Chatham, MA 02633 Phone: 508.945.5100 Fax: 508.945.3550

## Community Facilities and Services

# 2. Community Facilities and Services

## Overview

In 1996 the Monomoy Capacity Study warned that changes in the population demographics from seasonal to year round would significantly challenge the resources of Cape Cod towns. Chatham has seen significant change in the seasonal demographics since the Monomoy study.

Chatham is now a global destination. Its infrastructure is currently challenged by the need to manage its facilities and services for a winter population of seven thousand and a summer population which swells to thirty to forty thousand (Table 1). In 2000 Chatham had a year round population equivalent of greater than sixteen thousand people.

The Town currently owns and manages 26% of the land area exclusive of roadways. With additional land purchases, the area under management could rise to 31% (Table 2). The Town must manage these lands and their attendant buildings and structures with efficiency despite high variability in population density.

The committee believes that the key to an efficient planning and management effort is information that will allow us to understand the dynamics of our population growth and contraction. The Town needs to accurately determine for each property the number of bedrooms, restaurant seats or other use measurements and the amount of water consumed on each property by calendar quarter. This information will allow us to understand our population demographics.

Only after population demographics are understood, property inventories prepared and uses listed and defined should the Town proceed with the following goals and strategies. The goals which need to be addressed include:

Efficient housing for all government functions,
Additional burial and memorial space,
Safe pedestrian and vehicular transportation systems,
An adequate supply of safe water,
Advanced treatment and disposal of wastewater,
Economical solid waste disposal,
Protection of surface and ground waters.

## Goals & Policies

### 2.1 Goal - Town Lands

**Maintenance and management of town lands to meet the needs of municipal functions, and to include preservation of open space and conservation, consistent with deed restrictions or Town Meeting actions.**

**Policies**

A. **Maintain an inventory of town lands, including a file detailing use restrictions, maps, surveys, and deeds for all parcels.** (CF1)

B. **Develop management guidelines for all town lands. Zoning policies and decisions on the use of town lands shall be consistent with the stated purpose.** (CF2)

**Purpose**

**Conservation/Passive Recreation**

Purpose: preservation of open space, protection of natural resources, passive recreational uses such as walking, bicycling, picnicking. Structures and paved areas shall be limited to those necessary to protect resources and provide public access and passive recreational use.

***Conservation/Passive Recreation Lands - 550.62 acres***

| *Property* | *Map #*[1] | *Acres* | *Location* |
|---|---|---|---|
| Absegami Run | 51 | 3.24 | Oyster Pond Furlong |
| Cedar Swamp | 53 | 28 | Stage Neck |
| Forest Beach Conservation | 3A | 73 | Forest Beach Road |
| George Ryder Forest | 31 | 8 | George Ryder Rd. |
| Goose Pond (upper portion) | 16 | 49 | South of Old Queen Anne Rd. |
| Hardings Beach Marsh[2] | 25 | | Harding Beach Rd. |
| Honeysuckle Lane | 104 | 0.6 | Honeysuckle Lane |
| Indian Hill well site | 28 | 10 | Indian Hill Rd. |
| Ivy Lane | 101 | 1.8 | Ivy Lane |
| Lovers Lake | 38 | 1 | Old Queen Anne behind cemetery |
| McClure Property | 103 | 0.4 | Rte. 28 East of Pleasant St. |
| Middle Rd. - 2 parcels | 13/18 | 4 | Middle Rd. Near Rte. 137/Sam Ryder |
| Mill Hill Property | 100 | 4.1 | Mill Hill Rd. & Meetinghouse Rd. |
| Mill Pond area well site | 7 | 18 | South of Old Queen Anne Rd. |
| Morris Island Dike | 90 | 18 | Morris Island Rd., Stage Harbor |
| Morris Island Marsh | 106 | 6.6 | Morris Island Rd. |
| Muddy Creek | 20 | 1.75 | North of Old Queen Anne Rd. |
| Old Cranberry Bog | 14 | 6 | Rte. 137 at Old Queen Anne Rd. |
| Orleans Rd. | 67 | 17 | North side of Orleans Rd. |
| Red River property | 4 | 2 | Rte. 28 (next to S. Chatham Cemetery) |
| Red River Swamp | 1 | 1.5 | S. Chatham at Red River |
| Sam Ryder's Rd. Upper | 22A | 24 | Sam Ryder Rd. North of Volunteer |
| Stage Harbor Point | 89 | 1.93 | Off Morris Island Rd. |
| Stage Island Rd. Property | 66 | 0.7 | Stage Island Rd. |
| Strong Island marsh | 69 | 68 | Strong Island, Pleasant Bay |
| Town Forest | 6 | 148 | North of Rte. 28, S. Chatham |
| Training Field Triangle | 29 | 40 | Training Field Rd. |
| Training Field well site | 30 | 14 | Training Field Rd. @ Lovers Lake |

[1]See attendent map for location of properties

[2]Hardings Beach Marsh acreage is counted under Beaches (228 acres total)

***Parks and Recreation Area - 167.81 acres***

| *Property* | *Map #[1]* | *Acres* | *Location* |
|---|---|---|---|
| Chase Park | 82 | 3 | Off Cross Street |
| Doc Keene House | 83 | 0.3 | Stage Harbor Road at Cedar Street |
| Goose Pond (lower) | 15 | 42 | North of Middle Road |
| Kate Gould Park | 78 | 2.25 | Main @ Chatham Bars |
| Kolb Property | 102 | 2 | Rte. 28 West Chatham |
| Mack Monument | 94 | 0.55 | Lighthouse Overlook |
| Nickerson Park | 59 | 0.66 | Rotary |
| Ryder's Cove property (frm MCI) | 44A | 17 | Old Comers & Rt. 28/Stillwater Pd. |
| Samuel Hawes Park | 32 | 10 | South of Airport, Geo. Ryder Rd. |
| Sears Park | 61 | 0.25 | Main @ Seaview St. |
| Seaside Links Golf Course | 74/76 | 43 | Seaview St. |
| S. Chatham Tennis Courts | 8 | 0.8 | Bobby's Lane |
| MM Center/Tennis Cts./RR/Mus.[2] | 63 | | Depot Road |
| Veterans Field | 64 | 10 | Depot & Main |
| Volunteer Park & Forest | 22 | 36 | Sam Ryder Rd. |

[1]See attendent map for location of properties
[2]Acreage for these facilities is included in General Lands with the Police and Fire Station.

***Beaches - 828.27 acres***

| *Property* | *Map #[1]* | *Acres* | *Location* |
|---|---|---|---|
| *Cockle Cove | 19 | 0.72 | Cockle Cove Rd. |
| Forest Beach[2] | 3B | | Forest Beach Rd. |
| *Hardings Beach | 25 | 228 | Hardings Beach Rd. |
| Jacknife Harbor | 40 | 3.5 | Rte. 28, Pleasant Bay |
| North Beach | 99 | 250 | Pleasant Bay |
| Old Comers Rd. | 44B | 11.5 | Old Comers at Lover's Lake |
| *Oyster Pond Beach | 58 | 2 | Stage Harbor Rd. |
| Pleasant Street Beach | 2 | 0.25 | Pleasant St. |
| *Ridgevale Beach | 21 | 27 | Ridgevale Rd. |
| South Beach | 91 | 300 | Chatham Harbor |
| *School House Pond (fresh) | 23 | 1.3 | Off Sam Ryder Rd. |
| White Pond Beach | 36 | 4 | Wilfred Rd. |

* *Indicates an official beach, facilities provided.*

[1] See attendent map for location of properties

[2] *Acreage for Forest Beach (73) acres) is counted under Conservation/Passive Recreation*

***TOTAL RECREATION AND BEACHES: 1546.70 ACRES***

**Town Landings/Water Access**

Purpose: public access to waterways primarily for fishing, shellfishing and recreation. 3

***Town Landings/Water Access - 13.76 acres***

| Property | Map #[1] | Acres | Location |
|---|---|---|---|
| *Andrew Hardings Lane | 97 | | Andrew Hardings La., Chat. Har. |
| *Barn Hill | 26 | 0.41 | Barn Hill Rd., Oyster River |
| *Battlefield | 54 | 0.13 | Battlefield Rd., Stage Harbor |
| *Bearses Lane | 92 | | Off Morris Is. R., Chatham Harbor |
| *Bridge St.(east side Mitchell Rd.) | 88 | | Bridge St. at Mitchell River |
| Bridge St. Boatramp (leased) | 87 | | Bridge St. |
| Champlain Rd. | 55 | | Champlain Rd., Stage Harbor |
| *Claflin's | 77 | 0.23 | Off Shore Rd., Chatham Harbor |
| Cockle Cove (beach) | 19 | | Cockle Cove Rd. |
| *Cotchpinicut | 70 | 0.19 | Cotchpinicut Rd., Pleasant Bay |
| *Cow Yard | 73 | 0.37 | The Cow Yard, Chatham Harbor |
| *Crows Pond | 42 | 0.45 | Fox Hill Rd., Pleasant Bay |
| *Eliphamets Lane | 85 | | Eliphamets Lane, Mill Pond |
| Fish Pier | 75 | 2 | Shore Rd., Aunt Lydia's Cove |
| Forest Beach | 3 | 0.3 | Forest Beach Rd. |
| *Goose Pond Landing[2] | 16 | | South of Old Queen Anne Rd. |
| Hardings Beach | 25 | | Hardings Beach Rd. |
| *Holway St. | 98 | | Holway St., Chatham Harbor |
| *Jacknife Harbor | 40 | | Orleans Rd., Pleasant Bay |
| Lighthouse Overlook | 93 | | Main St./Bridge St. |
| Lovers Lake (behind cemetery) | 38 | | Old Queen Anne behind cemetery |
| Lovers Lake (Old Comers Rd.) | 44B | | Old Comers at Lover's Lake |
| *Mill Creek | 11 | 0.07 | Mill Creek Rd., Mill Creek |
| *Mill Pond | 84 | | So. of Old Queen Anne |
| Mistover Lane | 96 | | Off Main St., Chatham Harbor |
| Morris Island Dike[2] | 90 | | Morris Island Rd., Stage Harbor |
| *Old Mill Boatyard | 57 | 3.5 | Stage Neck Rd., Stage Harbor |
| *Oyster Pond Furlong | 52 | 0.42 | Oyster Pond Furlong, Oyster Pond |
| Pleasant Street (beach) | 2 | | Pleasant Street |
| *Port Fortune | 56 | 0.13 | Port Fortune Ln., Stage Harbor |
| Ridgevale Beach | 21 | | Ridgevale Rd. |
| Ridgevale South | 24 | | Ridgevale South Rd., Buck's Creek |
| *Ryders Cove | 44 | 0.31 | Ryder's Cove Rd. |
| Ryders Cove Overlook | 43 | 1.0 | Orleans Rd., Ryder's Cove |
| *Scatteree | 71 | 0.22 | Scatteree Rd., Pleasant Bay |
| *Sears Point | 34 | | Sears Point Rd., Stage Harbor |
| Stage Harbor Point[2] | 89 | | Off Morris Is. Rd., Stage Harbor |
| Stillwater Pond | 44A | | Off Old Comers Road |
| *Strong Island | 68 | 0.22 | Strong Is. Rd., Pleasant Bay |
| *Taylor Pond | 12 | 1.74 | Taylor's Pond Rd. |

**Designated town landing. Others provide access to the water, but are not designated town landings.*
*[1]See attendent map for location of properties*
*[2]Acreage for Goose Pond, Morris Island Dike, and Stage Harbor Point are counted under Conservation/Pass. Recreation.*
*3Town Landing acreage does not include town right-of-way. If a landing contains no land other than road right-of-way, no acreage is shown.*

**General Town Lands**

Purpose: General municipal use, including public offices, public facilities and utilities.

*General Town Lands - 250.20 acres*

| Property | Map #[1] | Acres | Location |
|---|---|---|---|
| Chatham Airport | 33 | 92 | George Ryder Rd. |
| Council on Aging | 72 | 1 | Stony Hill Rd. |
| Deport Rd. School | 63 | +/- 5 | Depot Rd. |
| Eldredge Public Library | 79 | 0.75 | Main St. |
| Highway Depot | 50 | 6 | Crowell Rd. |
| Jr.-Sr. High School | 46 | 32 | Crowell Rd. |
| Lighthouse/Mack Monument | 93/94 | .4 | Main Street |
| Main St. School | 65 | +/- 3 | Main St. |
| Misc. Drainage areas | None | 2.5 | |
| Parking Lot - Colonial Building | 60 | 2 | Off Stage Harbor Road |
| Parking Lot - former Water Dept. | 80 | .6 | Off Main St. |
| Pleasant Street Property | 105 | .2 | Pleasant Street |
| Police/Fire/Comm. Ctr./Water | 63 | 4 | Depot Rd. |
| South Chatham Fire Station | 9 | 0.25 | Main Street, S. Chatham |
| Town Hall | 81 | 2 | Main St. |
| Town Hall Annex. | 27 | 4 | George Ryder Rd. |
| Visitors Center, S. Chatham | 10 | 2.5 | Main Street and Rte. 137 |
| Wastewater Plant/Transfer Station | 17 | 89 | Old Harbor Rd. |
| Water Tower - Great Hill | 45 | 3 | Great Hill |

*Cemeteries - 38.26 acres*

| Property | Map #[1] | Acres | Location |
|---|---|---|---|
| Lord Grave | 39 | | Training Field Rd. |
| Nickerson Cemetery | 41 | .36 | Main St. And Fox Hill Rd. |
| Old Baptist Cemetery | 47 | 2.4 | Old Queen Anne S. Of Wilfred Rd. |
| Old Queen Anne | 37 | 2 | 2 par/Old Queen Anne @ Geo Ryder |
| Peoples | 49 | 5 | Crowell Rd. & Stepping Stones |
| Seaside | 62 | 8 | Crowell Rd. @ Depot Rd. |
| Smallpox Cemetery | 29 | | In Training Field Triangle |
| South Chatham | 5 | 7 | Main Street |
| Union Cemetery | 48 | 13.5 | Main St. W. Of Heritage Lane |

[1]See attendent map for location of properties

***TOTAL GENERAL LANDS AND CEMETERIES: 288.46 ACRES***

***GRAND TOTAL ALL TOWN LANDS: 1848.92 ACRES***

## 2.2 Goal - Town Buildings

**Provision of adequate and efficient housing for all town government functions.**

A. **Consolidate town offices except for field offices (Harbormaster, highway maintenance, etc.) on town property designated under General Town lands.** (CF3)

B. **Retain campus-like complex of public buildings in Depot Road area, including retention of Main Street School site for town use such as consolidated town offices, community center, police/fire departments and public parking.** (CF4)

1. Reduce intensity of uses and buildings surrounding Depot Road School. Consider relocating the community building function to another site such as the Main Street School site.

2. In planning new facilities, carefully consider the value of the front portion of the Main Street School (1924 section) to the heritage and character of the community.

3. If the site involves Veterans Field in the former Main Street School building include public restrooms and a concession stand.

C. **Retain Annex/Permit site on George Ryder Road for town use and provide parking for bike trail at the Annex site.** (CF5)

D. **Construct new Police/Fire Department Facilities on a site/s designated under General Town Lands. Consider use of the present site if enlarged by the relocation of the community building function.** (CF6)

E. **Construct a new community center. Include space and services to meet the needs of all segments of the Chatham population. Consider the inclusion of a community swimming pool.** (CF7)

F. **Institute a phased program for the construction of environmentally friendly public restrooms at the following locations:** (CF8)

1. Town Hall
2. West end of Main Street (downtown)
3. Veterans' Field
4. Old Mill Boatyard
5. Ridgevale Beach
6. School House Pond
7 Cockle Cove Beach
8. Hardings Beach (2nd restroom)
9. Oyster Pond

G. **Evaluate maintenance needs for all town buildings. Include in the program improvements to meet the requirements of the Americans with Disabilities Act.** (CF9)

## 2.3 Goal - Cemeteries

**Provide adequate burial and memorial space to meet needs through the year 2020.**

A. **Develop a program for meeting the projected needs for cemetery plots with consideration of the expansion of Union Cemetery and South Chatham Cemetery. Identify additional expansion land near downtown, and space saving layouts and methods.** (CF10)

B. **Perform an analysis of income vs operation costs for town cemeteries. Consider fee adjustments to better meet long-term maintenance needs.** (CF11)

C. **Develop a maintenance and improvement program for cemeteries and designate a town department for carrying out the program.** (CF12)

## 2.4 Goal - Transportation

**Provision of a safe and functional town-wide transportation system.**

A. **Work with the state Highway Department to include improvements proposed by the town in the reconstruction of Rte. 28.** (CF13)

1. Traffic signal installation and intersection reconfiguration - Rte. 137.
2. Safety improvements at George Ryder Rd., Barn Hill Rd., Old Queen Anne, Crowell Rd., the rotary, and Stony Hill Rd.
3. Addition of bus stop shelters at neighborhood centers: South Chatham, West Chatham, The Cornfield, Crowell Rd., Veterans Field, and North Chatham.
4. Vehicular access control modifications at commercial properties to meet local, state, and regional guidelines.
5. Sidewalks meeting Americans with Disabilities Act requirements on both sides of Rte. 28 within neighborhood centers. Where possible, maintain a grassed buffer between the sidewalk and the roadway.
6. Accommodations for bicycles.
7. Drainage improvements.
8. Addition of pedestrian level lighting, benches and trees.
9. Enlargement of culverts at the Muddy River, the Herring Run and Frostfish Creek consistent with Comprehensive Wastewater Plan.

B. **Improve vehicular safety in the Town.** (CF14)

1. Use signs to encourage visitors to enter town via Rte. 137 and Rte. 28 rather than Old Queen Anne.
2. Reconfigure Stepping Stone Road/Queen Anne Road/Wilfred Road intersection.
3. Improve safety at Old Queen Anne Road and George Ryder Road.

C. **Improve pedestrian safety and comfort by developing the following programs.** (CF15)

1. A systematic program to construct sidewalks on major roadways in Chatham, including roadways in the vicinity of schools, neighborhood centers, beaches and parks and improving shoulders for pedestrian use where sidewalk construction is not feasible.
2. Continue development of a town-wide network of walking trails through and connecting town recreation and conservation lands.
3. Develop downtown crosswalk improvements, seats, and amenities.

D. **Develop bicycle routes and trails extending from the Cape Cod Rail Trail and serving commercial and recreational areas and continue efforts to extend the Rail Trail to form a loop back to the Trail in Brewster or Orleans. Develop parking areas for bicycles and cars in commercial, recreational, and trail access areas.** (CF16)

E. **Install pedestrian level street lighting in all neighborhood centers and identify other high activity areas needing lighting for pedestrians.** (CF17)

F. **Increase availability of public parking through some or all of the methods listed below.** (CF18)

1. Use Main St. School site as a public parking area until a new use is designated.

2. Work with property owners to expand and improve parking.

3. Consider time limits on downtown parking spaces.

4. Develop public parking on the former Water Department property.

5. Develop a map of downtown showing public parking areas; distribute at Welcome Center and install directional signs for public parking.

**G. Work with the Regional Transit Authority to improve coordination of existing public transportation services.** (CF19)

## 2.5 Goal - Public Water

**Provision of an adequate supply of clean, safe water to meet needs through 2020.**

**A. Establish a population sustainability goal for water use through 2020.** (CF20)

**B. Record water usage by parcel and watershed and integrate into GIS database. This will allow continued update of population demand for water and wastewater management.** (CF21)

**C. Ensure that an adequate supply of public water is provided to meet needs for the next 20 year period, based on a minimum level of service of 75 gallons per person per day.** (CF22)

**D. Continue to meet state and federal requirements for system wide water pressure, fire fighting capacity and reserve capacity.** (CF23)

**E. Water Department must approve water systems in new subdivisions and ensure that new development covers the cost of expansion.** (CF24)

## 2.6 Goal - Wastewater Treatment Facilities

**Provision of an environmentally and economically sound wastewater collection, treatment and disposal system(s) commensurate with the specific wastewater needs of each town watershed through 2020.**

**A. Develop a wastewater nitrogen sustainability goal for 2020.** (CF25)

**B. Complete the town-wide Wastewater Management Plan by the end of 2005.** (CF26)

1. Determine areas where on-site disposal systems are not functioning properly or are contributing nitrogen loads at levels detrimental to natural resources. Identify options and prioritize recommendations for treating wastewater in identified problem areas, including regulatory changes and public and private treatment facility construction.

2. Carry out a public information and public participation process during preparation of the Plan to ensure public understanding and support of the Plan..

**C. Implement the recommendations of Wastewater Management Plan.** (CF27)

## 2.7 Goal - Solid Waste Management

**Provide an efficient and economical system of solid waste disposal.**

**A. Expand recycling program to reduce the cost of solid waste disposal.** (CF28)

1. Encourage recycling by private solid waste collection companies.

2. Continue and expand public education efforts to encourage increased recycling, especially at rental properties.

**B. Minimize the impacts of the transfer station on the surrounding neighborhood.** (CF29)

### 2.8 Goal - Stormwater Facilities

**Protect surface and groundwater water from stormwater pollution from public buildings, roofs, parking areas and roadways.**

**A. Continue the policy of upgrading catch basins on town roadways during repaving and reconstruction projects in order to reduce stormwater pollutants reaching the towns ponds, streams, and groundwater.** (CF30)

**B. Continue the policy of requiring private properties to provide treatment and on-site infiltration to reduce stormwater volumes reaching stormwater systems in town roads or wetlands.** (CF31)

**C. Use best management practices, such as installation of leaching basins for roof drainage on all town buildings during new construction or major renovations.** (CF32)

## Table 1
## Estimated Wastewater Volumes and Populations

| Month | Y1997 Wastewater Gals. (000) | Y1997 Estimated number of People | Y2000 Wastewater Gals (000) | Y2000 Estimated number of People | Y2001 Wastewater Gals (000) | Y2001 Estimated number of People |
|---|---|---|---|---|---|---|
| Jan | 14,743.5 | 8,652 | 22,242.7 | 13,064 | 17,395.6 | 10,209 |
| Feb | 10,562.3 | 6,863 | 18,333.0 | 11,912 | 13,525.3 | 8,787 |
| Mar | 13,662.9 | 8,019 | 17,329.0 | 10,169 | 14,937.0 | 8,766 |
| Apr | 15,385.5 | 9,331 | 19,844.0 | 12,034 | 20,992.0 | 12,729 |
| May | 21,985.0 | 12,901 | 27,408.7 | 16,084 | 38,663.7 | 22,690 |
| Jun | 35,354.2 | 21,439 | 39,663.0 | 24,053 | 44,815.6 | 27,178 |
| Jul | 60,005.5 | 35,214 | 55,586.4 | 32,620 | 59,485.7 | 34,909 |
| Aug | 47,274.7 | 27,744 | 44,003.4 | 25,823 | 54,805.8 | 32,162 |
| Sep | 28,920.2 | 17,538 | 32,612.2 | 19,776 | 40,817.0 | 24,753 |
| Oct | 25,849.1 | 15,170 | 25,136.9 | 14,752 | 28,546.6 | 16,753 |
| Nov | 19,214.9 | 11,652 | 18,158.4 | 11,012 | 18,990.5 | 11,517 |
| Dec | 15,756.9 | 9,247 | 17,479.7 | 10,257 | 16,581.5 | 9,719 |
| Totals | 308,714.2 | 15,387 | 337,798.3 | 16,837 | 369,536.3 | 18,418 |

(1) Used monthly pumping as published in Town annual reports.
(2) Irrigation allocated Mid May to Mid October.
(3) Private well pumpage based on 1997 Town Needs Assessment Report (N.A.R.) assumptions.
(4) Assumed 55 gallons per day per person wastewater generation.
(5) Yearly total population estimates more reliable than monthly figures.
(6) Population = Wastewater (gal)
55 gal/day/person

**Table 2**
**Town and Privately Owned Acreage***

| LANDUSE | PARCELS | BEDROOMS | ACRES | PERCENT |
|---|---|---|---|---|
| Residential | 6,260 | 18,276 | 3,709.23 | 45.8 |
| Commercial | 290 | 76 | 368.39 | 4.5 |
| Industrial | 45 | 2 | 61,33 | 0.8 |
| Multi-Use | 129 | 211 | 88.06 | 1.1 |
| Institutional | 35 | 22 | 39.76 | 0.5 |
| Town-Owned | 153 | 20 | 2,120.36 | 26.2 |
| Developable. | 564 | 13 | 474.92 | 5.9 |

*Data as of 1 October 2002

http://www.town.chatham.ma.us/Public_Documents/ChathamMA_Planning/CLRP5/

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## Natural Resources

DRAFT 03/15/03

# 3. Natural Resources

## Overview

*The mainland is described by Champlain as very hilly. It was well wooded although in places the natives had made considerable clearings, where they cultivated corn and other cereals. There were many walnut trees, oaks and cedars, but few pines. Wild grape vines were common, and beach plum bushes furnished an abundance of fruit "All the harbors, bays and coasts," writes Champlain, "are filled with every variety of fish. There are also many shellfish of various sorts, principally oysters. Game birds are very plenty."*

Samuel de Champlain as quoted by E.C. Smith
A History of Chatham, Massachusetts, p.11

From the early 1600 description of Chatham it is clear that humans have significantly impacted the natural environment. Trees have been cut, the land cleared for farming, salt marshes have become cranberry bogs. Hunting and fishing villages were established to take advantage of abundant game birds and sea resources. Much of the environment was altered.

Natural coastline alteration still is evolving. Eroding bluffs have been reinforced, groins have been built to stall the natural migration of beaches. Harbors continue to be dredged to clear constantly shifting, swiftly moving channels.

Coastal resources attracted visitors initially as tourists. Some returned. Houses were built consuming land, destroying forests squeezing out wildlife by the destruction and fragmentation of upland habitat and generally affecting water quality by human waste. Street runoff, fertilizers and the reduced circulation of estuaries due to culverting resulted in pond closures and eutrophication. Natural drainage patterns have been altered by roadways. Today "build-out" or development of all parcels of land in town (with the exception of legally protected and conservation lands) is in the foreseeable future.

Although the town has a small sewer system and wastewater treatment plant, nitrogen is accumulating in groundwater primarily from septic systems. Nitrogen has become a serious threat to our surface water particularly to the estuaries and salt ponds so nitrogen sensitive.

Despite the tremendous impact humans have had, Chatham's natural systems are largely healthy and have successfully adapted and re-adapted to changing conditions. Given their own resilience and some positive intervention, our resources are far from doomed. Chatham still has abundant shellfish; our potable water resources are projected to remain within nitrate guidelines except under extreme scenarios and are constantly monitored; reduction of phosphates in detergents have significantly reduced the introduction of the nutrients into freshwater systems; dwindling animal species are showing a comeback with cooperative habitat management.

As pressures continue on our natural environment, it is more important than ever to protect our natural resources from negative and unnecessary alteration and to identify measures that can be taken to counter and undo damage where we can. Maintaining the high quality of Chatham's natural assets is vital to the character and economic future of the town.

## Policies Goals and Implementation

Long-term objective: To preserve and protect, and where possible, to enhance, the quality of Chatham's unique natural resources for the benefit of all current residents and visitors, and for generations to come. Recognizing the fragile nature of our local ecological system and the pressures that are imposed on it by continuing growth in population density, growth in residential and

commercial developments, increasing intensity of recreational use of both coastal and inland waterways, and decreasing acreage of undeveloped open land to sustain wildlife habitat, a nevertheless important second objective is to enhance access and enjoyment of those resources by the public at large. This objective must be accomplished in ways that minimize the potential negative impact on these precious resources.

Policy: Consistent with these long-term strategic natural resource protection objectives it shall be the policy of the Town of Chatham that:

All future development efforts within the town, including residential, commercial, and municipal, and the infrastructure required to support such developments, be designed, implemented and managed in a way that will maintain the Town's natural resources.

To be consistent with the carrying capacity of the Town's natural resources, all projects involving new or expanded access to, and increased or more intensive use of its natural resources (as enumerated in this plan) shall include an assessment of the resulting impact on those resources and include steps to minimize any adverse impact that might result *before being approved.*

Future growth and development projects be encouraged to locate away from sensitive natural resource areas to maintain and enhance wildlife habitat.

Additional regulations and bylaw revisions be used to improve the protection and preservation of land areas adjacent to coastal and inland waters.

Protect natural resources by acquiring or securing development rights to land for conservation in keeping with the Regional Policy Plan's goal of protecting at least 50% of the remaining developable land in Chatham.

## 3.1 Goal
## Protecting the quality of our air and water resources.

While air quality in Chatham is not currently considered to be a problem, the quality of our water resources is of strategic and vital importance, since so much of the economic and social fabric of the community is dependent in one way or another on our water resources. Monitoring and improving the quality of our groundwater, our coastal in inland waters and protecting them from adverse impacts that often result from population pressure is one of the most important goals of the community. To achieve this goal, the following actions are planned:

**Water Quality Protection**

Complete and adopt the Comprehensive Wastewater Management Plan as expeditiously as possible and move forward with implementing its recommendations, and undertake the following associated actions: (NR1)

Designate nitrogen sensitive areas as appropriate, through the processes outlined in state environmental and Chatham Board of Health regulations. (NR2)

Support research, evaluation, and approval of alternative septic system technology aimed at nutrient reduction (nitrogen and phosphorus), especially on systems appropriate for seasonal use. (NR3)

Reduce the nitrogen load to impacted embayments or freshwater bodies through the purchase, or seek donation, of land. Target for public purchase lands on which development would adversely impact resources. (NR4)

Educate the public to the benefits of, and encourage the use of, native, low maintenance landscaping to minimize the use of fertilizers. (NR5)

Move forward with integration of Assessors, Water, and septic system data within the town Geographic Information System (GIS) to allow comprehensive management of nitrogen impacts. (NR6)

Require where feasible that new and replacement septic system disposal areas be located at least 300 feet from the high water line of freshwater ponds, streams and wetlands. (NR7)

Update the inventory and elevation data for the town's numbered conservancy districts, and review and update the information on a regular basis and incorporate it into the town's Geographic Information System (GIS). (NR8)

Continue the town's Coastal Water Nutrient Monitoring Program and freshwater pond monitoring programs to ensure the availability of sound scientific data upon which to evaluate the condition of Chatham's waters and to guide management decisions. (NR9)

Regularly update data associated with inland wetlands which serve as the basis for environmental regulation. (NR10)

Continue efforts, including land acquisition, to protect the watersheds of public wells from over-development and restrict land-use to those with minimal threat to groundwater quality. (NR11)

Institute a public education effort aimed at water conservation. (NR12)

Develop a Drought Management Plan to improve the effectiveness of the water use restriction ordinance now in place. Apply use restrictions to private wells. Require rain shut off devices on all automatic irrigation systems (with possible agricultural exemptions). (NR13)

**Storm Water**

Continue to employ appropriate stormwater Best Management Practices (BMP)(to reduce run-off into sensitive areas) for all town properties. (NR14)

Continue the implementation of the recommendations of the Oyster Pond Stormwater Management Study including: (NR15)

The design and installation of stormwater BMPs for those areas under town responsibility. (NR15)

Continue working with Massachusetts Highway to expedite the correction of stormwater problems under its jurisdiction. (NR15)

Continue to work with Massachusetts Highway to address stormwater problems from state highways in an expeditious manner. (NR16)

Continue to seek grant funding to offset town costs to implement stormwater management programs. (NR17)

For stormwater management purposes, amend the Zoning Bylaw, subdivision regulations, and other development regulations as necessary to require the following at the time of subdivision or site plan approval: (NR18)

A written operation and maintenance plan including the designation of responsible party for stormwater management systems. (NR18)

The posting of a bond, or other appropriate means, to ensure the long-term maintenance, and replacement if needed, of stormwater management systems. (NR18)

Control and mitigation of the impacts of stormwater runoff both during and after construction. (NR18)

Prohibition of the connection of privately owned drainage systems into any publicly controlled system. (NR18)

Appropriate testing and engineering for all proposed stormwater management systems. (NR18)

Encouragement of the use of low maintenance non invasive plant varieties in landscaping. (NR18)

Prohibition of any new direct discharge(s) of untreated stormwater into any fresh or marine surface water or

wetland. (NR18)

Encouragement of the use of alternative stormwater systems that can be incorporated into the site landscaping such as drainage swales and turf pavers. (NR18)

Minimization of the amount of impervious surface on sites and maintain the maximum amount of undisturbed pre-development vegetation. (NR18)

Require that undisturbed natural buffer strips be maintained around all marine water resource area and freshwater resource areas to minimize the impacts of surface runoff. (NR18)

**Coastal Resources**

Discourage the construction of revetments and other "hard" coastal protection structures unless "soft" solutions such as beach nourishment have been found to be ineffective. In cases where a "hard" structure is determined to be necessary, require that the beach is maintained in front of the structure to allow public passage along the shore whenever practical. (NR19)

2. In cases where "hard" structures have been permitted and constructed in the past, the Conservation Commission will continue to address the issue of renourishment to restore rights under State law for public passage for fishing and fowling. Along Chatham Harbor, revetments were constructed after the 1987 break in the barrier beach. When the barrier beach restores itself and beaches in front of revetments return, public rights for passage must be maintained. (See Environmental Impact Report entitled, "Phase I - Draft Environmental Impact Report - Shore Protection Structures - Aunt Lydia's Cove to Beach and Tennis Club - Chatham, MA," dated January 1993.) (NR20)

3. Work with property owners in the Little Beach area to permit the subterranean wall proposed by the Coastal Erosion Advisory Committee's study (Phase II) should protection become necessary because of changes in the configuration of South Beach. (NR21)

4. Complete the management plan for North and South beaches to provide general guidelines for balancing protection of natural resources with recreational, municipal and private property use. (NR22)

5. Carry out the proposed nourishment of Cockle Cove beach to restore the beach and shoreline habitat and to maintain the beach for public use. (NR23)

6. Support the update of the Stage Harbor Management Plan and expand its scope to cover areas along Nantucket Sound and The Southway (area between South Beach and Monomoy) and the area between Outermost Harbor and Minister's Point (where it joins the Pleasant Bay Management Plan). (NR24)

7. Continue the town's active participation in the Pleasant Bay Alliance and implement recommendations of the Alliance, pursuant to the Pleasant Bay Management Plan, to the extent that they are consistent with Chatham's amended plans and policies. (NR25)

8. Develop policies for coastal structures in areas not presently covered in a harbor management plan and require reviews for consistency with these policies prior to the issuance of any special permit or state permit for such structures. (NR26)

9. Continue the town's participation in the National Flood Insurance Program and Community Rating System. (NR27)

10. In promulgating development regulations and reviews, take into account the impacts of sea level rise and erosion in evaluating development proposals and in revising and updating applicable town policies, regulations and bylaws. (NR28)

**Shellfish Resources**

Expand the Town's shellfish propagation programs. (NR29)

Update the existing facilities housing the up-welling system for the shellfish propagation program to ensure the facilities are adequate to maintain the program in the long-term. (NR30)

Continue efforts at coastal and estuary water quality protection and improvement to ensure the long-term viability of the local shellfish industry. (NR31)

## 3.2 Goal
## Protection of vegetation and wildlife habitat

To protect the health and vitality of our inland vegetation and wildlife habitat areas, Chatham shall develop and strengthen current regulations by:

1. Prohibiting the clearing and grading of land without a site plan approval or, in the case of single family houses, without a building permit and requiring measures to protect wildlife habitat and to control runoff during and after construction. (NR32)

2. Requiring the consideration of habitat and tree preservation in development planning and that information on topography and vegetation particularly mature trees be required at the time of application for site plan approval and, in cases where site plan approval is not required, at the time of application for a building permit. (NR33)

3. Developing a bylaw to include specific procedures to preserve trees during construction, such as fencing around the tree's root zone to prevent compaction, heavy mulching, and pruning of damaged limbs. When removal of valuable trees is being proposed, the property owner be encouraged to plant replacement trees where appropriate. (NR34)

**B. Undertake the following actions by:**

1. Developing an educational program that will provide Chatham property owners with information on the control of insects and on indigenous plants that will provide wildlife food sources and habitat. (NR35)

2. Developing a management program for town conservation lands to include measures to enhance plant and habitat diversity, control invasive plants and insect infestation. (See Town Conservation Lands Management section of this element). (NR36)

3. Recommending native species to be sold by local nurseries for use by residential and business property owners. (NR37)

4. Identifying and acquiring where possible lands which are contiguous with or provide connections between other conservation areas to preserve wildlife habitat and prevent further fragmentation of undeveloped areas. (NR38)

5. Developing a comprehensive inventory of shade and other ornamental trees along Route 28, and certain areas (downtown Main St., Old Village, etc.), and developing recommendations for maintenance, areas for tree planting, desirable species types, and preservation mechanisms. This can be coordinated with Friends of Trees' data (all of their trees are tagged and listed). (NR39)

6. Exploring the conversion of abandoned cranberry bogs to a true wetlands function in cooperation with private landowners. (NR40)

## 3.3 Goal
## Conservation Land Management for the protection of natural resources on town lands.

**All lands designated under this plan as Conservation/Passive Recreation lands and all lands purchased or donated for conservation shall be monitored by the Conservation Commission. The Commission shall make recommendations**

**as deemed necessary for management of these lands in keeping with the provisions of this plan. (NR42)**

**The Conservation Commission will develop a comprehensive plan for the management of all lands purchased or donated to the Town for conservation. The plan will include:**

Measures to preserve and protect natural resources while allowing passive recreational use in keeping with the Natural Resources and the Open Space and Recreational Elements of this plan. (NR43)

2. An assessment and management program for vegetation including the control and eradication of invasive plants, and wildlife habitat. (NR44)

Maintenance, upgrade and extension of pedestrian trails, publication of trail maps, an annual maintenance program for clean-up and rectifying damage from misuse, measures for preventing misuse. (NR45)

Addition of amenities such as benches, signage, and parking areas. (NR46)

Appropriate funds should be budgeted to provide for protection of the natural resources in these areas, and the passive recreational use of our conservation lands. (NR47)

A 5 year program, updated annually, for actions to carry out the plan with cost estimates for inclusion in requests for funds in the town's capital program and annual budget. (NR48)

**The Town will appropriate funds to investigate conservation land deeds of acquisition and restrictions, if any, and to develop and implement the Conservation Management plan.** (NR49)

http://www.town.chatham.ma.us/Public_Documents/ChathamMA_Planning/CLRP6/

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## Open Space and Recreation

# 4. Open Space and Recreation

Chatham's dramatic beaches and quiet harbors began attracting summer visitors in the late 1800s. The town soon became a Mecca, not so much for the day tourist, but for families who returned year after year, often purchasing their own summer houses. Today, approximately half of the houses are used only seasonally. In the summer, the town's population swells to five to six times its year-round number with seasonal residents, occupants of rental houses and hotel and motel rooms as well as day tourists. Many of those who summered here returned to Chatham for their retirement.

Chatham has abundant resources for coastal recreation with over 1,000 acres of public ocean beaches, not including Monomoy Island, and over 30 town landings and public access points. Chatham Harbor, Pleasant Bay, Stage Harbor, the Oyster River and Oyster Pond, the Mill Ponds, Nantucket Sound, and several smaller coastal inlets provide scenic enjoyment and recreational opportunities. Inland recreational resources are also available but are less well known. The town has seven great ponds, three with usable public access, but only one with a public beach. Trails on the town's 600 acres of open lands are discontinuous, unmarked and not maintained. After long years of planning, a bike trail is under construction. The town has a handful of public parks which are small in size and limited in facilities. Active recreational facilities require attention. The community building, Veterans Field, the nearby little league field and tennis courts and playgrounds, Volunteer Park and Seaside Links comprise the only town-owned recreation facilities although school facilities are available on a limited basis for public use.

The 1985 Open Space and Recreation Plan emphasized open space. In the late 1980s, the town carried out the Plan's recommendations regarding open space and watershed protection with the purchase of an additional 155 acres of open land and in 2000 purchased the former RCA/MCI properties on Nantucket Sound and Ryders Cove to add another 17 acres with both salt and fresh water frontage. The focus now turns to upgrading and expanding active recreational facilities. A questionnaire survey in 1995 and a public forum in 1996 showed support for walking trails and outdoor exercise areas, a public swimming pool, indoor exercise

and playing courts, and bike trails. In a 2002 survey, respondents have expressed the need for a community center located in the Main Street School for the use of citizens of all generations.

The purpose of this section is to identify the recreational facilities now in the town and to suggest ways to maintain open spaces while providing townspeople and visitors with seasonal and year-round active and passive recreational opportunities.

**4.1 Goal**

**High quality recreational facilities, including beaches, parks, active and passive recreation facilities, and adequate open space to meet the needs and desires of Chatham residents and visitors.**

Town owned lands are classified for future use in the *Community Facilities Element*. Lands classified for recreation are as follows. Map numbers refer to the Map of Town Owned Lands.

***Conservation/Passive Recreation Lands - 550.62 acres***

| ***Property*** | ***Map #*** | ***Acres*** | ***Location*** |
|---|---|---|---|
| Absegami Run | 51 | 3.24 | Oyster Pond Furlong |
| Cedar Swamp | 53 | 28 | Stage Neck |
| Forest Beach Conservation | 3A | 73 | Forest Beach Rd. |
| George Ryder Rd. Forest | 31 | 8 | George Ryder Rd. |
| Goose Pond, upper portion* | 16 | 49 | South of Old Queen Anne Rd. |
| Hardings Beach Marsh[1] | 25 | | |
| Honeysuckle Lane | 104 | 0.6 | Honeysuckle Lane |
| Indian Hill well site | 28 | 10 | Indian Hill Rd. |
| Ivy Lane | 101 | 1.8 | Ivy Lane |
| Lovers Lake | 38 | 1 | Old Queen Anne behind cemetery |
| McClure Property | 103 | 0.4 | Rte. 28 East of Pleasant St. |
| Middle Rd - 2 parcels | 13/18 | 4 | Middle Rd. near Sam Ryder Rd. |
| Mill Hill Property | 100 | 4.1 | Mill Hill Rd. & Meetinghouse Rd. |
| Mill Pond area | 7 | 18 | South of Old Queen Anne Rd. |
| Morris Island Dike | 90 | 18 | Morris Island Rd., Stage Harbor |
| Morris Island Marsh | 106 | 6.6 | Morris Island Rd. |
| Muddy Creek | 20 | 1.75 | North of Old Queen Anne Rd. |
| Old Cranberry Bog | 14 | 6 | Rte. 137 at Old Queen Anne Rd. |
| Orleans Rd. | 67 | 17 | North side of Orleans Rd. |
| Red River property | 4 | 2 | Rte. 28 (next to S. Chatham Cemetery) |
| Red River Swamp | 1 | 1.5 | S. Chatham at Red River |
| Sam Ryder Rd., upper | 22A | 24 | Sam Ryder Rd. north of Volunteer |
| Stage Harbor Point | 89 | 1.93 | Off Morris Island Rd. |
| Stage Island Rd. Property | 66 | 0.7 | Stage Island Rd. |
| Strong Island Marsh | 69 | 68 | Strong Island, Pleasant Bay |
| Town Forest | 6 | 148 | North of Rte. 28, S. Chatham |
| Training Field Triangle | 29 | 40 | Training Field Rd. |
| Training Field well | 30 | 14 | Training Field Rd. @Lovers Lake |

** Purchased with state Self-Help funds for conservation.*

*[1] Hardings Beach Marsh acreage is counted under Beaches (228 acres total)*

***Park and Active Recreation Lands - 167.81 Acres***

| Property | Map# | Acres | Location |
|---|---|---|---|
| Chase Park | 82 | 3 | Off Cross Street |
| Doc Keene House | 83 | 0.3 | Stage Harbor Road at Cedar Street |
| Goose Pond, lower | 15 | 42 | North of Middle Road |
| Kate Gould Park | 78 | 2.25 | Main @ Chatham Bars |
| Kolb Property | 102 | 2 | Rte. 28 West Chatham |
| Mack Monument | 94 | 0.55 | Lighthouse Overlook |
| Nickerson Park | 59 | 0.66 | Rotary |
| Ryder's Cove property (frm MCI) | 44A | 17 | Old Comers & Rt. 28/Stillwater Pd. |
| Samuel Hawes Park | 32 | 10 | South of Airport, Geo. Ryder Rd. |
| Sears Park | 61 | 0.25 | Main @ Seaview St. |
| Seaside Links | 74/76 | 43 | Seaview St. |
| S. Chatham Tennis Courts | 8 | 0.8 | Bobby's Lane |
| MM Center/Tennis Cts./RR/Mus.[1] | 63 | | Depot Road |
| Veterans' Field | 64 | 10 | Depot & Main |
| Volunteer Park | 22 | 36 | Sam Ryder Rd. |

*[1]Acreage for these facilities is included in General Lands with the Police and Fire Station.*

***Beaches - 828.27 Acres***

| Property | Map# | Acres | Location |
|---|---|---|---|
| *Cockle Cove | 19 | 0.72 | Cockle Cove Rd. |
| Forest Beach[1] | 3B | | Forest Beach Rd. |
| *Hardings Beach | 25 | 228 | Hardings Beach Rd. |
| Jackknife Harbor | 40 | 3.5 | Rte. 28, Pleasant Bay |
| North Beach | 99 | 250 | Pleasant Bay |
| Old Comers Rd | 44B | 11.5 | Old Comers at Lover's Lake |
| *Oyster Pond Beach | 58 | 2 | Stage Harbor Rd. |
| Pleasant St. Beach | 2 | 0.25 | Pleasant St. |
| *Ridgevale Beach | 21 | 27 | Ridgevale Rd. |
| South Beach | 91 | 300 | Chatham Harbor |
| **School House Pond (fresh) | 23 | 1.3 | Off Sam Ryder Rd. |
| White Pond | 36 | 4 | Wilfred Rd. |

* ***Indicates an official beach***
[1] ***Acreage for Forest Beach (73 acres) is counted under Conservation/Passive Recreation***

***Total Open Space, Recreation and Beaches*** ***1546.70 Acres***

**Town Landings and Water Access**

**Note: Town Landing acreage does not include town right-of-way. If a landing contains no land other than road right-of-way, no acreage is shown.**

Key Facilities - those landings or access points which provide major access to a coastal water body and are heavily used. (See policies under "Town Landings" below.)

| ***Property*** | ***Map#*** | ***Acres*** | ***Location*** |
|---|---|---|---|
| Barn Hill Landing | 26 | 0.41 | Barn Hill Rd., Oyster River |
| Bridge St. Boatramp* | 87 | | Bridge St., north side |
| Fish Pier | 75 | 2 | Shore Rd., Aunt Lydia's Cove |
| Lighthouse Overlook | 93 | | Main St./Bridge St. |
| Morris Island Dike | 90 | | Morris Island Rd., Stage Harbor |
| Old Mill Boatyard | 57 | 3.5 | Stage Neck Rd, Stage Harbor |
| Oyster Pond Furlong | 52 | 0.42 | Oyster Pond Furlong, Oyster Pond |
| Ryder's Cove Landing | 44 | 0.31 | Ryder's Cove Rd |

** Leased Land*

Secondary Facilities - those landings or access points which provide additional access to major waterways or primary access to embayments.

| ***Property*** | ***Map#*** | ***Acres*** | ***Location*** |
|---|---|---|---|
| Battlefield Landing | 54 | 0.13 | Battlefield Rd.,Stage Harbor |
| Cotchpinicut Landing | 70 | 0.19 | Cotchpinicut Rd., Pleasant Bay |
| Cow Yard Landing | 73 | 0.37 | The Cow Yard, Chatham Harbor |
| Crow's Pond Landing | 42 | 0.45 | Fox Hill Rd., Pleasant Bay |
| Forest Beach Landing* | 3 | 0.3 | Forest Beach Rd., Nantucket Sound |
| Jackknife Harbor** | 40 | | Orleans Rd., Pleasant Bay |
| Mill Pond (dock) | 84 | | So. of Old Queen Anne |
| Taylor's Pond | 12 | 1.74 | Taylor's Pond Rd |
| Vineyard Ave. | 35 | 2.07 | Vineyard Ave., Oyster Pond River |

* Acreage counted with Conservation/Passive Recreation lands.
**Acreage counted with Beaches.

Low Usage Landings - those landings whose utility is limited because of physical problems or constraints

| ***Property*** | ***Map#*** | ***Acres*** | ***Location*** |
|---|---|---|---|
| Claflin's Landing | 77 | .23 | Off Shore Rd., Chatham Harbor |
| Cockle Cove (beach) | 19 | | Cockle Cove Rd. |
| Eliphamets Landing | 85 | | Eliphamets Lane, Mill Pond |
| Goose Pond Land (freshwater) | 16 | | South of Old Queen Anne Rd. |
| Hardings Beach | 25 | | Hardings Beach Rd. |
| Holway Street | 98 | | Holway St., Chatham Harbor |
| Lovers Lake (Old Comers Rd.) (fresh) | 44B | | Old Comers at Lover's Lake |
| Mill Creek | 11 | 0.7 | Mill Creek Rd., Mill Creek |
| Pleasant St. (beach) | 2 | | Pleasant Street |
| Port Fortune | 56 | 0.13 | Port Fortune Ln., Stage Harbor |
| Ridgevale South | 24 | | Ridgevale South Rd., Buck's Creek |
| Ryder's Cove Overlook | 43 | 1.0 | Orleans Rd., Ryder's Cove |
| Scatteree Landing | 71 | 0.22 | Scatteree Rd., Pleasant Bay |
| Sears Point | 34 | | Sears Point Rd., Stage Harbor |
| Stage Harbor Point | 89 | | Off Morris Is. Rd., Stage Harbor |
| Stillwater Pond (freshwater) | 44A | | Off Old Comers Road |
| Strong Island Landing | 68 | 0.22 | Strong Is. Rd., Pleasant Bay |
| White Pond (freshwater) | 36 | | Wilfred Rd |

Pedestrian Access Only - footpaths to the water or landings which are severely restricted because of physical problems or constraints.

| ***Property*** | ***Map#*** | ***Acres*** | ***Location*** |
|---|---|---|---|
| Andrew Hardings Lane | 97 | | Andrew Hardings La., Chat. Har. |
| Bearse's Lane | 92 | | Off Morris Is. Rd., Chatham Harbor |
| Bridge St. East | 88 | | Bridge St. At Mitchell River |
| Champlain Rd. | 55 | | Champlain Rd., Stage Harbor |
| Lovers Lake (behind cemetery)(fresh) | 38 | | Old Queen Anne behind cemetery |
| Mistover Lane | 96 | | Off Main St., Chatham Harbor |
| Ridgevale Beach | 21 | | Ridgevale Rd. |
| Water Street (west) | 86 | | Water Street, Mill Pond |
| Water Street Ext. | 95 | | Off School St., Mill Pond |

**A. General Policies**

1. Maintain parking areas unpaved except at major facilities. (OP1)

2. Keep signage to a minimum while devising tasteful, standard signage for all town landings and other recreation area. (OP2)

3. Maintain natural habitats where possible while combating invasive vegetation. (OP3)

4. Provide for periodic maintenance and upgrading of all town recreational facilities. (OP4)

5. Interfere with Nature as little as possible while keeping in mind needs of townspeople and visitors. (OP5)

**B. Open Space and Conservation**

1. The use of lands classified as "open space and conservation" is limited to passive recreation such as walking, biking, swimming, and picnicking. Structures and paved areas shall be limited to those necessary to protect resources and provide public access and passive recreational use. (See also Natural Resources section for information on the management and protection of natural resources on conservation lands.) (OP6)

2. Allow passive recreational use of town open space and conservation lands, including walking, picnicking, boat launching and boating, fishing, and other activities which are compatible with preservation of the land's natural resources. (OP7)

3. Develop a system of trails on conservation lands for public use and provide trail maps and information on protection of natural resources to the public. Utilize existing trails as the basis for the system and develop extensions and links to other public trails. Pursue partnerships with private organizations, such as the Chatham Conservation Foundation, on development of the trail system. (OP8)

4. Allow limited facilities to support the enjoyment of conservation lands, such as small, unpaved parking areas and access roads, small boat launching facilities, fishing docks, benches, and picnic facilities in keeping with the management program for the property. (OP9)

5. Make necessary provisions for passive recreational use of the upland portion of the Forest Beach Conservation area. (OP10)

**C. Lands classified for parks and active recreation are to be upgraded to provide additional use, while maintaining a "park like" character.**

1. Make provision for restrooms, locker facilities and showers for teams using Veterans Field. (OP11)
2. Provide public restrooms in the Depot Road area to serve the playground and Veterans' Field. (OP12)
3. Strive to maintain and protect Chase, Kate Gould, Sears, Nickerson Parks as open space parks. (OP13)
4. Provide additional recreational facilities at Volunteer Park including picnic tables, restrooms, playing field irrigation, and a connection to the Bike Trail. (OP14)
5. Insure completion of the Chatham extension of the Cape Cod Bike Trail to the Depot Road area and provide for the maintenance of the trail. (OP15)
6. Operate Seaside Links as a town managed 9 hole golf course upon expiration of the concessionaires contract. (OP16)
7. Consider acquiring or trading property with Chatham Bars Inn to gain a suitable site or building for a Pro Shop/Starter's cabin, snack bar and storage facility. (OP17)
8. Construct a park and an active sports complex using the landfill cap at the Transfer Facility, Lower Goose Pond property and Volunteer Park for such facilities as; a picnic area, possible future skateboard park, street hockey/ice rink, Parcourse, a driving range and a dog walking park. (OP18)
9. Consider development of a revenue producing Town managed golf course/driving range on Town owned land.

**D. Create a Community Center**

1. Expand the community center facilities, preferably in the Depot Road area, through renovation of the Main Street School or new construction, with ample multipurpose rooms to meet the needs of all segments of the population. (OP19)
2. Consider inclusion of a swimming pool in plans for the community center. (OP20)

**E. Upgrade the town's beaches in terms of access and usage facilities.**

1. Monitor the conditions at Lighthouse Beach to explore the possibility of future conversion to an official beach with restrooms and lifeguards. (OP21)
2. Provide permanent public restrooms at all official town beaches and a second set of restrooms at Hardings Beach. (OP22)
3. Complete and execute a plan which will restore the beach at Cockle Cove and protect Ridgevale Beach for the future. (OP23)
4. Meet increasing popularity of beaches staffed with lifeguards through alternative means of public transportation such as shuttle buses, rather than expanding parking. (OP24)
5. Adjust the level of Lifeguard compensation to attract enough staff to adequately patrol town beaches. (OP25)
6. Maintain the lifeguard protected beach at Schoolhouse Pond. (OP26)
7. Maintain the lifeguard protected beach at Oyster Pond. Build restroom and changing facilities there. (OP27)

**F. Increase Access to Freshwater Ponds**

1. Provide public access to all great ponds through improvements to town lands or through land acquisition. Great ponds: Emery Pond, Goose Pond, Lover's Lake, Mill Pond (West Chatham), Schoolhouse Pond, Stillwater Pond and

White Pond. Provide adequate supervision to minimize impact on surrounding neighborhood and natural resources. (OP28)

2. Establish White Pond Landing as a freshwater swimming area with limited improvements to provide access and preserve the quiet nature of the area. Expand the unpaved parking to accommodate a maximum of 20 vehicles. Expand the beach to obtain 50 yards of water access. (OP29)

3. Establish swimming and boating areas on newly acquired land on Stillwater Pond and Lovers Lake using White Pond as a model. (OP30)

**G. Upgrade town landings and salt water access.**

1. Usage and improvements to town landings shall be in keeping with their classification and shall be guided by the policies of this plan, including the following:

   a. Landing classified as key facilities under this plan shall be considered major points for fishing and public access to the water for residents and visitors. Facilities such as boat ramps, docks, parking areas, restrooms, and other fishing and recreational support facilities shall be considered appropriate and desirable. Upgrades and expansions of these landings shall be undertaken to accommodate fishing and recreation, provided such plans mitigate to the extent possible the impacts on surrounding neighborhoods. (OP31)

   b. The secondary landings shall be considered as back-up facilities, to supplement key facilities. Facilities such as docks, boat ramps, parking areas, restrooms, and other fishing and recreational support facilities shall be provided as appropriate, given the land area and location of the landing. Upgrades or expansions of such landings shall be undertaken with careful consideration of the impacts to surrounding neighborhoods. (OP32)

   c. Low usage landings shall be considered constrained facilities which provide pedestrian and limited vehicle access. Land acquisition to expand such landings shall be encouraged. Upgrades to facilities should be undertaken with careful consideration of the impacts to surrounding neighborhoods. Parking shall be provided where feasible. (OP33)

   d. Pedestrian access only landings shall be considered very limited in use. Limited parking and drop-off areas shall be provided where feasible. Facilities at these landings shall be limited to those necessary to allow public access to the water for pedestrians. (OP34)

2. Restore public access to the extent possible at landings along Chatham Harbor.

   a. Build a stairway over the revetment for pedestrians on Holway Street. (OP35)

   b. Allow pedestrian usage of Water Street Extension and Mistover Lane for viewing, regardless of the lack of beach access. (OP36)

   c. Explore having the Town, by itself or together with other local conservation/preservation organizations, acquire the beach between Andrew Harding's Lane and Holway Street for continuing public use. (OP37)

   d. Explore options for increasing parking capacity at the Cow Yard. (OP38)

   e. An historical pathway exists between Morris Island Road and Chatham Harbor which provides access to the stretch of beach between Outermost Marine Harbor inlet and the south tip of Morris Island. The Town should seek to clarify and confirm its right of access and further explore the possibility of acquiring the land (some 22 acres) from the Association. (OP39)

   f. Explore the acquisition of land at Battlefield Landing to allow for parking along the road. (OP40)

   g. Consider the purchase of Bridge Street Landing to insure future public access. (OP41)

   h. Explore options for adding public access points for the launching of small boats on Muddy Creek. Petition the state to alleviate the congestion in the culvert under Rte. 28 to provide a constant water flow between Muddy Creek and Little Pleasant Bay. (OP42)

i. Include provision for access and use by the disabled in any plans for town landing improvements. (OP43)

3. Provide boat launching facilities on all major waterways to serve both residents and visitors.

a. On newly acquired land adjacent to Ryder's Cove Landing, construct a public parking area for vehicles and boat trailers and public restrooms. (OP44)

b. Maintain Ryder's Cove and Barn Hill Road landings for general public use. (OP45)

c. Add a dock adjacent to the ramp at Crow's Pond and improve the parking area. (OP46)

d. Expand parking areas at key facilities and secondary facilities which serve as alternatives to key facilities. (OP47)

4. Maintain the character of lands.

a. Maintain parking areas unpaved except at major facilities. (OP48)

b. Keep signage to a minimum and devise tasteful, standard signage for marking landings. (OP49)

c. Continue removal of invasive vegetation while maintain natural habitats at Ryder's Cove Overlook and other landings. (OP50)

5. Allow for and manage multiple uses at landings, particularly key facilities.

a. Maintain Old Mill Boatyard parking for residents only, but consider a shuttle service to allow for usage by non residents. (OP51)
b. Develop management policies for uses at landings, particularly at Old Mill Boatyard and the Fish Pier, giving priority to fishing uses and general public access over recreational business or specific user group use. (OP52)

6. Provide for regular maintenance and upgrades to town landings.

a. Maintain access channels at landings, particularly the Fish Pier. (OP53)

b. Establish an annual maintenance fund for small repairs, improvements and clean up of landings. (OP54)

**H. Public Information**

1. Mark all town landings and access points with clear and consistent signage. (OP55)

2. Ensure that landings and access points are shown on maps available to the public. (OP56)

3. Print rules and regulations pertaining to the use of town landings on maps and brochures. (OP57)

http://www.town.chatham.ma.us/Public_Documents/ChathamMA_Planning/CLRP7/

Town of
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**ECONOMICS**

DRAFT 03/15/03

# 6. ECONOMICS

## Overview

Chatham's economy is similar to the region's in its high percentage of households with retirement income and its high percentages of persons employed in retail trade and services; but, there are differences. Chatham has twice the Cape Cod average of self-employed persons, a higher-than-regional average number of fishermen, and more highly valued residential properties.

Residents are employed in diverse occupations and businesses. All sources of data indicate that the dominant employment sector in Chatham is services. In part, this is because government employment reports include so many occupations within this category and, in part, because Chatham has numerous over-night accommodations, health-care facilities, and professionals, all of which are classified as service industries. Although numbers vary by source, the second largest employment sector is retail trade, including restaurants. The fishery industries, construction, banking and real estate sectors are just behind services and retail trade in employment importance, with the numbers among these sectors about equal.

The pattern of Chatham's personal income illustrates the town's demographics: the percentage of Chatham households with income from social security is twice the state-wide average, and a far higher percentage have income from pensions. The high percentage of retirement households in Chatham is an economic strength since their income brings funds to Chatham from outside sources. An income statistic of concern is that Chatham's median family income is lower than state and county averages, reflecting heavy employment in service and retail jobs characterized by low wages. The town's economy as a whole has offsetting assets, but families with below-average-incomes do not.

Among Chatham's assets are its residential properties. Residential property owners pay more than 90 percent of the town's taxes, and valuations are increasing. Chatham's tax base is one of the state's highest. The town's average, single-family house value is almost one and one-half times the state average. Because there are over 3000 houses that are occupied only seasonally, (more than one-half of the houses in town), combined with the reasonable assumption that those who can afford second homes have above-average incomes, it can be assumed that second home owners comprise a significant, although undocumented, portion of the town's economy. Besides being the primary support for town government, and its almost 300 employees, residential property also contribute through household purchases of retail goods and services and through payments to local building contractors for construction of new houses and alterations to existing ones. Construction of new houses on vacant lots was slower in the 1990s than during previous decades, but in 2002, the amount of money invested in both new houses and alterations to existing houses was $46 million, more than twice what was spent only five years earlier.

During the year 2000, reported Chatham fish landings were almost $15 million, and the town's 2001 shellfish harvest was $5.6 million. Both fisheries face threats — the fin fishery from federal restrictions and harbor access and shellfishing from closures because of pollution and from a possible federal closure of the Monomoy flats. Chatham's fishermen remain an important resource not only for the town but for the entire New England region.

To year-round residents it may not ring true, but Chatham is correctly described as a "resort community." This is, after all, a town whose population is estimated to be three times greater during mid-summer than mid-winter. It

could well be that the primary economic contribution of short-term, summer, visitors is their pattern of liking what they see, returning for extended stays, buying a vacation house and, (for many), making this house their retirement home. Unfortunately, there is no statistical source for the number of Chatham's day-trippers or the amounts they spend locally, but we do know, via room occupancy tax revenues, that year 2001 payments for over-night accommodations were roughly $12 million. The down side of the growing summer population is the congestion it brings to the town's streets and parking spaces. On the positive side is the extent to which it gives the town "an easily absorbed source of growth...and financial growth year after year." (Chamber of Commerce, 1997.)

In summary, this is a town that does not need to undertake drastic actions to turn its economy around, or even to promote expansion, yet there are challenges which town policies and actions need to address. We cannot expect this small town, located on a peninsula jutting 60 miles out to sea, to have it all, but there should be recognition of the elements of its economy that need strengthening, and commitment to do something about them. For one thing, the preservation of the town's natural resources and physical attractiveness should be fundamental in an economy with a large numbers of retirees and second homeowners, (who can live wherever they want), and with a large segment of its employment in businesses catering to visitors.

The following Goals and Policies are key to sustaining Chatham's healthy economy and to addressing identified issues.

# Goals & Policies

## 6.0 Overall Goal

**Maintenance of a vital economy that will benefit all residents.**

## 6.1. Goal

**Preservation and protection of the town's natural resources and unique character which are vital to maintaining the town's economic viability, including its attractiveness to retirees and second-home owners who are a mainstay of the local economy.**

**Policies:**

**A. Preserve the town's environmental quality in view of its importance to the economy of the town.**

1. Support provisions of this comprehensive plan proposed to protect drinking water supplies. (EE1)
2. Support provisions of this plan proposed to protect coastal water quality. (EE2)
3. Support provisions of this plan concerning the disposal of waste water and solid waste. (EE3)
4. Support provisions of this plan managing the use and development of commercial properties. (EE4)

**Preserve the community's character in view of its importance to the economy.**

1. Preserve Chatham's walking downtown, one of the few remaining on the Cape, with its attractive store fronts and an interesting mix of retail businesses. (EE5)
   a. Support the recommendations set forth in the Community Facilities and Open Space and Recreation elements for upgrading safety and facilities for visitors downtown.
   b. Encourage local ownership of commercial properties

c. Encourage public-private partnerships to address downtown issues.

d. Preserve the appearance through limiting outdoor display of commercial goods.

2. Support the provisions of this comprehensive plan proposed to protect community character, including implementing the neighborhood center concept, requiring off-street parking to the side or rear of buildings, controlling the size and scale of buildings, improving the appearance of commercial signage and providing service roads with limited access to Rte. 28 regulating site grading and clearing. (EE6)

3. Prevent commercial sprawl along Rte. 28 through the following: (EE7)

a. Support the provisions of this plan aimed at concentrating retail stores and services to already developed areas or neighborhood centers. (EE7)

b. Support the provisions of this plan calling for rezoning of areas between proposed neighborhood centers to residential. (EE7)

4. Preserve the appearance of Rte. 28 through limiting of outdoor display of commercial goods. (EE8)

5. Support provisions in this plan proposed to protect historic properties. (EE9)

6. Maintain the present boundaries of industrial areas except that expansion of the district into adjacent lands may be recommended to Town Meeting by the Planning Board provided that the land is found to be suitable for industrial use and that detrimental impact to adjacent properties can be adequately mitigated. (See Land Use section) (EE10)

## 6.2 Goal

**Continued viability of the fishing industries and preservation of the town's maritime heritage.**

**POLICIES:**

**A. Provide facilities to serve the fishing fleet.**

1. Continue to provide and operate mooring areas and facilities at Aunt Lydia's Cove for the fishing fleet and ensure that the channel is maintained to the Fish Pier at Aunt Lydia's Cove. (EE11)

2. Continue to maintain safe mooring areas and support facilities in Ryder's Cove and Stage Harbor for fishing vessels. (EE12)

**B. Support regional and local efforts to maintain the viability of the fishing industry.**

1. Support efforts of local fishermen to shape regulation of the fishing industry. (EE13)

2. Implement provisions of this plan proposed to protect the water quality of the town's harbors and embayments. (EE14)

3. Continue to support regional efforts to improve the marketing of local fish by participating in the programs and sponsoring or supporting grant applications and other program funding efforts. (EE15)

**C. Provide support to the shellfish industry.**

1. Continue and expand the town's shellfish seeding and propagation programs to sustain resources. (EE16)

2. Implement policies in the Stage Harbor Management Plan and maintain and improve town landings to serve the shellfish industry. (EE17)

**Explore the appropriateness and economic viability of aquaculture in support of the fishing industry.** (EE18)

## 6.3 Goal
## Harmonious co-existence of tourism and residential uses.

**POLICIES:**

**A. Support the Chamber of Commerce's efforts to manage rather than promote tourism. (EE19)**

**B. Support the provisions of this plan to improve parking facilities, institute shuttles to landings and beaches, and construct toilet facilities. (EE20)**

**C. Provide town financial assistance to activities performed by the Chamber of Commerce that benefit the town as a whole. (EE21)**

**D. Ensure that rental units, including summer rentals, are kept in safe and decent condition by establishing a mandatory rental inspection program. (EE22)**

## 6.4 Goal
## Improvements in incomes and housing prospects of low-wage Chatham workers.

**POLICIES:**

**A. Continue to actively work with the Lower Cape Cod Community Development Corporation in providing technical assistance and micro-loans to the area's small businesses. (EE23)**

**B. Implement the proposals in this plan for increasing affordable housing in order to assist in improving economic conditions and job opportunities. (EE24)**

**C. Encourage businesses to provide housing for their seasonal employees. (EE25)**

**D. Encourage home occupations to the extent that they are in keeping with other provisions of this plan. (EE26)**

**E. Encourage Cape Cod Community College and other agencies to provide programs meeting the educational and retraining needs of area residents and to establish satellite facilities for the convenience of Lower Cape residents. (EE27)**

**F. Support the provisions of this plan for zoning changes and programs to meet the community's need for affordable housing. (EE28)**

**G. Develop information to assist businesses in understanding and navigating the permit approval processes required by the town. (EE29)**

**H. Recognize the need of fishermen to use their property for storage of equipment in active use. (EE30)**

## 6.5 Goal

**Implementation of the provisions of this plan addressing economic issues and coordination with economic development efforts of the area's regional agencies.**

**POLICIES:**

**A. Establish an Economic Development Committee to coordinate activities addressing the town's economic issues as identified in this plan. Specifically, the Task Force would: (EE31)**

1. Work toward promoting year-round employment for Chatham residents. (EE31)
2. Work toward seeing that services needed by Chatham residents are available. (EE31)
3. Publicize town and regional programs to increase local participation and benefit. (EE31)

**B. Continue to participate in the area's regional agencies involved in economic development to ensure that their programs are designed and geared to address Chatham's economic issues. (EE32)**

# Appendix J

## 303d List of Impacted Waters for Cape Cod Watershed

# Massachusetts Category 2 Waters
# "Attaining Some Uses; Other Uses Not Assessed"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | USES ATTAINED* | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | Aesthetics | Fish, other Aquatic Life and Wildlife | Primary Contact Recreation | Secondary Contact Recreation | Shellfish Harvesting |
| Fearing Pond | MA95054 | Plymouth | 22.509 | ACRES | | | X | X | |
| Glen Charlie Pond | MA95061 | Wareham | 156.611 | ACRES | | | X | X | |
| Megansett Harbor | MA95-19 | From the outlet of Squeteague Harbor, Falmouth to Buzzards Bay at a line from the western tip of Scraggy Neck, Bourne south to the tip of Nyes Neck, Falmouth. | 1.461 | SQUARE MILES | | | X | X | X |
| New Long Pond | MA95112 | Plymouth | 20.977 | ACRES | X | X | | | |
| Queen Sewell Pond | MA95180 | Bourne (previously reported with PALIS # 96253). | 17.614 | ACRES | | | X | X | |
| Vaughn Pond | MA95153 | Carver | 19.629 | ACRES | | | X | X | |
| Weweantic River | MA95-04 | Outlet of small, unnamed pond at the confluence of Rocky Meadow Brook and South Meadow Brook, Carver to the inlet of Horseshoe Pond, Wareham. | 11.322 | MILES | X | | | | |
| **Cape Cod** | | | | | | | | | |
| Bassing Harbor | MA96-48 | Excluding Crows Pond and Ryder Cove, Chatham. | 0.13 | SQUARE MILES | | | X | X | X |
| Centerville Harbor | MA96-03 | From an imaginary line that extends from Dowses Beach, Barnstable to Hyannis Point including all waters north to the shore, Barnstable. | 1.46 | SQUARE MILES | | X | X | X | X |
| Chatham Harbor | MA96-10 | Harbor, bounded on the east by the Cape Cod National Seashore, with the northern extent as an imaginary line drawn northeast from northern tip of Strong Island to a point on the inner Cape Cod National Seashore and the western extent as an imaginary line drawn from the southern tip of Strong Island south to Allen Point including the waters south to an imaginary line along the northern edge of the South Beach Bar extending from Chatham Lighthouse to the inlet created by the 1987 storm, Chatham (area associated with Cape Cod National Seashore designated as ORW). | 2.85 | SQUARE MILES | | X | X | X | X |
| Crows Pond | MA96-47 | To Bassing Harbor, Chatham. | 0.19 | SQUARE MILES | | X | X | X | X |
| Falmouth Inner Harbor | MA96-17 | Waters included north of Falmouth Inner Harbor Light, Falmouth. | 0.05 | SQUARE MILES | | | | | X |
| Hinckleys Pond | MA96140 | Harwich | 164 | ACRES | X | X | | X | |
| Mashpee River | MA96-89 | Headwaters, outlet Mashpee Pond, Mashpee to Quinaquisset Avenue, Mashpee. | 2.7 | MILES | | X | | | |



* Attained uses denoted by "X"

# Massachusetts Category 3 Waters
# "No Uses Assessed"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS |
|---|---|---|---|---|
| Flax Pond | MA96090 | Dennis | 15 | ACRES |
| Goose Pond | MA96106 | Chatham | 35 | ACRES |
| Gull Pond | MA96123 | Wellfleet | 103 | ACRES |
| Herring Pond | MA96133 | Eastham | 42 | ACRES |
| Herring Pond | MA96134 | Wellfleet | 18 | ACRES |
| Hoxie Pond | MA96146 | Sandwich | 8 | ACRES |
| Kinnacum Pond | MA96163 | Wellfleet | 2 | ACRES |
| Lake Elizabeth | MA96080 | Barnstable | 6 | ACRES |
| Long Pond | MA96180 | Yarmouth | 54 | ACRES |
| Miss Thachers Pond | MA96258 | Yarmouth | 6 | ACRES |
| Nye Pond | MA96228 | Sandwich | 6 | ACRES |
| Pilgrim Lake | MA96246 | Orleans | 38 | ACRES |
| Rushy Marsh Pond | MA96266 | Barnstable | 14 | ACRES |
| Scargo Lake | MA96279 | Dennis | 54 | ACRES |
| Schoolhouse Pond | MA96281 | Chatham | 20 | ACRES |
| Shallow Pond | MA96285 | Barnstable | 76 | ACRES |
| Shubael Pond | MA96293 | Barnstable | 55 | ACRES |
| Village Pond | MA96329 | Truro | 2 | ACRES |
| **Charles** | | | | |
| Brookline Reservoir | MA72010 | Brookline | 21.111 | ACRES |
| Cambridge Reservoir | MA72014 | Waltham/Lincoln/Lexington | 532.011 | ACRES |
| Chestnut Hill Reservoir | MA72023 | Boston | 82.253 | ACRES |
| Crystal Lake | MA72030 | Newton | 27.273 | ACRES |
| Halls Pond | MA72043 | Brookline | 0.57 | ACRES |
| Little Farm Pond | MA72064 | Sherborn | 23.801 | ACRES |
| Louisa Lake | MA72068 | Milford | 7.772 | ACRES |
| Norumbega Reservoir | MA72086 | [North Basin] Weston | 13.643 | ACRES |
| Norumbega Reservoir | MA72087 | [South Basin] Weston | 38.41 | ACRES |
| Sandy Pond | MA72105 | Lincoln | 157.108 | ACRES |
| South End Pond | MA72109 | Millis | 29.525 | ACRES |
| Stony Brook | MA72-37 | Outlet Turtle Pond, Boston to culvert entrance, Boston. | 1.62 | MILES |
| Stony Brook Reservoir | MA72114 | Waltham/Weston | 63.58 | ACRES |
| Todd Pond | MA72117 | Lincoln | 9.257 | ACRES |
| Walker Pond | MA72126 | Millis | 9.008 | ACRES |
| Waseeka Sanctuary Pond | MA72155 | Holliston | 17.053 | ACRES |
| Weston Reservoir | MA72134 | Weston | 58.655 | ACRES |
| Weston Station Pond | MA72135 | Weston | 37.666 | ACRES |

# Massachusetts Category 4a Waters
# "TMDL is Completed"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | POLLUTANTS ADDRESSED BY TMDL | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| West Falmouth Harbor | MA95-22 | From the confluence with Harbor Head at Chappaquoit Road, Falmouth to the mouth at Buzzards Bay at a line connecting the ends of the seawalls from Little Island and Chappaquoit Point, Falmouth (including Inner West Falmouth Harbor, Outer West Falmouth Harbor, Snug Harbor, and Mashapaquit Creek). | 0.29 | SQUARE MILES | Estuarine Bioassessments | 34328 |
| | | | | | Estuarine Bioassessments | 34332 |
| | | | | | Fecal Coliform | 36172 |
| | | | | | Nitrogen (Total) | 34328 |
| | | | | | Nitrogen (Total) | 34332 |
| | | | | | Nitrogen (Total) | 34917 |
| | | | | | Nitrogen (Total) | 34918 |
| White Island Pond | MA95166 | (East Basin) Plymouth/Wareham | 164.803 | ACRES | (Non-Native Aquatic Plants*) | |
| | | | | | Chlorophyll-a | 38912 |
| | | | | | Excess Algal Growth | 38912 |
| | | | | | Oxygen, Dissolved | 38912 |
| | | | | | Phosphorus (Total) | 38912 |
| | | | | | Secchi disk transparency | 38912 |
| White Island Pond | MA95173 | (West Basin) Plymouth/Wareham | 122.074 | ACRES | (Non-Native Aquatic Plants*) | |
| | | | | | Excess Algal Growth | 38914 |
| | | | | | Oxygen, Dissolved | 38914 |
| | | | | | Phosphorus (Total) | 38914 |
| Wild Harbor | MA95-20 | Falmouth. | 0.145 | SQUARE MILES | Fecal Coliform | 36172 |
| **Cape Cod** | | | | | | |
| Areys Pond | MA96-70 | Orleans | 0.02 | SQUARE MILES | Estuarine Bioassessments | 33786 |
| | | | | | Nitrogen (Total) | 33786 |
| Baker Pond | MA96008 | Orleans/Brewster | 26 | ACRES | Mercury in Fish Tissue | 33880 |
| Bournes Pond | MA96-57 | west of Central Avenue, Falmouth to Vineyard Sound, including Israels Cove, Falmouth. | 0.24 | SQUARE MILES | Estuarine Bioassessments | 32535 |
| | | | | | Estuarine Bioassessments | 32638 |
| | | | | | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 32535 |
| | | | | | Nitrogen (Total) | 32638 |
| Bucks Creek | MA96-44 | Outlet from Harding Beach Pond (locally known as Sulfur Springs), Chatham to confluence with Cockle Cove, Nantucket Sound, Chatham. | 0.02 | SQUARE MILES | Enterococcus | 36772 |
| | | | | | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 36230 |
| Bumps River | MA96-02 | From outlet of pond at Bumps River Road, Barnstable through Scudder Bay to South Main Street bridge (confluence with Centerville River), Barnstable. | 0.07 | SQUARE MILES | Fecal Coliform | 36771 |
| Centerville River | MA96-04 | Approximately 300 feet west of Elliot Road, Barnstable to confluence with Centerville Harbor, including East Bay, Barnstable. | 0.24 | SQUARE MILES | Estuarine Bioassessments | 33858 |
| | | | | | Fecal Coliform | 36771 |
| | | | | | Nitrogen (Total) | 33858 |
| Chase Garden Creek | MA96-35 | New Boston Road, Dennis to mouth at Cape Cod Bay, Dennis/Yarmouth. | 0.13 | SQUARE MILES | Fecal Coliform | 36771 |
| Cotuit Bay | MA96-63 | From North Bay at Point Isabella, Barnstable oceanward to a line extended along Oyster Harbors Beach, Barnstable. | 0.85 | SQUARE MILES | Fecal Coliform | 36582 |
| | | | | | Nitrogen (Total) | 33988 |
| Duck Creek | MA96-32 | Source west of Route 6, Wellfleet to Wellfleet Harbor (at a line from Shirttail Point to Taylor Road), Wellfleet. | 0.15 | SQUARE MILES | Fecal Coliform | 36772 |



* TMDL not required (Non-Pollutant)

# Massachusetts Category 4a Waters
# "TMDL is Completed"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | POLLUTANTS ADDRESSED BY TMDL | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| Duck Pond | MA96068 | Wellfleet | 11 | ACRES | Mercury in Fish Tissue | 33880 |
| Dyer Pond | MA96070 | Wellfleet | 10 | ACRES | Mercury in Fish Tissue | 33880 |
| Frost Fish Creek | MA96-49 | Outlet from cranberry bog northwest of Stony Hill Road, Chatham to confluence with Ryder Cove, Chatham. | 0.01 | SQUARE MILES | Fecal Coliform | 22513 |
| | | | | | Nitrogen (Total) | 33781 |
| Great Harbor | MA96-18 | The waters north of an imaginary line drawn east from Penzance Point to Devils Foot Island and southeast from Devils Foot Island to Juniper Point (excludes Eel Pond), Falmouth. | 0.31 | SQUARE MILES | Fecal Coliform | 36772 |
| Great Pond | MA96114 | Truro | 17 | ACRES | Mercury in Fish Tissue | 33880 |
| Great Pond | MA96117 | Wellfleet | 41 | ACRES | Mercury in Fish Tissue | 33880 |
| Great Pond | MA96-54 | From inlet of Coonamessett River, Falmouth to Vineyard Sound (excluding Perch Pond), Falmouth. | 0.4 | SQUARE MILES | Estuarine Bioassessments | 32532 |
| | | | | | Nitrogen (Total) | 32532 |
| Great River | MA96-60 | From inlet of Abigails Brook, Mashpee to Waquoit Bay (excluding Jehu Pond), Mashpee. | 0.16 | SQUARE MILES | Estuarine Bioassessments | 33815 |
| | | | | | Nitrogen (Total) | 33815 |
| Green Pond | MA96-55 | east of Acapesket Road, Falmouth outlet to Vineyard Sound, Falmouth. | 0.21 | SQUARE MILES | Estuarine Bioassessments | 32534 |
| | | | | | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 32534 |
| Hamblin Pond | MA96-58 | From inlet of Red Brook, Falmouth/Mashpee to outlet of Little River, Mashpee and inlet/outlet of Waquoit Bay west of Meadow Neck Road, Falmouth/Mashpee. | 0.19 | SQUARE MILES | Estuarine Bioassessments | 33812 |
| | | | | | Fecal Coliform | 36771 |
| | | | | | Nitrogen (Total) | 33812 |
| Harding Beach Pond | MA96-43 | locally known as Sulfur Springs (northeast of Bucks Creek), Chatham. | 0.07 | SQUARE MILES | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 36229 |
| Herring River | MA96-22 | Outlet of Herring River Reservoir (at North Harwich Reservoir Dam) west of Bells Neck Road, Harwich to mouth at Nantucket Sound, Harwich. | 0.07 | SQUARE MILES | Fecal Coliform | 36772 |
| Hyannis Harbor | MA96-05 | The waters from the shoreline to an imaginary line drawn from the light at the end of Hyannis breakwater, Barnstable to the point west of Dunbar Point, Barnstable. | 0.68 | SQUARE MILES | Fecal Coliform | 36771 |
| Jehu Pond | MA96-59 | Mashpee. | 0.09 | SQUARE MILES | Estuarine Bioassessments | 33814 |
| | | | | | Nitrogen (Total) | 33814 |
| Johns Pond | MA96157 | Mashpee | 316 | ACRES | Mercury in Fish Tissue | 33880 |
| Little Harbor | MA96-19 | The waters north of an imaginary line drawn from Juniper Point, Falmouth east to Nobska Beach, Falmouth. | 0.07 | SQUARE MILES | Fecal Coliform | 36772 |
| Little Namskaket Creek | MA96-26 | Source to mouth at Cape Cod Bay, Orleans. | 0.01 | SQUARE MILES | Fecal Coliform | 36772 |
| Little River | MA96-61 | From outlet of Hamblin Pond, Mashpee to the Great River, Mashpee. | 0.02 | SQUARE MILES | Estuarine Bioassessments | 33813 |
| | | | | | Nitrogen (Total) | 33813 |
| Long Pond | MA96179 | Wellfleet | 35 | ACRES | Mercury in Fish Tissue | 33880 |
| Maraspin Creek | MA96-06 | From Commerce Road, Barnstable to confluence with Barnstable Harbor at Blish Point, Barnstable. | 0.03 | SQUARE MILES | Fecal Coliform | 36771 |
| Mashpee Pond | MA96194 | Mashpee/Sandwich | 377 | ACRES | Mercury in Fish Tissue | 33880 |



* TMDL not required (Non-Pollutant)

# Massachusetts Category 4a Waters
# "TMDL is Completed"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | POLLUTANTS ADDRESSED BY TMDL | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| Mashpee River | MA96-24 | Quinaquisset Avenue, Mashpee to mouth at Shoestring Bay (formerly to mouth at Popponesset Bay), Mashpee. | 0.08 | SQUARE MILES | Estuarine Bioassessments | 33965 |
| | | | | | Fecal Coliform | 36771 |
| Mill Creek | MA96-37 | From Keveney Lane/Mill Lane, Barnstable/Yarmouth north to confluence with Cape Cod Bay, Barnstable/Yarmouth. | 0.03 | SQUARE MILES | Fecal Coliform | 36771 |
| Mill Creek | MA96-41 | Outlet of Taylors Pond, Chatham to confluence with Cockle Cove, Chatham. | 0.03 | SQUARE MILES | Fecal Coliform | 36772 |
| Mill Pond | MA96-52 | including Little Mill Pond (PALIS # 96174), Chatham. | 0.06 | SQUARE MILES | Estuarine Bioassessments | 36222 |
| | | | | | Nitrogen (Total) | 36222 |
| Muddy Creek | MA96-51 | Source south of Countryside Drive and north-northeast of Old Queen Anne Road, Chatham to mouth at Pleasant Bay, Harwich/Chatham, including Upper and Lower reaches. | 0.05 | SQUARE MILES | Fecal Coliform | 22512 |
| | | | | | Nitrogen (Total) | 33797 |
| | | | | | Nitrogen (Total) | 33798 |
| Namequoit River | MA96-71 | Headwaters, outlet Areys Pond, Orleans to confluence with The River, Orleans. | 0.06 | SQUARE MILES | Estuarine Bioassessments | 33791 |
| | | | | | Nitrogen (Total) | 33791 |
| Namskaket Creek | MA96-27 | Source west of Route 6, Orleans to mouth at Cape Cod Bay, Brewster/Orleans. | 0.03 | SQUARE MILES | Fecal Coliform | 36772 |
| North Bay | MA96-66 | From Fox Island to just south of Bridge Street and separated from Cotuit Bay at a line from Point Isabella, Barnstable southward to the opposite shore (including Dam Pond), Barnstable. | 0.47 | SQUARE MILES | Estuarine Bioassessments | 33990 |
| | | | | | Fecal Coliform | 36584 |
| Oyster Pond | MA96-45 | Including Stetson Cove, Chatham. | 0.21 | SQUARE MILES | Estuarine Bioassessments | 36219 |
| | | | | | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 36219 |
| Oyster Pond | MA96-62 | east of Fells Road, Falmouth. | 0.1 | SQUARE MILES | Estuarine Bioassessments | 34345 |
| | | | | | Fecal Coliform | 36772 |
| | | | | | Oxygen, Dissolved | 34345 |
| Oyster Pond River | MA96-46 | Outlet of Oyster Pond, Chatham to confluence with Stage Harbor, Chatham. | 0.14 | SQUARE MILES | Estuarine Bioassessments | 36220 |
| | | | | | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 36220 |
| Pamet River | MA96-31 | Tidegate at Route 6A, Truro to mouth at Cape Cod Bay (including Pamet Harbor), Truro. | 0.14 | SQUARE MILES | Fecal Coliform | 36772 |
| Parkers River | MA96-38 | Outlet Seine Pond, Yarmouth to mouth at Nantucket Sound, Yarmouth. | 0.04 | SQUARE MILES | Fecal Coliform | 36771 |
| Perch Pond | MA96-53 | Connects to northwest end of Great Pond, west of Keechipam Way, Falmouth. | 0.03 | SQUARE MILES | Nitrogen (Total) | 32537 |
| Peters Pond | MA96244 | Sandwich | 123 | ACRES | Mercury in Fish Tissue | 33880 |



* TMDL not required (Non-Pollutant)

# Massachusetts Category 4a Waters
# "TMDL is Completed"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | POLLUTANTS ADDRESSED BY TMDL | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| Pleasant Bay | MA96-77 | The waters between the mouth of Muddy Creek, Harwich and imaginary lines drawn from the northeastern edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham and from the southeastern tip of Strong Island to Allen Point, Chatham (excluding the delineated segments; Bassing Harbor, Round Cove and Quanset Pond). | 2.88 | SQUARE MILES | Nitrogen (Total) | 33799 |
| Popponesset Bay | MA96-40 | From line connecting Ryefield Point, Barnstable and Punkhorn Point, Mashpee to inlet of Nantucket Sound (including Ockway Bay and Pinquickset Cove), Mashpee/Barnstable. | 0.68 | SQUARE MILES | Estuarine Bioassessments | 33967 |
| | | | | | Estuarine Bioassessments | 33968 |
| | | | | | Estuarine Bioassessments | 33969 |
| Prince Cove | MA96-07 | Includes areas east of Prince Cove which are locally known as "Warren Cove" and "Prince Cove Channel", Barnstable. | 0.14 | SQUARE MILES | Estuarine Bioassessments | 33991 |
| | | | | | Estuarine Bioassessments | 33992 |
| | | | | | Estuarine Bioassessments | 33993 |
| | | | | | Fecal Coliform | 36585 |
| Provincetown Harbor | MA96-29 | The waters northwest of an imaginary line drawn northeasterly from the tip of Long Point, Provincetown to Beach Point Beach, Truro (area associated with Cape Cod National Seashore designated as ORW). | 4.33 | SQUARE MILES | Fecal Coliform | 36772 |
| Quanset Pond | MA96-74 | Orleans. | 0.02 | SQUARE MILES | Nitrogen (Total) | 33791 |
| | | | | | Nitrogen (Total) | 33795 |
| Quashnet River | MA96-20 | Just south of Route 28, Falmouth to mouth at Waquoit Bay, Falmouth. Also known as Moonakis River. | 0.07 | SQUARE MILES | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 33811 |
| | | | | | Oxygen, Dissolved | 33811 |
| Quivett Creek | MA96-09 | Outlet of unnamed pond just south of Route 6A, Brewster/Dennis to the mouth at Cape Cod Bay, Brewster/Dennis. | 0.04 | SQUARE MILES | Fecal Coliform | 36771 |
| Rock Harbor Creek | MA96-16 | Outlet Cedar Pond, Orleans to mouth at Cape Cod Bay, Eastham/Orleans. | 0.03 | SQUARE MILES | Fecal Coliform | 36772 |
| Round Cove | MA96-75 | Harwich. | 0.02 | SQUARE MILES | Nitrogen (Total) | 33796 |
| Ryder Cove | MA96-50 | Chatham | 0.19 | SQUARE MILES | Estuarine Bioassessments | 33780 |
| | | | | | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 33780 |
| Saquatucket Harbor | MA96-23 | South of Route 28, Harwich to confluence with Nantucket Sound, Harwich. | 0.02 | SQUARE MILES | Fecal Coliform | 36772 |
| Scorton Creek | MA96-30 | Jones Lane, Sandwich to mouth at Cape Cod Bay, Sandwich. | 0.03 | SQUARE MILES | Fecal Coliform | 36771 |
| Seapuit River | MA96-64 | south of Osterville Grand Island, Barnstable to Cotuit Bay and West Bay, Barnstable. | 0.06 | SQUARE MILES | Fecal Coliform | 36583 |
| Sesuit Creek | MA96-13 | Approximately 625 feet east of Route 6A, Dennis to mouth at Sesuit Harbor, Cape Cod Bay, Dennis. | 0.01 | SQUARE MILES | Fecal Coliform | 36771 |



* TMDL not required (Non-Pollutant)

# Massachusetts Category 4a Waters
# "TMDL is Completed"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | POLLUTANTS ADDRESSED BY TMDL | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| Sheep Pond | MA96289 | Brewster | 138 | ACRES | Mercury in Fish Tissue | 33880 |
| Shoestring Bay | MA96-08 | Quinaquisset Avenue, Mashpee/Barnstable to Popponesset Bay (line from Ryefield Point, Barnstable to Punkhorn Point, Mashpee, including Gooseberry Island), Barnstable/Mashpee. | 0.31 | SQUARE MILES | Estuarine Bioassessments | 33966 |
| | | | | | Fecal Coliform | 36771 |
| Slough Pond | MA96298 | Truro | 29 | ACRES | Mercury in Fish Tissue | 33880 |
| Snake Pond | MA96302 | Sandwich | 81 | ACRES | Mercury in Fish Tissue | 33880 |
| Snow Pond | MA96303 | Truro | 7 | ACRES | Mercury in Fish Tissue | 33880 |
| Stage Harbor | MA96-11 | From the outlet of Mill Pond, Chatham (including Mitchell River) to the confluence with Nantucket Sound at a line from the southernmost point of Harding Beach southeast to the Harding Beach Point , Chatham. | 0.56 | SQUARE MILES | Fecal Coliform | 36772 |
| Taylors Pond | MA96-42 | Chatham | 0.02 | SQUARE MILES | Fecal Coliform | 36772 |
| | | | | | Nitrogen (Total) | 36231 |
| Wakeby Pond | MA96346 | Mashpee/Sandwich | 353 | ACRES | Mercury in Fish Tissue | 33880 |
| Wequaquet Lake | MA96333 | Barnstable | 576 | ACRES | (Non-Native Aquatic Plants*) | |
| | | | | | Mercury in Fish Tissue | 33880 |
| West Bay | MA96-65 | South of the Bridge Street bridge, Barnstable to Nantucket Sound including Eel River, Barnstable. | 0.52 | SQUARE MILES | Estuarine Bioassessments | 33989 |
| **Charles** | | | | | | |
| Bogastow Brook | MA72-16 | Headwaters, outlet Factory Pond, Holliston to inlet South End Pond, Millis. | 9.492 | MILES | Fecal Coliform | 32373 |
| Charles River | MA72-01 | Headwaters, outlet Echo Lake, Hopkinton to Dilla Street (just upstream of Cedar Swamp Pond), Milford. | 2.482 | MILES | (Low flow alterations*) | |
| | | | | | (Other flow regime alterations*) | |
| | | | | | Oxygen, Dissolved | 40318 |
| Charles River | MA72-33 | Outlet Cedar Swamp Pond, Milford to the Milford WWTF discharge, Hopedale (formerly part of segment MA72-02). | 2.037 | MILES | (Physical substrate habitat alterations*) | |
| | | | | | Escherichia coli | 32364 |
| | | | | | Nutrient/Eutrophication Biological Indicators | 40317 |
| Cheese Cake Brook | MA72-29 | Emerges south of Route 16, Newton to confluence with the Charles River, Newton. | 1.416 | MILES | (Alteration in stream-side or littoral vegetative covers*) | |
| | | | | | (Other anthropogenic substrate alterations*) | |
| | | | | | Dissolved oxygen saturation | 40317 |
| | | | | | Escherichia coli | 32380 |
| | | | | | Excess Algal Growth | 40317 |
| | | | | | Phosphorus (Total) | 40317 |
| Echo Lake | MA72035 | Milford/Hopkinton | 72.335 | ACRES | Mercury in Fish Tissue | 33880 |
| Factory Pond | MA72037 | Holliston | 9.699 | ACRES | (Non-Native Aquatic Plants*) | |
| | | | | | Aquatic Plants (Macrophytes) | 40319 |
| Franklin Reservoir Northeast | MA72095 | Franklin | 21.03 | ACRES | Aquatic Plants (Macrophytes) | 40319 |
| | | | | | Turbidity | 40319 |
| Franklin Reservoir Southwest | MA72032 | Franklin | 13.12 | ACRES | Aquatic Plants (Macrophytes) | 40319 |
| | | | | | Turbidity | 40319 |



* TMDL not required (Non-Pollutant)

# Massachusetts Category 5 Waters
# "Waters requiring a TMDL"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | IMPAIRMENT CAUSE | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| Wareham River | MA95-03 | From confluence of Wankinko and Agawam Rivers at Route 6 bridge, Wareham to Buzzards Bay (at an imaginary line from Cromeset Point to curved point east/southeast of Long Beach Point), Wareham. Including Marks Cove, Wareham | 1.178 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36172 |
| | | | | | Nitrogen (Total) | |
| West Branch Westport River | MA95-37 | Outlet Grays Mill Pond, Adamsville, Rhode Island to mouth at Westport Harbor, Westport. | 1.28526 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36172 |
| | | | | | Nitrogen (Total) | |
| Westport River | MA95-54 | From the confluences of the East Branch Westport River and the West Branch Westport River to Rhode Island Sound (at a line from the southwestern tip of Horseneck Point to the easternmost point near Westport Light), Westport. | 0.74 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36172 |
| | | | | | Nitrogen (Total) | |
| Weweantic River | MA95-05 | Outlet Horseshoe Pond, Wareham to mouth at Buzzards Bay, Marion/Wareham. | 0.617 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36172 |
| | | | | | Nitrogen (Total) | |
| Wild Harbor River | MA95-68 | Headwaters, Falmouth to mouth at Wild Harbor, Falmouth. | 0.029 | SQUARE MILES | Fecal Coliform | 36172 |
| | | | | | Nutrient/Eutrophication Biological Indicators | |
| **Cape Cod** | | | | | | |
| Ashumet Pond | MA96004 | Mashpee/Falmouth | 203 | ACRES | Abnormal Fish deformities, erosions, lesions, tumors (DELTS) | |
| | | | | | Abnormal Fish Histology (Lesions) | |
| | | | | | Mercury in Fish Tissue | 33880 |
| | | | | | Oxygen, Dissolved | |
| | | | | | Phosphorus (Total) | |
| Barnstable Harbor | MA96-01 | From the mouths of Scorton and Spring creeks, Barnstable east to an imaginary line drawn from Beach Point to the western edge of the Mill Creek estuary, Barnstable. | 3.2 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36771 |
| Bass River | MA96-12 | Route 6, Dennis/Yarmouth to mouth at Nantucket Sound, Dennis/Yarmouth (excluding Grand Cove, Dennis). | 0.69 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36771 |
| Bearse Pond | MA96012 | Barnstable | 64 | ACRES | (Non-Native Aquatic Plants*) | |
| | | | | | Mercury in Fish Tissue | |
| Boat Meadow River | MA96-15 | Headwaters east of old railway grade, Eastham to mouth at Cape Cod Bay, Eastham. | 0.05 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36772 |
| Cedar Pond | MA96-88 | Orleans (in Inner Cape Cod Bay ACEC) | 0.03 | SQUARE MILES | Chlorophyll-a | |
| | | | | | Dissolved oxygen saturation | |
| | | | | | Oxygen, Dissolved | |
| Cockle Cove Creek | MA96-79 | Northeast of the bend in Cockle Drive, Chatham to confluence with Bucks Creek, Chatham (2005 orthophotos used to delineate segment). | 0.007 | SQUARE MILES | Enterococcus | |
| | | | | | Fecal Coliform | |
| Crystal Lake | MA96050 | Orleans | 33 | ACRES | Oxygen, Dissolved | |



* TMDL not required (Non-Pollutant)

# Massachusetts Category 5 Waters
# "Waters requiring a TMDL"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | IMPAIRMENT CAUSE | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| Dock Creek | MA96-86 | From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich. | 0.02 | SQUARE MILES | Fecal Coliform | |
| East Harbor (Pilgrim Lake) | MA96-83 | Truro/Provincetown | 0.5 | SQUARE MILES | Fecal Coliform | |
| Great Pond | MA96115 | Eastham | 109 | ACRES | Chlorophyll-a | |
| | | | | | Oxygen, Dissolved | |
| | | | | | Phosphorus (Total) | |
| Halls Creek | MA96-93 | Estuarine portion, from Craigville Beach Road, Barnstable to mouth at Centerville Harbor, Barnstable. | 0.07 | SQUARE MILES | Fecal Coliform | |
| Hamblin Pond | MA96126 | Barnstable | 114 | ACRES | Mercury in Fish Tissue | 33880 |
| | | | | | Oxygen, Dissolved | |
| Herring River | MA96-33 | South of High Toss Road, Wellfleet to Wellfleet Harbor (at an imaginary line drawn due north from the eastern tip of Great Island to the opposite shore), Wellfleet. | 0.4 | SQUARE MILES | (Fish-Passage Barrier*) | |
| | | | | | (Other flow regime alterations*) | |
| | | | | | Aluminum | |
| | | | | | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36772 |
| | | | | | pH, Low | |
| Herring River | MA96-67 | From outlet of Herring Pond, Wellfleet to south of High Toss Road, Wellfleet. | 3.6 | MILES | (Fish Kills*) | |
| | | | | | (Fish-Passage Barrier*) | |
| | | | | | (Other flow regime alterations*) | |
| | | | | | Aluminum | |
| | | | | | pH, Low | |
| Horseleach Pond | MA96144 | Truro | 23 | ACRES | Mercury in Fish Tissue | |
| Hyannis Inner Harbor | MA96-82 | Waters landward of an imaginary line drawn from Harbor Bluff, Barnstable to Hyannis Park, Yarmouth. | 0.13 | SQUARE MILES | Fecal Coliform | |
| | | | | | Nitrogen (Total) | |
| Lawrence Pond | MA96165 | Sandwich | 138 | ACRES | Mercury in Fish Tissue | |
| Lewis Bay | MA96-36 | Includes portion of Pine Island Creek and Uncle Roberts Cove to confluence with Nantucket Sound, Barnstable/Yarmouth (excluding Hyannis Inner Harbor, Barnstable/Yarmouth and Mill Creek, Yarmouth). | 1.79 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36771 |
| Little Pleasant Bay | MA96-78 | Waters north and east of imaginary lines drawn from the northeasterly edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham then east to a point on the inner Cape Cod National Seashore (excluding the delineated segments; The River, Pochet Neck, and Paw Wah Pond). | 3.3 | SQUARE MILES | Fecal Coliform | |
| | | | | | Nitrogen (Total) | 33794 |
| Little Pond | MA96-56 | west of Vista Boulevard, Falmouth outlet to Vineyard Sound, Falmouth. | 0.07 | SQUARE MILES | Estuarine Bioassessments | 34009 |
| | | | | | Fecal Coliform | |
| Long Pond | MA96183 | Brewster/Harwich | 715 | ACRES | Oxygen, Dissolved | |

* TMDL not required (Non-Pollutant)

# Massachusetts Category 5 Waters
# "Waters requiring a TMDL"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | IMPAIRMENT CAUSE | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| Lovells Pond | MA96185 | Barnstable | 54 | ACRES | Chlorophyll-a | |
| | | | | | Excess Algal Growth | |
| | | | | | Oxygen, Dissolved | |
| | | | | | Phosphorus (Total) | |
| | | | | | Secchi disk transparency | |
| Lovers Lake | MA96186 | Chatham | 37 | ACRES | Secchi disk transparency | |
| Lower Mill Pond | MA96188 | Brewster | 44 | ACRES | Chlorophyll-a | |
| | | | | | Excess Algal Growth | |
| | | | | | Phosphorus (Total) | |
| | | | | | Secchi disk transparency | |
| | | | | | Turbidity | |
| Middle Pond | MA96198 | Barnstable | 104 | ACRES | Oxygen, Dissolved | |
| Mill Creek | MA96-80 | Headwaters, outlet Mill Pond, Yarmouth to confluence with Lewis Bay, Yarmouth. | 0.07 | SQUARE MILES | Fecal Coliform | |
| | | | | | Nitrogen (Total) | |
| Mill Creek | MA96-85 | Headwaters, outlet Shawme Lake Lower, Sandwich to confluence with Old Harbor Creek, Sandwich. | 0.02 | SQUARE MILES | Fecal Coliform | |
| Mystic Lake | MA96218 | Barnstable | 146 | ACRES | (Non-Native Aquatic Plants*) | |
| | | | | | Oxygen, Dissolved | |
| Old Harbor Creek | MA96-84 | From Foster Road, Sandwich to Sandwich Harbor, Sandwich. | 0.06 | SQUARE MILES | Fecal Coliform | |
| Paw Wah Pond | MA96-72 | Orleans | 0.008 | SQUARE MILES | Estuarine Bioassessments | 33792 |
| | | | | | Fecal Coliform | |
| | | | | | Nitrogen (Total) | 33792 |
| Pochet Neck | MA96-73 | to confluence with Little Pleasant Bay, Orleans. | 0.24 | SQUARE MILES | Estuarine Bioassessments | 33793 |
| | | | | | Fecal Coliform | |
| | | | | | Nitrogen (Total) | 33793 |
| Popponesset Creek | MA96-39 | All waters west of Popponesset Island (from Popponesset Island Road bridge at the north to a line extended from the southeastern most point of the island southerly to Popponesset Beach), Mashpee. | 0.05 | SQUARE MILES | Estuarine Bioassessments | |
| Red Lily Pond | MA96257 | Barnstable | 4 | ACRES | Fecal Coliform | |
| | | | | | Nutrient/Eutrophication Biological Indicators | |
| Round Pond (East) | MA96260 | Truro | 6 | ACRES | Mercury in Fish Tissue | |
| Round Pond (West) | MA96261 | Truro | 2 | ACRES | Mercury in Fish Tissue | |
| Ryder Pond | MA96268 | Truro | 18 | ACRES | Mercury in Fish Tissue | 33880 |
| | | | | | Oxygen, Dissolved | |
| | | | | | Phosphorus (Total) | |



* TMDL not required (Non-Pollutant)

# Massachusetts Category 5 Waters
# "Waters requiring a TMDL"

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | IMPAIRMENT CAUSE | EPA TMDL NO. |
|---|---|---|---|---|---|---|
| Santuit Pond | MA96277 | Mashpee | 164 | ACRES | Abnormal Fish deformities, erosions, lesions, tumors (DELTS) | |
| | | | | | Abnormal Fish Histology (Lesions) | |
| | | | | | Chlorophyll-a | |
| | | | | | Excess Algal Growth | |
| | | | | | Nutrient/Eutrophication Biological Indicators | |
| | | | | | pH, High | |
| | | | | | Phosphorus (Total) | |
| | | | | | Secchi disk transparency | |
| Santuit River | MA96-92 | From confluence with fresh water portion south of Old Mill Road, Mashpee to mouth at Shoestring Bay, Mashpee/Barnstable. | 0.008 | SQUARE MILES | Fecal Coliform | |
| Shawme Lake Lower | MA96288 | Sandwich | 25 | ACRES | Nutrient/Eutrophication Biological Indicators | |
| Snows Creek | MA96-81 | East of Old Colony Road, Barnstable to mouth at Lewis Bay, Barnstable. | 0.02 | SQUARE MILES | Fecal Coliform | |
| Spectacle Pond | MA96306 | Wellfleet | 2 | ACRES | Mercury in Fish Tissue | |
| Spectacle Pond | MA96307 | Sandwich | 93 | ACRES | Mercury in Fish Tissue | |
| Springhill Creek | MA96-87 | From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich. | 0.01 | SQUARE MILES | Fecal Coliform | |
| Stewarts Creek | MA96-94 | Estuarine portion west of Stetson Street, Barnstable to mouth at Hyannis Harbor, Barnstable. | 0.01 | SQUARE MILES | Fecal Coliform | |
| Stillwater Pond | MA96309 | Chatham | 18 | ACRES | Secchi disk transparency | |
| Swan Pond River | MA96-14 | Headwaters, outlet Swan Pond, Dennis to confluence with Nantucket Sound, Dennis. | 0.04 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36771 |
| The River | MA96-76 | The water landward of an imaginary line drawn between Old Field Point and Namequoit Point including Meetinghouse Pond, and Kescayo Gansett Pond locally known as "Lonnies Pond", Orleans (excluding the delineated segments; Namequoit River and Areys Pond). | 0.42 | SQUARE MILES | Estuarine Bioassessments | 33787 |
| | | | | | Estuarine Bioassessments | 33788 |
| | | | | | Estuarine Bioassessments | 33789 |
| | | | | | Estuarine Bioassessments | 33790 |
| | | | | | Fecal Coliform | |
| | | | | | Nitrogen (Total) | 33787 |
| | | | | | Nitrogen (Total) | 33788 |
| | | | | | Nitrogen (Total) | 33789 |
| | | | | | Nitrogen (Total) | 33790 |
| Town Cove | MA96-68 | Entire cove to Nauset Harbor, including Rachael Cove and Woods Cove, Orleans/Eastham (area associated with Cape Cod National Seashore designated as ORW). | 0.79 | SQUARE MILES | Estuarine Bioassessments | |
| | | | | | Fecal Coliform | 36772 |
| Upper Shawme Lake | MA96326 | Sandwich | 21 | ACRES | Nutrient/Eutrophication Biological Indicators | |
| Walkers Pond | MA96331 | Brewster | 100 | ACRES | Excess Algal Growth | |
| | | | | | Phosphorus (Total) | |
| | | | | | Secchi disk transparency | |
| | | | | | Turbidity | |



* TMDL not required (Non-Pollutant)

# Appendix 1
# Assessment Units and Integrated List Categories by Major Watershed

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | CATEGORY |
|---|---|---|---|---|---|
| Barnstable Harbor | MA96-01 | From the mouths of Scorton and Spring creeks, Barnstable east to an imaginary line drawn from Beach Point to the western edge of the Mill Creek estuary, Barnstable. | 3.2 | SQUARE MILES | 5 |
| Bass River | MA96-12 | Route 6, Dennis/Yarmouth to mouth at Nantucket Sound, Dennis/Yarmouth (excluding Grand Cove, Dennis). | 0.69 | SQUARE MILES | 5 |
| Bassing Harbor | MA96-48 | Excluding Crows Pond and Ryder Cove, Chatham. | 0.13 | SQUARE MILES | 2 |
| Bearse Pond | MA96012 | Barnstable | 64 | ACRES | 5 |
| Boat Meadow River | MA96-15 | Headwaters east of old railway grade, Eastham to mouth at Cape Cod Bay, Eastham. | 0.05 | SQUARE MILES | 5 |
| Bournes Pond | MA96-57 | west of Central Avenue, Falmouth to Vineyard Sound, including Israels Cove, Falmouth. | 0.24 | SQUARE MILES | 4A |
| Bucks Creek | MA96-44 | Outlet from Harding Beach Pond (locally known as Sulfur Springs), Chatham to confluence with Cockle Cove, Nantucket Sound, Chatham. | 0.02 | SQUARE MILES | 4A |
| Bumps River | MA96-02 | From outlet of pond at Bumps River Road, Barnstable through Scudder Bay to South Main Street bridge (confluence with Centerville River), Barnstable. | 0.07 | SQUARE MILES | 4A |
| Cedar Pond | MA96-88 | Orleans (in Inner Cape Cod Bay ACEC) | 0.03 | SQUARE MILES | 5 |
| Centerville Harbor | MA96-03 | From an imaginary line that extends from Dowses Beach, Barnstable to Hyannis Point including all waters north to the shore, Barnstable. | 1.46 | SQUARE MILES | 2 |
| Centerville River | MA96-04 | Approximately 300 feet west of Elliot Road, Barnstable to confluence with Centerville Harbor, including East Bay, Barnstable. | 0.24 | SQUARE MILES | 4A |
| Chase Garden Creek | MA96-35 | New Boston Road, Dennis to mouth at Cape Cod Bay, Dennis/Yarmouth. | 0.13 | SQUARE MILES | 4A |
| Chatham Harbor | MA96-10 | Harbor, bounded on the east by the Cape Cod National Seashore, with the northern extent as an imaginary line drawn northeast from northern tip of Strong Island to a point on the inner Cape Cod National Seashore and the western extent as an imaginary line drawn from the southern tip of Strong Island south to Allen Point including the waters south to an imaginary line along the northern edge of the South Beach Bar extending from Chatham Lighthouse to the inlet created by the 1987 storm, Chatham (area associated with Cape Cod National Seashore designated as ORW). | 2.85 | SQUARE MILES | 2 |
| Clapps Pond | MA96035 | Provincetown (area associated with Cape Cod National Seashore designated as ORW). | 40 | ACRES | 3 |
| Cliff Pond | MA96039 | Brewster | 191 | ACRES | 3 |
| Cockle Cove Creek | MA96-79 | Northeast of the bend in Cockle Drive, Chatham to confluence with Bucks Creek, Chatham (2005 orthophotos used to delineate segment). | 0.007 | SQUARE MILES | 5 |
| Coonamessett River | MA96-69 | Headwaters, outlet of Coonamessett Pond, Falmouth to the inlet of Great Pond, Falmouth. | 3.4 | MILES | 3 |
| Cotuit Bay | MA96-63 | From North Bay at Point Isabella, Barnstable oceanward to a line extended along Oyster Harbors Beach, Barnstable. | 0.85 | SQUARE MILES | 4A |
| Crows Pond | MA96-47 | To Bassing Harbor, Chatham. | 0.19 | SQUARE MILES | 2 |
| Crystal Lake | MA96050 | Orleans | 33 | ACRES | 5 |
| Depot Pond | MA96061 | Eastham | 26 | ACRES | 3 |
| Dock Creek | MA96-86 | From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich. | 0.02 | SQUARE MILES | 5 |
| Duck Creek | MA96-32 | Source west of Route 6, Wellfleet to Wellfleet Harbor (at a line from Shirttail Point to Taylor Road), Wellfleet. | 0.15 | SQUARE MILES | 4A |
| Duck Pond | MA96068 | Wellfleet | 11 | ACRES | 4A |

# Appendix 1
# Assessment Units and Integrated List Categories by Major Watershed

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | CATEGORY |
|---|---|---|---|---|---|
| Dyer Pond | MA96070 | Wellfleet | 10 | ACRES | 4A |
| East Harbor (Pilgrim Lake) | MA96-83 | Truro/Provincetown | 0.5 | SQUARE MILES | 5 |
| Falmouth Inner Harbor | MA96-17 | Waters included north of Falmouth Inner Harbor Light, Falmouth. | 0.05 | SQUARE MILES | 2 |
| Flax Pond | MA96090 | Dennis | 15 | ACRES | 3 |
| Frost Fish Creek | MA96-49 | Outlet from cranberry bog northwest of Stony Hill Road, Chatham to confluence with Ryder Cove, Chatham. | 0.01 | SQUARE MILES | 4A |
| Goose Pond | MA96106 | Chatham | 35 | ACRES | 3 |
| Great Harbor | MA96-18 | The waters north of an imaginary line drawn east from Penzance Point to Devils Foot Island and southeast from Devils Foot Island to Juniper Point (excludes Eel Pond), Falmouth. | 0.31 | SQUARE MILES | 4A |
| Great Pond | MA96114 | Truro | 17 | ACRES | 4A |
| Great Pond | MA96115 | Eastham | 109 | ACRES | 5 |
| Great Pond | MA96117 | Wellfleet | 41 | ACRES | 4A |
| Great Pond | MA96-54 | From inlet of Coonamessett River, Falmouth to Vineyard Sound (excluding Perch Pond), Falmouth. | 0.4 | SQUARE MILES | 4A |
| Great River | MA96-60 | From inlet of Abigails Brook, Mashpee to Waquoit Bay (excluding Jehu Pond), Mashpee. | 0.16 | SQUARE MILES | 4A |
| Green Pond | MA96-55 | east of Acapesket Road, Falmouth outlet to Vineyard Sound, Falmouth. | 0.21 | SQUARE MILES | 4A |
| Gull Pond | MA96123 | Wellfleet | 103 | ACRES | 3 |
| Halls Creek | MA96-93 | Estuarine portion, from Craigville Beach Road, Barnstable to mouth at Centerville Harbor, Barnstable. | 0.07 | SQUARE MILES | 5 |
| Hamblin Pond | MA96126 | Barnstable | 114 | ACRES | 5 |
| Hamblin Pond | MA96-58 | From inlet of Red Brook, Falmouth/Mashpee to outlet of Little River, Mashpee and inlet/outlet of Waquoit Bay west of Meadow Neck Road, Falmouth/Mashpee. | 0.19 | SQUARE MILES | 4A |
| Harding Beach Pond | MA96-43 | locally known as Sulfur Springs (northeast of Bucks Creek), Chatham. | 0.07 | SQUARE MILES | 4A |
| Herring Pond | MA96133 | Eastham | 42 | ACRES | 3 |
| Herring Pond | MA96134 | Wellfleet | 18 | ACRES | 3 |
| Herring River | MA96-22 | Outlet of Herring River Reservoir (at North Harwich Reservoir Dam) west of Bells Neck Road, Harwich to mouth at Nantucket Sound, Harwich. | 0.07 | SQUARE MILES | 4A |
| Herring River | MA96-33 | South of High Toss Road, Wellfleet to Wellfleet Harbor (at an imaginary line drawn due north from the eastern tip of Great Island to the opposite shore), Wellfleet. | 0.4 | SQUARE MILES | 5 |
| Herring River | MA96-67 | From outlet of Herring Pond, Wellfleet to south of High Toss Road, Wellfleet. | 3.6 | MILES | 5 |
| Hinckleys Pond | MA96140 | Harwich | 164 | ACRES | 2 |
| Horseleach Pond | MA96144 | Truro | 23 | ACRES | 5 |
| Hoxie Pond | MA96146 | Sandwich | 8 | ACRES | 3 |
| Hyannis Harbor | MA96-05 | The waters from the shoreline to an imaginary line drawn from the light at the end of Hyannis breakwater, Barnstable to the point west of Dunbar Point, Barnstable. | 0.68 | SQUARE MILES | 4A |
| Hyannis Inner Harbor | MA96-82 | Waters landward of an imaginary line drawn from Harbor Bluff, Barnstable to Hyannis Park, Yarmouth. | 0.13 | SQUARE MILES | 5 |
| Jehu Pond | MA96-59 | Mashpee. | 0.09 | SQUARE MILES | 4A |
| Johns Pond | MA96157 | Mashpee | 316 | ACRES | 4A |
| Kinnacum Pond | MA96163 | Wellfleet | 2 | ACRES | 3 |
| Lake Elizabeth | MA96080 | Barnstable | 6 | ACRES | 3 |

# Appendix 1
# Assessment Units and Integrated List Categories by Major Watershed

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | CATEGORY |
|---|---|---|---|---|---|
| Lawrence Pond | MA96165 | Sandwich | 138 | ACRES | 5 |
| Lewis Bay | MA96-36 | Includes portion of Pine Island Creek and Uncle Roberts Cove to confluence with Nantucket Sound, Barnstable/Yarmouth (excluding Hyannis Inner Harbor, Barnstable/Yarmouth and Mill Creek, Yarmouth). | 1.79 | SQUARE MILES | 5 |
| Little Harbor | MA96-19 | The waters north of an imaginary line drawn from Juniper Point, Falmouth east to Nobska Beach, Falmouth. | 0.07 | SQUARE MILES | 4A |
| Little Namskaket Creek | MA96-26 | Source to mouth at Cape Cod Bay, Orleans. | 0.01 | SQUARE MILES | 4A |
| Little Pleasant Bay | MA96-78 | Waters north and east of imaginary lines drawn from the northeasterly edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham then east to a point on the inner Cape Cod National Seashore (excluding the delineated segments; The River, Pochet Neck, and Paw Wah Pond). | 3.3 | SQUARE MILES | 5 |
| Little Pond | MA96-56 | west of Vista Boulevard, Falmouth outlet to Vineyard Sound, Falmouth. | 0.07 | SQUARE MILES | 5 |
| Little River | MA96-61 | From outlet of Hamblin Pond, Mashpee to the Great River, Mashpee. | 0.02 | SQUARE MILES | 4A |
| Long Pond | MA96179 | Wellfleet | 35 | ACRES | 4A |
| Long Pond | MA96180 | Yarmouth | 54 | ACRES | 3 |
| Long Pond | MA96183 | Brewster/Harwich | 715 | ACRES | 5 |
| Long Pond | MA96184 | Barnstable | 48 | ACRES | 4C |
| Lovells Pond | MA96185 | Barnstable | 54 | ACRES | 5 |
| Lovers Lake | MA96186 | Chatham | 37 | ACRES | 5 |
| Lower Mill Pond | MA96188 | Brewster | 44 | ACRES | 5 |
| Maraspin Creek | MA96-06 | From Commerce Road, Barnstable to confluence with Barnstable Harbor at Blish Point, Barnstable. | 0.03 | SQUARE MILES | 4A |
| Mashpee Pond | MA96194 | Mashpee/Sandwich | 377 | ACRES | 4A |
| Mashpee River | MA96-24 | Quinaquisset Avenue, Mashpee to mouth at Shoestring Bay (formerly to mouth at Popponesset Bay), Mashpee. | 0.08 | SQUARE MILES | 4A |
| Mashpee River | MA96-89 | Headwaters, outlet Mashpee Pond, Mashpee to Quinaquisset Avenue, Mashpee. | 2.7 | MILES | 2 |
| Middle Pond | MA96198 | Barnstable | 104 | ACRES | 5 |
| Mill Creek | MA96-37 | From Keveney Lane/Mill Lane, Barnstable/Yarmouth north to confluence with Cape Cod Bay, Barnstable/Yarmouth. | 0.03 | SQUARE MILES | 4A |
| Mill Creek | MA96-41 | Outlet of Taylors Pond, Chatham to confluence with Cockle Cove, Chatham. | 0.03 | SQUARE MILES | 4A |
| Mill Creek | MA96-80 | Headwaters, outlet Mill Pond, Yarmouth to confluence with Lewis Bay, Yarmouth. | 0.07 | SQUARE MILES | 5 |
| Mill Creek | MA96-85 | Headwaters, outlet Shawme Lake Lower, Sandwich to confluence with Old Harbor Creek, Sandwich. | 0.02 | SQUARE MILES | 5 |
| Mill Pond | MA96-52 | including Little Mill Pond (PALIS # 96174), Chatham. | 0.06 | SQUARE MILES | 4A |
| Miss Thachers Pond | MA96258 | Yarmouth | 6 | ACRES | 3 |
| Muddy Creek | MA96-51 | Source south of Countryside Drive and north-northeast of Old Queen Anne Road, Chatham to mouth at Pleasant Bay, Harwich/Chatham, including Upper and Lower reaches. | 0.05 | SQUARE MILES | 4A |
| Mystic Lake | MA96218 | Barnstable | 146 | ACRES | 5 |
| Namequoit River | MA96-71 | Headwaters, outlet Areys Pond, Orleans to confluence with The River, Orleans. | 0.06 | SQUARE MILES | 4A |

# Appendix 1
# Assessment Units and Integrated List Categories by Major Watershed

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | CATEGORY |
|---|---|---|---|---|---|
| Namskaket Creek | MA96-27 | Source west of Route 6, Orleans to mouth at Cape Cod Bay, Brewster/Orleans. | 0.03 | SQUARE MILES | 4A |
| Nauset Harbor | MA96-28 | The waters south of an imaginary line drawn east from Woods Cove, Orleans around the southern point of Stony Island, around the southern end of the unnamed island in the harbor, to the Cape Cod National Seashore point, excluding Mill Pond, Orleans (area associated with Cape Cod National Seashore designated as ORW). | 0.41 | SQUARE MILES | 2 |
| North Bay | MA96-66 | From Fox Island to just south of Bridge Street and separated from Cotuit Bay at a line from Point Isabella, Barnstable southward to the opposite shore (including Dam Pond), Barnstable. | 0.47 | SQUARE MILES | 4A |
| Nye Pond | MA96228 | Sandwich | 6 | ACRES | 3 |
| Old Harbor Creek | MA96-84 | From Foster Road, Sandwich to Sandwich Harbor, Sandwich. | 0.06 | SQUARE MILES | 5 |
| Oyster Pond | MA96-45 | Including Stetson Cove, Chatham. | 0.21 | SQUARE MILES | 4A |
| Oyster Pond | MA96-62 | east of Fells Road, Falmouth. | 0.1 | SQUARE MILES | 4A |
| Oyster Pond River | MA96-46 | Outlet of Oyster Pond, Chatham to confluence with Stage Harbor, Chatham. | 0.14 | SQUARE MILES | 4A |
| Pamet River | MA96-31 | Tidegate at Route 6A, Truro to mouth at Cape Cod Bay (including Pamet Harbor), Truro. | 0.14 | SQUARE MILES | 4A |
| Parkers River | MA96-38 | Outlet Seine Pond, Yarmouth to mouth at Nantucket Sound, Yarmouth. | 0.04 | SQUARE MILES | 4A |
| Paw Wah Pond | MA96-72 | Orleans | 0.008 | SQUARE MILES | 5 |
| Perch Pond | MA96-53 | Connects to northwest end of Great Pond, west of Keechipam Way, Falmouth. | 0.03 | SQUARE MILES | 4A |
| Peters Pond | MA96244 | Sandwich | 123 | ACRES | 4A |
| Pilgrim Lake | MA96246 | Orleans | 38 | ACRES | 3 |
| Pleasant Bay | MA96-77 | The waters between the mouth of Muddy Creek, Harwich and imaginary lines drawn from the northeastern edge of Orleans (near The Horseshoe), southeasterly to the northeastern tip of Sipson Island, then continuing to and around the northeastern border of Sipson Meadow, Orleans then south to the northern tip of Strong Island, Chatham and from the southeastern tip of Strong Island to Allen Point, Chatham (excluding the delineated segments; Bassing Harbor, Round Cove and Quanset Pond). | 2.88 | SQUARE MILES | 4A |
| Pochet Neck | MA96-73 | to confluence with Little Pleasant Bay, Orleans. | 0.24 | SQUARE MILES | 5 |
| Popponesset Bay | MA96-40 | From line connecting Ryefield Point, Barnstable and Punkhorn Point, Mashpee to inlet of Nantucket Sound (including Ockway Bay and Pinquickset Cove), Mashpee/Barnstable. | 0.68 | SQUARE MILES | 4A |
| Popponesset Creek | MA96-39 | All waters west of Popponesset Island (from Popponesset Island Road bridge at the north to a line extended from the southeastern most point of the island southerly to Popponesset Beach), Mashpee. | 0.05 | SQUARE MILES | 5 |
| Prince Cove | MA96-07 | Includes areas east of Prince Cove which are locally known as "Warren Cove" and "Prince Cove Channel", Barnstable. | 0.14 | SQUARE MILES | 4A |
| Provincetown Harbor | MA96-29 | The waters northwest of an imaginary line drawn northeasterly from the tip of Long Point, Provincetown to Beach Point Beach, Truro (area associated with Cape Cod National Seashore designated as ORW). | 4.33 | SQUARE MILES | 4A |
| Quanset Pond | MA96-74 | Orleans. | 0.02 | SQUARE MILES | 4A |
| Quashnet River | MA96-20 | Just south of Route 28, Falmouth to mouth at Waquoit Bay, Falmouth. Also known as Moonakis River. | 0.07 | SQUARE MILES | 4A |

# Appendix 1
# Assessment Units and Integrated List Categories by Major Watershed

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | CATEGORY |
|---|---|---|---|---|---|
| Quashnet River | MA96-90 | Headwaters, outlet Johns Pond, Mashpee to just south of Route 28, Falmouth. | 4.1 | MILES | 2 |
| Quivett Creek | MA96-09 | Outlet of unnamed pond just south of Route 6A, Brewster/Dennis to the mouth at Cape Cod Bay, Brewster/Dennis. | 0.04 | SQUARE MILES | 4A |
| Red Brook | MA96-25 | From dam at Red Brook Road, Falmouth/Mashpee to Hamblin Pond, Falmouth/Mashpee. | 0.01 | SQUARE MILES | 2 |
| Red Lily Pond | MA96257 | Barnstable | 4 | ACRES | 5 |
| Rock Harbor Creek | MA96-16 | Outlet Cedar Pond, Orleans to mouth at Cape Cod Bay, Eastham/Orleans. | 0.03 | SQUARE MILES | 4A |
| Round Cove | MA96-75 | Harwich. | 0.02 | SQUARE MILES | 4A |
| Round Pond (East) | MA96260 | Truro | 6 | ACRES | 5 |
| Round Pond (West) | MA96261 | Truro | 2 | ACRES | 5 |
| Rushy Marsh Pond | MA96266 | Barnstable | 14 | ACRES | 3 |
| Ryder Cove | MA96-50 | Chatham | 0.19 | SQUARE MILES | 4A |
| Ryder Pond | MA96268 | Truro | 18 | ACRES | 5 |
| Santuit Pond | MA96277 | Mashpee | 164 | ACRES | 5 |
| Santuit River | MA96-91 | Headwaters, outlet Santuit Pond, Mashpee to confluence with tidal portion south of Old Mill Road, Mashpee. | 1.6 | MILES | 2 |
| Santuit River | MA96-92 | From confluence with fresh water portion south of Old Mill Road, Mashpee to mouth at Shoestring Bay, Mashpee/Barnstable. | 0.008 | SQUARE MILES | 5 |
| Saquatucket Harbor | MA96-23 | South of Route 28, Harwich to confluence with Nantucket Sound, Harwich. | 0.02 | SQUARE MILES | 4A |
| Scargo Lake | MA96279 | Dennis | 54 | ACRES | 3 |
| Schoolhouse Pond | MA96281 | Chatham | 20 | ACRES | 3 |
| Scorton Creek | MA96-30 | Jones Lane, Sandwich to mouth at Cape Cod Bay, Sandwich. | 0.03 | SQUARE MILES | 4A |
| Seapuit River | MA96-64 | south of Osterville Grand Island, Barnstable to Cotuit Bay and West Bay, Barnstable. | 0.06 | SQUARE MILES | 4A |
| Sesuit Creek | MA96-13 | Approximately 625 feet east of Route 6A, Dennis to mouth at Sesuit Harbor, Cape Cod Bay, Dennis. | 0.01 | SQUARE MILES | 4A |
| Shallow Pond | MA96285 | Barnstable | 76 | ACRES | 3 |
| Shawme Lake Lower | MA96288 | Sandwich | 25 | ACRES | 5 |
| Sheep Pond | MA96289 | Brewster | 138 | ACRES | 4A |
| Shoestring Bay | MA96-08 | Quinaquisset Avenue, Mashpee/Barnstable to Popponesset Bay (line from Ryefield Point, Barnstable to Punkhorn Point, Mashpee, including Gooseberry Island), Barnstable/Mashpee. | 0.31 | SQUARE MILES | 4A |
| Shubael Pond | MA96293 | Barnstable | 55 | ACRES | 3 |
| Slough Pond | MA96298 | Truro | 29 | ACRES | 4A |
| Snake Pond | MA96302 | Sandwich | 81 | ACRES | 4A |
| Snow Pond | MA96303 | Truro | 7 | ACRES | 4A |
| Snows Creek | MA96-81 | East of Old Colony Road, Barnstable to mouth at Lewis Bay, Barnstable. | 0.02 | SQUARE MILES | 5 |
| Spectacle Pond | MA96306 | Wellfleet | 2 | ACRES | 5 |
| Spectacle Pond | MA96307 | Sandwich | 93 | ACRES | 5 |
| Springhill Creek | MA96-87 | From railroad crossing northeast of Route 6A, Sandwich to confluence with Old Harbor Creek, Sandwich. | 0.01 | SQUARE MILES | 5 |
| Stage Harbor | MA96-11 | From the outlet of Mill Pond, Chatham (including Mitchell River) to the confluence with Nantucket Sound at a line from the southernmost point of Harding Beach southeast to the Harding Beach Point , Chatham. | 0.56 | SQUARE MILES | 4A |

# Appendix 1
# Assessment Units and Integrated List Categories by Major Watershed

| NAME | SEGMENT ID | DESCRIPTION | SIZE | UNITS | CATEGORY |
|---|---|---|---|---|---|
| Stewarts Creek | MA96-94 | Estuarine portion west of Stetson Street, Barnstable to mouth at Hyannis Harbor, Barnstable. | 0.01 | SQUARE MILES | 5 |
| Stillwater Pond | MA96309 | Chatham | 18 | ACRES | 5 |
| Swan Pond River | MA96-14 | Headwaters, outlet Swan Pond, Dennis to confluence with Nantucket Sound, Dennis. | 0.04 | SQUARE MILES | 5 |
| Taylors Pond | MA96-42 | Chatham | 0.02 | SQUARE MILES | 4A |
| The River | MA96-76 | The water landward of an imaginary line drawn between Old Field Point and Namequoit Point including Meetinghouse Pond, and Kescayo Gansett Pond locally known as "Lonnies Pond", Orleans (excluding the delineated segments; Namequoit River and Areys Pond). | 0.42 | SQUARE MILES | 5 |
| Town Cove | MA96-68 | Entire cove to Nauset Harbor, including Rachael Cove and Woods Cove, Orleans/Eastham (area associated with Cape Cod National Seashore designated as ORW). | 0.79 | SQUARE MILES | 5 |
| Upper Mill Pond | MA96324 | Brewster | 249 | ACRES | 2 |
| Upper Shawme Lake | MA96326 | Sandwich | 21 | ACRES | 5 |
| Village Pond | MA96329 | Truro | 2 | ACRES | 3 |
| Wakeby Pond | MA96346 | Mashpee/Sandwich | 353 | ACRES | 4A |
| Walkers Pond | MA96331 | Brewster | 100 | ACRES | 5 |
| Waquoit Bay | MA96-21 | From mouths of Seapit River, Quashnet River (also known as Moonakis River), Falmouth and Great River, Mashpee to confluence with Vineyard Sound, Falmouth/Mashpee. | 1.42 | SQUARE MILES | 5 |
| Wellfleet Harbor | MA96-34 | The waters north of an imaginary line drawn east from the southern tip of Jeremy Point, Wellfleet to Sunken Meadow, Eastham excluding the estuaries of Herring River, Duck Creek, Blackfish Creek, and Fresh Brook, Wellfleet (area associated with Cape Cod National Seashore designated as ORW). | 8.4 | SQUARE MILES | 2 |
| Wequaquet Lake | MA96333 | Barnstable | 576 | ACRES | 4A |
| West Bay | MA96-65 | South of the Bridge Street bridge, Barnstable to Nantucket Sound including Eel River, Barnstable. | 0.52 | SQUARE MILES | 4A |
| **Charles** | | | | | |
| Alder Brook | MA72-22 | Headwaters northwest of the Route 135 and South Street intersection, Needham to the confluence with the Charles River, Needham. | 0.282 | MILES | 5 |
| Beaver Brook | MA72-12 | Headwaters, outlet Beaver Pond, Bellingham to the confluence with the Charles River, Bellingham. | 1.413 | MILES | 5 |
| Beaver Brook | MA72-28 | Headwaters, north of Route 2, Lexington through culverting to Charles River, Waltham. | 5.535 | MILES | 5 |
| Beaver Pond | MA72004 | Bellingham/Milford | 86.679 | ACRES | 5 |
| Beaver Pond | MA72006 | Franklin | 31.789 | ACRES | 4C |
| Bogastow Brook | MA72-16 | Headwaters, outlet Factory Pond, Holliston to inlet South End Pond, Millis. | 9.492 | MILES | 4A |
| Brookline Reservoir | MA72010 | Brookline | 21.111 | ACRES | 3 |
| Bulloughs Pond | MA72011 | Newton | 6.887 | ACRES | 5 |
| Cambridge Reservoir | MA72014 | Waltham/Lincoln/Lexington | 532.011 | ACRES | 3 |
| Cambridge Reservoir, Upper Basin | MA72156 | Lincoln/Lexington | 43.998 | ACRES | 5 |
| Cedar Swamp Pond | MA72016 | locally known as "Milford Pond", Milford | 98.978 | ACRES | 5 |
| Chandler Pond | MA72017 | Boston | 11.394 | ACRES | 5 |
| Charles River | MA72-01 | Headwaters, outlet Echo Lake, Hopkinton to Dilla Street (just upstream of Cedar Swamp Pond), Milford. | 2.482 | MILES | 4A |

# Appendix K

## Explanation of the Cost Estimate for Phase 1C Extension 2013 SRF PEF

# MEMORANDUM

August 29, 2012

| | | | |
|---|---|---|---|
| To | Town of Chatham | | |
| Copy to | Robert A. Duncanson, Ph.D., Director of Health and Environment | | |
| From | Nathan C. Weeks, P.E., BCEE, Jeff Gregg, P.E., Darlene Zelinski, EIT | Tel | 774-470-1630 |
| Subject | Cost Development for Phase 1C Sewer Extension 2013 SRF PEF | Job No. | 8614526 |

This memorandum is written to summarize the cost evaluations to develop the Phase 1C Sewer Extension Costs prepared for the 2013 State Revolving Fund (SRF) Project Evaluation Form (PEF).

Based on Town direction we have developed costs for sewersheds 35, 37, 43, 76, CTE-1, CTE-2, CTE-3, CTE-6, CTE-7, CTE-8, and CTE-12; and have broken out costs for existing pipeline improvements that had been included in the CTE (Connect to Existing) sewershed costs presented in the Comprehensive Wastewater Management Plan (CWMP).

These sewersheds are illustrated in the CWMP Figure 9-1.

The initial sewer extension (also referenced as Phase 1A) cut across several of the sewersheds as illustrated in the CWMP Figure 1-2 (attached). Therefore, the value of the Phase 1A construction in several of these sewersheds needed to be subtracted from the CWMP estimate.

The initial steps that we utilized to develop the SRF PEF costs are listed below.

- Utilized capital costs from Table 9-7 of the CWMP (attached) for the sewersheds
- Subtracted the value of the Phase 1A construction in the sewersheds where construction had occurred
- Scaled the resulting costs to an ENR of 9550 (recommended by MassDEP) to approximate 2013/2014 costs
- Completed an independent cost estimate to 2014 values based on recently bid projects
- Identified recommended capital cost budgets for each sewershed

These calculations and summaries are illustrated on the attached Table 1.

The next steps that we used include:

- Separated out the following components of the project costs:
  - system construction
  - grinder pump cost
  - construction engineering
  - police details
  - design engineering

**GHD Inc.** 1545 Iyannough Road Hyannis MA 02601 USA
**T** 1 774 470 1630 **F** 1 774 470 1631 **E** hyamail@ghd.com **W** www.ghd.com

- Summed the sewershed costs that will be in the three expected contracts (Nos. 1, 2, and 3)
- Segregated the eligible costs that are estimated for the PEF:
  - construction cost
  - construction contingency
  - construction services
  - police traffic detail
  - total
- Used these costs for the PEF
- We then added in the engineering design services to estimate the needed Town Meeting appropriation

Police traffic details were estimated based on the following formula:

[(length of pipe)/(80' of pipe laid per day) * $440/day * 3 policemen per day)] + [(number of laterals installed) * $440/day * 1 policeman per day)]

These next steps are illustrated in the attached Table 2 and 3.

These items were discussed with the Water and Sewer Advisory Committee which resulted in the summary in Table 4.

We believe these are realistic and consistent costs to use for SRF budgets and Town Meeting appropriation.

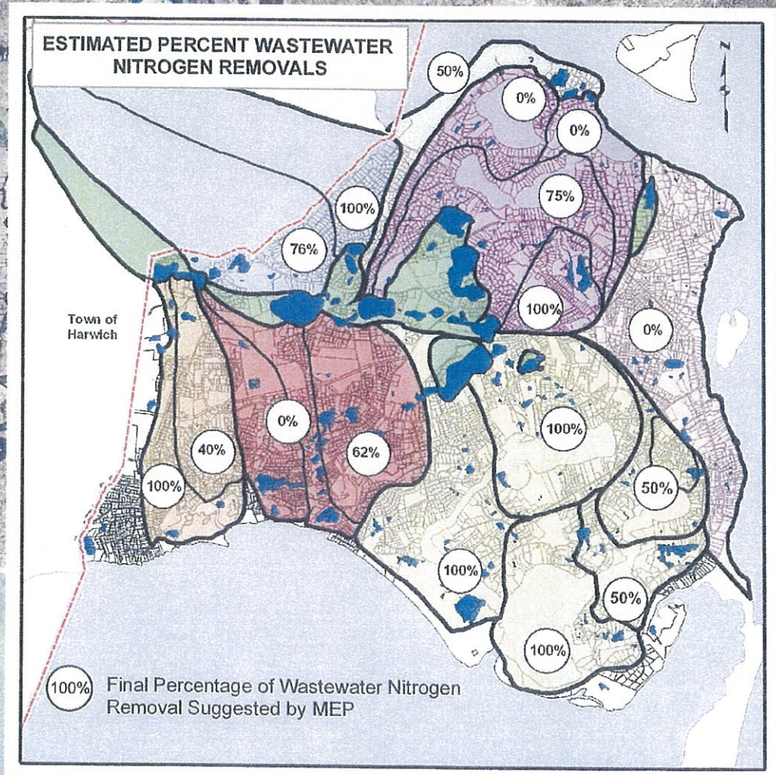
Please contact us if you have any questions.

## Legend

- Proposed Pumping Station
- Proposed Manhole
- Proposed Gravity Sewer
- Proposed Low Pressure Sewer
- Proposed Force Main
- 2 — Sewershed with ID No.
- Sewershed with Relay Pumping Station
- Existing Sewered Area
- Watershed Boundary

Existing WWTF

### ESTIMATED PERCENT WASTEWATER NITROGEN REMOVALS




(100%) Final Percentage of Wastewater Nitrogen Removal Suggested by MEP

Phase IC Sewershed

File Source: J:\GIS\GIS Project Folder\Job#\70000\70098\2007 CWMP\2008 Figures\70098F9-1.mxd

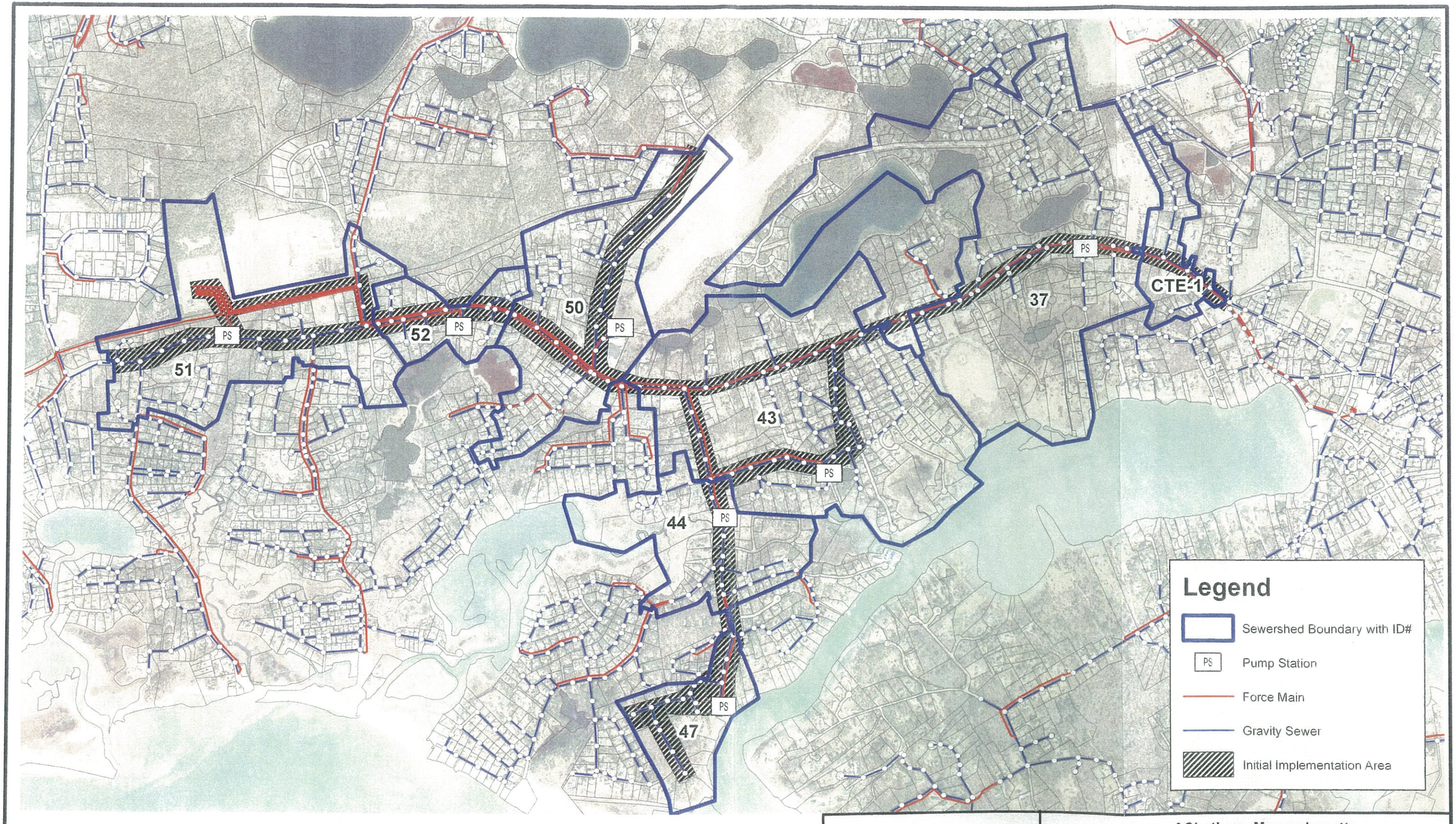
STEARNS & WHELER LLC
Environmental Engineers & Scientists
HYANNIS, MASSACHUSETTS
1545 Iyanough Road
Phone: 508 362 5680
Fax: 508 362 5684
Web: stearnswheler.com

Date: 4/15/2008

TOWN OF CHATHAM, MASSACHUSETTS

COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

TOWN WIDE PRELIMINARY SEWER LAYOUT
FIGURE 9 - 1

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PROJECT NO.: 91057
DATE: 5/20/09

**Town of Chatham, Massachusetts**

**Comprehensive Wastewater Management Planning**

**FIGURE 1-2**
**Initial Phase of Sewer Implementation**

## TABLE 9-7

## SEWERSHEDS NECESSARY TO ACHIEVE TMDL GOALS [1]

| SEWERSHED | Estimated Wastewater Flows (gpd) | | | | Estimated Capital Cost |
|---|---|---|---|---|---|
| | Average Annual Existing (NO I/I) | Average Annual Build-Out (No I/I) | I/I Total [3] | Average Annual Build-Out (with I/I) | |
| 3 | 22,000 | 32,000 | 16,000 | 48,000 | $ 7,800,000.00 |
| 4 | 6,100 | 9,400 | 4,600 | 14,000 | $ 2,200,000.00 |
| 5 | 3,600 | 5,300 | 2,700 | 8,000 | $ 1,400,000.00 |
| 6 | 6,300 | 9,800 | 3,000 | 13,000 | $ 2,300,000.00 |
| 7 | 9,000 | 11,000 | 9,100 | 20,000 | $ 4,300,000.00 |
| 8 | 5,100 | 6,600 | 3,900 | 11,000 | $ 2,000,000.00 |
| 9 | 7,200 | 9,000 | 4,300 | 13,000 | $ 2,300,000.00 |
| 10 | 6,600 | 7,600 | 5,000 | 13,000 | $ 2,000,000.00 |
| 11 | 18,000 | 21,000 | 12,000 | 33,000 | $ 4,500,000.00 |
| 14 | 14,000 | 16,000 | 8,400 | 25,000 | $ 3,700,000.00 |
| 17 | 15,000 | 19,000 | 11,000 | 30,000 | $ 4,400,000.00 |
| 18 | 4,700 | 6,900 | 4,300 | 11,000 | $ 1,800,000.00 |
| 20 | 38,000 | 48,000 | 21,000 | 68,000 | $ 8,300,000.00 |
| 27 | 19,000 | 23,000 | 8,100 | 31,000 | $ 3,300,000.00 |
| 29 | 5,300 | 6,600 | 2,100 | 8,700 | $ 1,000,000.00 |
| 30 | 24,000 | 31,000 | 6,200 | 37,000 | $ 5,300,000.00 |
| 31 | 15,000 | 18,000 | 5,000 | 23,000 | $ 3,900,000.00 |
| 33 | 3,800 | 4,700 | 3,300 | 8,000 | $ 1,500,000.00 |
| 34 | 13,000 | 21,000 | 4,000 | 25,000 | $ 3,700,000.00 |
| 35 | 9,400 | 14,000 | 5,100 | 19,000 | $ 2,600,000.00 |
| 36 | 7,800 | 13,000 | 5,200 | 18,000 | $ 2,200,000.00 |
| 37 | 35,000 | 48,000 | 16,000 | 63,000 | $ 7,000,000.00 |
| 38 | 7,900 | 9,700 | 5,600 | 15,000 | $ 2,500,000.00 |
| 39 | 10,000 | 14,000 | 6,300 | 20,000 | $ 2,800,000.00 |
| 40 | 7,200 | 8,600 | 4,800 | 13,000 | $ 2,500,000.00 |
| 41 | 7,700 | 11,000 | 7,900 | 19,000 | $ 2,800,000.00 |
| 43 | 33,000 | 48,000 | 19,000 | 67,000 | $ 7,700,000.00 |
| 44 | 7,300 | 12,000 | 5,600 | 17,000 | $ 3,800,000.00 |
| 45 | 3,700 | 5,800 | 3,500 | 9,000 | $ 1,400,000.00 |
| 46 | 15,000 | 23,000 | 12,000 | 34,000 | $ 3,800,000.00 |
| 47 | 4,100 | 7,600 | 3,300 | 11,000 | $ 1,500,000.00 |
| 48 | 7,200 | 9,400 | 2,600 | 12,000 | $ 1,900,000.00 |
| 50 | 21,000 | 29,000 | 12,000 | 41,000 | $ 4,500,000.00 |
| 51 | 25,000 | 31,000 | 10,000 | 41,000 | $ 4,000,000.00 |
| 52 | 6,300 | 10,000 | 4,300 | 14,000 | $ 2,300,000.00 |
| 56 | 17,000 | 24,000 | 12,000 | 36,000 | $ 4,700,000.00 |
| 59 | 9,700 | 18,000 | 7,500 | 25,000 | $ 3,300,000.00 |
| 63 | 7,200 | 10,000 | 3,800 | 14,000 | $ 1,500,000.00 |
| 67 | 3,400 | 5,200 | 2,900 | 8,000 | $ 1,200,000.00 |
| 68 | 1,200 | 2,300 | 1,900 | 4,000 | $ 1,100,000.00 |
| 69 | 1,700 | 2,500 | 1,300 | 4,000 | $ 800,000.00 |
| 70 | 1,400 | 2,600 | 1,500 | 4,000 | $ 800,000.00 |
| 71 | 9,900 | 12,000 | 6,100 | 18,000 | $ 2,600,000.00 |
| 72 | 1,400 | 2,100 | 1,700 | 4,000 | $ 1,000,000.00 |
| 73 | 21,000 | 25,000 | 11,000 | 35,000 | $ 5,900,000.00 |
| 74 | 3,400 | 4,000 | 2,800 | 7,000 | $ 1,300,000.00 |
| 75 | 6,300 | 8,600 | 5,200 | 14,000 | $ 2,300,000.00 |
| 76 | 4,900 | 5,400 | 1,500 | 7,000 | $ 900,000.00 |
| 77 | 4,500 | 6,900 | 3,700 | 11,000 | $ 1,700,000.00 |
| 79 | 3,000 | 4,100 | 1,400 | 6,000 | $ 1,000,000.00 |
| 80 | 3,100 | 4,200 | 1,500 | 6,000 | $ 900,000.00 |
| CTE-1 | 11,000 | 13,000 | 4,500 | 18,000 | $ 2,800,000.00 |
| CTE-2 | 6,100 | 7,800 | 3,400 | 11,000 | $ 2,700,000.00 |
| CTE-3 | 650 | 690 | 300 | 1,000 | $ 1,700,000.00 |
| CTE-4 | 4,900 | 6,500 | 1,000 | 8,000 | $ 2,100,000.00 |
| CTE-5 | 11,000 | 13,000 | 5,700 | 19,000 | $ 3,300,000.00 |
| CTE-6 | 970 | 1,200 | 400 | 2,000 | $ 1,700,000.00 |
| CTE-7 | 2,600 | 3,200 | 800 | 4,000 | $ 2,100,000.00 |
| CTE-8 | 840 | 1,300 | 900 | 2,000 | $ 1,900,000.00 |
| CTE-12 | 610 | 900 | 900 | 2,000 | $ 1,800,000.00 |
| CTE-14 | 10,200 | 12,000 | 4,200 | 16,000 | $ 2,800,000.00 |
| **Sewershed Total** | 590,000 | 800,000 | 340,000 | 1,100,000 | $ 170,000,000.00 |
| Existing Sewered Parcel | 100,000 | 110,000 | 20,000 | 130,000 | |
| Downtown infilling [5] | 7,700 | 9,800 | 0 | 9,800 | |
| Bailey's Path [4] [6] | 0 | 2,500 | 0 | 2,500 | |
| CBI [4] | 14,000 | 14,000 | 1,500 | 15,000 | |
| Laundrymat Dev. | 560 | 1,600 | 400 | 2,100 | |
| **TOTAL** | **710,000** | **940,000** | **360,000** | **1,300,000** | **$ 170,000,000.00** |

Notes:

1. All values rounded to two significant figures
2. Costs based on May 2007 (ENR index of 7942)
3. Total I/I includes I/I estimates for both sewers and lateral connections from the property.
4. Flows from these properties are currently being served by "cluster" systems and therefore are included with other existing sewered facilities.
5. No I/I estimated for infilling as the estimates for I/I are included with the existing collection system flows.
6. Bailey's Path has no estimated I/I because it is a presure sewer system where I/I is expected to be minimal based on the type of technology.

FOR 2013 SRF PEF DEVELOPMENT

Table 1 - Comparison of Total Values

| Sewershed | CWMP Cost | CWMP Cost Minus Constructed Portions | CWMP Values Adjusted to 2014 Values Using ENR Numbers | BID BASE CHECK for Estimated Cost | Recommended Budget Request by Sewershed |
|---|---|---|---|---|---|
| 35 | $ 2,600,000.00 | $ 2,600,000.00 | $ 3,200,000.00 | $ 1,900,000.00 | |
| 35 Pumping Station | (included above) | (included above) | (included above) | $ 630,000.00 | |
| 35 Grinder Pumps | (included above) | (included above) | (included above) | $ 41,000.00 | |
| Subtotal | $ 2,600,000.00 | $ 2,600,000.00 | $ 3,200,000.00 | $ 2,600,000.00 | $ 3,200,000.00 |
| 37 | $ 7,000,000.00 | $ 5,600,000.00 | $ 7,000,000.00 | $ 4,800,000.00 | |
| 37 Grinder Pumps | (included above) | (included above) | (included above) | $ 810,000.00 | |
| Subtotal | $ 7,000,000.00 | $ 5,600,000.00 | $ 7,000,000.00 | $ 5,600,000.00 | $ 7,000,000.00 |
| 43 | $ 7,700,000.00 | $ 3,400,000.00 | $ 4,200,000.00 | $ 3,300,000.00 | |
| 43 Grinder Pumps | (included above) | (included above) | (included above) | $ 610,000.00 | |
| Subtotal | $ 7,700,000.00 | $ 3,400,000.00 | $ 4,200,000.00 | $ 3,900,000.00 | $ 4,200,000.00 |
| 76 | $ 900,000.00 | $ 900,000.00 | $ 1,100,000.00 | $ 650,000.00 | |
| 76 Pumping Station | (included above) | (included above) | (included above) | $ 630,000.00 | |
| Subtotal | $ 900,000.00 | $ 900,000.00 | $ 1,100,000.00 | $ 1,300,000.00 | $ 1,300,000.00 |
| CTE-1 | $ 2,800,000.00 | $ 700,000.00 | $ 900,000.00 | $ 860,000.00 | $ 900,000.00 |
| CTE-2 | $ 2,700,000.00 | $ 1,000,000.00 | $ 1,200,000.00 | $ 1,300,000.00 | $ 1,300,000.00 |
| CTE-3 | $ 1,700,000.00 | $ 200,000.00 | $ 200,000.00 | $ 320,000.00 | $ 320,000.00 |
| CTE-6 | $ 1,700,000.00 | $ 200,000.00 | $ 200,000.00 | $ 330,000.00 | $ 330,000.00 |
| CTE-7 | $ 2,100,000.00 | $ 500,000.00 | $ 600,000.00 | $ 530,000.00 | |
| CTE-7 Grinder Pumps | (included above) | (included above) | (included above) | $ 68,000.00 | |
| Subtotal | $ 2,100,000.00 | $ 500,000.00 | $ 600,000.00 | $ 600,000.00 | $ 600,000.00 |
| CTE-8 | $ 1,900,000.00 | $ 300,000.00 | $ 400,000.00 | $ 460,000.00 | |
| CTE-8 Grinder Pumps | (included above) | (included above) | (included above) | $ 14,000.00 | |
| Subtotal | $ 1,900,000.00 | $ 300,000.00 | $ 400,000.00 | $ 480,000.00 | $ 480,000.00 |
| CTE-12 | $ 1,800,000.00 | $ 300,000.00 | $ 400,000.00 | $ 510,000.00 | $ 510,000.00 |
| Pipeline Improvements required for CTE sections | (included in CTE costs) | $ 1,920,000.00 | $ 2,400,000.00 | $ 1,400,000.00 | $ 1,900,000.00 |
| Pumping Station Improvements | (included in CTE costs) | $ 2,000,000.00 | $ 2,500,000.00 | $ 2,600,000.00 | $ 2,600,000.00 |
| **Total** | **$ 32,900,000.00** | **$ 19,600,000.00** | **$ 24,300,000.00** | **$ 21,800,000.00** | **$ 24,640,000.00** |

**Notes:**

Costs from CWMP at ENR=7942

MassDEP ENR=9550

2014 Estimated cost based on recently bid projects, adjusted to 2014.

For pipeline improvements, total costs are divided over CTE sewersheds. CWMP included a total of 12 sewersheds. 2014 estimate includes proportional value based on 7

All values rounded to 2 significant figures except the totals.

In certain cases, CWMP values and 2014 estimated values varied considerably, likely due to estimated contingencies. In these cases, the CWMP values are recommended as more appropriate for this level of planning.

Pipeline and pumping station improvements require further evaluation to determine the full extent of work necessary.

Proposed SRF Contract No

3

2

1



Table 2 - 2014 Recommended Budget Breakdown by Sewershed

| Sewershed | Construction | Grinder Pumps | Construction Engineering | Police | Total SRF Eligible | Design Engineering | TOTAL |
|---|---|---|---|---|---|---|---|
| 35 | $ 2,500,000.00 | $ 41,000.00 | $ 210,000.00 | $ 150,000.00 | $ 2,900,000.00 | $ 290,000.00 | $ 3,200,000.00 |
| 37 | $ 4,900,000.00 | $ 810,000.00 | $ 330,000.00 | $ 500,000.00 | $ 6,500,000.00 | $ 490,000.00 | $ 7,000,000.00 |
| 43 | $ 2,800,000.00 | $ 610,000.00 | $ 230,000.00 | $ 250,000.00 | $ 3,900,000.00 | $ 340,000.00 | $ 4,200,000.00 |
| 76 | $ 970,000.00 | | $ 130,000.00 | $ 40,000.00 | $ 1,100,000.00 | $ 160,000.00 | $ 1,300,000.00 |
| CTE-1 | $ 700,000.00 | | $ 60,000.00 | $ 50,000.00 | $ 810,000.00 | $ 90,000.00 | $ 900,000.00 |
| CTE-2 | $ 990,000.00 | | $ 91,000.00 | $ 75,000.00 | $ 1,200,000.00 | $ 140,000.00 | $ 1,300,000.00 |
| CTE-3 | $ 250,000.00 | | $ 23,000.00 | $ 10,000.00 | $ 280,000.00 | $ 35,000.00 | $ 320,000.00 |
| CTE-6 | $ 260,000.00 | | $ 24,000.00 | $ 10,000.00 | $ 290,000.00 | $ 36,000.00 | $ 330,000.00 |
| CTE-7 | $ 410,000.00 | $ 68,000.00 | $ 37,000.00 | $ 35,000.00 | $ 550,000.00 | $ 55,000.00 | $ 600,000.00 |
| CTE-8 | $ 360,000.00 | $ 14,000.00 | $ 33,000.00 | $ 20,000.00 | $ 430,000.00 | $ 49,000.00 | $ 480,000.00 |
| CTE-12 | $ 370,000.00 | | $ 31,000.00 | $ 20,000.00 | $ 420,000.00 | $ 92,000.00 | $ 510,000.00 |
| Pipeline Improvements required for CTE sections | $ 1,420,000.00 | | $ 140,000.00 | $ 20,000.00 | $ 1,600,000.00 | $ 210,000.00 | $ 1,900,000.00 |
| Pumping Station Improvements | $ 2,080,000.00 | | $ 210,000.00 | $ - | $ 2,300,000.00 | $ 410,000.00 | $ 2,600,000.00 |
| **Total** | **$ 18,000,000.00** | **$ 1,540,000.00** | **$ 1,550,000.00** | **$ 1,180,000.00** | **$ 22,300,000.00** | **$ 2,400,000.00** | **$ 24,640,000.00** |

**Notes**

Total SRF Eligible=Construction+Grinder Pumps+Construction Engineering+Police

TOTAL=Total SRF Eligible+Design Engineering

Many values rounded to the nearest 1000 to avoid rounding error.

Design Engineering for Pumping Station Improvements includes an additional $50,000 for preliminary design of Queen Anne and $50,000 for preliminary design of Mill Pond above value shown in Table 1. $410,000 is carried into Table 3.

FOR 2013 SRF PEF DEVELOPMENT

Table 3 - SRF Breakdown

| | | | IN ($1000s) | |
|---|---|---|---|---|
| | **Total Cost** | **Eligible Cost** | **Total Cost** | **Eligible Cost** |
| Construction | | | | |
| 35 | $ 2,541,000.00 | $ 2,541,000.00 | 2,541 | 2,541 |
| 37 | $ 5,710,000.00 | $ 5,710,000.00 | 5,710 | 5,710 |
| 43 | $ 3,410,000.00 | $ 3,410,000.00 | 3,410 | 3,410 |
| 76 | $ 970,000.00 | $ 970,000.00 | 970 | 970 |
| CTE-1 | $ 700,000.00 | $ 700,000.00 | 700 | 700 |
| CTE-2 | $ 990,000.00 | $ 990,000.00 | 990 | 990 |
| CTE-3 | $ 250,000.00 | $ 250,000.00 | 250 | 250 |
| CTE-6 | $ 260,000.00 | $ 260,000.00 | 260 | 260 |
| CTE-7 | $ 478,000.00 | $ 478,000.00 | 478 | 478 |
| CTE-8 | $ 374,000.00 | $ 374,000.00 | 374 | 374 |
| CTE-12 | $ 370,000.00 | $ 370,000.00 | 370 | 370 |
| Pipeline Improvements required for CTE sections | $ 1,420,000.00 | $ 1,420,000.00 | 1,420 | 1,420 |
| Pumping Station Improvements | $ 2,080,000.00 | $ 2,080,000.00 | 2,080 | 2,080 |
| Total Construction | $ 19,553,000.00 | $ 19,553,000.00 | 19,553 | 19,553 |
| Construction Services | $ 1,550,000.00 | $ 1,550,000.00 | 1,550 | 1,550 |
| Police Traffic Detail | $ 1,180,000.00 | $ 1,180,000.00 | 1,180 | 1,180 |
| Subtotal | $ 22,283,000.00 | | | |
| Construction Contingency | $ 1,960,000.00 | $ 1,960,000.00 | 1,960 | 1,960 |
| Total | $ 24,243,000.00 | $ 24,243,000.00 | 24,243 | 24,243 |
| | | | | |
| **Total** | **$ 24,240,000.00** | | | |
| | | | | |
| Engineering Design (separate) | $ 2,400,000.00 | | | |
| Total to Appropriate | **$ 26,640,000.00** | | | |

| SRF Construct Conting (10%) | | |
|---|---|---|
| $ | 254,000.00 | |
| $ | 571,000.00 | |
| $ | 341,000.00 | |
| $ | 97,000.00 | |
| $ | 70,000.00 | |
| $ | 99,000.00 | |
| $ | 25,000.00 | |
| $ | 26,000.00 | |
| $ | 48,000.00 | |
| $ | 37,000.00 | |
| $ | 37,000.00 | |
| $ | 142,000.00 | |
| $ | 208,000.00 | |
| $ | 2,000,000.00 | Total Rounded |

**Notes**

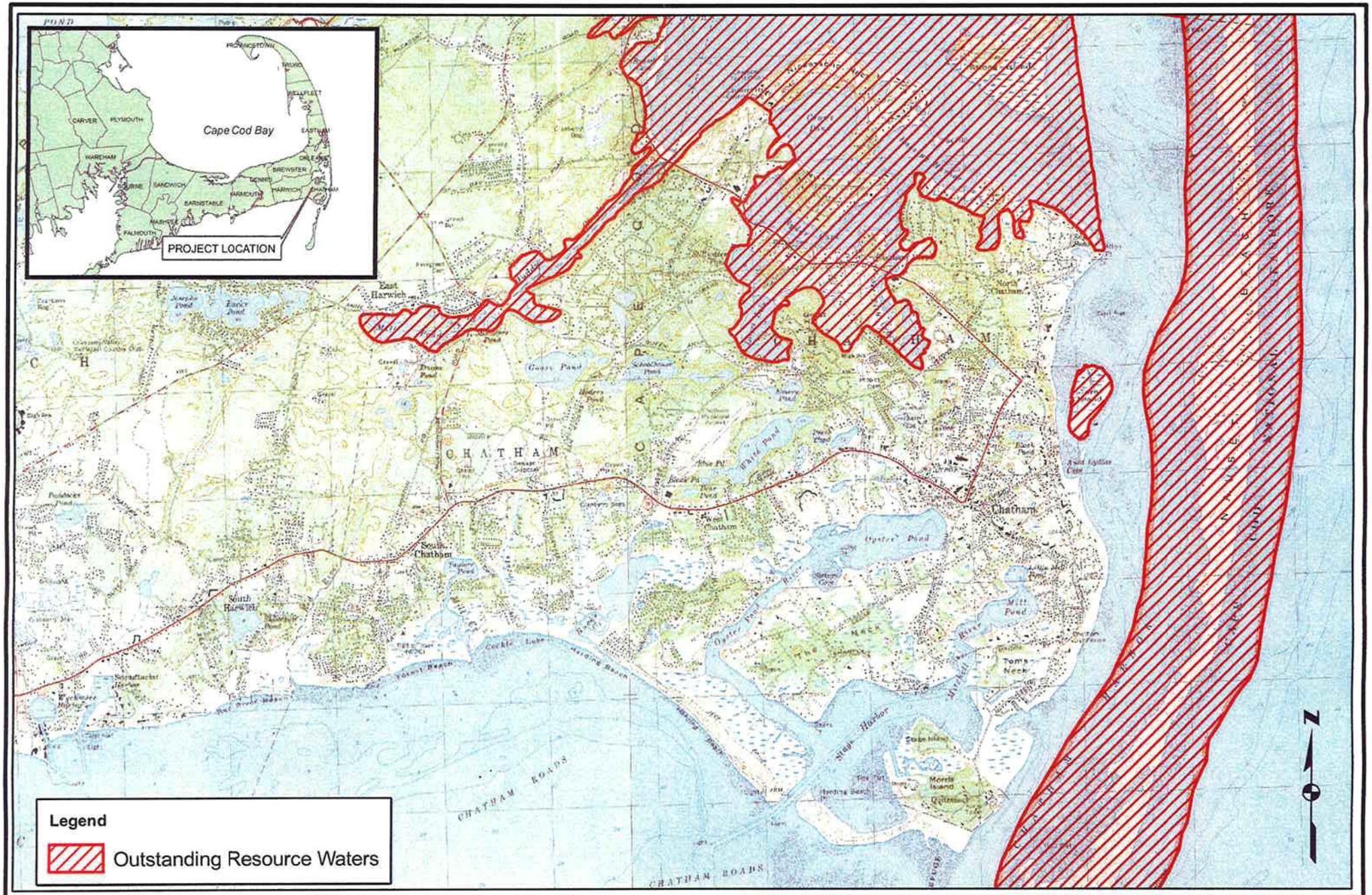
Costs for Pipeline Improvements are not to be considered valid unless included with related work portions (such as CTE-3, CTE-7, and CTE-8).
CTE-12 engineering design cost estimated at 30% due to increased engineering and permitting anticipated (others are 15%) due to easements and site constraints.
CTE-12 construction contingency estimated at 20% due to possibility of directional drilling (others are 10%) due to easement and side constraints.
It is understood that not all of the sewersheds will be selected. This table will be revised once the final selection of sewersheds is made.

## Table 4 W&S Estimate and Approriation Basis

| Sewershed | Original 2006 CWMP Cost | Updated 2014 Cost | Group Total | SRF Contingency | Updated 2014 Cost w/Cont | New Group Total | Appropriation Basis at 2 SD | Totals rounded to 10,000 |
|---|---|---|---|---|---|---|---|---|
| 35 | $ 2,600,000.00 | $ 3,200,000.00 | $ 3,200,000.00 | $ 254,000.00 | $ 3,454,000.00 | $ 3,454,000.00 | $ 3,500,000.00 | $ 3,450,000.00 |
| 37 | $ 7,000,000.00 | $ 7,000,000.00 | | $ 571,000.00 | $ 7,571,000.00 | | | |
| 43 | $ 7,700,000.00 | $ 4,200,000.00 | $ 12,500,000.00 | $ 341,000.00 | $ 4,541,000.00 | $ 13,509,000.00 | $ 13,500,000.00 | $ 13,510,000.00 |
| 76 | $ 900,000.00 | $ 1,300,000.00 | | $ 97,000.00 | $ 1,397,000.00 | | | |
| CTE-1 | $ 2,800,000.00 | $ 900,000.00 | | $ 70,000.00 | $ 970,000.00 | | | |
| CTE-2 | $ 2,700,000.00 | $ 1,300,000.00 | | $ 99,000.00 | $ 1,399,000.00 | | | |
| CTE-3 | $ 1,700,000.00 | $ 320,000.00 | | $ 25,000.00 | $ 345,000.00 | | | |
| CTE-6 | $ 1,700,000.00 | $ 330,000.00 | $ 8,940,000.00 | $ 26,000.00 | $ 356,000.00 | $ 9,677,000.00 | $ 9,700,000.00 | $ 9,680,000.00 |
| CTE-7 | $ 2,100,000.00 | $ 600,000.00 | | $ 48,000.00 | $ 648,000.00 | | | |
| CTE-8 | $ 1,900,000.00 | $ 480,000.00 | | $ 37,000.00 | $ 517,000.00 | | | |
| CTE-12 | $ 1,800,000.00 | $ 510,000.00 | | $ 37,000.00 | $ 547,000.00 | | | |
| Pipeline Imp | | $ 1,900,000.00 | | $ 187,000.00 | $ 2,087,000.00 | | | |
| PS Improv | | $ 2,600,000.00 | | $ 208,000.00 | $ 2,808,000.00 | | | |
| Construction Contingency | | $ 2,000,000.00 | $ 2,000,000.00 | | | | | |
| Total | $ 32,900,000.00 | $ 26,640,000.00 | $ 26,640,000.00 | $ 2,000,000.00 | $ 26,640,000.00 | $ 26,640,000.00 | $ 27,000,000.00 | $ 26,640,000.00 |

# Appendix L

## Outstanding Resource Waters in Chatham




Data Source: MassGIS/Town of Chatham.
Note: USGS Quadrangle modified to reflect current coastal conditions (2008).

GIS File Location: G:\Reference Folder\State Files\Massachusetts\Outstanding Resource Waters

0 2,125 4,250 8,500 Feet

1 inch = 4000 feet

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DATE: 8/20/08

TOWN OF CHATHAM, MASSACHUSETTS

COMPREHENSIVE WASTEWATER MANAGEMENT PLAN

OUTSTANDING RESOURCE WATERS
FIGURE 1