SELECTMEN'S MEETING AGENDA*

Griffin Room, Town Hall
732 Main Street, Harwich, MA
Executive Session 5:45 P.M.
Regular Meeting 6:30 P.M.
Monday, June 19, 2017

As required by Open Meeting Law, you are hereby informed that the Town will be video and audio taping as well as live broadcasting this public meeting. In addition, anyone in the audience who plans to video or audio tape this meeting must notify the Chairman prior to the start of the meeting.

I. **CALL TO ORDER**

II. **EXECUTIVE SESSION** - Pursuant to MGL c.30A, §21(2) to conduct strategy sessions in preparation for negotiations with non-union personnel or to conduct collective bargaining sessions or contract negotiations with non-union personnel – Town Administrator's Contract

III. **PLEDGE OF ALLEGIANCE**

IV. **WEEKLY BRIEFING**

V. **PUBLIC COMMENT/ANNOUNCEMENTS**

VI. **CONSENT AGENDA**

A. Approve request for assistance from the Caleb Chase Fund
B. Approve and sign Bond Anticipation Notes
C. Approve the Purchase of Surplus Beach Sand and authorize Chair to sign
D. Approve Committee Appointments as follows:

Carol Thayer	Council on Aging	3 Year Term
Joanne Lepore	Council on Aging	3 Year Term
Charlie Czeck	Wastewater Implementation Committee	3 Year Term
Tom Caruso	Treasure Chest Committee	3 Year Term
Matthew Cushing	Board of Health	unexpired term to 2018
Sandra Hall	By Law/Charter Review Committee	3 Year Term
Aaron Gingras	Agricultural Commission	3 Year Term
Roseanne Shapiro	Harwich Cultural Council	unexpired term to 2019
Paul Gazille	Bikeways Committee	3 Year Term

E. Approve Annual Committee Re-Appointments
F. Rescind appointment of Courtney West as member of Harwich Cultural Council
G. Approve request for One-Day Beer & Wine License by Historical Society

VII. **PUBLIC HEARINGS/PRESENTATIONS** *(Not earlier than 6:30 P.M.)*

VIII. **OLD BUSINESS**

A. Part-time Housing Coordinator and establishment of a Housing Trust
B. Pleasant Bay Composite Nitrogen Management Analysis / Joint Resolution
C. Categorized Tax Title List

IX. **NEW BUSINESS**

A. Joint Meeting with Harwich Housing Authority to nominate new member to fill vacancy
B. Amend the Personnel By-Law Plan for FY18 in keeping with union increases
C. Wastewater Inter-Municipal Agreement with Chatham

X. **TOWN ADMINISTRATOR'S REPORT**

A. Updates:
   1. West Harwich School
   2. Old Rec Building
   3. Bank Street Harbormaster Building
   4. Middle School Building Portable Classrooms

XI. **SELECTMEN'S REPORT**

XII. **ADJOURNMENT**

Per the Attorney General's Office: The Board of Selectmen may hold an open session for topics not reasonably anticipated by the Chair 48 hours in advance of the meeting following "New Business." If you are deaf or hard of hearing or a person with a disability who requires an accommodation contact the Selectmen's Office at 508-430-7513.

Authorized Posting Officer:

_____
Ann Steidel, Admin. Secretary

Posted by: _____
Town Clerk

Date: June 15, 2017

Sandy Robinson

From: Carol Coppola
Sent: Thursday, June 08, 2017 11:13 AM
To: Ann Steidel; Sandy Robinson
Cc: Christopher Clark; Amy Duffy
Subject: FW: Harwich BAN Results
Attachments: Harwich Certificate of Award.pdf

FYI,

Please add the BAN approval and signature to the June 19th BOS meeting.

Thank you!

Carol

From: Raela Trifoni (HTS) [mailto:Raela.Trifoni@hilltopsecurities.com]
Sent: Wednesday, June 07, 2017 11:45 AM
To: Amy Duffy <abullock@town.harwich.ma.us>; Carol Coppola <ccoppola@town.harwich.ma.us>
Cc: Peter Frazier (HTS) <peter.frazier@hilltopsecurities.com>; Kristy Tofuri (HTS) <Kristy.Tofuri@hilltopsecurities.com>; Megan Hyland (HTS) <megan.hyland@hilltopsecurities.com>; Melissa Toland (HTS) <Melissa.Toland@hilltopsecurities.com>; Clifford Oratokhai (HTS) <Clifford.Oratokhai@hilltopsecurities.com>
Subject: RE: Harwich BAN Results

Attached please find the Certificate of Award for the Town's $7,279,387 General Obligation Bond Anticipation Notes. Please sign the Certificate of Award and email it back to us at your earliest convenience. Please let me know if you have any questions.

Thank you!

Raela Trifoni
FirstSouthwest, a Division of Hilltop Securities Inc.
54 Canal Street, Suite 320, Boston, MA 02114
Direct: 617.619.4417 | Fax: 617.619.4411
Raela.Trifoni@hilltopsecurities.com

Please note: Our email address has changed. Please update your contact info.

From: Raela Trifoni (HTS)
Sent: Wednesday, June 07, 2017 11:06 AM
To: 'Amy Duffy' <abullock@town.harwich.ma.us>; 'ccoppola@town.harwich.ma.us' <ccoppola@town.harwich.ma.us>
Cc: Peter Frazier (HTS) <peter.frazier@hilltopsecurities.com>; Kristy Tofuri (HTS) <kristy.tofuri@hilltopsecurities.com>; Megan Hyland (HTS) <megan.hyland@hilltopsecurities.com>; Melissa Toland (HTS) <melissa.toland@hilltopsecurities.com>; Clifford Oratokhai (HTS) <Clifford.Oratokhai@hilltopsecurities.com>
Subject: Harwich BAN Results

Good Morning,

Attached please find the results and MPL for the Town's $7,279,387 General Obligation Bond Anticipation Notes. I will forward the Certificate of Award for your signature shortly.

We will be contacting you shortly to confirm where you would like the proceeds to go on June 22, 2017.

Should you have any questions please contact Peter Frazier at (617) 419-4409.

Thank you,

Raela Trifoni
Hilltop Securities Inc.
54 Canal Street, Suite 320, Boston, MA 02114
Direct: 617.619.4417 | Fax: 617.619.4411
Raela.Trifoni@hilltopsecurities.com

Please note: Our email address has changed. Please update your contact info.

Certificate of Award

i, the Treasurer of the Town of Harwich, Massachusetts, hereby award the $7,279,387 General Obligation Bond Anticipation Notes dated June 22, 2017 (the "Notes,,) to the bidder or bidders submitting the bid or bids attached hereto in accordance with the terms set forth in the attached bid or bids and in the Notice of Sale dated June 2, 2017, relating to the Notes, subject to the approval of this award by the Board of Selectmen.

Date: June 7, 2017

_____

Treasurer

Sandy Robinson

From: John Rendon
Sent: Tuesday, June 13, 2017 2:06 PM
To: Sandy Robinson
Cc: Charleen Greenhalgh; Christopher Clark
Subject: Surplus Beach Sand
Attachments: Revised Bid Opening2017.doc

Sandy,
Attached is a list of private homeowners/associations that submitted bids for surplus sand for beach nourishment. Since the bids were submitted, Hulse Point Family Trust c/o Deirdre Kelleher withdrew their bid. Sales agreements for the other four listed properties have been submitted and require BOS signature. Thank you. regards,

John C. Rendon
Harbormaster
Town of Harwich
774 212-6193 (c)

Bid Opening Minutes
Thursday, May 11, 2017
Surplus Beach Sand

At 2:00 P.M., Thursday, May 11, in the presence of Paul Sweetser, Bob Cafarelli received and opened sealed bids for the purchase of surplus beach sand.

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Results of the bid opening were as follows:

Company Name	Bid Price per CY	Cubic Yards Requested
Wydemere Beach Trust	$10.00	4,500
Ayer Lane Associates	$9.25	1,000
Wychmere Pines Assoc. (5 properties)	$9.00	2,000
Charlie Dickson	$9.00	1,000
Hulse Point Family Trust c/o Deirdre Kelleher.	$9.00	500
	Total Requested	9,000

The bids were taken under advisement for review by the Harbor Master.

The bid opening was adjourned at 2:15 pm

Notes by: Bob Cafarelli, Town Engineer

_____

OFFICE OF THE SELECTMEN

PHONE (508) 430-7513
FAX (508) 432-5039

732 MAIN STREET, HARWICH, MA 02645

MEMO

TO: Board of Selectmen

FROM: Jannell Brown, Don Howell
Selectmen's Interview/Nomination Committee

RE: Appointment Recommendation

DATE: June 19, 2017

Following posted interviews held on Tuesday, June 13, 2017, we would like to recommend the following appointments to the Board:

Carol Thayer	Council on Aging	3-year term
Joanne Lepore	Council on Aging	3-year term
Charlie Czeck	Wastewater Implementation Committee	3-year term
Tom Caruso	Treasure Chest Committee	3-year term
Matthew Cushing	Board of Health	unexpired term to 2018
Sandra Hall	By Law/Charter Review	3-year term
Aaron Gingras	Agricultural Commission	3-year term
Rosanne Shapiro	Harwich Cultural	unexpired term to 2019
Paul Gazaille	Bikeways Committee	3-year term

Selectmen's Interview/Nominations Subcommittee
Selectmen's Office, Town Hall
Tuesday, June 13, 2017
8:45 a.m.

AGENDA

I. **CALL TO ORDER**

II. **NEW BUSINESS**

A. Interview applicant(s) for various committee vacancies including but not limited to:
   1. Treasure Chest Committee
   2. Trail Committee
   3. Utility & Energy Conservation Committee
   4. By-Law and Charter Review Committee
   5. Council on Aging
   6. Cultural Council
   7. Agricultural Commission
   8. Board of Health

B. Term Limits – *discussion*

C. Review the Charges and appointments of various committees

D. Miscellaneous discussion regarding appointment issues and/or procedure

III. **ADJOURNMENT**

Per the Attorney General's Office: The Board of Selectmen may hold an open session for topics not reasonably anticipated by the Chair 48 hours in advance of the meeting following "New Business."

If you are deaf or hard of hearing or are a person with a disability who requires an accommodation, contact the Selectmen's Office at (508) 430-7512 ext. 2

Authorized Posting Officer: **Posted by:** _____
Town Clerk

Date: June 8, 2017

_____
Sandra Robinson, Admin. Secretary

INTERVIEWS – Tuesday, June 13, 2017

Time	Applicant:	Vacancy	Comment
8:45 am	Carol Thayer	Council on Aging (two 3-year terms)	
8:55 am	Charlie Czech	Wastewater (one 3-year term) Trails (two 3-year terms) Utility & Energy (one 3-year term) Bikeways (one 3-year term)	
9:10 am	Tom Caruso	Treasure Chest Committee (two 3-year terms and one 1-year alternate)	
9:20 am	Joanne Lepore	Council on Aging (two 3-year terms)	
9:30 am	Matthew Cushing	Board of Health (one term to 2018)	
9:40 am	Sandy Hall	By Law and Charter Review (one 3-year term)	
9:50 am	Aaron Gingras	Agricultural Commission (4 vacancies)	
10:00 am	Rosanne Shapiro	Harwich Cultural Council (one term to 2019)	
10:10 am	Paul Gazaille	Bikeways (one 3-year term)	

OFFICE OF THE SELECTMEN

PHONE (508) 430-7513
FAX (508) 432-5039

732 MAIN STREET, HARWICH, MA 02645

TO: Board of Selectmen

FROM: Sandra Robinson, Administrative Secretary

RE: Annual Committee/Board/Commission Re-appointments

DATE: June 19, 2017

Committee	Title	First	last
Agricultural Commission	Mr.	Brent	Hemeon
Agricultural Commission	Ms.	Angela	McNamara
Bikeways Committee	Mr.	Eric	Levy
Board of Appeals	Mr.	James	Hilliard
Board of Appeals	Mr.	Alexander	Donoghue
Board of Appeals	Ms.	Kathleen	Muller
Board of Assessors	Mr.	Bruce	Nightingale
Board of Health	Mr.	Frank	Boyle
By Law and Charter Review Committee	Mr.	Joseph	Powers
By Law and Charter Review Committee	Ms.	Katie	O'Sullivan
Community Center Facilities Committee	Mr.	Lee	Culver
Community Center Facilities Committee	Mr.	Brian	Power
Community Preservation Committee	Mr.	Robert	Bradley
Conservation Commission	Ms.	Paula	McGuire
Cultural Council	Ms.	Larraine	Bossi
Cultural Council	Ms.	Rosann	Donahue
Golf Committee	Mr.	Thomas	Johnson
Golf Committee	Mr.	John F.	Crook
Historical/Historic District Commission	Mr.	Robert	Doane
Historical/Historic District Commission	Ms.	Patricia	Scarnici
Historical/Historic District Commission	Ms.	Gayle	Carroll

Planning Board	Mr.	Thomas	Stello
Planning Board	Mr.	David	Harris
Real Estate and Open Space Committee	Mr.	Dave	Callaghan
Recreation and Youth Commission	Mr.	David	Nixon
Recreation and Youth Commission	Ms.	Janet	Bowers
Board of Registrars	Ms.	Dolly	Parkhurst
Traffic Safety	Mr.	Gerald	Beltis
Treasure Chest Committee	Ms.	Sheila	Eldredge
Utility and Energy Conservation Commission	Ms.	Valerie	Bell
Waterways Committee	Mr.	Cameron	Smith
Waterways Committee	Mr.	Daniel	Hall
Youth Services Committee	Mr.	James B.	Hartley
Youth Services Committee	Ms.	Paula	McGuire

HARWICH HISTORICAL SOCIETY
80 PARALLEL STREET
HARWICH MA 02645
508-432-8089

Town of Harwich Board of Selectmen
732 Main Street
Harwich MA 02645

RE: Elmer Crowell Barn Dance
July 8, 2017

Dear Members of the Board:

On Saturday, July 8, 2017, the Harwich Historical Society is holding a barn dance to celebrate the Elmer Crowell Barn. The event will begin at 6:30 PM and end at 8:30 PM and will feature music by the Sound Dunes Swing Ensemble from the 1930s, 40s and 50s. The ensemble is sponsored by a grant from the Harwich Cultural Council. The event would be held under a tent in the parking lot of the museum. Dress is casual or period costume and we will have an Elmer Crowell lookalike contest. To this end, we are requesting that you consider granting a one day liquor license so that we would have the option to offer beer and wine.

Thank you for your time.

Sincerely,

Peggy Rose

Ann Steidel

From: Chief David J. Guillemette
Sent: Thursday, June 15, 2017 9:15 AM
To: Ann Steidel
Subject: RE: Request for One Day Beer & Wine License

Ann,

I have no concerns about issuing the license.

Sincerely,

David J. Guillemette
Chief of Police

Harwich Police Department
183 Sisson Road
Harwich, MA 02645

Office: 508-430-7541

From: Ann Steidel
Sent: Thursday, June 15, 2017 9:10 AM
To: Chief David J. Guillemette <dguillemette@harwichpolice.com>
Cc: Deputy Chief Tom Gagnon <tgagnon@harwichpolice.com>
Subject: Request for One Day Beer & Wine License

Chief,

Attached is a request for a One Day Beer and Wine License by the Historical Society at Brooks Academy, specifically at the Elmer Crowell Barn for July 8th. This is on the Board's agenda for Monday night.
Please let me know if you have any concerns about this request which you would like me to include in the Board's packet.

Ann Steidel
Administrative Secretary
Board of Selectmen/Town Administrator's Office
Town of Harwich
732 Main Street
Harwich, MA 02645
Phone 508-430-7513 x2
Fax 508-432-5039

Ann Steidel

From: David LeBlanc
Sent: Thursday, June 15, 2017 9:49 AM
To: Ann Steidel
Cc: Norman Clarke
Subject: Re: Request for One Day Beer & Wine License

No concerns on my end

On Jun 15, 2017, at 09:18, Ann Steidel <asteidel@town.harwich.ma.us> wrote:

Chief,

Attached is a request for a One Day Beer and Wine License by the Historical Society at Brooks Academy, specifically at the Elmer Crowell Barn for July 8th. This is on the Board's agenda for Monday night.
Please let me know if you have any concerns about this request which you would like me to include in the Board's packet.

Ann Steidel
Administrative Secretary
Board of Selectmen/Town Administrator's Office
Town of Harwich
732 Main Street
Harwich, MA 02645
Phone 508-430-7513 x2
Fax 508-432-5039

<Historical Society request for 1 Day Beer & Wine.pdf>

May 1, 2017

Mr. Michael D. MacAskill, Chairman
Harwich Board of Selectmen
Harwich Town Hall
732 Main Street
Harwich, MA 02645

RE: Harwich Housing Production Plan

Dear Mr. MacAskill:

The Harwich Housing Committee has reviewed and fully accepts the Housing Production Plan (HPP) dated December 2016 with an effective date of March 23, 2017. We are looking forward to working with you and the Selectmen, along with other boards and committees within our community to help the Town fulfill its affordable housing goals assigned by the HPP.

To assist the Town in reaching its affordable housing goals, and as outlined in the HPP, the Harwich Housing Committee would like to request the Board of Selectmen approve the hiring of a part-time Housing Coordinator. This new position could be shared with a neighboring town (Brewster, Dennis or Chatham) to name a few.

Respectfully submitted,

Arthur Bodin, Chair

Cindi Maule

Julia W. Eldredge, Secretary

Brewster, Massachusetts

Position Title:	Housing Coordinator	**Grade Level:**	Bylaw Grade III
Department	Planning	**Date:**	April 2017
Reports to:	Town Planner	**FLSA**	Non-Exempt

Statement of Duties: Employee is to perform responsible professional, technical, and administrative work in providing support services for housing-related programs, projects and activities; all other related work as required. The Housing Coordinator is responsible for housing related services assigned through the Town Planner for the Town of Brewster Housing Partnership, the Community Preservation Committee and other boards and committees that have affordable housing initiatives.

Supervision Required: Under general supervision of the Town Planner, and in accordance with state and local laws and regulations. In coordination with the Town Planner the employee will develop an annual work plan and complete the work in accordance with established departmental policies and standards. The employee is familiar with the work routine and uses initiative in carrying out recurring assignments independently with specific instruction, as needed. The employee may supervise the work of various technical contractors.

Confidentiality: The work requires examining, analyzing and evaluating facts and circumstances surrounding individual problems, situations, or transactions, and determining actions to be taken within the limits of standard or accepted practices. Employee may have access to some confidential information that is obtained during performance of essential functions. Discretion regarding sensitive information is critical.

Judgment: State and Regional housing guidelines include a large body of policies, practices, and precedents, which may be complex or conflicting, at times. Judgment is used in analyzing specific situations to determine appropriate actions. Employee is expected to weigh efficiency and relative priorities in conjunction with procedural concerns in decision making. Requires understanding, interpreting and applying State and local regulations to ensure that department operations are in compliance.

Work Environment: Employee performs work in a typical office setting with frequent interruptions and no occupational risk to the employee.

Nature and Purpose of Relationships: Contacts are primarily with co-workers, the public, and State and Regional agencies involving frequent explanation, discussion or interpretation of affordable housing practices, procedures, regulations and guidelines. Other regular contacts are with service recipients and employees of outside organizations such as vendors, banks and/or developers/ contractors. More than ordinary courtesy, tact and diplomacy may be required to resolve complaints. Employee will coordinate with Town Planner before furnishing news media with information such as meeting agendas, project details or departmental procedures.

Accountability: Consequences of errors, missed deadlines or poor judgment could result in excessive cost, delay of service delivery or legal repercussions to the Town.

Essential Functions:

The essential functions or duties listed below are intended only as illustrations of the various type of work that may be performed. The omission of specific statements of duties does not exclude them from the position if the work is similar, related, or a logical assignment to the position.

1. Provides housing related support services for the Town, Housing Partnership, Community Preservation Committee (CPC), and the Planning Board, as appropriate.

2. Coordinates and assists in setting annual priorities for the implementation of the Affordable Housing Production plan.

3. Administers housing assistance programs such as the CPC Homeowner Buy-Down Program and other town supported housing assistance projects.

4. Maintains an inventory of the Town's Subsidized Housing Inventory and monitors compliance with affordability requirements.

5. Identifies affordable housing opportunities such as maintaining a list of town owned vacant parcels; identifying possible public private partnerships for housing; and seeking available housing grant opportunities.

6. With respect to any Town-initiated affordable housing projects, assists Planning Department, CPC, and Housing Partnership in developing scope, schedule and terms of requests for proposals (RFPs) and other project documents, coordinates review by other town boards and departments, and public comment. Coordinates plan review with technical experts and consulting engineers, as needed.

7. Attends regular meetings of the Housing Partnership. Attend other Boards or Committee meetings as needed. Prepares support materials as needed.

8. Assists the Town Planner in preparing and/or reviewing proposed zoning bylaw amendments and amendments to specific Board's rules and regulations.

9. Assists in development and execution of housing-related public educational programs/events.

10. Responds to questions and requests for information from the public and other town departments. Provides guidance and technical assistance as necessary.

11. Keeps current with state and federal housing policy issues.

12. Attends regional and professional development meetings as necessary.

13. Performs similar or related work as required, directed or as situation dictates.

Recommended Minimum Qualifications:

Education and Experience: Position requires an Associate's degree in government, municipal planning, business or related field, 1 - 3 years' experience municipal management, housing, planning, procurement or related field; or any equivalent combination of education, training and experience which provides the required knowledge, skills and abilities to perform the essential functions of the job.

Knowledge, Abilities and Skill

Knowledge: Comprehensive knowledge of the functions of municipal government, local bylaws, rules and regulations. Good understanding of affordable housing issues. General understanding of the interaction between local, state and federal government. General knowledge of Massachusetts General Laws, especially as they apply to housing and zoning. Good working knowledge of office practices and procedures, forms and equipment.

Ability: Ability to interact effectively and appropriately with the public and other town personnel; ability to complete multiple tasks in a timely, detailed and accurate manner. Has the ability to work independently and to maintain sensitive, confidential information.

Skill: Proficient computer skills including word processing and spread sheet applications, organizational skills, recordkeeping and clerical skills, oral and written communication and presentation skills.

Physical and Mental Requirements

The physical demands described here are representative of those that must be met by an employee to successfully perform the essential functions of this job. Reasonable accommodations may be made to enable individuals with disabilities to perform the position's essential functions.

Physical Skills: Work effort principally involves sitting to perform work tasks, with intermittent periods of stooping, walking, and standing. There may also be some occasional lifting of objects such as ledger books, photocopy and computer paper. Position requires basic motor skills for activities such as: operating a personal computer and/or most other office equipment, typing and/or word processing, filing, moving objects or sorting of papers. Employee is required to routinely read documents and reports for understanding and analytical purposes.

This job description does not constitute an employment agreement between the employer and employee. It is used as a guide for personnel actions and is subject to change by the employer as the needs of the employer and requirements of the position change.

Ann Steidel

From: Carole Ridley <cr@ridleyandassociates.com>
Sent: Thursday, June 15, 2017 9:58 AM
To: Michael MacAskill
Cc: Ann Steidel
Subject: Pleasant Bay
Attachments: Resolution of the Towns Sharing the Watershed of Pleasant Bay revised 0615517_.docx

Michael,

Ann has mentioned that the Board will be discussing the proposed resolution for Pleasant Bay on Monday. I plan to attend just in case there are questions.

I asked each Board to submit comments or suggested word changes by today, 6/15. So far, the only word changes suggested came from my meeting with the Harwich Board. The attached revision includes language to reflect Larry's comment about the Town as a WMA, and also your comment about funding. Please let me know if this is acceptable, and I will provide to Ann for the packet.

Thanks,
Carole

Ridley & Associates, Inc.
115 Kendrick Road
Harwich, MA 02645
(508) 430 2563 (office)
(508) 221 8941 (cell)
(508) 432 3788 (fax)
www.ridleyandassociates.com

Resolution of the Towns Sharing the Watershed of Pleasant Bay

Whereas, The Towns of Brewster, Chatham, Harwich and Orleans share the watershed of Pleasant Bay and, by intermunicipal agreement, have formed a Pleasant Bay Alliance to coordinate resource management of Pleasant Bay among the member towns;

Whereas, Pleasant Bay is a state-designated Area of Critical Environmental Concern;

Whereas, A Resource Management Plan for Pleasant Bay developed by the Alliance and approved by Town Meetings of the four member towns identifies excessive nitrogen loading from watershed land uses as a primary threat to the health and sustainability of Pleasant Bay;

Whereas, The Massachusetts Department of Environmental Protection, in conformance with the Federal Clean Water Act, established 19 Total Maximum Daily Loads (TMDLs) for Nitrogen in Pleasant Bay, which require substantial reductions in the amount of nitrogen flowing into Pleasant Bay from watershed sources;

Whereas, the Cape Cod Commission has developed an approved Section 208 Areawide Water Quality Management Plan Update, which designates the Towns as Waste Management Agencies (WMAs) responsible for meeting TMDLs, and which sets forth resources and assistance available to WMAs to facilitate compliance on a watershed basis;

Whereas, Each of the member towns of the Pleasant Bay Alliance has developed a plan to address its share of responsibility for reducing the amount of nitrogen flowing into Pleasant Bay from watershed sources;

Whereas, the Pleasant Bay Alliance has analyzed the combined effect of the four town plans on a watershed basis; and

Whereas, the composite analysis presents in a uniform way the attenuated nitrogen loads and load removal requirements already contained in individual town plans;

Therefore, Be it resolved that the Board of Selectmen of _____, pursuant to its authority under the Town Charter, hereby vote to take the following actions:

1. Endorse the **PLEASANT BAY COMPOSITE NITROGEN MANAGEMENT ANALYSIS** (March 2017) as an accurate representation of (a) the Town's share of current attenuated nitrogen load and of (b) the Town's responsibility to remove nitrogen in each subwatershed of Pleasant Bay.

2. The Town as a Waste Management Treatment Agency (WMA) Agrees to work with other member towns/WMAs in collaboration with ~~through~~ the Alliance

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and with the Cape Cod Commission and Massachusetts Department of Environmental Protection to:

A. Fully explore the opportunities for efficiency and cost savings identified in the **PLEASANT BAY COMPOSITE NITROGEN MANAGEMENT ANALYSIS.**
B. Support development of a Targeted Watershed Management Plan consistent with the requirements of the approved Section 208 Areawide Water Quality Management Plan Update.
C. Participate in a watershed permit pilot project in order to explore additional potential costs savings and efficiencies and determine the advantages and disadvantages to the Town.
D. Support other projects, studies or agreements as may be necessary to advance the foregoing activities pending the Board of Selectmen's review and authorization of any required funding.

Signed Date

Pleasant Bay Alliance

To: Harwich Board of Selectmen
Fr: Allin Thompson, Alliance Steering Committee and Watershed Work Group
Dolly Howell, Alliance Steering Committee and Watershed Work Group
Heinz Proft, Alliance Technical Resource Committee and Watershed Work Group
Carole Ridley, Alliance Coordinator
Date: March 31, 2017
Re: Request to Meet with Selectmen to present enclosed *Pleasant Bay Composite Nitrogen Management Analysis*

The Pleasant Bay Alliance (Alliance) was created by the Towns of Brewster, Chatham, Harwich, and Orleans to coordinate the management of resources within the Pleasant Bay Area of Critical Environmental Concern (ACEC) and its watershed. Alliance projects, programs and studies are intended to coordinate the Towns' efforts to promote and support healthy natural resources, and safe public access and use of Pleasant Bay. For close to two decades, the Alliance has been able to successfully address watershed issues and facilitate coordinated action among the four member towns. One primary issue of concern is management of nitrogen entering Pleasant Bay waters, which the Towns have individually addressed through their wastewater and nitrogen management planning efforts. Consistent with the Cape-wide 208 Plan and MassDEP guidance, the Alliance has developed a watershed-based overview of the four town efforts.

Accordingly, the Alliance is pleased to present the enclosed *Pleasant Bay Composite Nitrogen Management Analysis*. This analysis is submitted to the Board of Selectmen of each of the four member towns for consideration.

The purpose of this analysis is to show the combined effect of the four individual towns' wastewater/nitrogen management plans, when considered together, on nutrient management in Pleasant Bay and its watershed. The analysis shows that for the watershed as a whole, the town plans remove enough nitrogen to meet Total Maximum Daily Loads while achieving other wastewater-related town needs. However, on a sub-watershed basis, which is the scale at which nutrient management planning/implementation occurs, some gaps and overlaps have been identified. These gaps and overlaps in nitrogen management create opportunities for exploring cost efficiencies through nutrient trading and/or shared facilities or projects.

This analysis was prepared over the past fifteen months by the Alliance, with extensive input from each town's wastewater consultant, to ensure that information represented is

consistent with individual town plans. This analysis was also reviewed by the Cape Cod Commission and MassDEP. In the enclosed letter of comment, Cape Cod Commission Executive Director Paul Niedzwiecki has indicated that the analysis is a first step in meeting the requirements of a targeted watershed nutrient management plan called for under the Cape Cod 208 Plan, and for developing a watershed permit. Likewise, an enclosed letter from MassDEP Regional Director Millie Garcia-Serrano views the analysis as an appropriate way to optimize management of nitrogen and reduce overall costs, and invites the four towns to explore development of a watershed permit through a pilot project.

The analysis concludes with a series of recommended next steps to finalize the analysis and pursue opportunities to optimize nitrogen removal efforts across the watershed. At the discretion of each town, these next steps could lead to the development of a targeted watershed nutrient management plan and watershed permit. These steps should lead to streamlined regulatory review, and increased chances for enhanced project funding.

Over the coming months the Alliance, in concert with the Cape Cod Commission, MassDEP and Town Administrators and Managers from the Alliance towns will continue to pursue the next steps outlined in the analysis. These steps include: refining composite cost data, undertaking confirmatory estuary modeling, coordinating watershed-wide monitoring activities, exploring nitrogen trading in selected subwatersheds, and examining the potential for inter-municipal agreements that may be necessary for 208 plan compliance and possible watershed permitting. As each of these topics is explored and analyzed, additional information will be presented to the Board in greater detail to inform the Board's decisions about nitrogen management policies or projects.

We are requesting an opportunity to meet with you to discuss your comments and questions about the draft analysis and recommended next steps. Representatives from the Cape Cod Commission and MassDEP would also participate in the presentation. Carole Ridley, Alliance Coordinator, will follow up with your office regarding this request.

Cc: Chris Clark
Millie Garcia-Serrano, MassDEP
Brian Dudley, MassDEP
Paul Niedzwiecki, Cape Cod Commission
Dave Young, CDM Smith

3225 MAIN STREET • P.O. BOX 226
BARNSTABLE, MASSACHUSETTS 02630

(508) 362-3828 • Fax (508) 362-3136 • www.capecodcommission.org

CAPE COD
COMMISSION

March 16, 2017

Carole Ridley
Coordinator, Pleasant Bay Alliance
P.O. Box 1584
Harwich, MA 02645

Re: Pleasant Bay Composite Nitrogen Management Analysis

Dear Ms. Ridley,

I am writing with regard to the Pleasant Bay Composite Nitrogen Management Analysis, which illustrates the combined effect of the wastewater management plans developed individually by Brewster, Chatham, Harwich and Orleans on nutrient removal within the Pleasant Bay watershed. The Commission has been engaged with the efforts of the Pleasant Bay Alliance and its member communities to address Total Maximum Daily Loads and improve water quality.

As you know, the Commission was charged with developing an update to the Cape Cod Area Wide Water Quality Management Plan, pursuant to Section 208 of the Clean Water Act. The 208 Plan Update was certified and approved by the Commonwealth of Massachusetts and the Environmental Protection Agency in September 2015 and encourages communities to work together in shared watersheds. It provides a regulatory pathway for more efficiently and effectively achieving water quality goals through the development of Targeted Watershed Management Plans (TWMPs) that address nutrient remediation through a variety of approaches within a single watershed, as well as the issuance of watershed permits.

The Commission sees the analysis as a first step in meeting the requirements of a TWMP and for developing a watershed permit. To ensure effective communication and cooperation between the four Pleasant Bay communities, the Commission encourages the development of an inter-town memorandum of understanding that specifically outlines nutrient removal responsibilities and sets the stage for coordinated nutrient removal projects in the future.

I look forward to working with the Alliance and its member communities, as well as the MA Department of Environmental Protection on appropriate next steps.

Sincerely,

Paul Niedzwiecki
Executive Director

COUNTY OF BARNSTABLE • MASSACHUSETTS •

MassDEP
Commonwealth of Massachusetts
Executive Office of Energy & Environmental Affairs

Department of Environmental Protection

Southeast Regional Office • 20 Riverside Drive, Lakeville MA 02347 • 508-946-2700

Charles D. Baker
Governor

Karyn E. Polito
Lieutenant Governor

Matthew A. Beaton
Secretary

Martin Suuberg
Commissioner

March 30, 2017

Ms. Carole Ridley, Executive Director
Pleasant Bay Alliance
P.O. Box 1584
Harwich, Massachusetts

RE: Watershed Management Planning

Dear Ms. Ridley:

Over the past several months MassDEP has been actively engaged with the Pleasant Bay Alliance's (the "Alliance") and its member communities' efforts at developing a watershed wide nutrient management plan for Pleasant Bay. MassDEP has encouraged this approach as it offers opportunities for multi-town cooperation, realizes potential economies of scale in implementation strategies and addresses regional planning which is a core element of Cape Cod's 208 plan.

During the development of the plan, discussions among the Alliance, the Cape Cod Commission and MassDEP have also broached the possibility of a watershed permit for Pleasant Bay. As you know, MassDEP is currently in the process of developing guidelines and criteria for a watershed permit and would like to invite the Alliance to engage with us in a pilot program to test the draft guidance. This pilot program is entirely voluntary and would be useful in evaluating the efficacy and practicality of the proposed structure as well as identifying benefits and costs of a watershed permit. It would also provide an excellent opportunity for effectively coordinating the wastewater planning efforts of the Towns of Brewster, Chatham, Harwich and Orleans on watershed basis.

MassDEP believes that this effort would complement nicely the admirable work that the Alliance and the member towns have performed in advancing the concept of watershed planning and looks forward to working together with you on this approach.

If you have any questions, please feel free to contact Brian Dudley at (508)946-2814.

Very truly yours,

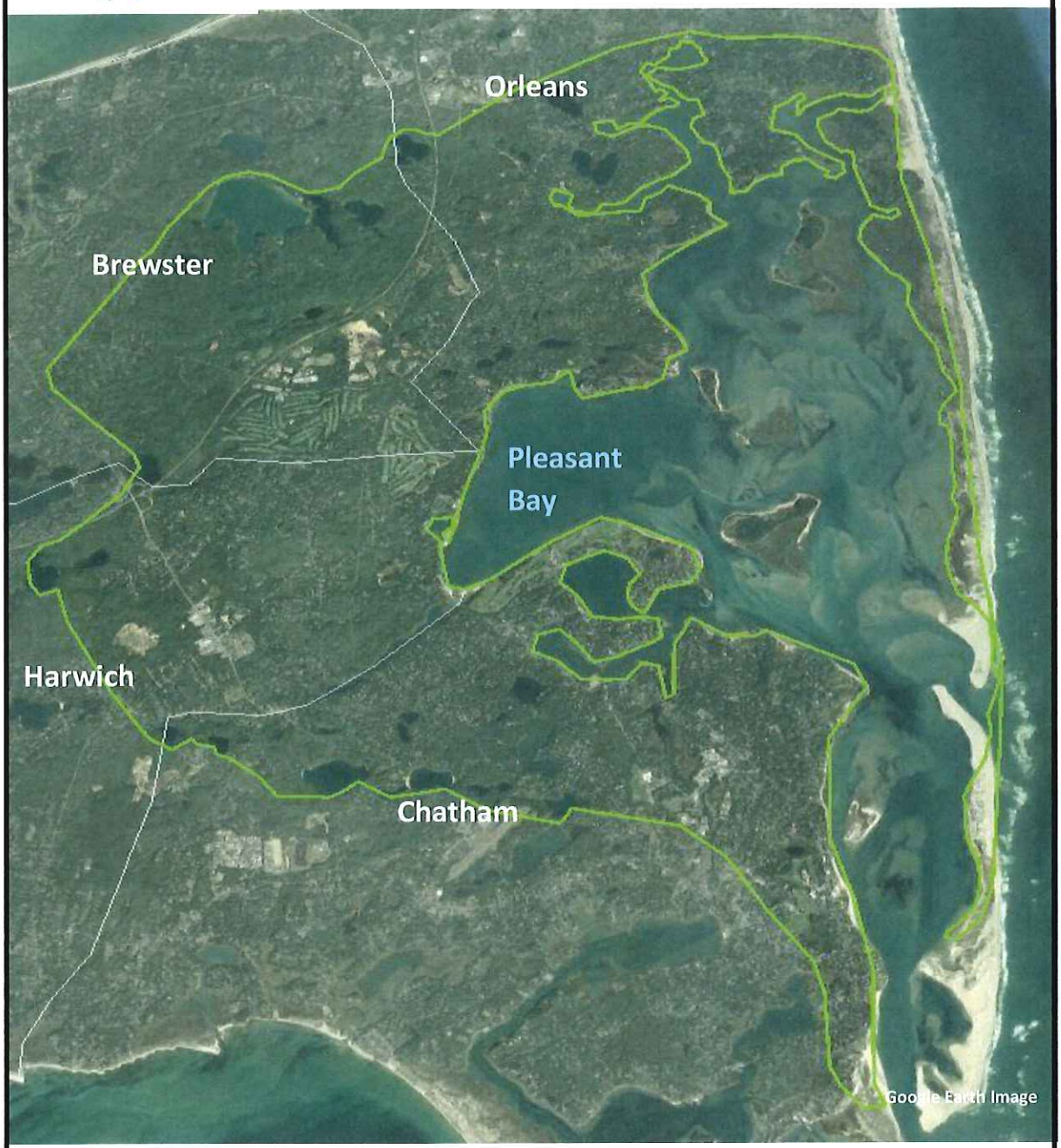
for

Millie Garcia-Serrano, Regional Director

ecc: DEP/Boston
Attn: Gary Moran

DEP/SERO
Attn: David Johnston
Brian Dudley

Pleasant Bay Alliance



PLEASANT BAY COMPOSITE NITROGEN MANAGEMENT ANALYSIS

An Assessment of the Wastewater and Nitrogen Management Plans of Brewster, Chatham, Harwich and Orleans

March 2017

PLEASANT BAY COMPOSITE NITROGEN MANAGEMENT ANALYSIS

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EXECUTIVE SUMMARY

The primary threat to the health of Pleasant Bay is nitrogen enrichment from watershed sources. For close to two decades, the Pleasant Bay Alliance (Alliance) has coordinated action among the four towns sharing the watershed of Pleasant Bay to address this concern. The Alliance's contributions to understanding and managing nutrient loading include establishing and sustaining a water quality monitoring program, and coordinating the bay-wide approach to the MEP Technical Analysis and development of TMDLs. The Alliance also generated the analysis that led to Chatham's and Harwich's decision to construct the Muddy Creek bridge, which is the first nutrient management project implemented in the Pleasant Bay watershed, and will significantly reduce the amount of sewering needed in the sub-watershed. The Alliance convenes a monthly Watershed Work Group that brings together town, state and county personnel involved in nutrient management. In addition, the Alliance monitors tide levels and conducts research on the geomorphology of the barrier beach and inlet system, which influence system-wide hydrodynamics and ecological conditions.

The *Pleasant Bay Resource Management Plan Update* approved by Town Meetings in each member town, and by the state, directs the Alliance to continue this work concerning watershed-based nutrient management. The Alliance has developed this composite nutrient management analysis in response to that charge.

The purpose of this composite analysis is to show the combined effect of four towns' wastewater management plans on nutrient removal within the Pleasant Bay watershed. With the benefit of this information, Brewster, Chatham, Harwich and Orleans may choose to modify their individual plans, pursue joint projects or enter into negotiations with each other to take advantage of efficiencies. This analysis has been vetted by Town staff and technical consultants, and submitted to the Cape Cod Commission and MassDEP for comment. This analysis is now presented to the four towns' Boards of Selectmen for consideration.

The town plans are designed to remove enough nitrogen to achieve published standards and address other wastewater-related town needs. Those published standards take the form of Total Maximum Daily Loads (TMDLs). (TMDLs have been set for several water quality parameters, the most significant of which is nitrogen. When the term TMDL is used in this report, it refers to nitrogen-based TMDLs.) System-wide, the amount of attenuated nitrogen load to be removed in order to meet TMDLs is 17,717 kg/yr, or 36% of the total load bay-wide. There are nineteen separate TMDLs in Pleasant Bay and the amount of removal needed varies in different subembayments, ranging from 0% removal in Crows Pond and Chatham Harbor, to 75% removal in Lower Muddy Creek and 83% removal in Meetinghouse Pond. These removals pertain to existing watershed load. It is understood that 100% of any future load from added development also needs to be removed.

Each town has agreed to remove nitrogen in proportion to its share of the current attenuated load. This approach is common to all four of the town plans and is the basis of this analysis. It should be formalized in an inter-town memorandum of understanding. There are seven subembayments where one town is solely responsible for load removal. In the remaining subembayments, two or more towns share load removal requirements.

Nearly three quarters of the required load removal is focused in six subembayments. There are six subembayments for which an individual town's load removal requirement exceeds 5% of the system-wide load reduction requirement. Combined, these subembayments account for 71% of the total load reduction requirement. These subembayments are Round Cove, Lower Muddy Creek, Ryder's Cove, Meetinghouse Pond, Pochet and Pleasant Bay/Little Pleasant Bay.

On a subwatershed basis, gaps and overages in nitrogen removal create opportunities for exploring cost efficiencies through nutrient trading and shared facilities. In eight subwatersheds, existing plan removals are slightly below the amount required to meet TMDLs. These differences are not significant enough to warrant plan modification, and could be met through adaptive management. In eight other subembayments, the amount of nitrogen removal exceeds the amount required to meet TMDLs. However, the performance of the town plans in meeting TMDLs could be affected by variable performance of non-traditional technologies, or additional wastewater flow from new development in the watershed.

Watershed wide, the four town plans provide a combination of traditional and non-traditional technologies (a so-called "hybrid approach'), with non-traditional technologies accounting for about 25% of the estimated removal system-wide. Individually, the plans differ in the degree to which they utilize traditional and non-traditional technologies. Non-traditional approaches make greater use of natural processes and their performance will vary due to environmental factors. For this reason, non-traditional approaches are subject to a regulatory requirement for a back-up traditional system in the event that the non-traditional approach does not function as predicted. Back-up is planned in some, but not all, subwatersheds in which non-traditional approaches are proposed.

In those subembayments where the nitrogen loads from more than one town must be reduced, costs savings may be realized through nitrogen trading. A watershed-wide approach may identify locations and technologies where one town removes more than its requirement and another town removes less, with payment of a negotiated amount to equal the costs. Such opportunities exist in the northerly headwaters subembayments shared by Brewster and Orleans, and in the Muddy Creek and Pleasant Bay subembayments shared by Chatham and Harwich.

The implementation of town plans will occur over several decades. Implementation has started with the Muddy Creek bridge and some non-traditional pilot projects. Sewering or further

measures are not scheduled to begin in the near future. In their implementation timelines, the towns have given relatively high priority to four of the six high-load sub-watersheds: Meetinghouse Pond, Muddy Creek Upper and Lower (Harwich) and Round Cove. The Pleasant Bay subembayment is designated as a high priority by Brewster and Harwich. It will be addressed in a later phases of the Chatham and the Orleans plans (although nitrogen removals in the headwaters embayments will have an indirect positive impact on Pleasant Bay). However, Pochet, which accounts for nearly 9% of the total load reduction requirement, is not scheduled for early implementation by Orleans.

Appropriate next steps are identified at the end of this report. They are aimed at taking advantage of cost efficiencies, ensuring enhanced funding, developing a Targeted Watershed Management Plan, undertaking confirmatory estuary modeling, preparing for inter-municipal agreements, ensuring consistency with the 208 Plan Update, and preparing for a possible Watershed Permit.

1.0 PURPOSE

Water quality in Pleasant Bay is impacted by watershed inputs form activities in four towns: Brewster, Chatham, Harwich and Orleans. Each town has formulated a plan for reducing the nitrogen loads that are the primary cause for water quality problems. Each town plan addresses multiple watersheds and accounts for a variety of town-wide needs and priorities. It is the purpose of this composite analysis to:

- compile the portions of the four town plans that deal specifically with the Pleasant Bay watershed,
- compare the proposed town-by-town nitrogen removals against the Total Maximum Daily Loads (TMDLs) for Pleasant Bay,
- identify gaps and overlaps in the collective plans for nitrogen removal,
- identify actions that may be helpful in improving the cost-effectiveness of the combined plans, and
- provide the foundation for developing a Targeted Watershed Management Plan for Pleasant Bay consistent with the 208 Plan Update and subsequent guidance prepared by the Cape Cod Commission, and for determining the applicability of watershed permitting.

This analysis is presented to the four towns' Boards of Selectmen for consideration. With the benefit of this information, each town may choose to modify its plan, pursue joint projects or enter into negotiations with one or more towns to take advantage of efficiencies. Such actions can easily be accommodated within the long implementation periods associated with each town plan.

2.0 DATA SOURCES AND METHODS

This analysis incorporates information from the Pleasant Bay portion of each town's wastewater management plan as of November 2016. The nutrient loading and load reduction information is based on the analyses generated by the Massachusetts Estuaries Project (MEP), as modified by engineering analyses provided in the individual town plans and vetted by each member community. Drafts of this report have been reviewed by each towns' representative on the Pleasant Bay Alliance's Watershed Work Group and by each town's wastewater consultant. Drafts of this report were also submitted to the Cape Cod Commission and MassDEP for comment.

As watershed-based analysis of the four town plans continues, use of watershed decision support tools available through the Cape Cod Commission may be advisable to facilitate consideration of updated land use information and nitrogen load estimates.

Numerous reports have been published related to the nature and extent of the nitrogen loading problem and proposals to reduce that loading. The most pertinent documents are listed in Table A-1 In Appendix A.

3.0 BACKGROUND

Pleasant Bay is the largest coastal embayment on Cape Cod. The Pleasant Bay system is state-designated as Outstanding Resource Waters and an Area of Critical Environmental Concern. According to the Cape Cod Commission, the water surface of the Bay covers nearly 6,200 acres and approximately 11,800 acres of land surface are within the watershed.

For modeling purposes, the system as a whole consists of 19 separate subembayments (e.g., Round Cove, Meetinghouse Pond, Crows Pond, etc.), each of which has a TMDL for total nitrogen. The land area contributing groundwater and, thus, nitrogen load to each subembayment is delineated as a separate subwatershed.

MEP studies have determined that the water quality in most Pleasant Bay subembayments is moderately or significantly impaired. Nitrogen has been identified as the principal contaminant, from the following controllable sources:

- Septic systems 75%
- Stormwater runoff 9%
- Lawn and golf course fertilization 16%

The MEP has determined that 36% of the current attenuated watershed nitrogen load bay-wide must be removed to restore water quality. Individual subembayments have nitrogen removal needs

ranging from 0% to 83%. Each of the four towns in the Pleasant Bay watershed has developed plans for nitrogen removal, and those plans are in varying stages of implementation.

4.0 NITROGEN LOADS AND REMOVAL REQUIREMENTS

Groundwater modeling performed as part of the MEP studies allows the Pleasant Bay watershed and individual subwatersheds to be delineated. The TMDLs were set for 19 individual subembayments and for the system as a whole. The watersheds to those 19 subembayments have been aggregated to 18 for this report, as shown in Figure 1. (That aggregation was necessary because the 2007 town-by-town allocation of existing loads was conducted for all individual subembayments except for the Pleasant Bay and Little Pleasant Bay subembayments. For the purposes of this report, these two subembayments were combined into one subembayment called "Pleasant Bay.")

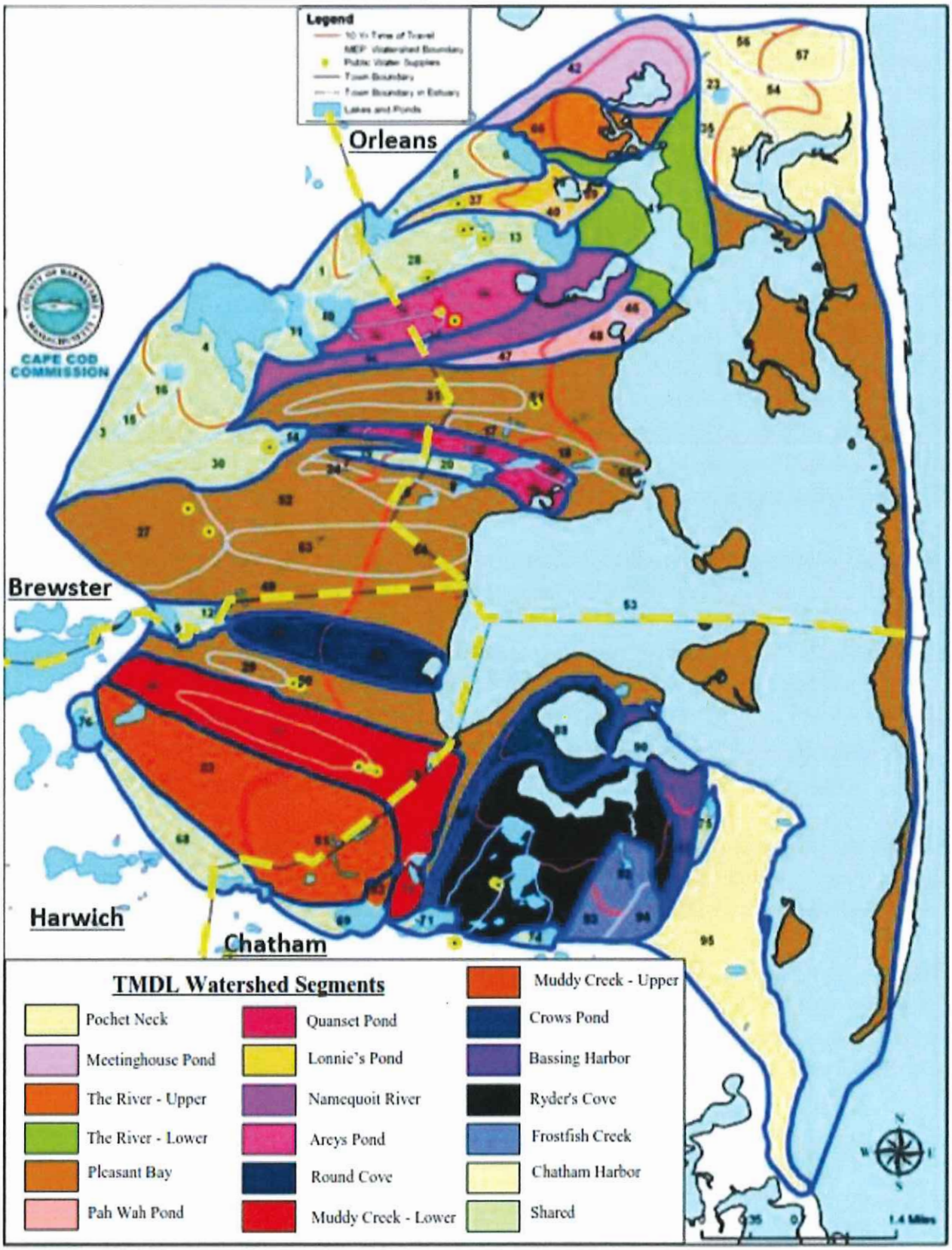
The MEP Technical Report presents estimates of nitrogen loads originating both within the watershed, as well as within the embayment. The "watershed loads" generally include nitrogen from septic systems; lawn, golf course and cranberry bog fertilization; and stormwater runoff. The watershed loads are considered "locally controllable" and it is those loads that are addressed in town plans and reported here. Loads that occur in the embayment, including atmospheric deposition and benthic release, are not considered to be locally controllable and, therefore, are not addressed in town plans or in this analysis.

The MEP studies also quantify the natural attenuation that reduces watershed loads once they reach the groundwater and flow toward the embayment. When nitrogen loads pass through multiple attenuation sites (bogs, streams, ponds), significant natural nitrogen removal can occur that must be accounted for. Over the entire Pleasant Bay system, natural processes reduce the unattenuated load by about 11%:

Overall unattenuated watershed load	54,500 kg/yr
Less natural attenuation	-6,000 kg/yr
Attenuated load	48,500 kg/yr

Table A-2 summarizes the unattenuated and attenuated loads coming from each town to each of the 18 subembayments in the Pleasant Bay system. On a percent-of-unattenuated-load basis, the greatest natural attenuation occurs in Brewster in the watersheds it shares with Orleans, and in the Muddy Creek watershed shared by Chatham and Harwich.

Figure 1. Location of Pleasant Bay Subembayments



Based on the ecological health of each subembayment, specifically the degree of water quality impairment, the MEP estimated the threshold loads (TMDLs) of nitrogen above which ecological impairment occurs. The difference between the actual load and the threshold load or TMDL is the amount of nitrogen that must be removed to restore water quality. Table A-3 summarizes the amount of nitrogen that must be removed in each of the 18 subembayments. The aggregate attenuated nitrogen load to be removed in order to meet TMDLs is 17,717 kg/yr.

5.0 ALLOCATION OF RESPONSIBILITY FOR NITROGEN LOAD REMOVALS

There needs to be some equitable assignment of responsibility for removal of the excess nitrogen loads in the watershed. Each of the four towns has developed its nitrogen management plan on the premise that its responsibility for nitrogen removal is proportional to its current attenuated nitrogen load. For example, 79% of the current attenuated nitrogen load to the Areys Pond subembayment comes from Orleans, so Orleans has assumed that it should remove 79% of the nitrogen over the threshold load. This approach is the one now recommended by the Cape Cod Commission in the 208 Plan Update and this approach is endorsed by DEP.

Table A-3 applies that approach to load removal to the 18 Pleasant Bay subembayments. In the aggregate, the town responsibilities for removal of attenuated nitrogen load are:

Brewster	2,262 kg/yr (13% of total removal responsibility)
Chatham	4,076 kg/yr (23% of total removal responsibility)
Harwich	4,399 kg/yr (25% of total removal responsibility)
Orleans	6,980 kg/yr (39% of total removal responsibility)
Total	17,717 kg/yr (100% of total removal responsibility)

Orleans has the largest load removal responsibility because the subembayments it impacts are the most impaired, overall. Chatham has the largest attenuated nitrogen load, but significant portions of that load are tributary to subembayments with no impairment (such as Chatham Harbor).

Table 1 presents the annual nitrogen load removals allocated to each town and to each subembayment. The blue-shaded cells in Table 1 are those where the nitrogen removal requirement exceeds 5% of the overall 17,717 kg/yr (886 kg/yr). Those eight shaded cells cover six subembayments and represent 71% of the total removal requirement Bay-wide. They are:

Meetinghouse Pond—Orleans
Round Cove—Harwich
Lower Muddy Creek—Harwich
Ryder's Cove—Chatham

Table 1. Nitrogen Removal Requirements by Town and by Subembayment (kg/yr)

Subembayment	Brewster	Chatham	Harwich	Orleans	Total
Meetinghouse Pond				1,876	1,876
Town Percent of Total Removal				100%	100%
Lonnies Pond	14			284	298
Town Percent of Total Removal	5%			95%	100%
Areys Pond	29			113	142
Town Percent of Total Removal	20%			80%	100%
The River - Upper	3			375	378
Town Percent of Total Removal	1%			99%	100%
The River - Lower	6			518	524
Town Percent of Total Removal	1%			99%	100%
Namequoit River	19			348	367
Town Percent of Total Removal	5%			95%	100%
Paw Wah Pond				413	413
Town Percent of Total Removal				100%	100%
Quanset Pond	29			227	256
Town Percent of Total Removal	11%			89%	100%
Round Cove	1		1,209		1,210
Town Percent of Total Removal	0.1%		99.9%		100%
Muddy Creek Upper		193	584		777
Town Percent of Total Removal		25%	75%		100%
Muddy Creek Lower		584	986		1,570
Town Percent of Total Removal		37%	63%		100%
Ryder's Cove		1,954			1,954
Town Percent of Total Removal		100%			100%
Crows Pond		0			0
Town Percent of Total Removal		-			-
Bassing Harbor		0			0
Town Percent of Total Removal		-			-
Frost Fish Creek		803			803
Town Percent of Total Removal		100%			100%
Pochet				1,569	1,569
Town Percent of Total Removal				100%	100%
Pleasant Bay (including Little Pleasant Bay)	2,161	542	1,620	1,257	5,580
Town Percent of Total Removal	39%	10%	29%	22%	100%
Chatham Harbor		0			0
Town Percent of Total Removal		-			-
Total (All Subembayments)	2,262	4,076	4,399	6,980	17,717
Town Percent of Total Removal	13%	23%	25%	39%	100%

Notes:

1. Blue shading denotes entries that are greater than 5% of total (more than 886 kg/yr).
2. Blue shaded entries account for 71% of overall requirement.
3. See Table A-2 and A-3 in Appendix A for derivation of load removal requirements.

Pochet—Orleans
Pleasant Bay (Main and Little Pleasant Bay)—Brewster, Harwich and Orleans

These high-load areas represent 48% (Chatham) to 96% (Brewster) of the individual town's overall responsibility.

6.0 DESCRIPTION OF TOWN PLANS FOR PLEASANT BAY

The town plans all provide significant details on the planning approaches taken and related findings and recommendations. Town-provided summaries of each plan, as they relate to Pleasant Bay, are presented in Appendix B.

7.0 COMPARISON OF TOWN PLANS WITH REMOVAL REQUIREMENTS

The four town plans were analyzed to determine the nitrogen load removals that should occur once those plans are implemented. Tables A-4 and A-5 compare the town-planned removals with the removal requirements derived from the TMDLs for each subembayment. Table 2 summarizes those tables for the entire Pleasant Bay system. The orange-shaded cells are those locations where the planned nitrogen removal is less than the TMDL requirements. The green-shaded cells are those locations where the town plans will remove more nitrogen than required by the TMDLs. Figure 2 graphically compares the planned removals with the TMDL requirements. Table 2 leads to the following key findings:

- In 10 subembayments, the town plans collectively achieve removals that are very close to those dictated by the TMDLs. In these places, all planned removals are within 5% of the removal need. Such minor differences are easily addressed through adaptive management.

- In six subembayments impacted by Chatham, the removals will be significantly in excess of the need. This reflects the fact that Chatman plans to install sewers town-wide, for multiple reasons beyond just nitrogen removal. Chatham will remove significant nitrogen loads in the watersheds of Crows Pond, Bassing Harbor and Chatham Harbor, where no removal is needed, and removals will exceed the TMDL requirements in Muddy Creek, Ryder's Cove and the Pleasant Bay subembayment.

Although no nitrogen removal is required in the Crows Pond, Bassing Harbor and Chatham Harbor subembayments, the proposed removals will have a positive impact on the system as a whole.

Table 2. Comparison of Town Plans with Watershed Load Removal Requirements

	Brewster	Chatham	Harwich	Orleans	TOTAL
Nitrogen Load Removal Requirement, kg/yr	2,262	4,076	4,399	6,980	17,717
Nitrogen Removal Included in Town Plan, kg/yr	1,871	13,058	4,540	6,974	26,442
Load Removal in Excess of TMDL, kg/yr	-	8,982	141	-	9,123
Load Removal Below TMDL, kg/yr	390	-	-	7	397
Load Removal Compared with TMDL	-17%	220%	3%	-0.1%	49%

Figure 2. Comparison of Nitrogen Removal Requirements and Town Plans

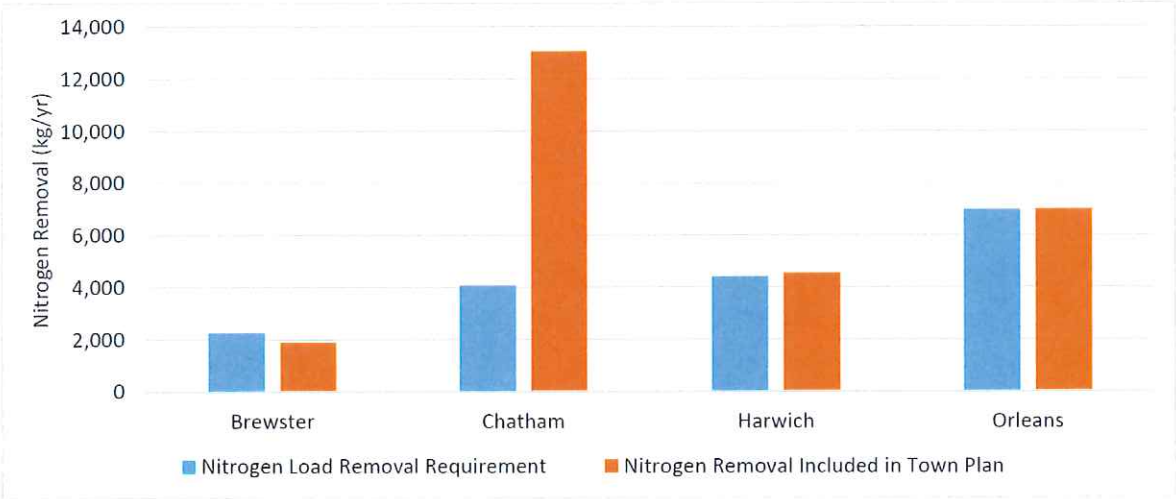


Table 2 shows that Brewster's plan will remove 390 kg/yr less than required by the TMDLs. A significant portion of that "shortfall" is a result of the construction of the Muddy Creek bridge which has shifted nitrogen load downstream into the main Pleasant Bay subembayment, where Brewster is responsible for a certain share of its removal. This anomaly could be addressed in future discussions on allocation of responsibilities among the towns.

This analysis of the town plans reveals a difference in how fertilizer loads are handled. Orleans is basing its plan on a 25% reduction in residential fertilizer nitrogen loads, consistent with direction provided by the Cape Cod Commission. Brewster is including 50% residential fertilizer reduction

as part of its plan. Chatham and Harwich intend to implement fertilizer control programs, but their nitrogen management plans do not explicitly take credit for that removal. Further, there has been differing interpretation of the fertilizer nitrogen loads determined from the MEP technical reports. Tables presented in this analysis include a uniform 25% reduction in residential fertilizer load for all towns, based on a consistent interpretation of the unattenuated fertilizer loads reported in the MEP documents. Brewster's plan also includes 100% of the documented reduction in fertilizer use at the Captains Golf Course.

8.0 USE OF NON-TRADITIONAL TECHNOLOGIES

Table 3 summarizes each town's choice of technology for load reduction and the associated load to be removed under existing conditions. Individually, the plans differ in the degree to which they utilize traditional and non-traditional technologies. However, the combination of the four town plans provides a hybrid approach watershed wide, with non-traditional technologies accounting for about 25% of the estimated removal system-wide. The system-wide removal is comprised of 72% sewering, 7% fertilizer reductions, and 21% other non-traditional methods.

In developing their respective nitrogen management plans, each of the four towns has gone through a thorough assessment of alternative approaches to meeting nutrient reduction targets through an extensive public engagement process. The resulting plans represent community consensus on nitrogen management approaches, in view of competing municipal needs.

Table 3 shows two types of nitrogen removal strategies: "source control" and "remediation". Source control approaches, such as traditional sewering, prevent the nitrogen from reaching the environment. In contrast, remediation approaches address the nitrogen once it is in the groundwater or in the embayment to be protected. Remediation techniques, also referred to as non-traditional approaches, rely on natural processes and their performance will vary due to environmental factors. For this reason, non-traditional approaches are subject to a regulatory requirement for traditional back-up in the event that the non-traditional measures do not function as predicted. Table 3 includes fertilizer reduction strategies as source control measures; those strategies have not been historically used to meet TMDLs and their efficacy is more difficult to document than sewering.

Remediation or non-traditional approaches will be piloted and monitored by the towns to determine the effectiveness and the appropriate degree of application of these approaches Within an adaptive management program. Table 3 shows how the load reduction expected through remediation is somewhat different from that associated with non-traditional technologies

Table 3. Summary of Towns' Nitrogen Removal Plans by Technology

	Brewster	Chatham	Harwich	Orleans	Total
Town-Planned Removal of Attenuated Nitrogen Load, Kg/yr					
Source Control					
Sewering	0	12,812	4,340	2,014	19,166
Residential Fertilizer Reduction	121	247	200	241	809
Golf Course Fertilizer Reduction	930	0	0	0	930
On-site Denitrifying Systems	590	0	0	1,709	2,299
Remediation					
Coastal Habitat Restoration	0	0	0	1,805	1,805
Permeable Reactive Barriers	0	0	0	322	322
Fertigation at Golf Courses	230	0	0	0	230
Shellfish Propagation	0	0	0	883	883
Total	1,871	13,059	4,540	6,974	**26,444**
Source Control vs. Remediation					
Source Control Subtotal, kg/yr	1,641	13,059	4,540	3,964	23,204
Remediation Subtotal, kg/yr	230	0	0	3,010	3,240
Percent Remediation Technologies	12%	0%	0%	43%	**12%**
Traditional vs. Non-Traditional					
Traditional Subtotal, kg/yr	930	12,812	4,340	2,014	20,096
Non-traditional Subtotal, kg/yr	941	247	200	4,960	6,348
Percent Non-traditional Tech.	50%	2%	4%	71%	**24%**

Notes:

1. Traditional technologies include sewering and golf course fertilizer reductions. All other technologies and approaches are considered non-traditional.
2. Brewster is currently evaluating on-site denitrifying systems, and small shellfish propagation options for meeting the town's nitrogen reduction requirement. If the use of denitrifying systems is adopted by Brewster, they will be developed in sufficient numbers to meet the TMDLs under current and build-out conditions and to provide an appropriate margin of safety.
3. Orleans' load removal plan is evolving as its Amended CWMP is being prepared.

9.0 MANAGING GROWTH

This analysis focuses on the existing nitrogen loads to Pleasant Bay, without regard to potential future growth in the watershed. Nonetheless, it is important to remember the two-part requirement for nitrogen control when existing loads exceed thresholds:

- Reduce current bay-wide nitrogen loads by 36% to bring those loads below the thresholds.
- Control 100% of all future loads to ensure that loads always stay below the thresholds.

Failure to control nitrogen load increases in sensitive watersheds can negate actions to reduce current loads. The longer the implementation period for initial nitrogen removal activities, the more likely that growth will negate that progress.

A review of the towns' plans has identified the increases in wastewater flow or nitrogen load assumed to occur through build-out or other planning horizon. These growth percentages range from 22% in the Orleans CWMP to 40% in the Harwich CWMP. In the aggregate, the towns' plans include growth allowances that are about 30% of the existing loads,. Since 100% of "new" nitrogen loads must be controlled in nitrogen-sensitive watersheds, a 30% growth in loads translates to an 80% increase in the loads that must be removed. Therefore, the long-term viability of a town's nitrogen removal plan is very dependent on that town's ability to implement future phases in a timely fashion to keep pace with growth.

There is no accepted uniform method of conducting build-out analyses, and a great deal of judgement is involved. This makes it difficult to compare projections developed by the towns, or for the towns in the MEP evaluations.

It is difficult to predict the extent and location of growth within the Pleasant Bay watershed. Each town should set a reasonable planning horizon, estimate the associated growth in watershed nitrogen load, and have a well-thought-out adaptive management plan to deal with that growth or with differing circumstances that actually play out.

Tools are available to control nitrogen loads from new development and redevelopment. Some of those tools can assist in addressing existing loads. Each town should adopt the appropriate nitrogen load management tools to specifically address new nitrogen loads from growth within the watershed.

Zero-percent State Revolving Loan Fund (SRF) funding is available from MassDEP for nutrient management projects that include plans to manage nitrogen load increases, including flow-neutral regulations. To the extent that zero-percent funding is crucial to the implementation of costly projects, the towns should be taking whatever actions are necessary to secure that funding. Chatham has a flow-neutral regulation and the Orleans CWMP includes an early draft. Harwich, which has the highest growth allowance in its plan, should be particularly aggressive in ensuring that growth does not negate early nitrogen removals or jeopardize enhanced funding.

10.0 COSTS

This analysis includes an assessment of town-provided cost estimates for Pleasant-Bay-related infrastructure and programs. That assessment is under development. Estimates prepared by the towns show comparable costs per pound of nitrogen removed for traditional technologies. Costs

for non-traditional approaches are still being developed and potential savings may not be clearly identified until extensive demonstration projects are complete. Once costs are more fully established, a composite cost analysis will be provided.

11.0 IMPLEMENTATION SCHEDULES

The four towns are in varying stages of implementation of their nitrogen management plans; see Figure 3.

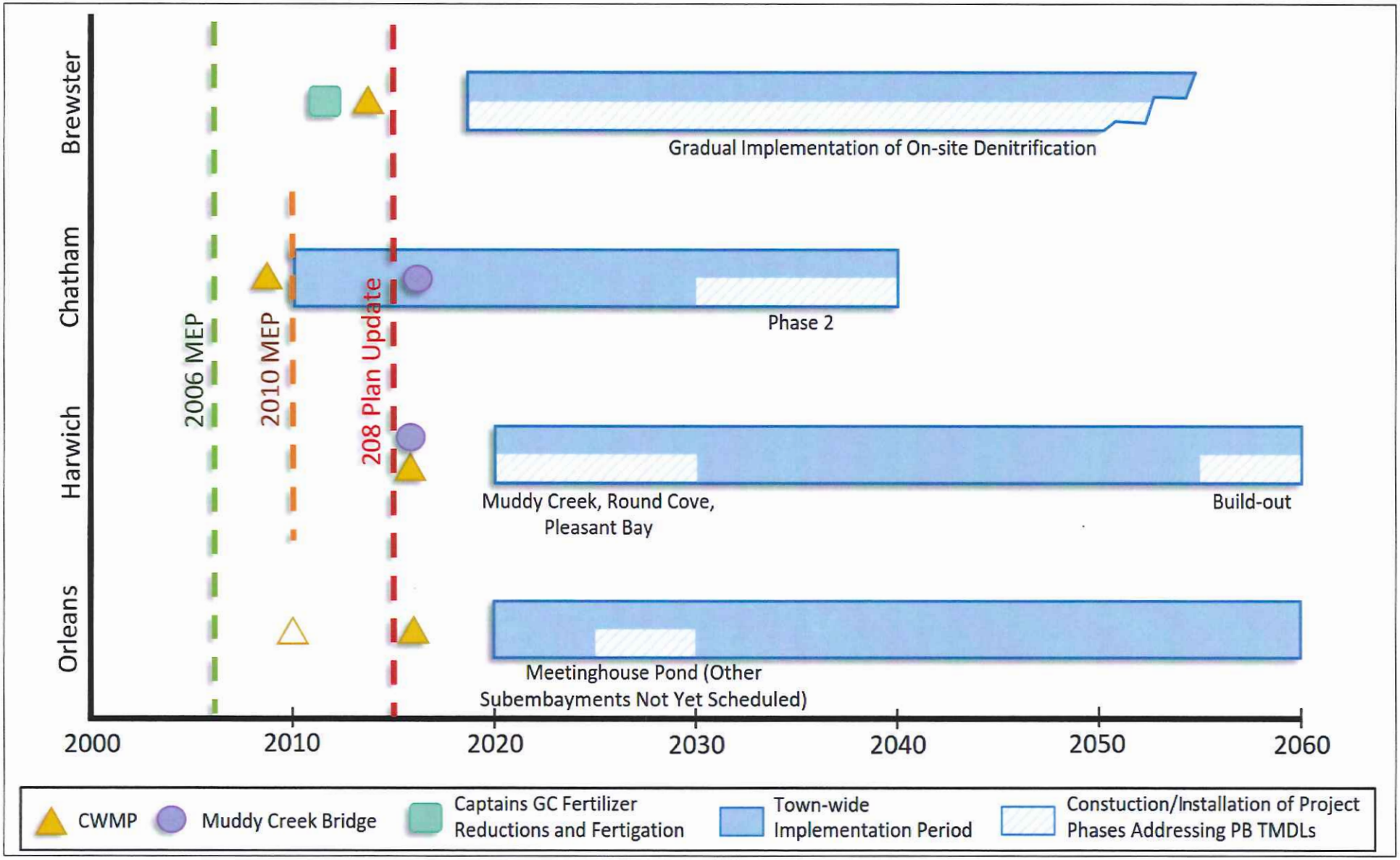
The fertilizer reductions that are a major part Brewster's plan have been implemented. Chatham and Harwich have jointly completed the Muddy Creek Restoration Bridge Project. Chatham has constructed a new, expanded state-of-the-art wastewater treatment plant and begun expansion of its collection system, and is in a position to begin sewering Pleasant Bay sub-watersheds. Orleans has embarked on a pilot project for nitrogen removal from Lonnies Pond (shellfish propagation) and is developing one for Quanset Pond (shellfish).

Figure 3 shows the plan implementation periods set forth in each town's plans. Chatham's plan is expected to cover 30 years (with the first 20 years focusing on subembayments with TMDLs), and Harwich's plan will take 40 years. The original 18-year program contained in the Orleans CWMP will be extended to 30 to 40 years in the Amended CWMP. Brewster's plan is open-ended. Figure 3 shows the expected periods of construction/installation of nitrogen removal measures. Actual reductions in nitrogen concentrations within the embayments will occur sometime after implementation of the control measures, particularly for source control measures implemented far from the shoreline.

The towns have designated the Pleasant Bay subembayments that will be addressed first in their plans. Table 1 highlights the six subembayments where 71% of the load removal is required. Figure 3 shows that the towns have given relatively high priority to five of those sub-watersheds including Meetinghouse Pond, Muddy Creek Upper and Lower (Harwich) and Round Cove. The Pleasant Bay subembayment is designated as a high priority by Brewster and Harwich. It will be addressed in later phases of the Chatham plan and the Orleans plan (although nitrogen removals in the headwaters embayments will have an indirect positive impact on Pleasant Bay.) Pochet, which accounts for nearly 9% of the total load reduction requirement, is not scheduled for early implementation by Orleans.

The implementation periods shown in Figure 3 for Chatham and Harwich are essentially as published in each town's CWMP. The plans of Brewster and Orleans are still being developed and Figure 3 shows the current thinking of each town's wastewater planning representatives. Many factors will influence actual implementation steps; Figure 3 represents the best available information as of November 2016.

Figure 3. Town Implementation Schedules



12.0 OPPORTUNITIES FOR NITROGEN TRADING

Looking at the Pleasant Bay watershed in its entirety, one can identify the most cost-effective locations for nitrogen load removal. The nitrogen removed at those optimum locations will not necessarily match the towns' responsibilities for TMDL compliance. That is, without a watershed-wide approach, one or more of the towns in a shared subwatershed may implement projects that are not as cost-effective as projects in other towns. That problem can be overcome through nitrogen trading, in which the town with the low-cost options removes more nitrogen than it is responsible for and another town removes less. The second town pays the first town for the "extra' nitrogen load that is removed on its behalf.

While the cost of nitrogen removal is a key factor in determining the "optimal" approach, other considerations are important as well. One must also consider the location of the removal in the watershed, because options that remove nitrogen along the shore or in the water body are preferred over those that remove nitrogen high in the watershed. Nitrogen removals upgradient of natural attenuation locations are not as favored as those downgradient of those locations.

Nitrogen trading should be considered between Brewster and Orleans in the headwaters subembayments at the north end of Pleasant Bay. In six shared subembayments (Lonnies Pond, Areys Pond, the Upper and Lower River, Namequoit River and Quanset Pond), Brewster is responsible for 5% of the nitrogen removal and Orleans for 95%. Brewster's raw loads are attenuated by 71% before reaching receiving waters, so removing 100 kg in Brewster reduces the load to the receiving waters by only 29 kg. It is likely that the most cost-effective solution is for Orleans to remove all of the load necessary for TMDL compliance, with Brewster paying Orleans 5% of Orleans' cost.

Nitrogen trading should also be considered between Chatham and Harwich in the Muddy Creek and Pleasant Bay subwatersheds. Chatham intends to remove all of its septic load in the Pleasant Bay watershed as part of a town-wide sewering program that is aimed at more than just nitrogen removal. In these three subembayments, Chatham's plan would remove 1,240 kg/yr more than required to meet the TMDL. This "over removal" is equivalent to about 40% of Harwich's responsibility in these subembayments. By nitrogen trading, Harwich could pay Chatham and avoid significant infrastructure.

An important consideration in nitrogen trading is the location of the nitrogen to be removed. Once specific trading scenarios are identified, it will be necessary run the MEP model to be sure that relocation of the removal still allows water quality goals to be met.

The actual cost paid for nitrogen trading would be determined through negotiations between the participating towns, and would likely fall somewhere between the cost avoided by the "buyer" and the incremental cost incurred by the "seller".

13.0 MONITORING AND ADAPTIVE MANAGEMENT

Pleasant Bay has an extensive database and ongoing monitoring to assess changes in ecological conditions resulting from implementation measures. Per MEP guidance, the focus of monitoring efforts is on water column nitrogen and dissolved oxygen concentrations, eelgrass coverage and vitality, and benthic infauna health and diversity.

Water column concentrations – The Alliance's Water Quality Monitoring Program recently completed its 17th monitoring season. Monitoring occurs at 24 station locations selected to track TMDL compliance. A MassDEP-approved Quality Assurance Project Plan (QAPP) is in place and includes the following parameters: nitrogen (DON, PON, DIN, TON, TN), oxygen, temperature, salinity, and phytoplankton pigments. Sample collection occurs five times annually from July through September. Data are analyzed by the UMASS Dartmouth School for Marine Science and Technology (SMAST) and reported to the Alliance. The Alliance issues periodic reports with basic statistics, and conducts in-depth statistical trend assessments on a five-year basis. The statistical trend assessments were further evaluated by SMAST to discern the ecological implications of any statistically significant trends. The Alliance monitoring program is funded annually by the towns and will continue.

Eelgrass coverage – The MEP relied on eelgrass coverage reported by the MassDEP Eelgrass Mapping Project. The project conducted mapping using aerial imagery and field verification methods. Data are available for the following years: 1994, 2001, 2006, 2010 and 2012. The schedule and extent of future mapping to be conducted by the program needs to be identified, to determine whether additional data collection will be necessary to monitor future changes in Pleasant Bay eelgrass beds.

Benthic infauna – The MEP conducted quantitative sediment sampling in 2000 for benthic animals at 34 locations throughout the Bay. Species number and individual counts were assessed for diversity and evenness and compared to findings developed by SMAST over the past 30 years based on measurements in other Cape Cod estuaries. In 2008 MEP conducted a more detailed estimate of Muddy Creek that included collection of benthic infauna at six locations. In 2014, the Provincetown Center for Coastal Studies (PCCS) collected benthic infauna samples at all MEP locations except Muddy Creek. This effort was undertaken in concert with a benthic mapping project for the Cape Cod National Seashore. The results of this PCCS study are not yet available.

Recently the Alliance asked SMAST to assess the water quality, eelgrass, and benthic infauna data needed for assessing ecological health in Pleasant Bay through updated MEP modeling. The Alliance proposes to review the data needs for modeling with its member towns through the Watershed Work Group. Based on this review, the Alliance may recommend that the towns pursue joint actions to update data on a cost-effective watershed basis.

In addition, it should be noted that individual towns are developing monitoring programs tailored to pilot projects for non-traditional technologies. For example:

- Orleans worked with SMAST to develop a monitoring program for an oyster growing pilot project in Lonnies Pond;
- Brewster has installed groundwater test wells at several locations (mostly around Captains Golf Course) to track impacts of fertilizer reductions;
- Chatham and Harwich are undertaking bacterial and nitrogen-related water quality monitoring to evaluate changes in water quality resulting from the Muddy Creek Restoration Bridge Project.

Each town's plan incorporates adaptive management to allow monitoring results to direct or redirect implementation measures.

14.0 ANNUAL PROGRESS REPORTING

The ultimate TMDL compliance point is the restoration of habitat (eelgrass or benthic infauna); a town is not in compliance with the federal Clean Water Act until watershed nitrogen loads have been reduced to the point where that habitat is restored. A difficult regulatory issue is the travel time of nitrogen in the groundwater and the uncertainties associated with estimating how a reduction in watershed load will impact water-column nitrogen concentrations and how that reduction will lead to habitat restoration. Complicating the issue is the fact that the watersheds of most impacted embayments span multiple towns which may be proceeding with nitrogen control on different schedules and at different paces. Achievement of the nitrogen load reductions implicit in the TMDLs is the only substantive mechanism for compliance over the short term.

Towns will be well served to document implementation steps annually to provide assurances to regulatory agencies, inform the public and allow coordination with other towns. Such documentation would give each town the assurance that other towns are acting toward the common goals and help inform each town's adaptive management plan.

The Alliance's Watershed Work Group could develop a standardized reporting form that each town would complete by the end of each January documenting key information from the previous year. The Watershed Work Group would then compile the data to produce a composite report by

the end of each February. One important component of the proposed annual report would be an update of towns' water use by sub-embayment as a tool to judge changes in watershed nitrogen loads. Other information could include:

- The status of all of its activities called for in the CWMP;
- A spreadsheet-based estimate of the nitrogen load removals accomplished to date;
- The results of the water quality monitoring program conducted during the year;
- The results of habitat assessments (may not be done every year);
- Documentation of the capital expenditures that have been made and that are expected over the upcoming five years, from the town's Capital Improvement Plan;
- Progress made on non-structural elements of the CWMP; and
- Proposed changes in implementation (such as acceleration or delay of upcoming segments).

All of this information is critical input to the towns' adaptive management plans.

15.0 CONSISTENCY WITH 208 PLAN UPDATE

Pleasant Bay has been identified by the Cape Cod Commission as a priority watershed for the development of a Targeted Watershed Nutrient Management Plan (TWMP) by mid 2017. Among the purposes of the TWMP is to demonstrate consistency with the 208 Plan Update and provide a basis for future watershed permitting of non-traditional technologies.

Specific guidance on the requirements for 208 Plan consistency is anticipated from the Cape Cod Commission. The consistency requirements initially described at the June 2016 One Cape Conference are listed below, with notation of how the four Pleasant Bay towns are meeting this requirement:

- **Towns accept responsibility for their controllable loads** – As noted above, town plans assume responsibility for removing their proportional share of attenuated nitrogen load reduction necessary to achieve the TMDL based on the town's contribution of attenuated load.
- **Plans meet targets (TMDLs)** – The composite analysis shows that TMDLs will be met.
- **Towns plan a hybrid approach at a watershed level** – The composite analysis shows that the individual town plans vary in the degree to which they employ non-traditional technologies. The composite of plans demonstrates a hybrid approach on a watershed basis, with 71% reduction coming from traditional technologies, 23% non-traditional technologies, and 6% fertilizer reduction.

- **Public engagement has occurred**– Each town plan has undergone extensive community review and vetting, as detailed in the respective plans.
- **Growth management strategy** – Each town plan includes assumptions about growth in watershed nitrogen loads; however, greater detail is needed to ensure that future phases are implemented in a timely fashion to keep pace with growth.
- **Monitoring programs are planned** – The Alliance has extensive baseline data on water quality, eelgrass and benthic infauna, and an ongoing water quality monitoring program. Each town has instituted monitoring protocols for specific pilot projects and initial efforts, and each town plan incorporates adaptive management to adjust implementation based on monitoring results.
- **Plans include adaptive management and 5-yr consistency check-ins** – All town plans incorporate adaptive management programs.
- **Plans include evidence of collaboration and propose shared solutions** – The four towns have collaborated in addressing nutrient management issues in Pleasant Bay through the Pleasant Bay Alliance. Initial collaboration led to the watershed-wide MEP analysis. Coordination continues in the implementation stage. Chatham and Harwich have coordinated in constructing the Muddy Creek Restoration Bridge Project and are negotiating an IMA for shared treatment and effluent disposal. This composite analysis identifies other areas where joint action among the towns could be pursued such as nitrogen trading.

This composite analysis is intended to help demonstrate the four towns' progress in meeting the requirements for 208 consistency, and lays the foundation for a future TWMP.

16.0 PREPARING FOR A POSSIBLE FUTURE WATERSHED PERMIT

Massachusetts DEP is formulating a watershed permitting program to accomplish multiple goals including the facilitation of non-traditional nitrogen management technologies. Application for a watershed permit will require submission of a TWMP that demonstrates 208 compliance. Additional guidance on watershed permitting will be forthcoming from DEP.

17.0 NEXT STEPS

This analysis of the four town plans has identified several issues that should be addressed to optimize the overall nitrogen removal program and to prepare for a TWMP and watershed permit(s):

1. The Boards of Selectmen in each town should establish a process to develop and execute memoranda of understanding (MOUs) that address watershed-wide issues. The

first such MOU could be an agreement that each town is responsible for the load removals summarized in Table 1.

2. Once specific guidance is obtained from the Cape Cod Commission on TWMPs and consistency with the 208 Plan Update, steps should be taken to address any issues not addressed by the individual plans or by this composite analysis.
3. A bay-wide compilation of nitrogen management costs should be completed to identify aggregate needs and to serve as a basis for funding requests. Efforts by Brewster and Orleans should continue to identify costs of non-traditional technologies and the requisite traditional back-up plans.
4. Efforts should be made to synchronize the plans so that expenditures lead to improved water quality at the earliest possible time in as many subembayments as possible. Table 1 identifies six subembayments where 71% of the load removal is needed; other prioritization options should also be considered, such as focusing initial expenditures on the smaller removal requirements in the headwaters embayments to demonstrate early progress to the public.
5. Harwich and Chatham should consider nitrogen trading, so that Chatham's nitrogen control measures that will exceed TMDLs can be used by Harwich to address its requirements without duplication of capital expenditures. Such trading might result in capital savings of tens of millions of dollars.
6. Brewster should consider nitrogen trading with Harwich, Chatham and Orleans, respectively, to augment its load reduction in watersheds.
7. Where non-traditional approaches are proposed, town plans should be made more robust by identification of the nature and timing of traditional technologies that will be put in place if non-traditional means are insufficient, as required by DEP.
8. The four town plans should be made more specific as to how future increases in nitrogen load will be accommodated. Flow-neutral approaches should be adopted as tools to manage future growth in nitrogen-sensitive watersheds and to ensure zero-interest DEP funding.
9. Figure 3 illustrates the long-term nature of the planned nitrogen removal program, and highlights important steps that have already been taken. An annual reporting mechanism should be developed to track additional progress, document evolving estimates of nitrogen loading, and facilitate public involvement.
10. MEP modeling should be undertake to ensure that the amount and location of load removal will achieve the desired water quality. This is best done after the towns have fully explored and further defined scenarios for joint action such as nitrogen trading.

APPENDIX A

Data Tables

Table A-1. Information Sources

Report	Author	Date
MEP Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Pleasant Bay System, Orleans, Chatham, Brewster and Harwich, Massachusetts	MassDEP, University of Massachusetts Dartmouth School of Marine Science and Technology	May-06
Final Pleasant Bay System Total Maximum Daily Laods for Total Nitrogen	Commonwealth of Massachusetts Executive Office of Energy and Environmental Affairs, MassDEP, Bureau of Resource Protection	May-07
CCC Technical Memorandum - RE: Individual Town Nitrogen Loads by TMDL Watershed/Segments to Pleasant Bay	Cape Cod Commission (Ed Eichner)	28-Nov-07
Town of Chatham: Final Comprehensive Wastewater Management Plan and Final Environmental Impact Report	Stearns & Wheeler, LLC	May-09
MEP Techincal Memorandum - RE: MEP Scenarios to Evaluate Water Quality Impacts of the Addition of a 24-ft Culvert in Muddy Creek Inlet	MassDEP, University of Massachusetts Dartmouth School of Marine Science and Technology	5-Oct-10
Town of Orleans: Comprehensive Wastewater Management Plan and Single Environmental Impact Report	Wright-Pierce	Dec-10
Town of Brewster, Massachusetts: Integrated Water Resource Management Plan Phase II Final Report	Horsley Witten Group, Inc.	28-Jan-13
Town of Brewster, Massachusetts: Pleasant Bay Nitrogen Management Alternatives Analysis Report	Horsley Witten Group, Inc.	20-Mar-13
208 Plan: Cape Code Area Wide Water Quality Management Plan Update	Cape Cod Commission	Jun-15
Final Comprehensive Wastewater Management Plan/Single Environmental Impact Report Town of Harwich, Massachusetts	CDM Smith	Mar-16
Amended Comprehensive Wastewater Management Plan - Preliminary Draft (Prepared for the Town of Orleans, MA)	AECOM Technical Services, Inc.	Jun-16

Table A-2. Unattenuated and Attenuated Watershed Loads

Subembayment, kg/yr	Brewster	Chatham	Harwich	Orleans	TOTAL
Meetinghouse Pond					
Unattenuated Watershed Load				2,256	2,256
Attenuated Watershed Load				2,256	2,256
% Attenuation				0%	0%
Lonnies Pond (Kescayo Gansett Pond)					
Unattenuated Watershed Load	248			1,139	1,387
Attenuated Watershed Load	40			838	878
% Attenuation	84%			26%	37%
Areys Pond					
Unattenuated Watershed Load	282			367	649
Attenuated Watershed Load	95			367	462
% Attenuation	66%			0%	29%
The River - Upper					
Unattenuated Watershed Load	61			1,174	1,235
Attenuated Watershed Load	7			998	1,005
% Attenuation	89%			15%	19%
The River - Lower					
Unattenuated Watershed Load	107			1,549	1,656
Attenuated Watershed Load	16			1,390	1,406
% Attenuation	85%			10%	15%
Namequoit River					
Unattenuated Watershed Load	117			1,034	1,151
Attenuated Watershed Load	51			935	986
% Attenuation	56%			10%	14%
Paw Wah Pond					
Unattenuated Watershed Load				679	679
Attenuated Watershed Load				679	679
% Attenuation				0%	0%
Quanset Pond					
Unattenuated Watershed Load	142			723	865
Attenuated Watershed Load	72			569	641
% Attenuation	49%			21%	26%
Round Cove					
Unattenuated Watershed Load	2		2,291		2,293
Attenuated Watershed Load	1		2,277		2,278
% Attenuation	50%		1%		1%
Muddy Creek Upper					
Unattenuated Watershed Load		1,234	3,808		5,042
Attenuated Watershed Load		531	1,637		2,168
% Attenuation		57%	57%		57%

Subembayment, kg/yr	Brewster	Chatham	Harwich	Orleans	TOTAL
Muddy Creek Lower					
Unattenuated Watershed Load		1,488	2,512		4,000
Attenuated Watershed Load		1,458	2,462		3,920
% Attenuation		2%	2%		2%
Ryder's Cove					
Unattenuated Watershed Load		4,054			4,054
Attenuated Watershed Load		3,613			3,613
% Attenuation		11%			11%
Crows Pond					
Unattenuated Watershed Load		1,542			1,542
Attenuated Watershed Load		1,537			1,537
% Attenuation		0.3%			0.3%
Bassing Harbor					
Unattenuated Watershed Load		620			620
Attenuated Watershed Load		607			607
% Attenuation		2%			2%
Frost Fish Creek					
Unattenuated Watershed Load		1,059			1,059
Attenuated Watershed Load		1,059			1,059
% Attenuation		0%			0%
Pochet					
Unattenuated Watershed Load				3,135	3,135
Attenuated Watershed Load				3,073	3,073
% Attenuation				2%	2%
Pleasant Bay (including Little Pleasant Bay)					
Unattenuated Watershed Load	6,212	1,526	4,743	4,055	16,536
Attenuated Watershed Load	6,077	1,526	4,553	3,538	15,694
% Attenuation	2%	0%	4%	13%	5%
Chatham Harbor					
Unattenuated Watershed Load		6,308			6,308
Attenuated Watershed Load		6,241			6,241
% Attenuation		1%			1%
ALL SUBEMBAYMENTS					
Unattenuated Watershed Load	**7,171**	**17,831**	**13,354**	**16,111**	**54,468**
Attenuated Watershed Load	**6,359**	**16,572**	**10,929**	**14,643**	**48,503**
% Attenuation	**11%**	**7%**	**18%**	**9%**	**11%**

Notes:

1. Unattenuated and attenauted loads are as reported by the Cape Cod Commission (Eichner, November 28, 2007) and by the MEP (MEP Technical Memorandum, October 5, 2010) for Round Cove, Muddy Creek (Upper and Lower), and Pleasant Bay.

Table A-3. Attenuated Watershed Load Removals

Subembayment, kg/yr	Brewster	Chatham	Harwich	Orleans	TOTAL
Meetinghouse Pond					
Attenuated Watershed Load				2,256	2,256
Threshold Watershed Load				386	386
Removal Required				1,870	1,870
Lonnies Pond (Kescayo Gansett Pond)					
Attenuated Watershed Load	41			838	879
Threshold Watershed Load	27			566	593
Removal Required	14			272	286
Areys Pond					
Attenuated Watershed Load	95			367	462
Threshold Watershed Load	69			265	334
Removal Required	26			102	128
The River - Upper					
Attenuated Watershed Load	7			998	1,005
Threshold Watershed Load	4			630	634
Removal Required	3			368	371
The River - Lower					
Attenuated Watershed Load	16			1,390	1,406
Threshold Watershed Load	10			882	892
Removal Required	6			508	514
Namequoit River					
Attenuated Watershed Load	51			935	986
Threshold Watershed Load	33			599	632
Removal Required	18			336	354
Paw Wah Pond					
Attenuated Watershed Load				679	679
Threshold Watershed Load				266	266
Removal Required				413	413
Quanset Pond					
Attenuated Watershed Load	72			569	641
Threshold Watershed Load	44			350	394
Removal Required	28			219	247
Round Cove					
Attenuated Watershed Load	1		2,277		2,278
Threshold Watershed Load	1		1,068		1,069
Removal Required	0.3		1,209		1,209
Muddy Creek Upper					
Attenuated Watershed Load		531	1,637		2,168
Threshold Watershed Load		346	1,046		1,392
Removal Required		185	591		776

Subembayment, kg/yr	Brewster	Chatham	Harwich	Orleans	TOTAL
Muddy Creek Lower					
Attenuated Watershed Load		1,458	2,462		3,920
Threshold Watershed Load		874	1,476		2,350
Removal Required		584	986		1,570
Ryder's Cove					
Attenuated Watershed Load		3,613			3,613
Threshold Watershed Load		1,630			1,630
Removal Required		1,983			1,983
Crows Pond					
Attenuated Watershed Load		1,537			1,537
Threshold Watershed Load		1,540			1,540
Removal Required		0			0
Bassing Harbor					
Attenuated Watershed Load		607			607
Threshold Watershed Load		609			609
Removal Required		0			0
Frost Fish Creek					
Attenuated Watershed Load		1,059			1,059
Threshold Watershed Load		257			257
Removal Required		802			802
Pochet					
Attenuated Watershed Load				3,073	3,073
Threshold Watershed Load				1,505	1,505
Removal Required				1,568	1,568
Pleasant Bay (including Little Pleasant Bay)					
Attenuated Watershed Load	6,077	1,526	4,553	3,538	15,694
Threshold Watershed Load	3,913	981	2,932	2,275	10,101
Removal Required	2,164	545	1,621	1,263	5,593
Chatham Harbor					
Attenuated Watershed Load		6,241			6,241
Threshold Watershed Load		6,241			6,241
Removal Required		0			0
ALL SUBEMBAYMENTS					
Attenuated Watershed Load	**6,360**	**16,572**	**10,929**	**14,643**	**48,504**
Threshold Watershed Load	**4,101**	**12,478**	**6,522**	**7,724**	**30,825**
Removal Required	**2,259**	**4,099**	**4,407**	**6,919**	**17,684**

Notes:

1. Attenuated watershed loads are taken from Table A-2. Total threshold watershed loads are taken from Table VIII-4 of the 2006 MEP report and Table 2 of the 2010 MEP Technical Memo. Town shares of thresholds are proportional to their attenuated loads.

Table A-4. Town Plan Removals (kg/yr) and Reliance on Non-Traditional Technologies

Subembayment	Brewster	Chatham	Harwich	Orleans	Total
Meetinghouse Pond				1,876	1,876
Non-Traditional Technologies Share				2%	10%
Lonnies Pond	0.5			284	285
Non-Traditional Technologies Share	100%			100%	100%
Areys Pond	1.0			113	114
Non-Traditional Technologies Share	100%			100%	100%
The River - Upper	0.1			374	374
Non-Traditional Technologies Share	100%			54%	47%
The River - Lower	0.3			517	517
Non-Traditional Technologies Share	100%			100%	100%
Namequoit River	0.8			348	349
Non-Traditional Technologies Share	100%			100%	100%
Paw Wah Pond				413	413
Non-Traditional Technologies Share				100%	100%
Quanset Pond	1.0			228	229
Non-Traditional Technologies Share	100%			100%	100%
Round Cove	0.0		1,251		1,251
Non-Traditional Technologies Share	100%		3%		3%
Muddy Creek Upper		438	805		1,243
Non-Traditional Technologies Share		2%	3%		3%
Muddy Creek Lower		1,192	1,073		2,265
Non-Traditional Technologies Share		2%	4%		3%
Ryder's Cove		2,674			2,674
Non-Traditional Technologies Share		3%			3%
Crows Pond		1,248			1,248
Non-Traditional Technologies Share		3%			3%
Bassing Harbor		514			514
Non-Traditional Technologies Share		1%			1%
Frost Fish Creek		832			832
Non-Traditional Technologies Share		3%			3%
Pochet				1,564	1,564
Non-Traditional Technologies Share				100%	100%
Pleasant Bay (including Little Pleasant Bay)	1,867	930	1,411	1,257	5,465
Non-Traditional Technologies Share	50%	3%	6%	100%	48%
Chatham Harbor		5,229			5,229
Non-Traditional Technologies Share		1%			1%
Total (All Subembayments)	1,871	13,058	4,540	6,974	26,442
Non-Traditional Technologies Share	50%	2%	4%	71%	24%

Notes:

1. Non-traditional technologies are considered to be remediation technologies, residential fertilizer reductions, and on-site denitrification systems.
2. All town plans have been adjusted for a uniform 25% residential fertilizer reduction.
3. Yellow shaded cells identify subembayments where town plans rely on non-traditional technologies for >25% of their planned removals.

Table A-5. Town Plan Nitrogen Removals Compared to TMDL (kg/yr)

Subembayment	Brewster	Chatham	Harwich	Orleans	Total
Meetinghouse Pond *Amount Town Plans Over / Under*				0	0
Lonnies Pond *Amount Town Plans Over / Under*	13			0	13
Areys Pond *Amount Town Plans Over / Under*	28			0	28
The River - Upper *Amount Town Plans Over / Under*	2.5			1	4
The River - Lower *Amount Town Plans Over / Under*	5.8			1	7
Namequoit River *Amount Town Plans Over / Under*	18			0	18
Paw Wah Pond *Amount Town Plans Over / Under*				0	0
Quanset Pond *Amount Town Plans Over / Under*	28			1	27
Round Cove *Amount Town Plans Over / Under*	0.8		42		42
Muddy Creek Upper *Amount Town Plans Over / Under*		245	221		466
Muddy Creek Lower *Amount Town Plans Over / Under*		608	87		696
Ryder's Cove *Amount Town Plans Over / Under*		720			720
Crows Pond *Amount Town Plans Over / Under*		1,248			1,248
Bassing Harbor *Amount Town Plans Over / Under*		514			514
Frost Fish Creek *Amount Town Plans Over / Under*		29			29
Pochet *Amount Town Plans Over / Under*				5	5
Pleasant Bay (including Little Pleasant Bay) *Amount Town Plans Over / Under*	294	388	209	0	115
Chatham Harbor *Amount Town Plans Over / Under*		5,229			5,229
Total (All Subembayments) *Amount Town Plans Over / Under*	**390**	**8,982**	**141**	**7**	**8,726**

Notes:

1. Orange font and shading indicate the amount a town plan is under the TMDL.
2. Green font and shading indicate the amount a town plan is over the TMDL.
3. All town plans have been adjusted for a uniform 25% residential fertilizer reduction.

APPENDIX B

Summary of Town Plans for Pleasant Bay

APPENDIX B

SUMMARY OF TOWN PLANS FOR PLEASANT BAY

Brewster

The Town of Brewster contributes approximately 13% of the attenuated wastewater nitrogen load to the Pleasant Bay watershed and is responsible for 13% of the aggregate removal. The Town has developed an Integrated Water Resources Management Plan (IWRMP). The IWRMP Phase II report was issued in final form in January 2013 with assessments and recommendations addressing nitrogen loading to Pleasant Bay, existing and future drinking water, and stormwater and freshwater pond needs. Nitrogen management alternatives are further discussed in a March 2015 report. The Brewster Plan includes significant fertilizer reductions that have already taken place at the Captain's Golf Course, fertigation at the golf course, and reductions in residential fertilizer loads. Brewster considered shellfish propagation or aquaculture to meet the remaining nitrogen reduction for the Town. The Town is currently looking at new septic leachfield technologies for nitrogen reduction (since the shellfish management option may not be feasible) and is investigating potential pilot projects to test this option. Sewering of a residential neighborhood has been identified as a backup option, but the proposed location is at the upper end of the watershed, meaning it would take decades for there to be water quality improvement in the Bay.

Chatham

The Town of Chatham contributes approximately 34% of the attenuated wastewater nitrogen load to the Pleasant Bay watershed and is responsible for 23% of the overall removal. The Town began implementing its Comprehensive Wastewater Management Plan (CWMP) in 2010. The CWMP includes the sewering of the entire town, with the implementation of later sewering phases being contingent upon results of on-going monitoring under the adaptive management plan. The Town of Chatham, in cooperation with the Town of Harwich, recently completed the construction of a new bridge to replace inadequate culverts that will provide increased tidal flushing and improved water quality in Muddy Creek.

Harwich

The Town of Harwich contributes approximately 22% of the attenuated wastewater nitrogen load to the Pleasant Bay watershed and is responsible for 25% of the overall removal. The Town developed a recommended program to address nitrogen removal and meet other town needs. That program, described in a draft CWMP, was submitted for review to MEPA and the CCC in February 2013. Upon further refinement of infrastructure and non-infrastructure program components and review of the 208 Water Quality Plan, the Town filed the final CWMP in March 2016 with MEPA and the CCC. MEPA issued a Certificate of Approval on May 13, 2016. The Commission gave Development of Regional Impact Individual (DRI) approval in August 2016.

The CWMP proposes wastewater collection in the Pleasant Bay watershed and recommends a community partnership with Chatham to treat wastewater generated and collected in the Pleasant Bay watershed at the existing Chatham treatment facility. Treated effluent would initially be

recharged at the Chatham facility but may in the future be conveyed back to East Harwich for recharge, depending on water quality results. The Harwich CWMP also includes several nontraditional components such as the Muddy Creek inlet widening, and inclusion of stormwater best management practices (BMPs) throughout town. Several non-infrastructure components are included, such as review of potential open space acquisition parcels to minimize buildout, and fertilizer education programs (instead of a fertilizer control ordinance).

Orleans

The Town of Orleans contributes 30% of the attenuated wastewater nitrogen load to the Pleasant Bay watershed and is responsible for 39% of the overall removal. The Town's CWMP was completed in 2010 and received MEPA and DRI approvals with conditions in 2011. The CWMP characterizes nitrogen reduction needs pursuant to the MEP and TMDL reports for Pleasant Bay. The Needs Assessment completed in 2009 identifies other wastewater needs to address Title 5 compliance and economic development. The Town's CWMP is a phased sewering plan supplemented with non-traditional solutions that may reduce the scale of later sewering requirements.

The Town has embarked on supplemental planning aimed at accelerating the use of non-traditional solutions to minimize sewering. The Orleans Water Quality Advisory Panel developed a "Consensus Agreement" in 2015 that recommends a strong emphasis on evaluation of the ability of non-traditional technologies to meet the TMDL requirements for Pleasant Bay. In 2016, the Town has installed a demonstration oyster-growing project in Lonnie's Pond and is planning another shellfish project in Quanset Pond, The Town is also seeking funds to install a pilot project of four on-site septic systems with nitrogen removing biofilters.

APPENDIX C

Acknowledgements

ACKNOWLEDGEMENTS

This composite nitrogen management analysis has been prepared by the Pleasant Bay Alliance with technical assistance from Wright-Pierce. Substantive input was obtained by the members of the Alliance's Watershed Work Group:

Brewster	Mr. Chris Miller, Director, Natural Resources Dept.
Chatham	Dr. Robert Duncanson, Director, Natural Resources Dept.
Harwich	Mr. Heinz Proft, Natural Resource Director
Orleans	Mr. George Meservey, Planning Director
Coordinator	Ms. Carole Ridley

Technical consultants of the four towns have reviewed this document, and their comments have been addressed. Comments by Brian Dudley of MassDEP and the staff of the Cape Cod Commission have also been incorporated.

This report was approved by the Pleasant Bay Alliance Steering Committee:

Brewster	Mr. Chris Miller, Director, Natural Resources Dept.
	Ms. Ryan Bennett, Town Planner
Chatham	Ms. Jane Harris
	Mr. Chuck Bartlett
Harwich	Mr. Allin P. Thompson, Jr.
	Ms. Dolly Howell
Orleans	Ms. Judith Bruce
	Ms. Fran McClennen

March 24, 2017
WP Project No. 13351A,B

Ms. Carole Ridley
Pleasant Bay Alliance
115 Kendrick Road
Harwich, MA 02645

Subject: Pleasant Bay Composite Nitrogen Management Analysis
Final Report

Dear Carole:

Enclosed is the final report entitled "Pleasant Bay Composite Nitrogen Management Analysis: An Assessment of the Wastewater and Nitrogen Management Plans of Brewster, Chatham, Harwich and Orleans".

We have enjoyed collaborating with you on the analysis of the four towns plans and the development of this report, and we are pleased by the active involvement of the Alliance's Watershed Work Group. All technical aspects of this report have been prepared by me or under my direction.

We look forward to assisting in the presentation of this report to each of the four towns.

Please contact me with any questions you may have.

Very truly yours,
WRIGHT PIERCE

Michael D. Giggey, PE
Senior Vice President

40 Shattuck Road, Suite 305
Andover, MA 01810
Phone: 978.416.8000 | Fax: 978.470.3558

Pleasant Bay Alliance

To: Harwich Board of Selectmen
Fr: Carole Ridley, Alliance Coordinator
Date: May 16, 2017
Re: Pleasant Bay Watershed Nitrogen Management

The Pleasant Bay Alliance (Alliance) is scheduled to meet with the Board of Selectmen on May 22nd to discuss the *Pleasant Bay Composite Nitrogen Management Analysis*. This analysis was initially submitted to the Board in early April. A copy of the analysis and our original explanatory memo is attached.

We will be joined in this presentation by Paul Niedzwiecki, of the Cape Cod Commission, and Brian Dudley of MassDEP. Mr. Niedzwiecki and Mr. Dudley will discuss how the composite analysis addresses compliance with the 208 Plan Update and watershed permitting, respectively. A copy of our joint PowerPoint presentation is enclosed.

Also enclosed is a proposed resolution to endorse the composite analysis and agree to continue working with the other watershed towns to explore next steps identified in the analysis. We look forward to discussing your comments on the proposed resolution on May 22nd.

The Alliance is submitting the composite analysis and proposed resolution to the Boards of Selectmen of each of the four Alliance towns sharing the watershed of Pleasant Bay. We will be meeting with each Board individually to discuss this information. We are proposing to follow up on these individual meetings with a joint meeting of the four Boards on June 22, at which time we would ask you to consider taking action on the resolution.

Cc: Brian Dudley, MassDEP
Paul Niedzwiecki, Cape Cod Commission
Allin Thompson
Dolly Howell
Heinz Proft
Dave Young

Resolution of the Towns Sharing the Watershed of Pleasant Bay

Whereas, The Towns of Brewster, Chatham, Harwich and Orleans share the watershed of Pleasant Bay and, by intermunicipal agreement, have formed a Pleasant Bay Alliance to coordinate resource management of Pleasant Bay among the member towns;

Whereas, Pleasant Bay is a state-designated Area of Critical Environmental Concern;

Whereas, A Resource Management Plan for Pleasant Bay developed by the Alliance and approved by Town Meetings of the four member towns identifies excessive nitrogen loading from watershed land uses as a primary threat to the health and sustainability of Pleasant Bay;

Whereas, The Massachusetts Department of Environmental Protection, in conformance with the Federal Clean Water Act, established 19 Total Maximum Daily Loads (TMDLs) for Nitrogen in Pleasant Bay, which require substantial reductions in the amount of nitrogen flowing into Pleasant Bay from watershed sources;

Whereas, the Cape Cod Commission has developed an approved Section 208 Areawide Water Quality Management Plan Update, which designates the Towns as Waste Management Agencies (WMAs) responsible for meeting TMDLs, and which sets forth resources and assistance available to WMAs to facilitate compliance on a watershed basis;

Whereas, Each of the member towns of the Pleasant Bay Alliance has developed a plan to address its share of responsibility for reducing the amount of nitrogen flowing into Pleasant Bay from watershed sources;

Whereas, the Pleasant Bay Alliance has analyzed the combined effect of the four town plans on a watershed basis; and

Whereas, the composite analysis presents in a uniform way the attenuated nitrogen loads and load removal requirements already contained in individual town plans;

Therefore, Be it resolved that the Board of Selectmen of _____, pursuant to its authority under the Town Charter, hereby vote to take the following actions:

1. Endorse the **PLEASANT BAY COMPOSITE NITROGEN MANAGEMENT ANALYSIS** (March 2017) as an accurate representation of (a) the Town's share of current attenuated nitrogen load and of (b) the Town's responsibility to remove nitrogen in each subwatershed of Pleasant Bay.

2. Agree to work with other member towns through the Alliance and with the Cape Cod Commission and Massachusetts Department of Environmental Protection to:
   A. Fully explore the opportunities for efficiency and cost savings identified in the **PLEASANT BAY COMPOSITE NITROGEN MANAGEMENT ANALYSIS.**
   B. Support development of a Targeted Watershed Management Plan consistent with the requirements of the approved Section 208 Areawide Water Quality Management Plan Update.
   C. Participate in a watershed permit pilot project in order to explore additional potential costs savings and efficiencies and determine the advantages and disadvantages to the Town.
   D. Support other projects, studies or agreements as may be necessary to advance the foregoing activities.

Signed Date

PARCELS WITH BUILDINGS

OWNER	PARCEL	PARCEL LOCATION	TOTAL TITLE	TAKE DT	BILLS MAILED TO	WATER	LETTER
BARBARA ADAMS	69/X5-R	404 QUEEN ANNE RD	49,549.50	02/20/2008		FY 17 & 16 DUE	RETURNED
MYRA LOUISE SPRINGER BURNS	46/X6-R	21 DEACONS FOLLY RD	89,317.89	02/20/2008		NONE	RETURNED
SUZANNE R SAUVAGE	40/S7-R	25 PARALLEL ST	19,948.77	02/20/2008	OUT OF STATE	FY 17 DUE	
ARLENE KOMYATHY &	80/D97-R	19 INKBERRY LN	44,992.12	11/20/2008	OUT OF STATE	FY 17 DUE	
CHARLES N FELT	6B/L89-R	25 CENTRAL AV	25,765.27	11/20/2008	OUT OF STATE	FY 17 DUE	
JAMES D PENA	70/E4-R	466 QUEEN ANNE RD	23,858.01	11/05/2009	LYNNFIELD	PAID	
LINDSEY B HALE	6B/H1-2-R	38 OCEAN AV	41,982.84	11/05/2009	WALTHAM	PAID	
ROBERT S GROSE ET AL,	18/X1-11-R	75 DEPOT ROAD WEST	31,645.31	11/05/2009		PAID	
THOMAS P WOODRUFF SR &	18/E5-R	111 DEPOT ROAD WEST	45,576.66	11/05/2009		FY 17 & 16 DUE	
LINDA AZANOW	32/F1-41-R	3 PASTURE LN	50,075.51	06/07/2010	NATICK	PAID	
SHARON JAMES	56/W3-R	13 QUEEN ANNE RD	16,600.78	06/07/2010	OUT OF STATE	FY 17 & 16 DUE	
FORTUNATA SANTOS	39/C3-11-R	5 SANTOS LN	7,519.86	11/10/2011		NONE	
JEANNETT J SULLIVAN	3/E1-B-R	125 BELMONT RD	20,600.48	07/27/2012	OUT OF STATE	FY 17 & 16 DUE	
STEVEN LEDERMAN	23/W2-R	58 HOYT RD	30,344.28	07/27/2012		FY 17 & 16 DUE	
ANITA M ERAMIAN ET AL	47/A6-1-R	448 MAIN ST	4,002.33	11/07/2013		PAID	
FRANCA V EILERS &	70/K3-24-R	8 OAK LEAF CIR	14,421.67	10/16/2014		PAID	
CAROLYN CURTIS-MAHONEY &	18/X3-13-R	52 BELLS NECK RD	5,616.74	08/07/2015	STOUGHTON	PAID	
JOHN HARDIN &	18/N3-R	199 DIVISION ST	950.55	08/07/2015	HOPKINGTON	PAID	
BERNARD G SYKES TRUSTEE,	16/N1-23-R	27 SAQUATUCKET BLUFFS	69,672.67	10/13/2016		FY 17 DUE	
ELSA M GALETSA ET ALS	22/A2-8-R	35 MOODY RD	5,033.21	10/13/2016	OUT OF STATE	FY 17 DUE	
WALTER D DALUZE,	72/A1-4-R	656 QUEEN ANNE RD	6,317.77	10/13/2016		PAID	
BLUE HIGHLIGHT INDICATES POSSIBLE RESIDENCY			603,792.22				

CONDOS

OWNER	PARCEL	PARCEL LOCATION	TOTAL TITLE	TAKE DT	LOCATION	WATER	LETTER
BERNARD G SYKES TRUSTEE,	58/G4-2-5-R	136 FACTORY RD	3,405.02	10/16/2014			
BERNARD G SYKES TRUSTEE,	58/G4-2-1-R	136 FACTORY RD	3,411.72	10/16/2014			
BERNARD G SYKES TRUSTEE,	58/G4-2-6-R	136 FACTORY RD	3,888.20	10/16/2014			
BERNARD G SYKES TRUSTEE,	58/G4-2-4-R	136 FACTORY RD	3,913.88	10/16/2014			
BERNARD G SYKES TRUSTEE,	58/G4-2-2-R	136 FACTORY RD	6,989.56	10/16/2014			
DEBORAH ANN DESIMONE	13/T4-2-14A-R	405 LOWER COUNTY RD	1,620.09	10/16/2014	QUINCY		RETURNED
BERNARD G SYKES TRUSTEE,	58/G4-2-7-R	136 FACTORY RD	1,286.45	10/13/2016			
BERNARD G SYKES TRUSTEE,	58/G4-2-8-R	136 FACTORY RD	1,286.45	10/13/2016			
BERNARD G SYKES TRUSTEE,	58/G4-2-9-R	136 FACTORY RD	2,340.71	10/13/2016			
			28,142.08				

LAND ONLY OWNER	PARCEL	PARCEL LOCATION	TOTAL TITLE	TAKE DT	LOCATION	WATER	LETTER
IDA HUBBARD	55/L1-R	DEPOT ST	6,573.34	07/05/1968			RETURNED
ROGER NUNES SR	39/J4-R	MAIN ST	22,239.73	07/29/1970			
PATRICIA MARKOFF TRS,	22/S3-R	71 FOREST ST	56,149.30	09/14/1979	FALMOUTH		
UNKNOWN OWNERS	31/D13-1-R	129 FOREST ST	7,900.27	09/14/1979	UNKNOWN		
CHASE HARRY H EST OF	11/U3-B-R	191 ROUTE 28	82,491.72	09/24/1982	S. DENNIS		
DELLA F GABBETT EST OF	44/P4-A-R	70 DEPOT RD	59,399.62	09/30/1983	AMHERST		
CHARLES D HOLMES	72/G3-R	QUEEN ANNE RD	94,832.04	09/28/1984			RETURNED
DAVIS STEPHEN	31/P8-R	FOREST ST	17,118.97	09/27/1985			RETURNED
LILLIAN HARDING	115/K6-R	ROUTE 28	10,338.73	09/27/1985	UNKNOWN		
UNKNOWN OWNERS	69/N2-R	MID CAPE HWY	6,865.69	09/27/1985	UNKNOWN		
WILLIAM JOHNSTON	78/A1-52--53-R	BELMONT GARDENS	54.03	09/27/1985	UNKNOWN		
UNKNOWN OWNERS	24/C3-R	GORHAM RD	2,737.26	09/25/1986	UNKNOWN		
UNKNOWN OWNERS	76/B3-R	MUDDY CREEK	5,374.17	09/25/1986	UNKNOWN		
UNKNOWN OWNERS	31/D18-R	115 FOREST ST	64,090.66	09/25/1986	UNKNOWN		
CHASE MARSHALL E EST OF	27/A3-R	BELLS NECK RD	3,866.74	09/24/1987	OUT OF STATE		RETURNED
CHASE MARSHALL E EST OF	28/A1-R	BELLS NECK RD	9,328.92	09/24/1987	OUT OF STATE		RETURNED
JOHN S FERNANDES	56/W5-R	244 MAIN ST	49,728.91	09/24/1987	OUT OF STATE		
UNKNOWN OWNERS	31/C7-R	BANK ST	3,818.71	09/24/1987	UNKNOWN		
UNKNOWN OWNERS	32/B6-R	BANK ST	3,822.30	09/24/1987	UNKNOWN		
UNKNOWN OWNERS	32/B5-R	BANK ST	4,389.28	09/24/1987	UNKNOWN		
UNKNOWN OWNERS	57/E3-R	QUEEN ANNE RD	4,603.24	09/24/1987	UNKNOWN		
UNKNOWN OWNERS	31/C3-R	SISSON RD	5,583.78	09/24/1987	UNKNOWN		
UNKNOWN OWNERS	31/P4-R	BANK ST	8,336.38	09/24/1987	UNKNOWN		
UNKNOWN OWNERS	31/C5-R	FOREST ST	14,988.43	09/24/1987	UNKNOWN		
UNKNOWN OWNERS	32/B7-R	BANK ST	15,160.96	09/24/1987	UNKNOWN		
UNKNOWN OWNERS	55/L4-R	DEPOT ST	17,836.04	09/24/1987	UNKNOWN		
PATRICIA MARKOFF TRS,	22/X1-21-R	GRASSY POND RD	5,209.65	09/30/1988	FALMOUTH		
PATRICIA MARKOFF TRS,	22/M1-R	GRASSY POND RD	42,569.51	09/30/1988	FALMOUTH		
STEVEN A COVE SR	34/E5-R	CHATHAM RD	1,126.44	11/02/1989	PROVINCETOWN		
STEVEN A COVE SR	43/E8-R	CHATHAM RD	3,525.69	11/02/1989	PROVINCETOWN		
STEVEN A COVE SR	34/E4-R	CHATHAM RD	42,893.09	11/02/1989	PROVINCETOWN		
UNKNOWN OWNERS	31/P11-R	BANK ST	14,199.70	11/02/1989	UNKNOWN		
JOHN J CROWLEY ET AL TRUSTEE	46/M9-R	DEACONS FOLLY RD	2,613.88	11/26/1990	HINGHAM		
UNKNOWN OWNERS	57/A6-R	88 QUEEN ANNE RD	56,186.35	11/26/1990	UNKNOWN		

GRACE SPINOLA	48/T11-R	511 MAIN ST	10,384.21	01/27/1993	BROCKTON	NONE	
GRANITE MOTORBILE COMPANY	73/X173-R	1238 ORLEANS RD	4,830.52	01/27/1993	CHATHAM		RETURNED
DAVID M HALL	13/L1-13-R	13 VILLAGE GREEN	56,164.48	10/11/1994	BOSTON		RETURNED
CLARENCE L CHASE	46/F6-R	260 MAIN ST	33,576.07	10/16/1995	W. SOMERVILLE		
CLARENCE L CHASE	46/F2-R	259 MAIN ST	34,213.03	10/16/1995	W. SOMERVILLE		
UNKNOWN OWNERS	28/C8-R	BELLS NECK RD	26,384.60	10/17/1995	UNKNOWN		
BARNSTABLE HOLDING CO INC	103/V4-2-R	LONG POND DR	13,006.42	11/10/1998	HYANNIS		RETURNED
LOUIS HELFAND OR THE HEIRS OF	78/A47-R	5 ROGERS RD	25,546.57	03/30/2000	OUT OF STATE		
BENJAMIN ROSE ESTATE OF	69/X4-R	QUEEN ANNE RD	25,807.81	02/26/2003	FALMOUTH		
DONALD NEWTON &	113/K1-R	HALLS WAY	136,905.38	02/26/2003	MELROSE		
EMMA FREEMAN WHITE ET ALS	33/E1-R	CHATHAM RD	9,442.92	02/26/2003	OUT OF STATE		
EUGENE F NICHOLS	94/B1-1-R	NATHAN WALKER RD	63,938.52	02/26/2003	UNKNOWN		
FLORENCE ELDREDGE	31/D13-R	FOREST ST	47,497.56	02/26/2003			RETURNED
HENRY SMALL ET ALS	58/N9-R	281 QUEEN ANNE RD	73,448.61	02/26/2003	UNKNOWN		
JAMES MCFILLIN	41/S1-73A-R	CHATHAM RD	1,596.59	02/26/2003	OUT OF STATE		
JAMES MCFILLIN	41/S1-7-R	3 BERIAH BROOKS RD	2,866.67	02/26/2003	OUT OF STATE		
JAMES MCFILLIN	41/S1-52A-R	13 TODY BOLE LN	29,218.47	02/26/2003	OUT OF STATE		
JOHN E WHITE &	43/E11-R	CHATHAM RD	7,431.74	02/26/2003	OUT OF STATE		
JOHN PERRY	56/K4-R	72 BOG LN	68,754.31	02/26/2003	OUT OF STATE		RETURNED
LOUISA ESTATE NICKERSON OF	73/F7-R	SETH WHITEFIELD RD	69,370.66	02/26/2003	UNKNOWN		
MANUEL SANTOS ESTATE OF	47/C7-R	MAIN ST	6,627.22	02/26/2003			RETURNED
MANUEL THACHER JR	39/C3-8-2-R	7 SANTOS LN	71,636.07	02/26/2003			RETURNED
MANUEL THACHER JR	39/C3-8-1-R	3 SANTOS LN	85,747.19	02/26/2003			RETURNED
RAGOSA MARY MARGARET ET ALS	39/B6-R	404 GREAT WESTERN RD	51,177.37	02/26/2003	BOSTON		RETURNED
RALPH C NICKERSON ET ALS	67/T3-R	MID CAPE HWY	2,583.09	02/26/2003	OUT OF STATE		RETURNED
DEBORAH L HALLIDAY ET AL	28/D2-R	NORTH RD	1,559.78	11/07/2003	WEYMOUTH		RETURNED
JOSEPH W CULLEN	4/S5-4-R	122 LOWER COUNTY RD	49,136.94	11/07/2003			
BARBARA J DECOSTA	32/C3-R	4 LOVERS LN	1,069.37	06/30/2004	OUT OF STATE		RETURNED
STEPHEN KONOPACKA	74/R3-4-R	1289 ORLEANS RD	23,378.54	06/30/2004	STONEHAM		
FIDELITY FINANCIAL INC	93/C2-7-R	COURTNEY RD	1,108.82	02/20/2008	CENTERVILLE		RETURNED
FLEET BANK SUCCESOR TRUSTEE	95/B18-R	ROUND COVE RD	3,825.11	02/20/2008	BOSTON		RETURNED
JENNIFER S WELCH TR	78/H11-7-11-R	16 ENGLE ST	20,665.39	11/20/2008	CUMMAQUID		
SHAWN M ELLIS TRS ET ALS	78/H3-8-11-R	FULLER ST	18,347.40	11/20/2008	SANDWICH		
CHRISTOPHER R KEYES	78/A16-19-20-F	DEPOT ST	983.24	11/05/2009	S. SANDWICH		
JOHN W MISKELL	66/G2-R	NORTH WESTGATE RD	830.19	11/05/2009	E. DENNIS		
MADELINE M CROWELL ESTATE OF	92/P1-R	PLEASANT LAKE AV	893.59	11/05/2009			RETURNED

CHARLES S HARTIG ESTATE OF ET	32/Q9-R	LESLIE LN	779.44	06/07/2010			RETURNED
DORIS B GESSNER TRUSTEE,	60/C4-R	PLEASANT LAKE AV	2,537.44	06/07/2010	E. FALMOUTH		
KIM WOODBURY TRS,	72/L261-R	QUEEN ANNE RD	3,853.21	06/07/2010	LAKEVILLE		
NANCY M BAILEY	83/P8-R	31 LAKEVIEW DR	21,248.95	06/07/2010			RETURNED
NANCY M BAILEY	83/P25-R	33 LAKEVIEW DR	27,803.41	06/07/2010			RETURNED
ALFRED BAKER ESTATE OF	20/A24-R	LOTHROP AV	482.25	07/27/2012			RETURNED
DAVID WHITE TR,	78/H11-16-19-F	BELMONT AV	8,276.26	07/27/2012	CUMMAQUID		
DAVID WHITE TR,	78/H15-16-19-F	BELMONT AV	8,276.26	07/27/2012	CUMMAQUID		
JAMES H QUIRK JR TR,	78/H11-12-15-F	15 BELMONT AV	8,276.26	07/27/2012	YARMOUTHPORT		
JONATHAN F WELCH TR,	78/H11-21-25-F	RUTH ST	8,577.19	07/27/2012	CUMMAQUID		
STEVEN A COVE SENIOR	34/E6-R	CHATHAM RD	494.22	07/27/2012	PROVINCETOWN		
KATHLEEN BADER	56/B3-12-R	51 RYDER RD	3,067.19	11/07/2013	CONCORD		
HERBERT F ROWLEY TRS ET AL	21/X3-2-R	10 NOTRE DAME AV	5,949.22	10/16/2014		NONE	RETURNED
KATHY ROWLEY CAFARELLI &	13/E3-1-R	15 DOANE RD	17,072.23	10/16/2014		FY 17 & 16 DUE	
AWE LLC	16/W7-B-R	107 JULIEN RD	39,549.07	08/07/2015	OUT OF STATE		RETURNED
FLOYD L THAYER TR,	31/P1-8-R	PINE KNOLL RD	355.62	08/07/2015			RETURNED
			1,982,506.20				
			2,614,440.50				

Copy to - Bob McCready
- John Stewart

Christopher Clark

From: John Giorgio <JGiorgio@k-plaw.com>
Sent: Monday, June 05, 2017 4:48 PM
To: Michael D. MacAskill; Christopher Clark
Cc: Donald F Howell; Anita Doucette
Subject: RE: Housing Authority Appointment
Attachments: 20170605161707395.pdf

Dear Mike:

In my opinion, in the absence of any further action by the Town to fill the vacancy created as a result of the position not being on the ballot, the Housing Authority member in question may continue to serve in a holdover capacity. We do not recommend, however, that a holdover continue in the position for an entire year since it might subject the Town to a legal challenge. Moreover, as you correctly state in your email, the Town is not required to continue the holdover appointment if other action is taken to fill the vacancy.

Pursuant to G. L. c. 41, s. 11, whenever there is a vacancy in an elected office, which includes a failure to elect, that vacancy may be filled until the next annual election. The procedure to fill the vacancy is as follows:

1. The Housing Authority must give notice to the Board of Selectmen within one month of the vacancy (the date of the 2017 annual election) notifying the Selectmen that there is a vacancy on the Housing Authority.
2. After at least one week's notice, the Housing Authority and the Board of Selectmen meet in open session to accept nominations and vote on a candidate to fill the vacancy on the Housing Authority until the 2018 annual election. Any member of either board eligible to vote may place names in nomination. A vote of a majority of the remaining members of the Housing Authority and the members of the Board of Selectmen is required to fill the vacancy. The member of the Housing Authority who holds the holdover appointment at this time, should recuse himself from the vote as I do not believe he is "entitled to vote," as required by the statute.
3. If the Housing Authority does not notify the Board of Selectmen within one month of the vacancy, then the Board of Selectmen may fill the vacancy on its own.

I understand that the Housing Authority sent the letter attached to this email dated April 27, 2017, to the Board of Selectmen recommending that Bob McCready be recommended for appointment to the vacancy. That letter, however, does not constitute a vote by the Housing Authority to appoint Mr. McCready as required by the procedure set forth in c. 41, s. 11. In my opinion, however, the Housing Authority letter may reasonably be construed as the notice which the Housing Authority is required to provide to the Board of Selectmen under G.L. c. 41, s. 11. Accordingly, the Board of Selectmen may now schedule with at least 7 days notice the joint meeting in order to vote on an appointment to fill the vacancy. At that meeting any other individual's name may be submitted by nomination. Once all nominations have been made, the boards should vote on each nomination separately until a candidate receives the required majority vote.

Please let me know if you have any further questions.

John

John W. Giorgio, Esq.
KP | LAW
101 Arch Street, 12th Floor
Boston, MA 02110
O: (617) 556 0007
D: (617) 654 1705
F: (617) 654 1735

Harwich Housing Authority

Telephone 508-430-2390
Fax 508-945-5666
P.O. Box 714 · Harwichport, MA 02646

April 27, 2017

Board of Selectmen
Town of Harwich
732 Main Street
Harwich, MA 02645

To the Board of Selectmen:

At the April 25, 2017 meeting of the Harwich Housing Authority, a motion was made, seconded and unanimously approved for a letter to be sent to the Board of Selectmen asking that Robert MacCready be appointed to fill the seat on our Board that will be left vacant after the May town elections.

Please accept this letter as said request.

Thank you,

John Stewart
Executive Director

Email: harwichha@verizon.net

C: (617) 785 0725
jgiorgio@k-plaw.com
www.k-plaw.com

From: Michael D. MacAskill [mailto:mmacaskill@townofharwich.us]
Sent: Monday, June 05, 2017 2:05 PM
To: Christopher Clark
Cc: John Giorgio; Donald F Howell
Subject: Housing Authority Appointment

Chris-
The Housing Authority appointment saga continues and I would like a clear and definitive answer fro KP Law on this issue.
The way I read it is that it is a failure to elect and the town Can allow current representative to stay on for a year but does not have to? It does not say anywhere that we must.

If this is the case then the process is to advertise (which we have and then to have a joint meeting as previously scheduled and cancelled) and then have a joint meeting. I recognize that the housing authority has voted the current member but we do not have to nor have we accepted that in a meeting.
A letter explaining this should be sent immediately to Housing authority outlining the process and the the current member has not been accepted by the board and that he is not sworn in so any actions taken with a vote of the board including this member can be challenged.

Thank you for your attention,

Michael MacAskill

CHAPTER 41 Section 11

Section 11

As used in this section, the term "vacancy" includes a failure to elect. If a vacancy occurs in any town office, other than the office of selectman, town clerk, treasurer, collector of taxes or auditor, the selectmen shall in writing appoint a person to fill such vacancy.

If there is a vacancy in a board consisting of two or more members, except a board whose members have been elected by proportional representation under chapter fifty-four A, the remaining members shall give written notice thereof, within one month of said vacancy, to the selectmen, who, with the remaining member or members of such board, shall, after one week's notice, fill such vacancy by roll call vote.

The selectmen shall fill such vacancy if such board fails to give said notice within the time herein specified. A majority of the votes of the officers entitled to vote shall be necessary to such election. The person so appointed or elected shall be a registered voter of the town and shall perform the duties of the office until the next annual meeting or until another is qualified.

Personnel By Law Compensation Plans as of July 1, 2017 – 2% increase

NON-UNION COMPENSATION PLAN

BY-LAW POSITIONS: FULL TIME MANAGEMENT

Grade	Position	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
Contract	Police Chief Finance Director/Accountant Fire Chief										
M-7	Assistant Town Administrator DPW Director Deputy Police Chief	**88,422**	**90,632**	**92,897**	**95,220**	**97,600**	**100,040**	**102,543**	**105,105**	**107,733**	**110,425**
M-6	Water / Wastewater Superintendent	**81,121**	**83,147**	**85,226**	**87,357**	**89,542**	**91,781**	**94,074**	**96,428**	**98,837**	**101,306**
M-5		**74,422**	**76,283**	**78,191**	**80,145**	**82,149**	**84,203**	**86,307**	**88,464**	**90,676**	**92,944**
M-4	Library Director; Personnel Director	**68,279**	**69,984**	**71,733**	**73,528**	**75,366**	**77,249**	**79,181**	**81,161**	**83,189**	**85270**
M-3		**62,640**	**64,205**	**65,810**	**67,456**	**69,143**	**70,871**	**72,642**	**74,459**	**76,320**	**78,229**
M-2		**57,468**	**58,903**	**60,379**	**61,886**	**63,434**	**65,019**	**66,634**	**68,309**	**70,019**	**71,769**
M-1		**45,973**	**47,124**	**48,300**	**45,509**	**50,747**	**52,015**	**53,316**	**54,650**	**56,016**	**57,416**

BY-LAW POSITIONS: FULL/PART TIME ADMINISTRATIVE

Grade	Position	Step 1	Step 2	Step 3	Step 4	Step 5	Step 6	Step 7	Step 8	Step 9	Step 10
OA-4	Administrative Secretary	**27.45**	**28.13**	**28.83**	**29.57**	**30.28**	**31.06**	**31.82**	**32.64**	**33.44**	**34.27**
OA-3	Administrative Asst; ZBA Clerk	**22.33**	**22.88**	**23.45**	**24.03**	**24.64**	**25.28**	**25.90**	**26.54**	**27.20**	**27.90**
OA-2	Board Secretary; Video and Communications Information Specialist	**18.76**	**19.24**	**19.71**	**20.21**	**20.72**	**21.23**	**21.76**	**22.31**	**22.86**	**23.43**
OA-1	Board Clerk	**16.32**	**16.74**	**17.14**	**17.57**	**18.01**	**18.47**	**18.92**	**19.40**	**19.87**	**20.37**

SEASONAL HOURLY WAGE SCHEDULE

GRADE	JOB TITLE	STEP 1	STEP 2	STEP 3	STEP 4	STEP 5
9	Golf Instructor	**31.21**	**46.82**	**62.42**	**78.03**	
8	Golf Employee and Operations Manager Shellfish Instructor	**21.85**	**22.89**	**23.93**	**24.97**	**26.01**
7	Waterfront Director (S7) Beach Supervisor (S7A) Asst Animal Control Officer (S7B) Seasonal Laborer (3C)	**13.79**	**14.31**	**14.83**	**15.35**	**15.87**
6	Ass't. Harbormaster (S6) Ass't Beach Supervisor (S6A) Playground Director (S6B) Activities Coordinator (S6C)	**12.75**	**13.27**	**13.79**	**14.31**	**14.83**
5	Kayak Instructor (S5) ($14.00) Parking Enforcement Officer (S5A)	**12.23**	**12.75**	**13.27**	**13.79**	**14.31**
4	Lifeguard (S4B) Swimming Instructor (S4C) Golf Ass't. (S4) Golf Maintenance Person (S4A) Work Leader (S4D) GIS Ass't (S4E) Project Ass't. (S4F) Summerball Director	**11.71**	**12.23**	**12.75**	**13.27**	**13.79**
3	Tennis Instructor (S3) Golf Utility Person (S3B) Playground Instructor (S2) Harbor Assistant (S2A) Parking Attendant (S2B) Summerball Instructor	**10.71**	**11.22**	**11.73**	**12.24**	**12.75**
2		**9.63**	**10.15**	**10.67**	**11.19**	**11.71**
1	Shellfish Interns (S1)	**9.36**	**9.63**	**10.15**	**10.67**	**11.19**

Personnel By-Law Compensation Plan as of July, 2017 – 2% increase

Grade		*MIN.*	*Step 2*	*Step 3*	*Step 4*	*Step 5*	*Step 6*	*Step 7*	*Step 8*	*Step 9*	*Step 10*
PT - 8	Alternate Building Commissioner	**39.93**									
PT-7	Plumbing, Wiring, Gas, Building and Alternate Inspectors *	**21.17**	**21.70**								
PT - 6	Part-time Dispatcher	**18.40**	**19.51**	**20.60**	**21.71**	**22.80**	**23.89**				
PT-5	Emergency Mgmt Director Special Police Officer Police Matron Mechanic	**19.06**	**19.54**	**20.03**							
PT- 4	Customer Service Rep – Sticker Sales Recycling/ Scalehouse Monitor Recycling/ Scalehouse Laborer	**15.25**	**15.64**	**16.03**	**16.42**	**16.83**	**17.27**	**17.69**	**18.14**	**18.57**	**19.05**
PT-3	Substitute Custodian ($13.84)** Transfer Station Attendant Assistant Outreach Worker Program Aide Clerical Aide Circulation Assistant	**13.99**	**14.35**	**14.70**	**15.07**	**15.45**	**15.82**	**16.24**	**16.64**	**17.05**	**17.48**
PT-2	Registrars of Voters Weight Room Worker	**12.80**	**13.11**								
PT-1	Library Pages Election Worker ($9.18-$10.00)** Sealer of Weights and Measures	**9.55**	**9.79**								

**Compensation will include $32.00 per inspection (PT 7) and emergency fee when called by public safety officer of 2 x the appropriate hourly rate or portion thereof*
***Grandfathered rates shown in parenthesis*

INTERMUNICIPAL AGREEMENT

For

Wastewater Collection and Treatment by and between

(CHATHAM/HARWICH)

This Intermunicipal Agreement ("Agreement") is entered into as of _____ (the "Effective Date") by and between the Town of CHATHAM, Massachusetts ("Chatham"), a municipal corporation, and the Town of HARWICH, Massachusetts ("Harwich"), a municipal corporation (collectively, with their successors and assigns, the "Parties").

RECITALS

WHEREAS, Chatham owns and operates a sewage collection, treatment and disposal system, including customer service operations for which the Commonwealth of Massachusetts Department of Environmental Protection ("DEP„) has issued a Ground Water Discharge Permit (Permit No.: 44-1), located within the municipal corporate boundaries of Chatham; and

WHEREAS, Harwich plans to construct and operate a sanitary wastewater system within the boundaries of Harwich to service the East Harwich area but desires to deliver its wastewater from the East Harwich area to the Chatham System for treatment and recharge; and

WHEREAS, Chatham and Harwich deem it to be in the public interest to enter into an intermunicipal agreement whereby Chatham would receive and treat Harwich's wastewater and septage at the Chatham Water Pollution Control Facility (the "WPCF„) in consideration of Harwich's contribution toward the capital and operational expenses generated by said connection and the other terms and conditions set forth herein, and

WHEREAS, in order to accommodate the additional flow of wastewater from East Harwich as set forth on Figure 13-1 attached hereto as Exhibit A, Chatham must allow construction of a connection with Harwich (the "Connection Point„). Costs associated with the Connection Point shall be borne by Harwich in accordance with Section 9.a herein. Costs associated with the collection system from the Connection Point to the WPCF shall be apportioned in accordance with the Harwich Project Share. The Chatham WPCF can accommodate the flow from East Harwich as set forth in Exhibit A while it continues to expand the Chatham collection system to other parts of Chatham not currently connected to the Chatham collection system. Chatham will continue to evaluate the need to design and build upgrades to the WPCF taking into account Chatham's needs, the Harwich flow, and water conservation efforts in both communities; and

WHEREAS, municipalities are authorized in accordance with G.L. c. 40 §§ 4 and 4A to enter into intermunicipal agreements for the purpose of aiding the prevention or abatement of water pollution; and

WHEREAS, Chatham and Harwich have been authorized to enter into this Agreement as evidenced by the execution of this Agreement by their respective Boards of Selectmen.

NOW, THEREFORE, for good and valuable consideration, the receipt and sufficiency of which is hereby acknowledged and for the mutual covenants, promises, obligations and agreements contained herein, the Parties hereto, intending to be legally bound, agree as follows:

AGREEMENT

1. DEFINITIONS.

The below terms, as used in this Agreement, shall have the following meanings:

a. "Connection Point" means an underground sewage pipe at which the Chatham collection system is connected to the Harwich collection system and which Connection Point is in approximately the location indicated on the diagram attached hereto as Exhibit B.

b. "Harwich Flow" means the sum of metered flow, which is metered at the Connection Point, and Unmetered Flow.

c. "Harwich Project Share" means Harwich's proportionate share of Project Costs which shall be calculated on the ratio between the 300,000 gpd and the total treatment capacity of the WPCF at the time of the Project (1.3 mgd). With respect to PS6 and associated piping, the Harwich Project Share shall be a proportional share as mutually agreed to by the Parties prior to design and construction.

d. "East Harwich Flow" means the amount of wastewater flowing into Chatham from East Harwich Service Area via the Connection Point.

e. "East Harwich Service Area,, means the areas in East Harwich, specifically sub-watersheds to Upper Muddy Creek, Lower Muddy Creek, Pleasant Bay, Round Cove, and potentially the Great Sand Lakes Area provided the combined flow does not exceed 300,000 gpd daily annual average, as described in the Harwich Comprehensive Wastewater Management Plan dated March 2016. (Figure 13-1, Exhibit A).

f. "Operation and Maintenance Expenses" (O&M Expense) includes the total annual expenses actually incurred by Chatham in the operation and maintenance of the System pursuant to a budget covering the categories of annual operating and maintenance expense listed on Exhibit C attached hereto, which budget shall be adopted prior to the commencement of each

Fiscal Year; provided, however, that O&M Expense (a) shall not exceed in the aggregate the total amount of the budget for such fiscal year, (b) shall not include any principal, interest or other charges in connection with any indebtedness incurred by Chatham, and (c) shall not include any Chatham expenses not directly attributable to and included in such annual budget of the System except for supplemental and/or emergency appropriations.

g. "O&M Share" means that portion of Harwich's Fixed and Flow Variable O&M Expenses determined quarterly as defined in Section 4.

h. "Project" means any future upgrades or capital improvements to the System required by regulatory or other legal authority, including without limitation by MassDEP, any future capital improvements to the System deemed necessary by Chatham to preserve the System's useful life, add/improve treatment quality or parameters treated, or maintain capacity to the System and any cost-saving capital modifications to the System. The term "Project,, shall also include pumping station(s), gravity sewer, forcemain and any other wastewater infrastructure used to convey Harwich wastewater to the Chatham WPCF.

i. "Project Cost" means the total cost to be incurred in the execution of the Project, including, but not limited to, assessment/feasibility, architectural, permitting, and engineering services, and construction work and construction phase services, interest or other costs of borrowing.

j. "System" means the WPCF, including the effluent recharge beds, the Connection Point(s), pumping station(s), and the gravity sewer and forcemain to convey the collected wastewater from Harwich to the Chatham WPCF.

k. "Total Flow,, means the sum of measured flow received at the WPCF including, but not limited to, wastewater from Chatham, East Harwich Service Area, septage, and grease. Flow shall be calculated on a 12 month rolling average. Exhibit D depicts the average daily Total Flow into the WPCF for the period July, 2015 through June, 2016.

l. "Unmetered Flow" means flow from Harwich which is not measured by Harwich metering devices at the Connection Point as a result of Harwich residential sewer users being connected directly to the Chatham collection system and billed directly by Harwich. Unmetered flow shall be calculated based upon water usage of those users as set forth in the regulations and shall be paid by Harwich directly to Chatham on a quarterly basis.

m. "WPCF" means the Chatham Water Pollution Control Facility and all components thereof, including improvements constructed and as may be amended from time to time.

2. EAST HARWICH SERVICE AREA.

2.1 Chatham agrees to receive and treat wastewater from Harwich users in the East Harwich Service Area at an annual average daily volume of up to 300,000 gpd at the Connection Point, and at such other mutually agreeable connection locations as may be designated by Chatham and Harwich. Notwithstanding the foregoing, Harwich may expand the East Harwich Service Area to serve the Great Sand Lakes Area, subject to the approval of Chatham, which approval shall not be unreasonably withheld, provided that Harwich shall not extend its sewer system beyond the East Harwich Service Area if the result of such an extension would cause Harwich to deliver wastewater to Chatham for treatment in excess of 300,000 gpd, unless this Agreement is amended.

2.2 Flow Management Plan. When the Harwich total annual flow metered at the Connection Point exceeds 80 percent of the purchased capacity for a three month period, then Harwich shall present, within 90 days, a plan to Chatham explaining how Harwich intends to manage the remaining 20 percent of the purchased capacity so that total flow exceedances do not occur on a 12-month rolling average. The plan shall 1.) define measures to be taken by Harwich to limit flow connection areas in the future; 2.) define measures to be taken by Harwich to reduce existing flows entering the system; 3.) discuss potential expansion options at the Chatham WPCF; or 4.), define other appropriate action as may be required to enforce the flow capacity allocation. Such Flow Management Plan measures shall be subject to Chatham's approval, which shall not be unreasonably withheld, and, upon written notification to Harwich of such approval, Harwich shall be bound to undertake such measures. Any failure of Harwich to satisfactorily complete such Flow Management Plan measures shall be deemed a material breach of this Agreement. Likewise, Chatham's failure or refusal to approve a Flow Management Plan without reasonable basis shall be deemed a material breach of this agreement.

3. CAPACITY PURCHASE FEE

Harwich will purchase 300,000 gpd average annual daily flow capacity of the Chatham WPCF, for the amount of $6,765,000. Harwich shall make an initial payment of $2,265,0000 upon execution of this Agreement; a second payment of $1,500,000 shall be made upon the commencement of flow from the East Harwich Service Area to the WPCF; a third payment of $1,500,000 shall be made upon an average daily flow of over 50,000 gpd or five (5) years from the date of signing of this Agreement, whichever occurs first; and, a fourth payment of $1,500,000 shall be made upon an average daily flow of over 150,000 gpd or seven (7) years from the date of signing this Agreement, whichever occurs first.

4. O&M EXPENSES

Terms for paying these costs will be defined into two categories: Fixed and Flow Variable.

A. WPCF

1) Given that Chatham will be reserving capacity for Harwich which will require ongoing O&M expenses to maintain the WPCF, Harwich shall pay Fixed O&M expenses (including but not limited to Contract Services, Plant Maintenance, 20% of Chatham DPW Director salary, SCADA contracts, etc.) based on the actual percentage (%) of wastewater flow capacity for East Harwich Service Area to Chatham WPCF Phase I design flow capacity (300,000 gpd/1,300,000 gpd = 23.08%). Fixed O&M payments shall begin at the time of Harwich connection.

2) Flow Variable O&M expenses for the WPCF (including but not limited to chemicals, electricity, natural gas, diesel, sludge removal/disposal, testing, etc.) shall be paid based on the actual percentage (%) of wastewater flow from the East Harwich Service Area as measured at the Connection Point(s) to Total Flow. Flow Variable O&M payments shall begin once flow is measured at the Connection Point.

B. Collection System

1) Harwich shall pay Fixed O&M costs in a ratio of Harwich design flow to Chatham design flow for that portion of the conveyance system from the Connection Point(s), through pumping station(s), to the WPCF and any off-site effluent recharge location within Chatham, if applicable. Fixed O&M payments shall begin at the time of Harwich connection.

2) Flow Variable O&M expenses for the collection system (including but not limited to chemicals, electricity, natural gas, diesel, testing, etc.) shall be paid based on the actual percentage (%) of wastewater flow from the East Harwich Service Area as measured at the Connection Point(s) to total flow measured at Pump Station 6 or other such pump station designation. Flow Variable O&M payments shall begin once flow is measured at the Connection Point.

3) For the avoidance of any doubt, Harwich shall not be responsible for the payment of any O&M expenses incurred by Chatham that relate solely and exclusively to the operation and maintenance of any portion of the Chatham sewer collection system or other components thereof that are not used by Harwich.

C. Within thirty (30) days after the end of each calendar quarter, Chatham will send a statement to Harwich showing, for the period since the beginning of the Fiscal Year to the end of such quarter, Total Flow, flow for that quarter as measured at the Connection Point and the total flow measured at Pump Station 6 or other such pump station designation.

5. EFFLUENT RECHARGE

Chatham shall recharge effluent originating from the East Harwich Service Area at the Chatham WPCF site during the initial years of the Agreement. While the existing recharge system was sized for the capacity of the Chatham WPCF, the Groundwater Discharge Permit (GDP) is limited to five (5) years. The discharge allowed by the current GDP is 1.0 MGD, below the WPCF's capacity of 1.3 MGD. The duration of the initial recharge of Harwich effluent at the Chatham WPCF would be at least until the Chatham facility reaches 80% of its permitted flow capacity. Upon being notified by MassDEP that Chatham must redirect effluent recharge, Chatham shall notify Harwich, in which case Harwich shall construct, maintain and repair the necessary infrastructure to redirect the Harwich flow to a suitable site in Harwich, in an amount necessary to meet the requirements of the MassDEP. In the event that Chatham notifies Harwich of the need to construct infrastructure required to redirect treated effluent back to Harwich for recharge, Harwich shall, at its sole cost and expense, complete the infrastructure construction within three years of said notice from Chatham. Thereafter, the Harwich share of O&M costs shall not include any costs incurred by Chatham for effluent recharge for the portion of effluent directed back to Harwich for recharge. Chatham shall provide any easements necessary at the Chatham WPCF to locate a treated effluent pumping station and appurtenances, including forcemain easements necessary on town-owned properties or within existing rights-of-way from the Chatham WPCF to Harwich. Chatham shall have the right to review and comment on the location of any proposed easements to ensure coordination with other Chatham infrastructure. Chatham shall not unreasonably deny, delay or condition the granting of such easements.

6. SEPTAGE

Chatham shall accept septage pumped from properties located in the East Harwich Service Area upon abandonment of the septic system as part of the connection to sewer process, subject to appropriate documentation, and at the prevailing rate of the Chatham WPCF.

7. FLOW BUY BACK PROVISION

Harwich shall notify Chatham upon completion of the sewering of the East Harwich Service Area in accordance with the Harwich Comprehensive Wastewater Management program. In the event Harwich does not use the entirety of the 300,000 gpd allocated to it at any time during the term of this Agreement, Chatham may buy back any unused flow at a price reflecting the ratio of the amount of gallons to be bought back to the total number of gallons purchased by Harwich at the commencement of this Agreement multiplied by $6,765,000 which amount shall be adjusted for inflation in accordance with the Consumer Price Index – Northeast Region or any other mutually accepted cost method. Harwich shall not transfer any portion of the 300,000 gpd allocation to any other entity. Harwich shall not divert any portion of the 300,000 gpd allocation to any area outside the East Harwich Service Area.

8. TERM.

This Agreement shall commence on Execution of the Agreement and shall continue, unless sooner terminated, for a Term of twenty five (25) years. This Agreement shall continue in full force and effect on the Expiration Date unless it is modified in writing by the Parties or notice is provided by one of the Parties to the other Party of the intent not to renew this Agreement. Such notice shall be provided no later than five (5) years prior to the Expiration Date. If this Agreement is not renewed, Harwich shall pay to Chatham any unpaid amounts owing hereunder. If this Agreement is extended beyond the original 25 year Term Harwich shall not be responsible for any additional Capacity Purchase Fee.

9. CONNECTION POINT.

a. Harwich may construct and connect the East Harwich Service Area portion of its wastewater system as set forth on Exhibit A in coordination with Chatham's infrastructure implementation schedule. Chatham will furnish to Harwich wastewater conveyance and treatment services. The connection of Harwich with the System shall take place by means of the Connection Point at or near the Chatham town line. The cost for initial design, construction, and any future expansion or additions to the Connection Point necessary to accommodate any increases in wastewater flow of the East Harwich Service Area shall be borne by Harwich at no cost to Chatham and shall be subject to approval by Chatham.

b. Harwich hereby grants Chatham and its agents and independent contractors the authority, right and license at all times to have access to such portion of the Connection Point located within Harwich for the purpose of improving, repairing, using and inspecting the same and will issue, promptly upon request therefor, such permits and licenses as shall be necessary to accomplish any of such purposes.

c. Harwich will pay its proportional share of System Project Costs to convey the collected wastewater from the Connection Point to the Chatham WPCF. The proportional share shall be based on the ratio of Harwich's design flow and Chatham's design flow for that segment of the collection system.

10. REGULATIONS.

a. Sewer Use Regulations. Harwich shall adopt local Sewer Use Regulations ("Harwich Regulations,,) for residential and commercial users of the Harwich System located in East Harwich, which is no less stringent and is as broad in scope as the sewer use regulations set forth in the Chatham Regulations, as amended. The Harwich Regulations shall include pollutant specific local limits which address at least the same pollutant parameters and are at least as stringent as the local limits enacted by Chatham. Harwich shall forward to Chatham for review a proposed draft of the Harwich Regulations within six (6) months, or such longer period of time as may be reasonably agreed upon by the parties, of the date of this Agreement, and shall adopt the Harwich Regulations within

sixty (60) days of receiving approval from Chatham of the content thereof or by any other time as reasonably agreed to by the parties..

b. Revisions by Chatham. Whenever Chatham proposes to adopt revisions to its sewer use Regulations it shall forward to Harwich for review the proposed revisions. Whenever Chatham adopts a revision to its sewer use Regulations, it shall forward a copy of the revisions to Harwich within ten (10) business days of enactment thereof. Harwich shall adopt revisions to the Harwich Regulations that are consistent with and at least as stringent as those adopted by Chatham. Harwich shall forward to Chatham for review its proposed revisions within thirty (30) days of receipt of Chatham's revisions. Harwich shall adopt its revisions within sixty (60) days of receiving approval from Chatham of the content thereof or by any time as reasonably agreed to by the parties.

c. Revisions by Harwich. Harwich shall forward a copy of any proposed revisions to the Harwich Regulations to Chatham for review and comment no later than forty-five (45) days prior to proposed adoption. Chatham shall provide comment to Harwich within fifteen (15) days of receipt. Harwich shall not enact any such revisions inconsistent with this Agreement.

d. Review. The Parties shall periodically review their respective sewer use Bylaw(s) and/or Regulations and jointly draft and adopt amendments (which are equivalent in scope and stringency) when deemed necessary for the effective administration and operation of Chatham's or Harwich's pretreatment program or may be responsive to requirements of MassDEP or address other matters which Chatham or Harwich deem appropriate to maintain the System. This review shall be conducted not less than once every five (5) years. However, either Party may request a joint review whenever such party believes that a review is necessary.

e. Compliance with Law. Each of the Parties shall comply with all applicable current and subsequent regulations of the U.S. E.P.A. and MassDEP relating to the administration, operation and control of the System during the term of this Agreement, and no party shall be liable for the act or neglect of the other. Chatham shall maintain compliance with the MassDEP permit requirements applicable to the WPCF and all federal, state, and local laws, water quality standards, orders and decrees of governmental authorities with jurisdiction over the treatment and discharge of wastewater. Chatham shall comply with any orders issued by governmental entities relating to the WPCF and shall pay any fines, penalties, or costs resulting from such enforcement actions without recourse to Harwich, except to the extent the violation is caused by flow entering the System from Harwich or other acts or omissions directly attributable to Harwich.

11. IMPLEMENTATION; ENFORCEMENT.

a. Agency. As holder of Groundwater Discharge Permit #44-1 Chatham is responsible for complying with all conditions in said Permit. In order to ensure that flow entering the Harwich collection system does not place Chatham in a potential Permit violation, Harwich designates Chatham as an agent of Harwich for the purposes of implementation and enforcement of Harwich's sewer use Regulations against all users located in the East Harwich Service Area. Chatham may take any action under Harwich's sewer use Regulations that could have been taken by Harwich, including the enforcement of the Regulations in courts of law. Chatham shall have concurrent authority with Harwich to enforce its sewer use Regulation in Harwich. The foregoing authorization is not an abdication of Harwich's obligations to in good faith enforce this Agreement but in addition thereto. Harwich's Regulations shall indicate said designation of Chatham as a supplemental implementation/ enforcement authority. Notwithstanding the foregoing, Harwich shall have the responsibility of all collections related to users of Unmetered Flow. Harwich shall be required, regardless of the users' collection status, to pay Chatham on a quarterly basis for all Unmetered Flow.

b. Duties. Chatham, on behalf of and as agent for Harwich, may, at its sole option , perform any and all technical and administrative duties necessary to implement and enforce Harwich's sewer use Regulations or its own sewer use Bylaw. Chatham may, at its sole option: (1) update the industrial waste survey; (2) issue permits to all industrial users required to obtain a permit; (3) conduct inspections, sampling, and analysis; (4) take all appropriate enforcement action; and (5) perform any other technical and administrative duties the Parties mutually deem appropriate.

c. Permitting. Under no circumstances may Harwich discharge any industrial waste or other waste requiring pretreatment into Chatham's wastewater treatment system until an industrial wastewater pretreatment permit (or modification to an existing permit) is issued by Chatham which allows such industrial waste discharges. Any future industrial user must apply for a permit in conformance with this Agreement and the controlling sewer use Bylaw. Chatham shall not unreasonably deny, delay or condition the granting of such an application.

d. Right of Access. Harwich grants to Chatham the authority to access all parts of Harwich's sewer system which flow to the Connection Point and, as permitted by applicable law, all parts of the facilities of industrial users located within Harwich that contribute to Chatham's System, including the right to review and copy all records compiled by Harwich and, as permitted by applicable law, industrial users in relation to discharge activities, to periodically verify compliance with all applicable permits, orders, rules, Regulations and Bylaws, including pretreatment standards and requirements. On-site inspections and monitoring may be conducted (i) during business hours without prior notice or (ii) during non-business

hours with notification to the Harwich Police Department or Public Works Department.

e. Restriction on Foreign Wastewater. Harwich shall not authorize the use of the Connection Point for the transmission of wastewater to the System generated by any source of wastewater that is not located in East Harwich Service Area.

f. Violations. Industrial users of the system in Harwich, if any, shall be subject to enforcement action by Chatham for any violation of Harwich's or Chatham 's sewer use Bylaw or Regulations, or any applicable federal, state or local pretreatment regulation or standard, including, but not limited to, administrative orders, fines and penalties (up to such limits as may be then applicable under state and federal law), injunctive relief, and/or termination of sewer service; provided, however, that Chatham shall be entitled to implement the remedy of termination of sewer services only if any such violation by the industrial user results in a discharge which, in Chatham's sole determination, reasonably appears to present a danger or threat as described in Section (11)((g) of this Agreement.

g. Emergencies. Notwithstanding anything to the contrary contained herein, Chatham shall have the immediate and effective authority, on its own behalf and as the agent of Harwich, to take emergency action to halt or prevent any discharge to the System which (i) presents or may present an imminent danger to the health or welfare of humans, (ii) reasonably appears to threaten the environment, (iii) threatens to cause to pass through sludge contamination or substantial interference with the appropriate operation of the System, or (iv) may result in a Permit violation.

h. Costs. All costs and expenses (including, but not limited to, labor, equipment, attorneys' fees, etc.) incurred by Chatham in implementing and enforcing Harwich's sewer use Regulations against users of the System located in East Harwich shall be paid by Harwich upon issuance of a quarterly invoice by Chatham itemizing the same.

i. Secondary Authority. If the authority of Chatham to act as agent for Harwich under this Agreement is questioned by an industrial or any other user, court of law, or otherwise, Harwich will take whatever action is necessary to ensure the implementation and enforcement of its sewer use Regulations against any of its users, including, but not limited to, implementing and enforcing its sewer use Regulations on its own behalf and/or amending this Agreement to clarify Chatham's authority.

j. Natural Disasters. In the event of floods or other natural disasters that cause water flows in the System to exceed capacity limits and/or that result in an unsafe condition, and/or that cause, or threaten to cause, harm to the public health, the Parties shall cooperate fully and reasonably to resolve such capacity, safety and public health concerns in accordance

with the broad objectives of this Agreement and applicable laws and regulations.

12. ALLOCATIONS OF MAXIMUM FLOWS; FLOW CHARACTERISTICS.

a. Maximum Flows. The annual average daily flow from the East Harwich Service Area shall be 300,000 gpd or less calculated on a 12 month rolling average. This represents 23.08% of the initial design average annual flow of the WPCF. Because the flow from Harwich will be pumped to the Chatham WPCF, Harwich is allowed 23.08% of other measured or calculated flows including, but not limited to, maximum 30 day average, peak day, and peak hour.

b. Flow Characteristics. Harwich will not authorize, and Chatham shall exclude, wastewater flows into the System in excess of the rates of flow specified above for the East Harwich Service Area; provided, however, that before excluding flow from the East Harwich Service Area hereunder, a determination based on actual data over a period of at least twelve (12) months shall have been made that the average flow from the East Harwich Service Area shall have exceeded the limitation applicable thereto and Harwich shall have been given at least ninety (90) days prior written notice thereof. Chatham and Harwich shall take all reasonable steps to preclude the introduction into the System of wastewater having characteristics, including, but not limited to, BOD, TSS, Total Nitrogen, Nitrate Nitrogen, Turbidity, TOC, Oil & Grease, Sodium, not in accordance with the local limits in place from time to time as established by Chatham.

Local Limits shall be defined as follows:

1. BOD, TSS, Total Nitrogen – Harwich shall be allowed a share of the influent load planned for the WPCF that is commensurate with the flow from the East Harwich Service Area. Preliminary Design Memo M-1B defines the Chatham WPCF loads (Exhibit E).

2. Turbidity, Oil & Grease, TOC, and Nitrate Nitrogen – are expected to be similar to Chatham's influent.

3. Harwich shall not discharge into the Harwich or Chatham system waste originating from marine pumpout facilities, or other non-standard sources, without the prior written approval of Chatham.

13. METHODS OF DETERMINING FLOWS.

a. East Harwich Service Area Flow, other than Unmetered Flow, shall be measured by a standard metering device to be located and installed at the Connection Point in the location indicated on Exhibit B. Unless replaced or changed pursuant to a future agreement between the parties, such standard metering device will consist of the following apparatus: One

Venturi Meter, a direct reading totalizer, indicator, and recorder-transmitter with instantaneous flow signal data transmitted to the Chatham Water Pollution Control Facility SCADA system on a continuous basis. Chatham shall be responsible for maintaining the SCADA system. Said apparatus shall be subject to the approval of Chatham, which shall not be unreasonably withheld.

b. Chatham will cause the flow of wastewater from East Harwich to be measured and recorded on a continuous basis in the same manner as set forth in Section 13(a) above, so that the Total Flow (other than Unmetered Flow) and flow from East Harwich shall at all times be known.

c. In the event any metering device fails to register or registers incorrectly the flow of wastewater, Chatham and Harwich will agree on an estimate (if an historic record is not available from earlier similar periods) of the period of time during which the metering device failed to register or registered incorrectly and the quantity of wastewater that would have been measured were the metering device operating correctly, and an appropriate adjustment based thereon shall be made in the wastewater flow to be used as the basis on which to determine Harwich's O&M Share.

d. For billing purposes, Chatham shall read the metering devices at intervals of approximately thirty (30) days. Harwich, at its expense, shall periodically, but not less than twice each year (spring and fall), inspect, test and calibrate the Venturi metering device referred to in Section 13(a) and within 48 hours after any failure of the meter.

e. Harwich recognizes that the System has a maximum permitted flow of One (1) MGD and that further there are portions of Chatham that still require connection to the System. Harwich, therefore, shall be entitled to no more than 300,000 gpd of permitted Flow into the System.

14. COLLECTION OF AMOUNTS PAYABLE.

a. O&M Share. Within thirty (30) days after the end of each calendar quarter, Chatham will send a statement to Harwich showing, for the period since the beginning of the Fiscal Year to the end of such quarter, (a) East Harwich Flow, (b) the Total Flow, (c) O&M Expense incurred, (d) Harwich's O&M Share thereof and (e) the amount, if any, previously paid by Harwich on account thereof. Harwich shall remit payment of the balance due to Chatham within thirty (30) days of receipt of such statement.

b. Harwich Project Share. Harwich shall pay the Harwich Project Share of the Project Costs. Such payments shall be based upon the payments actually made by Chatham pursuant to all financings and/or borrowings, including, without limitation, interest costs, in connection with the Project, but shall not include any amounts reimbursed to Chatham under

any federal or state grant program. Chatham will send a monthly statement to Harwich showing the amount actually paid to Chatham's lender. Harwich shall remit payment to Chatham within thirty (30) days of receipt of such statement.

c. Construction Costs Following Early Termination. In the event of any termination of this Agreement prior to the Expiration Date, Harwich shall pay to Chatham the full amount of (i) Harwich's Project Share of the Project Costs for work actually performed and invoiced to Chatham and which remains unpaid as of the date of termination, (ii) Harwich's Project Share of the Project Costs for all then-remaining work to be performed in connection with the Upgrades resulting from Harwich's use of the WPCF and (iii) any other amounts owing hereunder. Such payment shall be made to Chatham within thirty (30) days of the date of notice of termination or, for work not yet performed at the time of the notice of termination, within thirty (30) days of the date of invoicing for work when it is actually performed. In the event that any payment due under this Section 14 is not received by Chatham within forty-five (45) days of Harwich's receipt of Chatham's statement, interest on the amount overdue shall accrue at the rates and in the manner as is charged to Chatham ratepayers who have amounts owed and past due. The provisions of this Section 14 shall survive any termination of this Agreement.

d. Fees. Harwich shall be responsible for collecting, and Chatham shall be entitled to receive the proceeds from, the issuance and collection of sewer use and pretreatment fees and assessments, if any, as set forth in the controlling sewer use Bylaw or Regulations, as amended, from any and all contributing users located within Harwich. Harwich hereby covenants and agrees that East Harwich-based users of the System shall be subject to and responsible for the payment of such fees, including without limitation any special assessment or similar charge to the extent such fees, assessments or charges are also payable by Chatham-based users of the System, and that Harwich shall bill and collect said amounts and pay to Chatham, at no cost or expense to Chatham, all such amounts on a quarterly basis.

15. MATTERS SUBJECT TO CONFERENCE BETWEEN THE PARTIES.

Chatham and Harwich recognize and agree that they are both users of the System and contribute financially to the O&M Expense of the same, and that such use of the System and financial contribution to Chatham from Harwich shall be considered whenever such facts are pertinent to the observance and performance of this Agreement. Representatives of Harwich may be requested to attend any conference with Chatham where the matters discussed are or may be affected by such use and contribution or may affect such use and contribution. Further, Chatham and Harwich shall create an advisory board for the purpose of exchanging communication regarding the System. Such board shall consist of five (5) members, comprised of three (3) from Chatham and two (2) members from Harwich. The Chatham Town Manager shall serve as one of Chatham's

designated members and shall also act as chair. The board shall meet quarterly to discuss the status of the System and any major issues related thereto. The board shall be advisory in nature, and may make recommendations to Chatham with respect to proposed improvements or other modifications to the administration of the System, but shall not have the legal authority to require or direct that its recommendations be implemented. Each Town shall determine on their own, how to designate their remaining members of the board.

16. DISPUTE RESOLUTION.

Any disputes arising out of this Agreement shall be submitted to non-binding mediation performed by an independent mediator stipulated by Chatham and Harwich. A resolution reached in mediation shall in no way limit Chatham's power to enforce pretreatment standards and requirements directly against industrial users or other users located in Harwich, nor shall it preclude the parties from seeking other remedies against each other including without limitation proceedings in a court of competent jurisdiction. The cost of such mediation, except for the cost of each Party's direct representation, shall be shared equally between the Parties.

17. REMEDIES.

a. Legal and Equitable Relief. The Parties acknowledge and agree that money damages may not be a sufficient remedy for any breach of this Agreement, that either Chatham or Harwich may be entitled to equitable relief (including, without limitation, injunction, specific performance and termination of this Agreement) as a remedy for any such breach or threatened breach, and that neither Party shall oppose the granting of any such relief to Chatham. Such remedy shall not be deemed to be the exclusive remedy for a breach of this Agreement but shall be in addition to all other remedies available to either Party for all damages, costs and expenses, including reasonable attorneys' fees, incurred by it in this regard.

b. Waiver. No delay or failure to exercise a right resulting from breach of this Agreement shall impair such right or be construed as a waiver thereof, so that such right may be exercised from time to time and as may be deemed expedient. Any waiver shall be in writing and signed by the party granting such waiver. If any provision contained in this Agreement is breached by either Party and thereafter waived by the other Party, such waiver shall be limited to the particular breach so waived and shall not be deemed to waive any other breach under this Agreement.

18. TERMINATION.

18.1 Either party may terminate this Agreement for convenience by providing at least five (5) years advance written notice to the other party, provided that such notice is delivered to the other Party on or after the Tenth Anniversary of this Agreement All benefits and obligations under this Agreement will cease upon

the termination date set forth in such written notice. Upon the effective date of such termination, Chatham shall discontinue the services of its System, including collection and treatment of wastewater discharge, for any and all residential, industrial and other users located in Harwich. All users located in Harwich shall cease and desist discharging into Chatham's System upon Chatham's election to discontinue services. In the event of any termination of this Agreement prior to the Expiration Date, Harwich shall pay to Chatham the amount described in Section 14 hereof, in addition to any other amounts owing hereunder.

In the event that Chatham terminates this Agreement pursuant to this section, Chatham shall pay to Harwich the unamortized portion of the Capacity Purchase Fee remaining on the effective date of the termination in accordance with the following formula:

(((50 year WPCF Life) minus (Year from Date of original agreement that Termination takes effect)) times ($135,300)).

- Where $135,300 is the Capital Purchase Fee divided 50.
- Payment to Harwich shall be reduced by $135,300 per year up to the "Initiate Termination,, year 44 from the execution date of the original Agreement following renewal of said Agreement.

Example:

- Chatham Initiates Termination in Year 10 (notice not allowed prior to Year 10 per Agreement)
- Termination takes effect in Year 15 (Agreement requires 5 years minimum Notice)
- Therefore, Payment to Harwich = (50 – 15)*$135,300 = $4,735,500

Table below shows full schedule estimated for 50 year WPCF system life.

Initiate Termination at year (years from original agreement date)	Year Termination takes effect (5 years after "Initiate Termination,,)	Years remaining in WPCF Life	Payment to Harwich
10	15	35	$ 4,735,500
11	16	34	$ 4,600,200
12	17	33	$ 4,464,900
13	18	32	$ 4,329,600

14	19	31	$ 4,194,300
15	20	30	$ 4,059,000
16	21	29	$ 3,923,700
17	22	28	$ 3,788,400
18	23	27	$ 3,653,100
19 [1]	24	26	$ 3,517,800
20	*25*	*25*	*$ 3,382,500*
21	*26*	*24*	*$ 3,247,200*
22	*27*	*23*	*$ 3,111,900*
23	*28*	*22*	*$ 2,976,600*
24	*29*	*21*	*$ 2,841,300*
25	*30*	*20*	*$ 2,706,000*
26	*31*	*19*	*$ 2,570,700*
27	*32*	*18*	*$ 2,435,400*
28	*33*	*17*	*$ 2,300,100*
29	*34*	*16*	*$ 2,164,800*
30	*35*	*15*	*$ 2,029,500*
31	*36*	*14*	*$ 1,894,200*
32	*37*	*13*	*$ 1,758,900*
33	*38*	*12*	*$ 1,623,600*
34	*39*	*11*	*$ 1,488,300*
35	*40*	*10*	*$ 1,353,000*
36	*41*	*9*	*$ 1,217,700*
37	*42*	*8*	*$ 1,082,400*
38	*43*	*7*	*$ 947,100*

39	*44*	*6*	*$ 811,800*
40	*45*	*5*	*$ 676,500*
41	*46*	*4*	*$ 541,200*
42	*47*	*3*	*$ 405,900*
43	*48*	*2*	*$ 270,600*
44	*49*	*1*	*$ 135,300*
45	*50*	*0*	*$ -*

Notes:

1. Termination for convenience per the Agreement may not be initiated after year 19 without the renewal or renegotiation of the Agreement between Chatham and Harwich.

18.2.

A. For any material breach of this Agreement, either party may terminate this Agreement by giving the other party written notice thereof with an effective termination date twelve (12) months after receipt of the notice to terminate and after providing an opportunity to cure such material breach. For purposes of this Agreement, a material Breach is defined as a substantial failure of a party to perform its duties or obligations hereunder which prevents the Agreement from being completed, alters the financial burdens of the Parties, or defeats the purpose of the Agreement.

B. No failure or delay in any performance hereunder shall be deemed to be a breach of this Agreement when such failure or delay is occasioned by or due to an Act of God, strike, lockout, war, riot, epidemic, explosion, sabotage, breakage, or accident to machinery or line or pipes or binding order of any court or governmental authority, or any other cause whether of the kind herein enumerated or otherwise not attributable to or within the control of the Party against whom the breach is alleged.

C. It shall be deemed a material breach of this Agreement if sixty (60) days passes after which Chatham has sent to Harwich a written notice of overdue payment of any undisputed amount and Harwich does not pay same within ten (10) days after receipt of said overdue notice. It shall further be deemed a material breach of this Agreement if Harwich fails to timely adopt/revise Sewer Use Regulations as required by Section 10 or fails to timely fund, construct, maintain and repair the necessary effluent recharge infrastructure to redirect the Harwich flow to a suitable site in Harwich as required by Section 5 as triggered by notification from DEP that Chatham must re-direct effluent recharge.

19. NOTICES.

Whenever notice shall be required to be given pursuant to the terms of this Agreement, it shall be in writing and shall be deemed given when mailed by United States registered or certified mail, postage prepaid, return receipt requested and addressed as follows:

To Chatham:

Town Manager
549 Main St.
Chatham, MA 02633
With copy to Board of Selectmen

To Harwich:

Town Administrator
732 Main St.
Harwich, MA 02645
With copy to Board of Selectmen

20. MISCELLANEOUS.

a. Entire Agreement. This Agreement constitutes the entire agreement between the Parties with respect to implementation and enforcement of a pretreatment program to control wastewater discharges from all industrial users of the System.

b. Periodic Review. The Parties will review and revise this Agreement to ensure compliance with the Federal Clean Water Act (33 U.S.C. § 1251 et seq.) and rules and regulations (see 40 C.F.R. Part 403) and the rules and regulations of the DEP, as necessary.

c. Further Assurances. Each of the Parties hereto shall execute and deliver any and all additional documents or instruments (including easements and other rights in land), in recordable form as appropriate, shall provide other assurances, shall make any necessary applications or filings and submit any records or data to any regulatory body, governmental entity or agency having jurisdiction as necessary to obtain any additional permits, licenses and approvals required, and shall do any and all acts and things reasonably necessary to carry out the intent of the Parties hereto and to confirm the continued effectiveness of this Agreement. Without limiting the foregoing, the Parties agree to amend their respective facilities plans as necessary in connection with any change in applicable industrial pretreatment requirements.

d. Industrial User Contracts. Nothing in this Agreement precludes Chatham from entering into direct contracts with users located in Harwich establishing wastewater discharge restrictions and pretreatment

requirements that are at least as stringent as those provided for in Harwich's sewer use Regulations.

e. Relationship. This Agreement does not create a fiduciary relationship between the Parties. Nothing in this Agreement is intended to constitute either Party an agent, legal representative, subsidiary, joint venture, partner, employee, or servant of the other for any purpose.

f. Modification. No modification, alternation, amendment or waiver of any provision of this Agreement shall be effective or binding on either party unless mutually agreed to in writing by the Parties.

g. Captions. The captions appearing in this Agreement are inserted only as a matter of convenience and for reference, and in no way define, limit construe or describe the scope or intent of any provisions of this Agreement nor in any way affect this Agreement.

h. Governing Law. This Agreement shall be governed by, construed and interpreted in accordance with the laws of the Commonwealth of Massachusetts, which shall also be determinative in any litigation in connection with, or enforcement of this Agreement.

i. Severability. If any term of this Agreement is held to be invalid in any judicial action, it shall be severed from this Agreement and the remaining terms will be unaffected.

j. Third Parties. Nothing contained in this Agreement shall create a contractual relationship with, or a cause of action in favor of, a third party against any or all of the Parties.

k. Binding Effect. The terms, covenants, and conditions contained in this Agreement shall be binding upon and inure to the benefit of the Parties hereto and their respective legal representatives, successors and assigns and any person or persons, natural or corporate, claiming through or under them, or any of them.

l. Assignment. No assignment of this Agreement or any Party's rights, interests or obligations hereunder may be made without the other Party's consent, which shall not be unreasonably denied, withheld, delayed or conditioned.

m. The obligation of Harwich to pay Chatham the Capacity Purchase Fee and its proportionate share of the improvements to the System required to deliver wastewater to the WPCF, including the construction of conveyance infrastructure, shall be subject to appropriation. Notwithstanding the legal requirement for an appropriation, any failure of Harwich to pay any sum due hereunder to Chatham in a timely basis shall constitute a material breach of the terms hereof for purposes of Article 18.2.

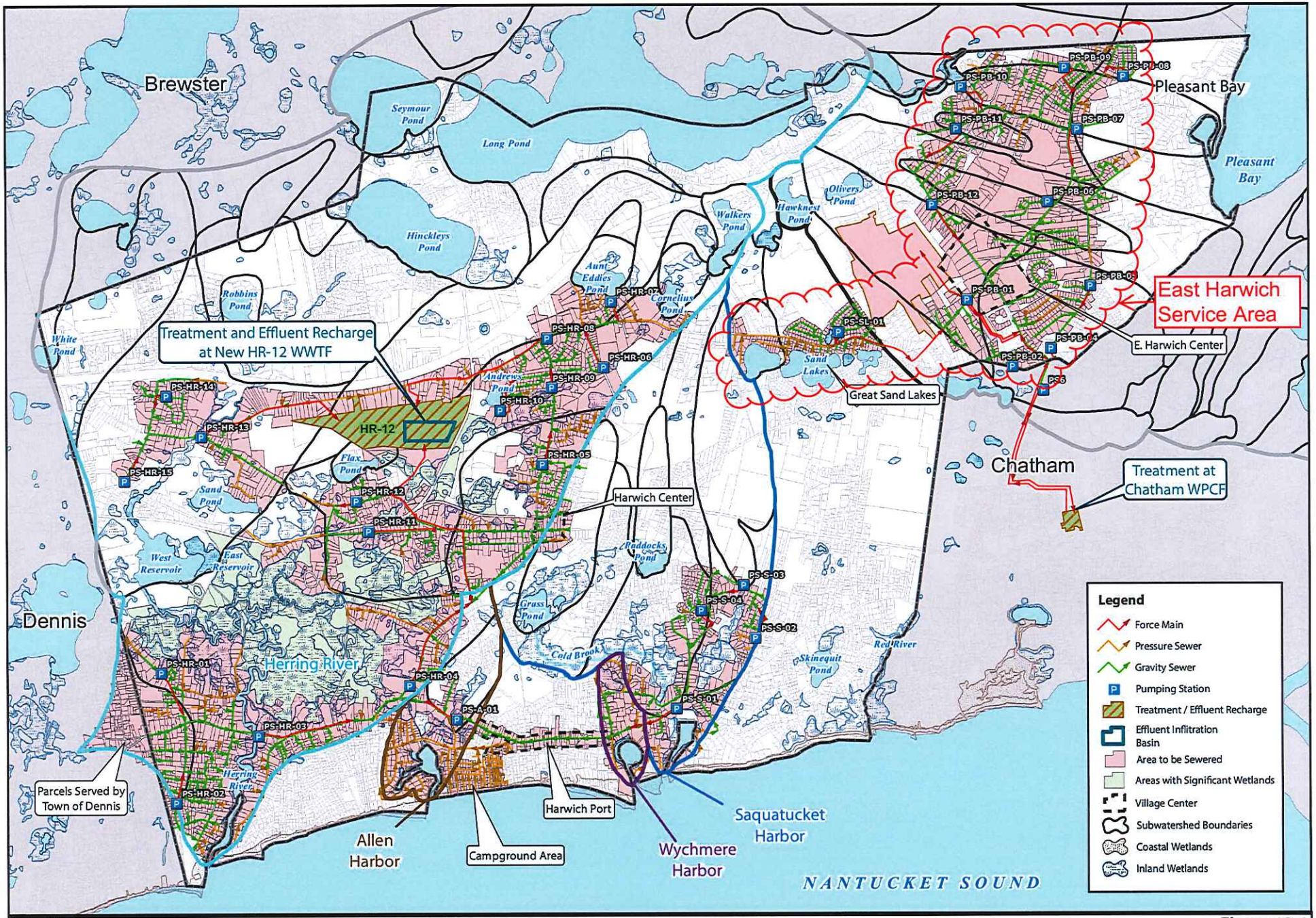
[Signature page follows]

IN WITNESS WHEREOF, the Parties hereto have caused this Agreement to be executed by their duly authorized officers and their respective seals to be affixed as of the dates given below.

Board of Selectmen, Town of Chatham	Board of Selectmen, Town of Harwich
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

Exhibit A

East Harwich Service Area



N

Town of Harwich
Comprehensive Wastewater
Management Plan

1 inch = 4,000 feet
0 1,000 2,000 4,000 Feet

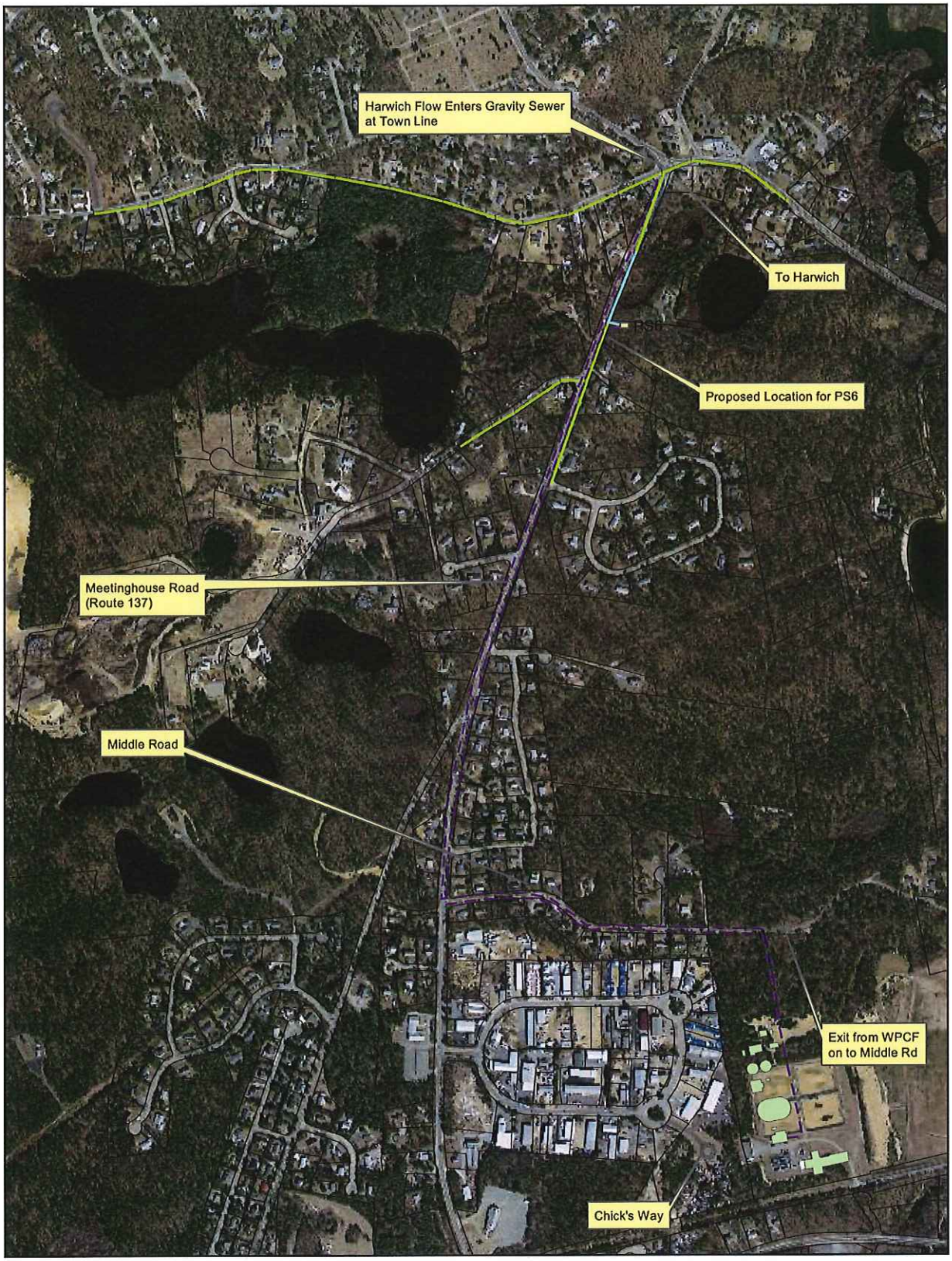
Figure 13-1
Recommended Areas to be Sewered

CDM Smith

Z:\Harwich\Harwich_cwmp\MXD\Section_13\Fig13-1Recommended_Plan_Overview.mxd NEWELLJD 12/5/2012

Exhibit B

Connection Point



Legend

Force Main
10"

Gravity Sewer
8"
12"

Manholes

New Buildings

0 250 500 1,000 Feet

Paper Size ANSI B

Map Projection: Lambert Conformal Conic
Horizontal Datum: North American 1983
Grid: NAD 1983 StatePlane Massachusetts Mainland FIPS 2001 Feet

CDM Smith Inc.
Harwich Comprehensive
Wastewater Management Plan

Site 6 Gravity
and Force Main Extents

Job Number 86-14969
Revision A
Date 11 Jun 2012

Figure 5

G:\86\14969\GIS\Fig 5 - Site 6.mxd

1545 Iyannough Rd Hyannis MA 02601 USA T 774-470-1630 F774-470-1631 E hyamail@ghd.com W www.ghd.com

Exhibit C

O&M Expenses

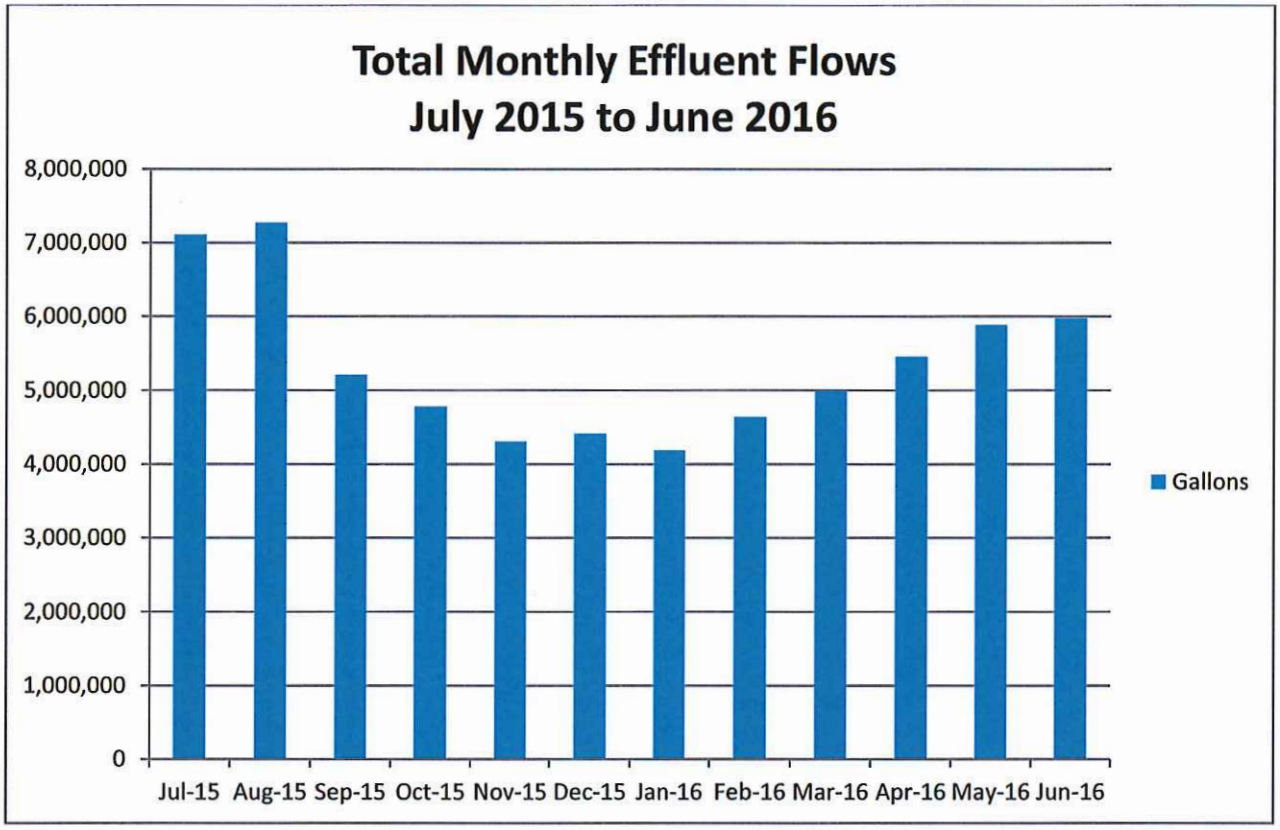
Department Detail

FY 2018 Budget	Dept - 443 Sewer	Department Detail

		FY 2015 Actual	FY 2016 Actual	FY 2017 Budget	FY 2017 YTD 12/31/16	FY 2018 Dept Req	Supplemental Request	FY 2018 Town Manager
5110	Regular Wages	22,884	27,021	22,753	10,971	23,910	-	23,910
5120	Temporary Wages	-	-	-	-	-	-	-
5130	Overtime	-	-	-	-	-	-	-
5141	Longevity	-	-	-	-	-	-	-
	Personnel Services	**22,884**	**27,021**	**22,753**	**10,971**	**23,910**	**0**	**23,910**
5200	Purchase of Services	-	8,083	500	-	500	-	500
5203	Testing	17,261	17,225	20,000	9,259	20,000	(1,500)	18,500
5209	Electric WWFT	106,099	116,207	140,000	69,713	140,000	(8,000)	132,000
5210	Electric-Pump Station	37,511	35,168	45,000	16,658	45,000	4,000	49,000
5212	Gas Heat	35,528	24,709	40,000	3,603	40,000	(2,700)	37,300
5249	Plant Maintenance	107,763	100,603	90,000	63,935	90,000	30,000	120,000
5289	Solid Waste Disposal	26,537	32,831	26,000	14,066	26,000	16,000	42,000
5307	Contract Services	487,630	497,410	507,190	252,780	516,970	-	516,970
5312	Traffic Control/Public Safety	6,584	7,958	5,000	5,786	5,000	5,400	10,400
5317	Professional/Legal/Consulting	7,630	3,652	5,000	1,874	5,000	-	5,000
5340	Telecommunications	-	-	500	-	500	(500)	-
5343	Advertising	129	185	500	-	500	-	500
5344	Printing	420	-	100	-	100	-	100
5345	Postage	183	47	100	-	100	-	100
5400	Operational Supplies	585	2,643	500	-	500	-	500
5420	Office Supplies	212	416	250	577	250	-	250
5430	Building & Grounds Maintenance	-	175	500	-	500	-	500
5432	Chemicals	36,696	34,308	30,000	19,287	30,000	6,000	36,000
5481	Vehicle & Equipment Maint	9,999	6,028	4,800	2,705	4,800	1,500	6,300
5705	Meetings/Dues & Travel	189	-	250	-	250	-	250
5800	Capital Outlay-Operating	-	-	200	-	200	(200)	-
5805	Ground Water Monitoring	23,806	20,850	24,000	-	24,000	-	24,000
	Expenses	**904,761**	**908,498**	**940,390**	**460,243**	**950,170**	**50,000**	**1,000,170**
	Total Sewer	**927,645**	**935,518**	**963,143**	**471,214**	**974,080**	**50,000**	**1,024,080**

Exhibit D

WPCF Flow


Total Monthly Effluent Flows
July 2015 to June 2016
8,000,000
7,000,000
6,000,000
5,000,000
4,000,000
3,000,000
2,000,000
1,000,000
0
Jul-15 Aug-15 Sep-15 Oct-15 Nov-15 Dec-15 Jan-16 Feb-16 Mar-16 Apr-16 May-16 Jun-16
Gallons

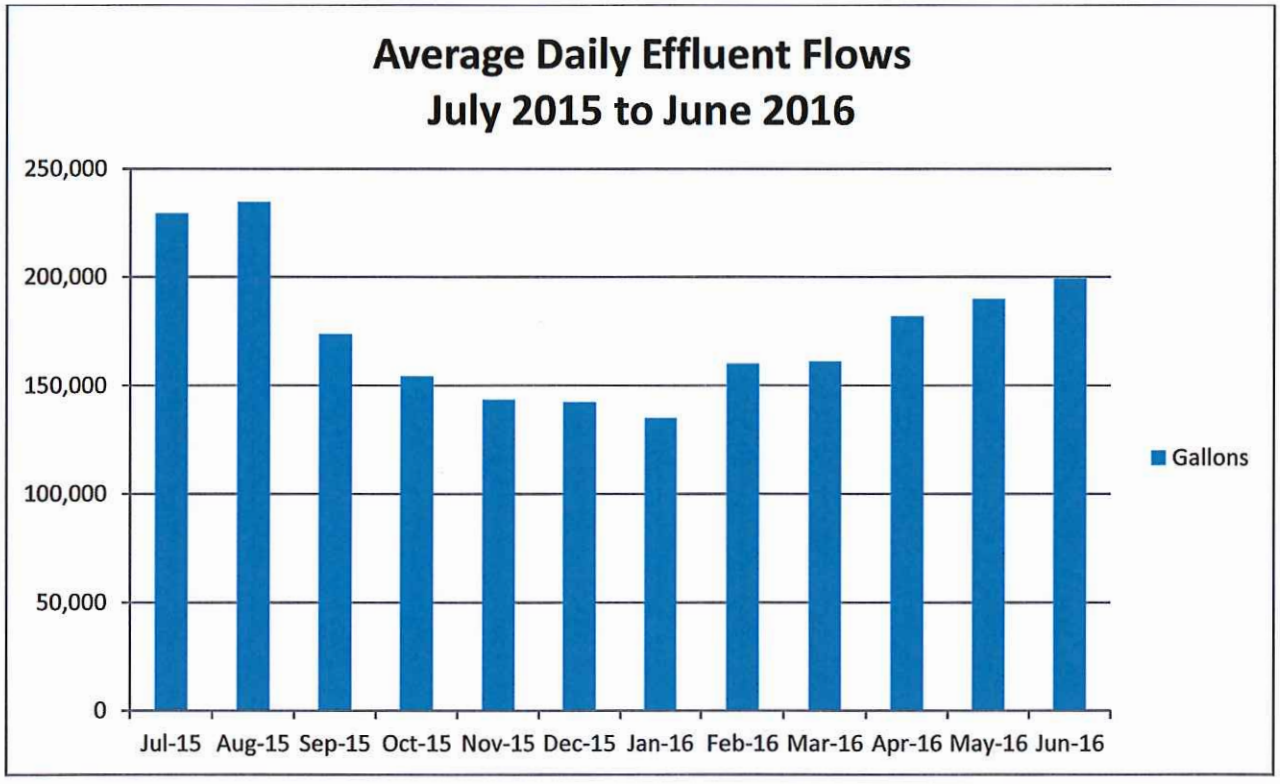

Average Daily Effluent Flows
July 2015 to June 2016
250,000
200,000
150,000
100,000
50,000
0
Jul-15 Aug-15 Sep-15 Oct-15 Nov-15 Dec-15 Jan-16 Feb-16 Mar-16 Apr-16 May-16 Jun-16
Gallons

Exhibit E

Draft Preliminary Design Memorandum M-1B Flows and Loadings

STEARNS & WHELER LLC
Environmental Engineers & Scientists

DRAFT PRELIMINARY DESIGN MEMORANDUM M-1B

From: J. Jefferson Gregg, P.E.

Date: April 21, 2006

Re: Chatham, MA Preliminary Design
Flows and Loadings

Purpose of Memo

The purpose of this memorandum is to summarize the development of wastewater flows and loadings for the Town of Chatham (Town) to be used in the preliminary design of wastewater facilities.

Average Wastewater Flows Development

To remain consistent with the facilities planning process to date and the Massachusetts Estuaries Project Efforts, the Town's existing water consumption data has been used as the basis for the future Wastewater Treatment WWTF design flows and loadings.

The following is a summary of the Town's water data analysis and how it is being applied to this project:

1. 2002-2003 Water data (provided by the Town – summer to summer, and used as part of the Massachusetts Estuaries Project (MEP)). Currently approximately 90 percent of the Town is on public water.

2. Ninety percent reduction applied to convert water use to wastewater generation (facilities plan, and MEP). This 90% reduction is based on an analysis of the wastewater flows to the existing Chatham WWTF.

3. Calculated average water use per parcel for those parcels without known irrigation systems, as identified by Town.

4. Actual water data was used where available, if no water data was available the following approach was used:

    a. Average water use for single family home was estimated to be 120 gpd/parcel (rounded to two significant figures). Estimations based on the parcel by parcel analysis.
    b. For non-single family homes, estimated water use assigned to these parcels was based on the average water use of parcels with the same state class code (similar property type).
    c. Build-out parcels (future) were assigned 120 gpd/parcel.

5. Build-out projections based on the approach established as part of the facilities planning effort and accepted by the Town and Cape Cod Commission (CCC).

6. Existing developed-properties wastewater flow compared to projected build-out flow, and the higher of the two values used.

7. Additional build-out criteria used, as agreed upon with the Town:

- Residential properties are redeveloped to full extent based on current zoning.
- Commercial and Industrial, vacant-developable land is converted to residential.
- All other existing uses remain the same.
- Maps were reviewed with the Town and site specific modifications were made.

Wastewater Flows and Peaking Factors

Table 1 presents the average flows seen at the existing Chatham wastewater treatment facility, generated from the existing collection system.

TABLE 1

EXISTING WWTF FLOWS (2002-2005)

CONDITION	FLOW (MGD)
Average Flow	0.10
Minimum Month Flow	0.07
Maximum Month Flow	0.16

Water use and wastewater flow peaking factors were evaluated and compared to TR-16. The peaking factors considered for the preliminary design are presented in Table 2. As part of the evaluation, both the wastewater flows recorded at the existing WWTF and the drinking water well pumping records were evaluated for the following reasons:

- The limited size of the existing collection system may not be representative of the Town demographics.
- Existing WWTF peaking factors may represent a more year round population and might not be representative of the entire Town (if sewered).
- Town water supply well pumping records are more likely to show the seasonal impacts of the entire Town.
- Well pumping records also reflect higher peak pumping rates in the summer because of additional uses like car washing, lawn irrigation, etc, and therefore would require downward adjustments to the wastewater estimate.
- Well pumping does not equate to 100% wastewater generation, and therefore should not be considered as the sole means of estimating peaking factors.

Therefore, peaking factors falling between those seen at the WWTF and from the well pumping records were considered as a reasonable approximation of those for a Townwide system and were compared to estimated TR-16 values, for validation purposes. The peak day and peak hour estimates

were well within the range recommended by TR-16. TR-16 does not have estimates for summer average, minimum month or maximum month flows.

TABLE 2

PEAKING FACTORS

CONDITION	EXISTING WWTF [1]	TR-16 [5]	PROPOSED
Minimum Month	0.7		0.5
Summer Average [2]	1.3		1.6
Maximum Month [3]	1.6		1.9
Peak Day [4]	1.8	2.1	2.2
Peak Hour		3.4	3.4

Notes:
1. Based on 2002 through 2005 data
2. Three month average (June, July, and August) divided by average annual
3. Maximum month divided by average annual
4. Peak day divided by average annual
5. TR-16 estimates based on average annual flow of 1.5 mgd

Summer average flows during the years 2002 through 2005 were evaluated for June through August, June through September and July through September. The highest average summer flow occurred during the June through August period, although all three periods yielded similar results.

Table 3 presents the Townwide wastewater flow estimates. Existing average annual flow and build-out flows are based on the previously agreed upon approach. Peaking factors are then applied to calculate the remaining build-out flows. Build-out is considered the design conditions for this project.

TABLE 3

TOWN-WIDE FLOW ESTIMATES
(not including I/I)

CONDITION	FLOW (MGD)
Existing (2003) Average Annual Flow [1]	1.0
Build-out (BO) Average Annual Flow	1.3
BO Summer Average Flow	2.1
BO Minimum Month Flow	0.86
BO Maximum Month Flow	2.5
BO Peak Day Flow	2.9
BO Peak Hourly Flow	4.5

Note:
1. Calculated flow based on 2002-2003 water data and existing Town wide land use and units based on 2004 Town assessors data.

The future Chatham collection system will be a new system over very significant areas of Town. The new gravity PVC sewers and manhole joints and covers will be gasketed. Portions of the Town will be low pressure sewers. All new connections will be wye-connections with new laterals to the house, and no roof leaders or sump pumps and/or foundation drain connections will be allowed under any condition. In addition, public education programs should be employed to prevent illegal connections. Because of this, inflow is expected to be negligible.

Table 4 summarizes the projected Infiltration and Inflow (I/I) estimates for the collection system. The "startup" condition is based on the existing collection system and an infiltration rate of 500 gpd/in-mile (based on TR-16). I/I was calculated based on the preliminary sewer layouts developed at the time of this memorandum, and based on 8-inch diameter pipe, and using an I/I rate of 500 gpd/in-mile. I/I for laterals is based on 500 gpd/in-mile for approximately 5,100 4-inch connections each approximately 80 feet long. Estimated length based on Town-wide average distance of building to property line based on GIS information. Although 500 gpd/in-mile is on the high end of the TR-16 range for just infiltration, for this preliminary design it will be used to represent infiltration and inflow.

TABLE 4

INFILTRATION / INFLOW ESTIMATE

CONDITION	FLOW (GPD)
Existing Collection System	20,000
Preliminary Gravity Sewer Layout	350,000
Laterals (All Phases)	160,000
Total	530,000

The proposed sewer areas presented in Table 4 are based on future areas of Town to be sewered as presented in a memorandum to the Town dated June 7, 2005 and entitled Wastewater System Implementation Capital Improvement Planning Items.

Once the proposed sewer layouts are finalized, the estimated I/I values will be adjusted. At this time, the lengths of pressure sewers and gravity sewers have not been finalized. I/I values are not peaked and represent the condition of maximum I/I occurring under any flow condition.

Table 5 presents the proposed WWTF design flows, which are the total of the Townwide flows under build-out conditions presented in Table 3 and the I/I flows presented in Table 4.

TABLE 5

TOTAL PROPOSED WWTF DESIGN FLOWS [1]

CONDITION	FLOW (MGD)
Startup Minimum Month Flow	0.08
Average Annual Flow	1.9
Average Summer Design Flow	2.7
Minimum Month Design Flow	1.2
Maximum Month Design Flow	3.1
Peak Day Design Flow	3.5
Peak Hourly Design Flow	5.1
Note: 1. Includes I/I	

Maximum month flows and loadings will be critical for meeting any effluent nitrogen limit. Peak flows are also critical for process design and hydraulic considerations and effluent disposal. Also, with continued reconstruction of homes in Chatham, it is quite possible that a higher proportion of year-round residents may eventually reside in Town. However, such projections are not available at the time of this technical memorandum, so for planning purposes the present distribution of seasonal and year-round properties (outside of the projected growth due to Build-out) would remain the same in the future. To minimize the impact of future conversion of seasonal to year round homes, the facility will also consider a summer average flow rate and loading, which would account for the majority of the potential residential sewer users in the future. However the fact that the facility will be designed around maximum month and peak day conditions will address this increase in flow and loading.

Development of Loadings

Table 6 presents TR-16 factors for loading variability.

TABLE 6

TR-16 LOADING FACTORS

CONDITION	MAXIMUM MONTH	PEAK DAY
BOD	1.14	1.8
TSS	1.3	2.1

Table 7 presents the existing loadings for the Chatham WWTF (2002-2005).

TABLE 7

EXISTING WWTF FLOWS AND LOADINGS (2002-2005)

CONDITION	AVERAGE	MINIMUM MONTH	MAXIMUM MONTH
Flow, mgd	0.1	0.08	0.16
BOD_5, lb/day	180	70	420
TSS, lb/day	180	80	300
TKN, lb/day	30	10	60
Ammonia, lb/day	20	< 10	40

Note:
Flows and loadings represent a 4 year average (through October 2005)
Rounded to two significant figures

Table 8 presents the flows and loads for the entire WWTF (Phase 1 and 2). Loadings were based on concentrations currently seen at the existing WWTF, increased with build-out estimates, and TR-16 factors were applied for Maximum Month and Peak Day conditions for TSS, and BOD.

TABLE 8

WWTF DESIGN FLOWS AND LOADINGS

CONDITION	STARTUP (3)	AVERAGE ANNUAL	DESIGN SUMMER AVERAGE	MINIMUM MONTH	MAXIMUM MONTH	PEAK DAY	PEAK HOUR (2)
Flow, mgd	0.08	1.9	2.7	1.2	3.1	3.5	5.1
BOD_5, lb/day (1)	100	3,200	6,200	1,400	7,400	8,500	-
TSS, lb/day (1)	160	3,400	5,900	2,200	7,000	8,100	-
TKN, lb/day	20	600	900	200	1,100	1,300	-
Ammonia, lb/day	10	400	600	100	800	900	-

Notes:
1. BOD and TSS loadings for Maximum Month and Peak Day adjusted based on recommended Loading Factors listed in Table 8.
2. Peak Hour loadings not calculated.
3. Start-up loadings based on 2005 data.

For design purposes, seasonal correlations were developed showing under what temperature conditions the facility might see its maximum loading conditions. This impacts the sizing of the facility.

TABLE 9

SEASONAL CORRELATION OF FLOWS AND LOADS

SEASON	DESIGN FLOW	DESIGN LOAD	DESIGN AVERAGE MONTHLY TEMPERATURE (DEGREES C)
Dec-Feb	Use Min. Month	Use Min. Month	7
March-May	Use Average Design Flow	Use Average Design Flow	10
June-Aug	Use Max Month	Use Max Month	20
Sept-Nov	Use Average Design Flow	Use Average Design Flow	16

WWTF Phasing

Preliminary design of the WWTF is based on two phases, based on a preliminary division of the Town to address potential sewering options. Phase I flows would cover portions of the Town located generally south of Route 28, and Phase II would encompass the remaining areas of Town.

Table 10 summarizes the approximate flow split.

TABLE 10

PHASED WWTF DESIGN FLOWS [1]

CONDITION	PHASE I FLOWS (MGD)	PHASE II FLOWS (MGD)
Startup Minimum Month Flow	0.08	0.8
Average Annual Flow	1.3	1.9
Average Summer Design Flow	1.8	2.7
Minimum Month Design Flow	0.8	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

Other Flow Considerations

1. Future Harwich Sewer Extensions:

The Town is currently in discussions with the Town of Harwich regarding the possible extension of any proposed collection system into Harwich. This would require an inter-municipal agreement between the two Towns establishing the quantity of flow and other requirements. No flow estimate is available at this time, and the ultimate ability of Chatham to extend sewers into Harwich will be dependant on the effluent disposal capacity of the Town of Chatham.

2. Septage:

As identified in the 1999 Needs Assessment Report (Table 5-8), "Septage and grease are treated in the sludge holding tanks and the decant liquid and belt filter press filtrate from these flows have minimal contributions to the wastewater treatment process." Therefore for this analysis concentrations from septage are considered to have minimal impact on the new WWTF. Also, the Town of Chatham only receives septage from the Town, therefore as more of the Town is sewered, an even smaller portion of the wastewater flow stream will originate from this source. However, the septage will be considered in the sludge processing and disposal calculations.