

**Popponeset Bay Watershed Permitting
Pursuant to the Massachusetts Clean Waters Act
Intermunicipal Agreement
Between
The Towns of Barnstable, Mashpee, and Sandwich**

This Intermunicipal Agreement ("Agreement") is entered into as of November 13, 2017 (the "Effective Date") by and among the Towns of Barnstable, Mashpee, and Sandwich, each one a municipal corporation acting through their respective chief executive officers (collectively, with their successors and assigns, the "Parties").

RECITALS

WHEREAS, municipalities are authorized in accordance with G.L. c. 40, §4A to enter into intermunicipal agreements for the purpose of performing jointly, or on behalf of each other, activities or undertakings which any of the municipalities are authorized by law to perform; and

WHEREAS, Mashpee and Sandwich have been authorized to enter into this Agreement as evidenced by the execution of this Agreement by their respective Boards of Selectmen; and

WHEREAS, the Town of Barnstable Town Manager is authorized to enter into this Agreement; and

WHEREAS, the Commonwealth of Massachusetts has, pursuant to the Federal Clean Water Act §208(b) (3) and 40 C.F.R. 130.6(e), prepared and certified the Cape Cod Water Quality Management Plan Update ("208 Plan Update") developed by the Cape Cod Commission, which was certified by the Governor of the Commonwealth on June 10, 2015, and submitted to the United States Environmental Protection Agency, Region 1 ("USEPA"); and

WHEREAS, USEPA approved the 208 Plan Update on September 15, 2015; and

WHEREAS, Section 2A of Chapter 259 of the Acts of 2014 requires MassDEP "to develop a watershed permitting approach to address and optimize nitrogen management measures intended to restore water quality to meet applicable water quality standards in watersheds included in an approved area wide nitrogen management plan developed pursuant to section 208 of the federal Clean Water Act," and

WHEREAS, the 208 Plan Update includes a number of recommendations for improving water quality in the estuaries and embayments on Cape Cod; and

WHEREAS, one of the most significant recommendations contained in the 208 Plan Update is the development of a watershed-based permit program (“Permit”) pursuant to Section 2A of Chapter 259 of the Acts of 2014; and

WHEREAS, the estuaries and embayments of the Popponeset Bay system have experienced greatly increased anthropogenic loads of nitrogen delivered to the water through surface and groundwater sources from the increasingly developed watershed, and that this increase in nitrogen has increased the rate of eutrophication of the waters causing adverse aesthetic, water quality and habitat impacts that result in violation of state water quality standards, all as documented in the Massachusetts Estuary Project (“MEP”) report entitled, “Popponeset Bay, Total Maximum Daily Loads for Total Nitrogen (Report #96-TMDL-4, Control #217.0), MADEP, April 10, 2006.”; and

WHEREAS, Mashpee, Barnstable, and Sandwich recognize that increased nitrogen loads to the embayment come from surface and groundwater sources in the watershed shared by the Parties; and

WHEREAS, the Parties believe that it is in their mutual best interests to apply jointly for a Permit for the following reasons: (1) such a Permit will provide more flexibility to achieve TMDL compliance by authorizing additional nitrogen mitigation measures beyond a traditional groundwater discharge permit issued by MassDEP; (2) a Permit will authorize opportunities for achieving compliance with the Clean Water Act through non-traditional nitrogen management approaches; and (3) the Parties will have an opportunity to share resources to achieve the mutual goal of nitrogen reduction in Popponeset Bay (“Bay”); and

WHEREAS, the Massachusetts Department of Environmental Protection (MassDEP) has developed and the USEPA has approved the Total Maximum Daily Load (TMDL) limitations for nitrogen discharges to the Bay;

WHEREAS, the Parties agree that wastewater, fertilizer, and stormwater are the prime source of controllable nitrogen causing impairment of the embayment and that, as a result, a joint effort is required to restore and protect beneficial uses and aquatic resources of the Bay and its tributaries; and

WHEREAS, each of the Parties have, to varying degrees, established or are in the process of preparing a Comprehensive Wastewater Management Plan (“CWMP”) or equivalent plan, pursuant to the requirements of the MassDEP; and

WHEREAS, Attachment A to this Agreement provides the current status of the CWMP planning process for each of the Parties to this Agreement; and

WHEREAS, Mashpee, Barnstable, and Sandwich believe that it is in their mutual best interests to work cooperatively in seeking a Permit for nitrogen discharge as recommended in the 208 Plan Update, and believe that this Agreement represents the best opportunity to establish a framework of cooperation to achieve that goal.

NOW, THEREFORE, in consideration of the promises and mutual benefits to be derived by the Parties hereto, the Parties agree as follows:

1. The Parties agree that the most cost-effective means in terms of total cost, of meeting the TMDL requirements and attaining water quality and beneficial use goals may be a regional, watershed-based approach to mitigate the nitrogen at locations within the watershed where the contributing loads are the greatest and the methods useful for nitrogen reduction are the most effective.

2. Each Party will continue to develop and/or implement its own MassDEP approved CWMP or Targeted Watershed Management Plan, but shall include in their respective plan, if appropriate, any joint efforts undertaken by the Parties pursuant to this Agreement.

3. The Parties agree to jointly apply for a Permit for the Bay pursuant to the 208 Plan Update and Chapter 259 of the Acts of 2014, and any future requirements for such Permits established by MassDEP pursuant to 315 C.M.R. 5.00. If necessary and feasible, the Parties shall be joint Permittees. The joint permit application will include provisions that Mashpee will implement its plan in 5 year blocks in accordance with its approved CWMP and that Sandwich and Barnstable agree to propose a schedule that enables them to respectively complete their respective CWMP's as set forth in Attachment A, and then incorporate their planning implementation schedule in the watershed permit.

4. As the Party having the largest allocated load of nitrogen, Town of Mashpee shall serve as the fiscal agent under this Agreement and, as such, shall receive, hold, and expend any funds appropriated by the Parties for joint actions required in the implementation of this Agreement as well as any grant funds awarded to the Parties for the purpose of pursuing, securing, and implementing a Permit. Unless otherwise provided in the watershed permit or an amendment to this Agreement is made, capital projects undertaken individually by any one of the Parties pursuant to an approved CWMP or Targeted Watershed Plan shall be the sole responsibility of that Party. On December 31st and June 30th of each Fiscal Year during the term of this Agreement, Mashpee shall provide an accounting of the expenditure of funds as the fiscal agent. Any Party to this Agreement may request that Mashpee include an audit of the funds held under this Agreement as part of Mashpee's regular annual audit.

5. The Parties hereby establish a Popponesset Bay Watershed Work Group ("Work Group"), comprised of three members from each Town. The three members from each Town shall consist of the Town Manager from each Town, a member of the Town Council from Barnstable and a member of the Board of Selectmen from Mashpee and Sandwich, and a technical representative appointed by the Town Manager in each Town. Appointments shall be made in accordance with any applicable local Charter and bylaw provisions. The purposes of the Work Group will be to:

- a. Administer the day-to-day joint activities of the Parties under this Agreement;
- b. Coordinate with the various departments and boards of their respective towns to apply for and implement a Permit for the Bay, subject to approval by each of the Parties prior to filing;
- c. Share or develop engineering and economic studies and evaluations to define means of meeting the Parties' respective nitrogen reduction targets and to develop cost-performance relationships that define most cost-effective technologies and practices for the removal of nitrogen;
- d. Develop and propose for adoption amendments to this IMA, if necessary, or other forms of agreement that will define and require the action of each Party to implement agreed-upon plans to apply for and implement, a Permit;
- e. The Work Group has no authority to bind one or more of the Parties. Its role shall be solely administrative in nature and to make recommendations to the Parties for actions required to implement such recommendations. The incurrence of any obligation under this Agreement by any Party shall be subject to the approval of the chief executive officer of each Party and the legislative body, if required, to implement such recommendations.

The Work Group shall be considered a public body subject to the Open Meeting Law. As the fiscal agent, Mashpee shall be responsible for posting meetings as well as preparing and distributing meeting minutes.

6. The Parties have determined that it is in their mutual best interests to establish a nitrogen allocation formula for the purpose of allocating certain costs in a fair and reasonable manner. The parties believe that the watershed permitting responsibilities should be allocated on the basis of unattenuated and attenuated nitrogen loadings. Unattenuated loads consist of the nitrogen load from the watershed contributed by septic systems, wastewater effluent, fertilizer application, storm water runoff, golf course operations, landfill activities, and natural sources. Attenuated loads are the nitrogen loadings that reach Popponesset Bay after natural attenuation in wetlands, ponds or streams, as measured at the Sentinel Testing Station. The Technical Memorandum, attached hereto as Attachment B, sets forth the technical basis agreed to by the parties for establishing the nitrogen loading allocation formulas for both unattenuated and attenuated loads as follows:

	Unattenuated	Attenuated
Barnstable	12.6%	16.0%
Mashpee	65.4%	74.5%
Sandwich	22.0%	9.5%
Total	100%	100%

The unattenuated load percentages will be used to calculate each Party's responsibility for TMDL compliance and for the tracking and accounting of implementation measures. The attenuated load percentages will be used to calculate watershed-based shared expenses including administrative costs, sentinel station monitoring costs, watershed permit application costs, watershed permit compliance costs and updates, and MEP confirmatory model runs, and such other watershed-based costs that the Parties may agree to in the future.

The allocation formula shall be reviewed every five years and will be adjusted based on any revisions to the TMDL or in accordance with a revised formula that the Towns mutually determine to be appropriate.

7. The Parties agree to adopt a fair and practical methodology for implementing the most cost-effective watershed-wide approach, in order to comply with any permits issued by MassDEP, and to share on a fair and equitable basis the capital, operating, administrative, legal, operational, and other ancillary costs associated with a regional, watershed-based wastewater and/or nutrient management system. The Towns further agree to individually fund those measures expected to achieve control of their respective share of the load identified in Paragraph 6 above unless they mutually agree to joint efforts to mitigate nitrogen.

8. The Parties agree to develop, if deemed mutually beneficial based on comparison of other wastewater management options of each Town, a fair and practical methodology for a reasonable nitrogen trading mechanism, including metrics for determining a nitrogen credit trading "currency" in terms of dollars per pound or other trading metric, as a means to implement a watershed-based plan.

9. The Parties agree to adopt, as a fair and practical methodology for monitoring the water quality of the watershed following the implementation of regional, watershed-based wastewater and/or nutrient management approaches, and the allocation of costs as agreed to in Paragraph 6 above.

10. Each Party shall cooperate with the other Parties and other entities as appropriate to identify, apply for, secure, manage and fairly allocate federal, state and other funding sources, as such may become available, to finance the planning and implementation of multi-town or regional nutrient management plans resulting from the cooperative efforts of the Parties under this Agreement.

11. Effective Date of Agreement – The effective date of this Agreement shall be the date upon which this Agreement is entered into as first written above.

12. Term of Agreement – Pursuant to G.L. c. 40, §4A, the maximum term of this Agreement shall be 25 years, recognizing, however, that any permit issued by MassDEP will likely be for a term of twenty years in 4 five year increments. Notwithstanding the foregoing, this Agreement will be reassessed at intervals of five years, or, if more stringent, in accordance with any permit renewal requirements established by the MassDEP and may be modified by mutual agreement of the Parties through an amendment of this Agreement, if necessary, to achieve permit renewal and compliance.

13. Termination – This Agreement may be terminated by any one Party upon sixty (60) days notice to the other Parties, provided, however, that any obligations created by a joint Permit issued by the MassDEP shall continue for each of the Parties unless the Permit is modified pursuant to a joint application filed by all of the Parties.

14. Dispute Resolution – In the event of a dispute arising out of or in relation to the terms of this Agreement, representatives of the Parties shall meet and endeavor to settle the dispute in an amicable manner through mutual consultation. If such persons are unable to resolve the dispute in a satisfactory manner within thirty (30) calendar days, either party may seek assistance of an independent third party, mutually-agreeable to both or all Parties.

15. Assignment - Any Party may assign to another governmental entity established for the purpose of addressing wastewater issues in the Town the responsibility in whole or in part for implementing the watershed permitting activities contemplated in the Agreement.

16. Amendment of this Agreement – This Agreement may be changed or modified through a mutually agreed upon written Amendment executed by each and all of the Parties to this Agreement. Any Amendment shall be attached to and shall become part of this Agreement.

17. Mutual Indemnification – Each party to this Agreement shall indemnify and hold harmless each and all other Parties to this Agreement, their officers, agents, consultants, employees and assigns for all liability arising out of the activities under this Agreement.

18. Subject to Appropriation – The obligations of each of the Parties shall be subject to appropriation and the availability of funds.

19. No Remuneration – Parties to this Agreement shall be solely responsible for any and all costs incurred by themselves, their agents, their employees, committee members, consultants or other persons or entities resulting from activities undertaken pursuant to this Agreement.

20. Governance – This Agreement shall be governed by, construed under and enforced in accordance with the laws of the Commonwealth of Massachusetts.

21. Severability – If any provision of this Agreement is determined to be illegal, unenforceable, or void, then all Parties shall be relieved of their obligations under that provision, provided, however, that the remainder of the Agreement shall remain in full effect.

22. Entire Agreement - This Agreement constitutes the entire agreement between the Parties.

IN WITNESS THEREOF, the Parties hereto have executed this Agreement as of the first date written above.

Town of Mashpee
By its Board of Selectmen

Town of Barnstable
By its Town Manager



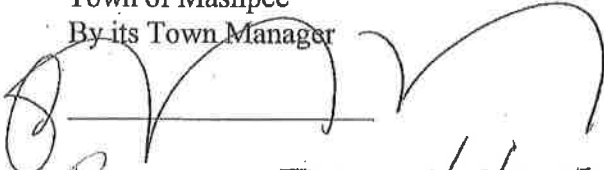
Mark S. Ellis.

Town of Sandwich,
By its Board of Selectmen

595247v.1/Sand/0373

IN WITNESS THEREOF, the Parties hereto have executed this Agreement as of the first date written above.

Town of Mashpee
By its Town Manager



RATIFIED BY BOS 11/13/2017

Town of Barnstable
By its Town Manager

Town of Sandwich,
By its Board of Selectmen

595247v.1/Sand/0373

IN WITNESS THEREOF, the Parties hereto have executed this Agreement as of the first date written above.

Town of Mashpee
By its Board of Selectmen

Town of Barnstable
By its Town Manager

Town of Sandwich,
By its Board of Selectmen

Susana R. James
David J. Jones
Michael J. Miller
[Signature]

595247v.1/Sand/0373

ATTACHMENT A

Attachment A
Town of Barnstable
CWMP Status

The Town of Barnstable has been implementing its CWMP under MEPA certificates issued on May 18, 2007, and July 20, 2012.

With the advent, in 2013, of an update of the Section 208 Water Quality Plan under the Cape Cod Commission, the Barnstable Town Council established a Water Resources Advisory Committee (WRAC) to advise the Council regarding compliance with Section 208 of the Clean Water Act relative to the Town's CWMP.

The WRAC has developed a watershed-based plan that not only addresses nutrient issues related to coastal estuaries, but the entirety of wastewater management issues throughout the Town. The Town's plan includes developing relationships with neighboring Town's with which we have shared watersheds, which include Mashpee, Sandwich, and Yarmouth.

The WRAC Plan was presented to the Town Council in July 2017.

The schedule for implementation of the plan is under advisement and discussion among Town staff and officials. Attachment A will be amended as additional information becomes available.



Memorandum

October 24, 2017

To:	Town of Mashpee, MA	Ref. No.:	11110988
From:	J. Jefferson Gregg, P.E., BCEE	Tel:	774-470-1640
cc:	File		

Subject: IMA – DRAFT Attachment B – Mashpee Planning Status

1. BACKGROUND

The Town of Mashpee, MA (Town) initiated its formal Watershed Nitrogen Management Planning (WNMP) effort in 1999 to address the Town's need for reducing nitrogen impacts to its coastal embayments and to evaluate options for restoring their water quality. At that time, the Town, through its Sewer Commission, hired GHD Inc (formerly Stearns & Wheler, LLC) to perform this planning work.

The following documents were generated as part of the planning process:

1. **Needs Assessment Report (NAR)**—issued in April 2007
2. **Technology Screening Report**—issued in November 2007
3. **Draft Alternative Scenarios Analysis and Site Evaluation Report**—issued in March 2008
4. **Two (2) Notices of Project Change**—the first issued in 2007 and the second in 2012
5. **Alternatives Screening Analysis Report (ASAR)**—issued in August 2013
6. **Draft Recommended Plan/Draft Environmental Impact Report (DRP/DEIR)**—issued in June 2014
7. **Final Recommended Plan/Final Environmental Impact Report (FRP/FEIR)**—issued May 2015

2. APPROVALS AND STATUS

Subsequent to the submittal of the above referenced documents through the Massachusetts Environmental Policy Act / Cape Cod Commission Development of Regional Impact (MEPA/DRI) review process (a joint review by State and local regulatory agencies), the following most recent approvals were received:

1. Certificate of the Secretary of Energy and Environmental Affairs on the Final Environmental Impact Report – Comprehensive Watershed Nitrogen Management Plan – EEA # 12615 – Dated July 31, 2015. This document stated that the above submitted documents: “adequately and properly complies with the Massachusetts Environmental Policy Act (MEPA) (M.G.L. c. 30, ss.61-62I) and its implementing regulations (301 CMR 11.00). No further MEPA review is required.”
2. Cape Cod Commission Consistency Letter for Phase 1 of the CWNMP dated October 16, 2015. This letter states the activities proposed in Phase 1 of this document “are consistent with the 208 Plan Update and should be implemented for the benefit of the town and the region.” The letter states that a formal 208 Consistency document will be forthcoming as the Cape Cod Commission (CCC) had yet



to issue formal guidance setting forth the requirements for a town to obtain 208 Plan Update consistency determination.

3. CURRENT STATUS AS OF OCTOBER 2017

The CCC has extended its DRI Public Hearing Period in anticipation of the development of a Draft Watershed Permit.

The Town of Mashpee has initiated Phase 1 of its plan as follows:

1. Initiated IMA / Watershed Permit Discussions with the neighboring communities of Barnstable and Sandwich regarding the Popponeset Bay Watershed: June 2016 to Present.
2. Initiated Feasibility Studies:
 - a. Quashnet / Moonakis River Evaluation—flushing and shellfish/fin fish habitat restoration: June 2016 to Present.
 - b. Mashpee Commons and Wampanoag Private WWTF evaluations: March 2016 to Present.
3. Shellfish aquaculture/propagation/restoration—Phase 1 expansion: 2016 to present.
 - a. Mashpee River / Shoestring Bay—oysters.
 - b. Great River / Jehu Pond / Little River / Hamblin Pond—quahogs.
 - c. Department reconfiguration and expansion of personnel.
 - d. Monitoring per MEP protocols with additional water quality meters deployed.

ATTACHMENT A

POPPONESSET BAY INTER-MUNICIPAL AGREEMENT STATUS OF WASTEWATER-RELATED PLANNING FOR TOWN OF SANDWICH 25 October 2017

Sandwich has been developing its Comprehensive Water Resources Management Plan (CWRMP) since October 2012. Sandwich completed its CWRMP Needs Assessment (draft March 2012, updated draft October 2016) and its CWRMP Alternatives Analysis (draft April 2013, updated draft October 2016). Sandwich has submitted the Draft CWRMP to the Massachusetts Department of Environmental Protection for technical review and to the Cape Cod Commission for a “208 Plan Update Consistency Review”. These reviews are on-going. The CWRMP will be updated to address review comments and finalized in December 2017. The CWRMP is funded by a grant received from the Commonwealth Natural Resources Damages Assessment fund and this grant expires December 31, 2017.

The Town received town meeting approval in May 2017 for an initial appropriation of \$150,000 for continued planning efforts, including items such as pre-design activities, Massachusetts Environmental Policy Act (MEPA) review, Development of Regional Impact (DRI) review (if applicable). Sandwich has been, and will continue to be, involved in discussions with Joint Base Cape Cod (JBCC) and other municipal and quasi-municipal entities regarding sewer treatment capacity at the existing JBCC wastewater collection, treatment and disposal facilities.

ATTACHMENT B

ATTACHMENT B

EXHIBIT A TO INTER-MUNICIPAL AGREEMENT TECHNICAL BASIS FOR NITROGEN LOADING ALLOCATION Towns of Barnstable MA, Mashpee MA and Sandwich MA

Date: March 1, 2017; rev. March 14, 2017; rev. May 2, 2017

Prepared by: J. Jefferson Gregg, PE, BCCE – GHD Inc; Edward J. Leonard, PE, Wright-Pierce

BACKGROUND AND PURPOSE

Watershed nitrogen loadings to Popponesset Bay have been studied and reported on numerous times by various authors since 2000, including the studies identified below:

- MEP "Technical Report" (and associated "data disk") [Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Popponesset Bay, Mashpee and Barnstable, Massachusetts, Commonwealth of Massachusetts, Department of Environmental Protection, Massachusetts Estuaries Project, Final Report – September 2004]
- DEP "Revised TMDL" [Popponesset Bay Total Maximum Daily Loads for Total Nitrogen, Report #96-TMDL-4, Control #217.0, Department of Environmental Protection, December 5, 2006]
- DEP "Pilot Project Report" [Inter-Municipal Watershed Planning and TMDL Implementation to Restore Embayment Water Quality on Cape Cod, Massachusetts Department of Environmental Protection, Massachusetts Estuaries Project, Nov 2008]
- MEP "Unified Database" Memorandum [MEP Technical Memorandum, Report on Unified Database and Requested MEP Scenarios for the (a) Popponesset Bay Estuary and (b) Eastern Basins of the Waquoit Bay System, December 15, 2009]
- Mashpee "Watershed Nitrogen Management Plan (WNMP)" [Watershed Nitrogen Management Plan, Final Recommended Plan/Environmental Impact Report, GHD, May 2015]
- CCC "208 Plan Update" [208 Plan, Cape Cod Area Wide Water Quality Management Plan Update, Cape Cod Commission, June 2015]
- GHD "Allocation Memo" ["Popponesset Bay Load Allocation Approach", GHD Memorandum, May 19, 2016]
- Sandwich "CWRMP Needs Assessment" [Updated Draft Report, Wright-Pierce, October 2016]
- Sandwich "CWRMP Alternatives Analysis" [Updated Draft Report, Wright-Pierce, October 2016]

Each of these reports contributes to the body of data available for planning and implementation of watershed solutions for the Popponesset Bay system. The purpose of this memorandum is to summarize the watershed nitrogen loadings that will serve as the basis for an inter-municipal agreement (IMA) between the Towns of Barnstable, Mashpee and Sandwich.

INTRODUCTION

On June 16, 2016, representatives from the Towns of Barnstable, Mashpee and Sandwich held a kickoff meeting at the Mashpee Town Hall to discuss the development of an Inter-municipal Agreement (IMA) and the potential development of an application for a Watershed Permit as part of the effort of all three communities to address Total Nitrogen (TN) Total Maximum Daily Loads (TMDLs) for Popponesset Bay. These TMDLs were established by MassDEP and the USEPA based on the efforts of the ongoing Massachusetts Estuaries Project (MEP).

ATTACHMENT B

EXHIBIT A TO INTER-MUNICIPAL AGREEMENT TECHNICAL BASIS FOR NITROGEN LOADING ALLOCATION Towns of Barnstable MA, Mashpee MA and Sandwich MA

Date: March 1, 2017; rev. March 14, 2017; rev. May 2, 2017

Prepared by: J. Jefferson Gregg, PE, BCEE – GHD Inc; Edward J. Leonard, PE, Wright-Pierce

The key component in establishing the IMA is the agreement of each community on their share of the nitrogen load migrating to Popponesset Bay estuary through the watersheds that feed this system and include portions of each of the three communities. Following the Town of Mashpee's completion of their Comprehensive Planning efforts and the completion of the Cape Cod Commission's (CCC) recent 208 Planning efforts, GHD Inc was retained to compare three nitrogen load allocation approaches and propose an allocation that could be used in an IMA.

GHD prepared a memorandum dated May 19, 2016 entitled "Popponesset Bay Load Allocation Approach" presenting the analysis and recommendations for further discussion among the communities. This information was presented to each of the three communities and discussed during several joint meetings held on June 16, 2016, June 30, 2016, August 11, 2016 and February 15, 2017. The memorandum reviewed some previously presented allocations of nitrogen load under unattenuated and attenuated conditions and both "existing" or "baseline" conditions (considered the condition established in the MEP technical reports) and "future" conditions (build-out conditions). The Memorandum then summarized an approach of averaging such values.

During the February 15, 2017 and April 27, 2017 meetings, that included representatives of each community, the following items were agreed upon:

- CCC wMVP values would not be utilized because existing, watershed-specific information is already available (i.e., MEP original data disk and MEP "unified database").
- MEP approach (i.e., land use, water use, unattenuated loads, natural attenuation, attenuated loads and hydrodynamic assessments) is a reasonable approach.
- Allocation of responsibility would use average percent allocations based on the percent allocations established as part of the DEP Pilot Project and those established by the WNMP under the "existing" conditions. The difference between these values ranged from 0.1% to 1.0%, depending on the condition (attenuated or unattenuated) and on the community.
- Underlying data for the MEP approach will be re-evaluated in the future in the context of a watershed permit.
- Both unattenuated and attenuated loads should be presented in the IMA.
 - The purpose of presenting unattenuated loads is to provide a benchmark to allow for tracking and accounting of nitrogen reductions which result from implemented measures.
 - The purpose of presenting attenuated loads is to provide a benchmark for comparison of improvements to water quality based on implemented measures. Attenuated load is what is 'received in the estuary'.
- The allocation of responsibility for existing loads should be considered the baseline year identified in the MEP/DEP work projects (i.e., 2000/2001).
- The average values of the comparable results of the DEP Pilot Project and the Mashpee WNMP/Unified Database would be used to establish the baseline loads for the IMA.
- The parcels which have been developed or redeveloped since the baseline year represent "future conditions" in terms of TMDL compliance (i.e., there has been at least 16 years of growth since the baseline year).
- The allocation of responsibility for development or redevelopment that has occurred since the baseline year will be the responsibility of the municipality that the growth occurred in.

ATTACHMENT B

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Prepared by: J. Jefferson Gregg, PE, BCEE – GHD Inc; Edward J. Leonard, PE, Wright-Pierce

BRIEF DESCRIPTION OF NITROGEN LOADING MODELS

The tables below include the average “existing” (i.e., baseline) TN load based on the loads presented in the “rainbow”¹ spreadsheets used in the MEP analysis and those estimated based on the “unified”² database used in the Mashpee WNMP analysis. The primary differences in the loading estimates using the “unified” database are associated with build-out, which was the focus of the WNMP analysis in achieving TMDL compliance. However, as part of the development of the IMA, GHD was requested to generate existing loadings related to allocation estimates. In generating those numbers, two primary differences were identified in the GHD analysis when comparing to the original MEP analysis, which may have contributed to the slight increase in nitrogen load values under existing conditions:

- GHD analysis of assigning parcels to watersheds were based on the “centroid” method in GIS (where the centroid is the geometrical center of a parcel) vs. the MEP analysis where parcels were “split” and the location of septic system leaching areas relative to watershed lines were used.
- GHD used conservative average performance concentrations (for planning purposes) at the existing WWTFs in the watershed. Concentrations of either 5 mg/L or 10 mg/L TN were applied depending on the size of the facility. Estimated wastewater generation from parcels connected to each WWTF were used to estimate flows, whereas the MEP analysis used flows and concentration values for WWTFs based on “Town of Mashpee Board of Health/Planning Dept.” records (per the notes provide on the “factors” worksheet in the “rainbow” spreadsheet data).

NITROGEN LOAD ALLOCATION

As part of the DEP Pilot Project, an approach was presented that if each community removed 49.2% of their share of the load, the TN TMDL could be achieved in Popponesset Bay at the sentinel station. Table 1 presents this approach, however since the Pilot Project only estimated the maximum total unattenuated load to “sustain” the threshold concentration at the sentinel station (as presented in Figure 2.15 of the Pilot Project Report), an attenuated load had to be estimated as part of this effort. This attenuated value was estimated by calculating the average attenuation by Town using the results of the analysis performed by Brian Dudley of MassDEP during the Pilot Project study. During the MassDEP effort, each Town’s contribution according to the MEP dataset was divided out such that an estimated contribution by Town could be established (as that was not done as part of the original MEP efforts).

It should be noted that the Pilot Project like the WNMP and MEP technical reports all present different ways to achieve TMDL compliance by targeting different amounts of nitrogen in different subwatersheds. The Pilot Project simply attempted to streamline the process for communities using the approximately 50% reduction across the board. Therefore, it is understood that this approach may be conservative and the ultimate effectiveness of any approach will only be realized during the periodic monitoring and modeling necessary to demonstrate compliance and that will need to be defined in the Watershed Permit.

The following tables have been prepared to summarize the pertinent data from the MEP Technical Report and the DEP Pilot Project (Table 1), the WNMP/MEP Unified Database (Table 2) and the Basis for the IMA (Table 3).

Each table uses the TMDL value of 40.3 kg/day (14,710 kg/year) as the maximum attenuated load which can remain in the watershed and which would be expected to achieve the Massachusetts Water Quality Criteria, based on Table 2-5 of the TMDL Report dated December 10, 2006.

¹ Popponesset Data Disk, MEP, “Poppy_summary_public.xls”

² MEP Technical Memo: “Report on Unified Database and Requested MEP Scenarios for the: (a) Popponesset Bay Estuary and (b) Eastern Basins of Waquoit Bay System”, SMAST, December 15, 2009

ATTACHMENT B

**EXHIBIT A TO INTER-MUNICIPAL AGREEMENT
TECHNICAL BASIS FOR NITROGEN LOADING ALLOCATION
Towns of Barnstable MA, Mashpee MA and Sandwich MA**

Date: March 1, 2017; rev. March 14, 2017; rev. May 2, 2017
Prepared by: J. Jefferson Gregg, PE, BCEE – GHD Inc; Edward J. Leonard, PE, Wright-Pierce

Table 1 – MEP Technical Report/DEP Pilot Project Report

	Unattenuated (Baseline 2000/2001)				Attenuated (Baseline 2000/2001)			
	Applied Load ⁽¹⁾	TMDL Load to Sustain ⁽²⁾	Load to Remove ⁽²⁾	% Load ⁽¹⁾	Applied Load ⁽¹⁾	TMDL Load to Sustain ⁽⁴⁾	Load to Remove ⁽⁴⁾	% Load ⁽¹⁾
Barnstable	6,224	3,162	3,062	12.8%	5,199	2,398	2,801	16.3%
Mashpee	31,705	16,106	15,599	65.4%	23,811	10,981	12,830	74.7%
Sandwich	10,585	5,377	5,208	21.8%	2,886	1,331	1,555	9.0%
Total	48,514	24,645	23,869	100%	31,896	14,710⁽³⁾	17,187	100%

Notes:

1. Values as reported in MEP Pilot Project Report Table 2.8.
2. Values as reported in MEP Pilot Project Report Figure 2.15.
3. Value reported in Popponeset Bay TMDL Report Table 2-5.
4. Values “Prorata” (in relation to TMDL value and % load), except as noted above.

Table 2 – Watershed Nitrogen Management Plan (Mashpee/GHD)

	Unattenuated (Baseline 2000/2001)				Attenuated (Baseline 2000/2001)			
	Applied Load ⁽¹⁾	TMDL Load to Sustain ⁽³⁾	Load to Remove ⁽¹⁾	% Load ⁽¹⁾	Applied Load ⁽¹⁾	TMDL Load to Sustain ⁽³⁾	Load to Remove ⁽³⁾	% Load ⁽¹⁾
Barnstable	6,239	3,045	3,194	12.4%	5,263	2,300	2,963	15.6%
Mashpee	33,054	16,133	16,921	65.5%	25,022	10,935	14,087	74.3%
Sandwich	11,200	5,467	5,733	22.2%	3,373	1,474	1,899	10.0%
Total	50,493	24,645⁽²⁾	25,848	100%	33,658	14,710⁽⁴⁾	18,949	100%

Notes:

1. Values developed as part of the Town of Mashpee, MA Watershed Nitrogen Management Planning (WNMP) efforts, except as noted.
2. Value as reported in MEP Pilot Project Report Figure 2.15.
3. Values “Prorata” (in relation to TMDL value and % load), except as noted above.
4. Value reported in Popponeset Bay TMDL Report Table 2-5.

ATTACHMENT B

**EXHIBIT A TO INTER-MUNICIPAL AGREEMENT
TECHNICAL BASIS FOR NITROGEN LOADING ALLOCATION
Towns of Barnstable MA, Mashpee MA and Sandwich MA**

Date: March 1, 2017; rev. March 14, 2017; rev. May 2, 2017

Prepared by: J. Jefferson Gregg, PE,BCEE – GHD Inc; Edward J. Leonard, PE, Wright-Pierce

Table 3 – Basis for Inter-Municipal Agreement (IMA)⁽¹⁾⁽²⁾

	Unattenuated (Baseline 2000/2001)				Attenuated (Baseline 2000/2001)			
	Applied Load	TMDL Load to Sustain	Load to Remove	% Load	Applied Load	TMDL Load to Sustain	Load to Remove	% Load
Barnstable	6,230	3,100	3,130	12.6%	5,230	2,350	2,880	16.0%
Mashpee	32,380	16,120	16,260	65.4%	24,420	10,960	13,460	74.5%
Sandwich	10,890	5,420	5,470	22.0%	3,130	1,400	1,730	9.5%
Total	49,500	24,640	24,860	100%	32,780	14,710	18,070	100%

Notes:

1. Values represent the average of Tables 1 and 2.
 2. Values are rounded to the nearest 10kg/yr.
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