



REGION 1

BOSTON, MA 02109

June 4, 2024

Bonnie Heiple, Commissioner
Department of Environmental Protection
One Winter Street
Boston, MA 02108

Re: Approval of the Wareham River Estuary System and New Bedford Inner Harbor Embayment System TMDLs for Total Nitrogen

Dear Commissioner Heiple:

Thank you for the Massachusetts Department of Environmental Protection's (MassDEP) submittal of the TMDL analyses for the Wareham River Estuarine System and New Bedford Inner Harbor Embayment System on May 7, 2024. We appreciate your efforts and involvement with our office to finalize these TMDLs. The U.S. Environmental Protection Agency (EPA) has reviewed the documents titled "Final New Bedford Inner Harbor Embayment System Total Maximum Daily Load for Total Nitrogen" (CN – 544.1) and "Final Wareham River Estuary System Total Maximum Daily Load for Total Nitrogen" (CN – 549.1). It is my pleasure to approve the Total Nitrogen TMDLs. EPA has determined, as set forth in the enclosed review documents, that these TMDL documents meet the requirements of Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 Code of Federal Regulations Part 130.

MassDEP's efforts will help restore water quality and prevent further degradation of these, and adjacent, waterbody segments. My staff and I look forward to continued cooperation with MassDEP in exercising our shared responsibility of implementing the requirements under Section 303(d) of the CWA. If you have any questions regarding this approval, have your staff contact Ivy Mlsna of at (617) 918-1311.

Sincerely,

/s

Kenneth Moraff, Director
Water Division

Enclosure

cc:

Richard Carey, MassDEP

Matthew Reardon, MassDEP

Mel Cote, EPA

Ivy Mlsna, EPA



Department of Environmental Protection

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Maura T. Healey
Governor

Kimberley Driscoll
Lieutenant Governor

Rebecca L. Tepper
Secretary

Bonnie Heiple
Commissioner

May 7, 2024

Melville P. Coté, Jr., Chief
Surface Water Protection Branch
U.S. Environmental Protection Agency, Region 1
Five Post Office Square, Suite 100 (06-1)
Boston, MA 02109

**RE: Final New Bedford Inner Harbor Embayment System and
Final Wareham River Estuary System TMDLs for Total Nitrogen**

Dear Mr. Coté:

The Massachusetts Department of Environmental Protection (MassDEP) through its Watershed Planning Program is pleased to submit for EPA review and approval the enclosed reports listed below.

**Final New Bedford Inner Harbor Embayment System
Total Maximum Daily Load for Total Nitrogen (CN 544.1)**

The impairments addressed in the Final New Bedford Inner Harbor Embayment System TMDL report are presented in Table 1.

Table 1 – Impairments addressed in the Final New Bedford Inner Harbor Embayment System TMDL report.

Waterbody Name	Segment ID	Impairment	TMDL Type	TMDL (kg/day)
Acushnet River (Upper Basin)	MA95-33	- Dissolved Oxygen - Nitrogen, Total Nutrient/Eutrophication Biological Indicators	Restoration	70.70
New Bedford Inner Harbor (Mid and Lower)	MA95-42	- Dissolved Oxygen - Nitrogen, Total - Nutrient/Eutrophication Biological Indicators	Restoration	137.11 ¹
Acushnet River	MA95-31		Protection ²	62.46 ³
Acushnet River	MA95-32		Protection ²	6.36 ³
New Bedford Inner Harbor (total system)				276.6

¹ Total N load for the New Bedford Inner Harbor (MA95-42) is a combination of Massachusetts Estuaries Project (MEP) technical report Middle and Lower sub-embayment loading

² Protective TMDL assigned to freshwater segments based on hydraulic connection to New Bedford Inner Harbor

³ The load for MEP technical report Acushnet River freshwater sub-embayment was split between the two MassDEP segments (MA95-31 and MA95-32)

**Final Wareham River Estuary System
Total Maximum Daily Load for Total Nitrogen (CN 549.1)**

The impairments addressed in the Wareham River Estuary System TMDL report as presented in Table 2.

Table 2 – Impairments addressed in the Final Wareham River Estuary System TMDL report.

Waterbody Name	Segment ID	Impairment	TMDL Type	TMDL (kg/day)
Wareham River	MA95-03	- Total Nitrogen - Chlorophyll- <i>a</i> - Estuarine Bioassessments	Restoration	75.80
Agawam River	MA95-29	- Total Nitrogen - Algae - Nutrient/Eutrophication Biological Indicators	Restoration	20.92
Agawam River	MA95-28		Protection ¹	22.11
Wankinco River	MA95-50		Protection ¹	25.85
Broad Marsh River	MA95-49		Protection ¹	17.95
Crooked River	MA95-51		Protection ¹	2.88
Wareham River Estuary (total system)				165.52

¹ Pollution Protection TMDLs (kg-N/day) for community planning and to prevent further downstream impairment

The TMDL reports are submitted as final for these waterbodies pursuant to Section 303(d) of the Clean Water Act and in accordance with the provisions of the EPA/State Performance Partnership Agreement.

MassDEP publicly announced the availability of both draft TMDLs in November 2023 and copies were distributed to key stakeholders. The draft TMDLs were published on the Department’s website for public review. Public meetings were held for both TMDLs to mark the beginning of the 30-day public comment periods. An in-person public meeting was held at the New Bedford Department of Public Infrastructure on November 8, 2023, for the New Bedford Inner Harbor Embayment System TMDL. A virtual public meeting was held on November 28, 2023, for the Wareham River Estuary System TMDL. Notices of the public meetings and comment periods were published in local newspapers and in the Massachusetts Environmental Monitor. Responses to comments received during the public comment period and public meetings have been included in the TMDL documents.

This document now constitutes a final submittal by MassDEP for formal approval by EPA. I would like to thank you and other EPA staff for your continued support and assistance during the development of these TMDL reports. Please feel free to contact me (Richard.Carey@mass.gov; 617-312-1319) or Matthew Reardon (Matthew.Reardon@mass.gov; 857-248-8349) if you have any additional questions.

Sincerely,

Richard O. Carey, Ph.D.
Director, Watershed Planning Program
Massachusetts Department of Environmental Protection

Enclosures

cc: w/o enclosure

Ivy Mlsna, EPA Region 1

Gerard Martin, Regional Director, MassDEP SERO

Drew Osei, Environmental Engineer, MassDEP SERO

Matthew Reardon, TMDL Section Chief, MassDEP WPP

EPA NEW ENGLAND'S TOTAL MAXIMUM DAILY LOAD (TMDL) REVIEW

DATE: June 4, 2024

TMDL: Wareham River Estuary System TMDL for Total Nitrogen

STATUS: Final

IMPAIRMENT/POLLUTANT: Two Total Nitrogen TMDLs and Four Protection TMDLs (See Attachment 1)

BACKGROUND: EPA Region 1 received the *Final Wareham River Estuary System Total Maximum Daily Load for Total Nitrogen* (Control Number: CN 549.1) from the Massachusetts Department of Environmental Protection (MassDEP) with a transmittal letter dated May 7, 2024. In addition to the Final Nitrogen TMDL itself, the submittal included, either directly or in reference, the following documents:

- Public Meeting Information and Response to Comments, page 39 and Appendix E
- Applicable Massachusetts Surface Water Quality Standards (WQS), Appendix A
- Massachusetts Estuaries Project, Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Wareham River, Broad Marsh and Mark's Cove Embayment System, Wareham, Massachusetts, May 2014.
<https://www.mass.gov/doc/linked-watershed-embayment-model-for-wareham-2014/download>
- Final Massachusetts Integrated List of Waters for the Clean Water Act 2022 Reporting Cycle (CN 568.1), May 2023.
<https://www.mass.gov/doc/final-massachusetts-integrated-list-of-waters-for-the-clean-water-act-2022-reporting-cycle/download>
- Massachusetts Estuaries Project Embayment Restoration and Guidance for Implementation Strategies, MassDEP 2003
<https://www.mass.gov/doc/embayment-restoration-and-guidance-for-implementation-strategies/download>

The following review explains how the TMDL submission meets the statutory and regulatory requirements of TMDLs in accordance with § 303(d) of the Clean Water Act and EPA's implementing regulations in 40 CFR Part 130.

REVIEWERS: Ivy Mlsna (617-918-1311) e-mail: mlsna.ivy@epa.gov

REVIEW ELEMENTS OF TMDLS

Section 303(d) of the Clean Water Act (CWA) and EPA's implementing regulations at 40 C.F.R. § 130 describe the statutory and regulatory requirements for approvable TMDLs. The following information is generally necessary for EPA to determine if a submitted TMDL fulfills the legal requirements for approval under Section 303(d) and EPA regulations and should be included in the submittal package. Use of the verb "must" below denotes information that is required to be submitted because it relates to elements of the TMDL required by the CWA and by regulation.

1. Description of Waterbody, Pollutant of Concern, Pollutant Sources and Priority Ranking

The TMDL analytical document must identify the waterbody as it appears on the State/Tribe's 303(d) list, the pollutant of concern and the priority ranking of the waterbody. The TMDL submittal must include a description of the point and nonpoint sources of the pollutant of concern, including the magnitude and location of the sources. Where it is possible to separate natural background from nonpoint sources, a description of the natural background must be provided, including the magnitude and location of the source(s). Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. The TMDL submittal should also contain a description of any important assumptions made in developing the TMDL, such as: (1) the assumed distribution of land use in the watershed; (2) population characteristics, wildlife resources, and other relevant information affecting the characterization of the pollutant of concern and its allocation to sources; (3) present and future growth trends, if taken into consideration in preparing the TMDL; and, (4) explanation and analytical basis for expressing the TMDL through surrogate measures, if applicable. Surrogate measures are parameters such as percent fines and turbidity for sediment impairments, or chlorophyll-a and phosphorus loadings for excess algae.

A. Description of Waterbody, Priority Ranking, and Background Information

The Wareham River Estuary System is an ~797-acre complex estuarine system tributary to Buzzards Bay on its northwestern shore. The estuary is located within the town of Wareham in southeastern Massachusetts and its watershed is located within the Towns of Carver, Plymouth, and Wareham. The large upper watershed is drained by two large river systems, the Wankinco River and Agawam River, which run in a north-south manner. Both the Agawam River and Wankinco River discharge to the head of the estuary and are among the largest rivers discharging to Buzzards Bay. The central estuary, the Wareham River, is a drowned river valley estuary, with smaller tributary basins: Broad Marsh Cove, Crooked River, and Marks Cove. The Town of Wareham also operates the Wareham Wastewater Control Facility (NPDES Permit No. MA0101893) that discharges directly to the headwaters of the Agawam River estuary.

The benthic habitat in the Wareham River and Agawam River ranges from moderately to significantly impaired. Both waterbodies are also considered impaired due to elevated chlorophyll *a* concentration. Additionally, the Wareham River is significantly to moderately impaired based on

the loss of historic eelgrass beds. The distribution of these habitat impairments throughout the Wareham River Estuary system is consistent with the observed N and the chlorophyll levels and the functional basin types comprising this estuary. As a result, both eelgrass and infaunal animal habitats are impaired in this estuary system, and N management is required for their restoration. The primary ecological threat to Wareham Harbor is degradation resulting from nutrient enrichment. Most of the total N load (43%) is from septic systems, with other “controllable” N contributions coming from fertilizers (20%), WWTF discharge (16%), and impervious surface runoff (11%). Other sources that are not locally controllable include atmospheric deposition to the surface of the estuary and natural surfaces. N from these sources migrates downward to groundwater and eventually enters the estuary system.

The primary goal of the TMDL implementation is to lower N concentrations in the Wareham River Estuary System. The MEP linked model has shown that the load reduction combination necessary to achieve the threshold N concentrations include a 79% removal of septic load (associated with direct groundwater discharge to the embayment) as well as a reduction of N load from the Wareham Wastewater Control Facility to 4,300 kg/year (11.78 kg N/day).

MassDEP has determined that all nutrient impaired segments in the Commonwealth are a high priority. See the Massachusetts 2022 Integrated List of Waters at:

<https://www.mass.gov/lists/integrated-lists-of-waters-related-reports>

B. Pollutant of Concern

In the Wareham River Estuarine System, the pollutant of concern is the nutrient nitrogen. Additional relevant impairment parameters include macroalgae, elevated chlorophyll α , degradation of benthic infauna habitat, and eelgrass loss.

C. Pollutant Sources

Most of the watershed N loading to the estuary is from on-site subsurface wastewater disposal systems (septic systems, 33%), atmospheric deposition (16%), agricultural fertilizers (15%) and the wastewater treatment facilities (WWTFs, 12%). Less N originates from impervious surfaces, natural surfaces, lawn fertilizers, and landfills. The N loading that is considered controllable affecting this system originates predominately from on-site subsurface wastewater disposal systems (43%), agricultural fertilizers (20%), and the Wareham WWTF (8%).

Assessment: EPA Region 1 concludes that the TMDL document meets the requirements for describing the TMDL waterbody segments, pollutants of concern, identifying and characterizing sources of impairment, and priority ranking.

2. Description of the Applicable Water Quality Standards and Numeric Water Quality Target

The TMDL submittal must include a description of the applicable State/Tribe water quality standard, including the designated use(s) of the waterbody, the applicable numeric or narrative water quality criterion, and the antidegradation policy. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation. A numeric water quality target for the TMDL (a quantitative value used to measure whether or not the applicable water quality standard is attained) must be identified. If the TMDL is based on a target other than a numeric water quality criterion, then a numeric expression, usually site specific, must be developed from a narrative criterion and a description of the process used to derive the target must be included in the submittal.

Wareham River, Crooked River, Broad Marsh River, and Wankinco River are classified as Class SA waterbodies based on the Massachusetts Surface Water Quality Standards (314 CMR 4.06). The estuarine portion of the Agawam River is classified as Class SB and the freshwater portion of the Agawam River is classified as a Class B\WWF waterbody.

Massachusetts currently has narrative standards for nutrients (nitrogen and phosphorus) for waters of the Commonwealth such that *"all surface waters shall be free of nutrients in concentrations that would cause or contribute to impairment of existing or designated uses and shall not exceed site specific criteria developed in a TMDL or otherwise, established by the department"*. Water quality standards of particular interest to the issues of cultural eutrophication are dissolved oxygen, nutrients, aesthetics, excess plant biomass and nuisance vegetation. The Massachusetts Water Quality Standards (314 CMR 4.00) contain descriptions of coastal and marine classes and numeric criteria for dissolved oxygen but have only narrative standards that relate to the other variables, as further described in Appendix A of the TMDL document. As stated on page 15 of the TMDL document and in EPA guidance, individual estuarine and coastal marine waters tend to have unique characteristics and therefore, site-specific analyses of the individual water body are typically required.

The Massachusetts Estuaries Project analytical method is the Linked Watershed-Embayment Management Model (Linked Model), discussed on pages 16-24 of the TMDL document. It links watershed inputs with embayment circulation and nitrogen characteristics, and:

- requires site-specific measurements within each watershed and embayment;
- uses realistic "best-estimates" of nitrogen loads from each specific type of land-use;
- spatially distributes the watershed nitrogen loading to the embayment;
- accounts for nitrogen attenuation during transport to the embayment;
- includes a 2D or 3D embayment circulation model depending on embayment structure;
- accounts for basin structure, tidal variations, and dispersion within the embayment;
- includes nitrogen regenerated within the embayment;
- is validated by both independent hydrodynamic, nitrogen concentration, and ecological data; and
- is calibrated and validated with field data prior to generation of "what if" scenarios.

The Linked Model has been previously applied to watershed nitrogen management in numerous embayments throughout Southeastern Massachusetts. In these applications it became clear that the model can be calibrated and validated and has use as a management tool for evaluating watershed nitrogen management options. The Linked Model provides a quantitative approach for determining an embayment's: (1) nitrogen sensitivity; (2) nitrogen threshold loading levels (TMDL); and (3) response to changes in loading rate. Determination of the critical nitrogen threshold for maintaining high quality habitat within Wareham River Estuary is based primarily on the nutrient, dissolved oxygen, and chlorophyll data and benthic community indicators. The nitrogen thresholds for Wareham River are based upon the goal of restoration of eelgrass and benthic habitat for infauna animals. The approach for determining nitrogen thresholds, which will maintain acceptable habitat quality throughout an embayment system, is to first identify a sentinel location within the embayment and second to determine the N concentration within the water column that will restore the sentinel location to the desired habitat quality. The sentinel location is selected such that the restoration of that one site will necessarily bring the other regions of the system to acceptable habitat quality levels.

The primary sentinel stations are in the mainstem of the Wareham River. Threshold concentrations for tidally averaged TN of 0.40 mg/L at the Lower Wareham River and 0.42 mg/L at Upper Wareham River were selected to restore eelgrass habitat based upon the depth and TN levels surrounding the eelgrass bed located in the upstream region of the Wareham River. Target concentrations were also established at secondary sentinel stations within the Wareham River Estuary System. The secondary sentinel stations are in the Wareham River and in the Broad Marsh River. Threshold concentrations for tidally averaged TN of 0.5 mg/L at the Upper Wareham River and at Lower Broad Marsh River were selected to ensure restoration of infaunal habitat throughout the embayment. Prior analyses, including the Bournes Pond Estuary in Falmouth, Lewis Bay in Barnstable & Yarmouth, Swan Pond River Estuarine System in Dennis, and the Westport River Embayment System in Westport, were taken into consideration when developing N threshold concentrations for eelgrass restoration. For regions within these estuary systems, the MEP identified stable beds of eelgrass at tidally averaged N concentrations ranging from 0.40 to 0.50 mg/L.

Should the target concentration be met at the sentinel stations without eelgrass bed and benthic community restoration in the Wareham River Estuary, other management activities would have to be identified and considered to reach the goals outlined in this TMDL (page 37 of the TMDL document). MassDEP's commitment to monitor the receiving water response is, in EPA's view, a reasonable measure designed to manage the inherent uncertainty around selecting a target against a backdrop of considerable scientific and technical uncertainty. While there is sufficient basis in the administrative record at the time of approval to conclude that the selected target will be protective, EPA will coordinate with the MassDEP to review any additional monitoring data or other information that may become available concerning eelgrass bed and benthic macroinvertebrate populations in the receiving waters, consistent with MassDEP's commitment to evaluate the adequacy of the target. EPA may determine at some point in the future whether a

revision of this TMDL may be necessary to achieve water quality that fully supports the aquatic life designated use. These revisions may require additional monitoring, modeling, and revised nitrogen targets at the sentinel station.

Assessment: The use of the Linked Model, the description of the process in the TMDL document, and the companion Technical Report to this TMDL document adequately demonstrate the basis for deriving the target nitrogen loads and demonstrating that the targets will achieve water quality standards. EPA Region 1 concludes that MassDEP has properly presented its numeric water quality targets and has made a reasonable and appropriate interpretation of its narrative water quality criteria for the designated uses of the Wareham River Estuarine System. In addition, MassDEP's adaptive management approach to the TMDL allows for revision if the target concentrations are reached but habitat indicators of restoration are not met.

3. Loading Capacity - Linking Water Quality and Pollutant Sources

As described in EPA guidance, a TMDL identifies the loading capacity of a waterbody for a particular pollutant. EPA regulations define loading capacity as the greatest amount of loading that a water can receive without violating water quality standards (40 C.F.R. § 130.2(f)). The loadings are required to be expressed as either mass-per-time, toxicity or other appropriate measure (40 C.F.R. § 130.2(i)). The TMDL submittal must identify the waterbody's loading capacity for the applicable pollutant and describe the rationale for the method used to establish the cause-and-effect relationship between the numeric target and the identified pollutant sources. In most instances, this method will be a water quality model. Supporting documentation for the TMDL analysis must also be contained in the submittal, including the basis for assumptions, strengths and weaknesses in the analytical process, results from water quality modeling, etc. Such information is necessary for EPA's review of the load and wasteload allocations which are required by regulation.

In many circumstances, a critical condition must be described and related to physical conditions in the waterbody as part of the analysis of loading capacity (40 C.F.R. § 130.7(c)(1)). The critical condition can be thought of as the "worst case" scenario of environmental conditions in the waterbody in which the loading expressed in the TMDL for the pollutant of concern will continue to meet water quality standards. Critical conditions are the combination of environmental factors (e.g., flow, temperature, etc.) that results in attaining and maintaining the water quality criterion and has an acceptably low frequency of occurrence. Critical conditions are important because they describe the factors that combine to cause a violation of water quality standards and will help in identifying the actions that may have to be undertaken to meet water quality standards.

As stated in the TMDL document, the Linked Model is a robust and fairly complicated model that determines an embayment's nitrogen sensitivity, nitrogen threshold watershed loading levels, and response to changes in the loading rate. A key feature of the approach involves the selection of sentinel locations that have the poorest water quality in the embayment system. If these degraded areas come into compliance with the TMDL, other areas will also achieve water

quality standards for nitrogen in the system. This approach captures the critical targets needed to address the impaired segments.

The percent reductions of existing nitrogen loads necessary to meet the target threshold watershed loads range from 15.5% to 54.7% with an overall required reduction of 37.7% for the Wareham River system as a whole (TMDL Table 6 below, page 24 of the TMDL document). As described in the TMDL document, these loads represent one scenario using the Linked Model that could achieve the target threshold N concentration at the sentinel station. An alternative scenario to meet the target threshold N concentration can also be evaluated as part of the MEP process, at the town’s request.

TMDL TABLE 6. Present Watershed Nitrogen Loading Rates, Calculated Loading Rates that are Necessary to Achieve Target Threshold Nitrogen Concentrations, and the Percent Reductions of the Existing Loads Necessary to Achieve the Target Threshold Loadings

System Component	Present Total Watershed Load ¹ (kg/day)	Target Threshold Watershed Load² (kg/day)	Watershed Reductions Needed to Achieve Target Threshold Loads
Broad Marsh River	7.945	4.101	-48.4%
Marks Cove	4.875	4.073	-16.4%
Crab Cove	3.548	2.299	-35.2%
Crooked River	5.351	2.551	-52.3%
Wareham River (Lower)	0.718	0.468	-34.7%
Wareham River (Upper)	42.189	19.121	-54.7%
Agawam River	34.268	22.112	-35.4%
Wankinco River	30.586	25.851	-15.5%
System Total	129.479	80.634	-37.7%

1 Composed of fertilizer, runoff, atmospheric deposition to lakes and natural surfaces and septic system loadings.

2 Target threshold watershed load is the load from the watershed needed to meet the target threshold N concentrations as identified above in Table 4.

The TMDL for each watershed area considers all sources of N and is therefore the sum of the calculated target threshold watershed load, atmospheric deposition load, and benthic flux load

from sediment sources (Table 8 below, page 32 of the TMDL document). The TMDLs for the Wareham River system range from 2.88 kg N/day to 64.45 kg N/day. The TMDL for the system as a whole is 165.52 kg N/day.

TMDL Table 8: The Nitrogen Total Maximum Daily Load for the Wareham River System

MEP Watershed	Target Threshold Watershed Load ¹ (kgN/day)	Atmospheric Deposition (kgN/day)	Load from Sediments ² (kgN/day)	TMDL ³ (kgN/day)
Broad Marsh River	4.101	1.681	12.168	17.95
Marks Cove	4.073	0.959	2.407	7.44
Crab Cove	2.299	1.614	0 ⁴	3.91
Crooked River	2.551	0.333	0 ⁴	2.88
Wareham River (Lower)	0.468	5.18	58.8	64.45
Wareham River (Upper)	19.121	1.803	0 ⁴	20.92
Agawam River	22.112	-	-	22.11
Wankinco River	25.851	-	-	25.85
System Total	80.634	11.57	73.375	165.52

¹Target threshold watershed load is the load from the watershed needed to meet the embayment target threshold Nitrogen concentration identified in Table 4

²Projected future flux (present rates reduced approximately proportional to watershed load reductions).

³Sum of target threshold watershed load, atmospheric deposition load, and sediment load.

⁴Negative benthic flux is set to zero.

Assessment: The TMDL document explains, and EPA concurs with the approach for applying the Linked Model to specific embayments for the purpose of developing target nitrogen loading rates and in identifying sources of needed nitrogen load reduction. EPA believes that this approach is reasonable because the factors influencing and controlling nutrient impairment were well justified, as demonstrated by the foregoing and the TMDL’s administrative record.

4. Load Allocations (LAs)

EPA regulations require that a TMDL include LAs, which identify the portion of the loading capacity allocated to existing and future nonpoint sources and to natural background (40 C.F.R. § 130.2(g)). Load allocations may range from reasonably accurate estimates to gross allotments (40 C.F.R. § 130.2(g)). Where it is possible to separate natural background from nonpoint sources, load allocations should be described separately for background and for nonpoint sources.

If the TMDL concludes that there are no nonpoint sources and/or natural background, or the TMDL recommends a zero-load allocation, the LA must be expressed as zero. If the TMDL recommends a zero LA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero LA implies an allocation only to point sources will result in attainment of the applicable water quality standard, and all nonpoint and background sources will be removed.

Using the Linked Model, MassDEP has identified the portion of the loading capacity allocated to existing and future nonpoint sources necessary to meet water quality standards. LAs identify the portion of loading capacity allocated to existing and future nonpoint sources. In the case of the Wareham River system, the controllable nonpoint source loadings are primarily from on-site subsurface wastewater disposal systems. Additional N sources include stormwater runoff (except from impervious cover classified as “directly connected” to the waterbody, which is defined as part of the waste load), fertilizers, and landfill runoff.

MassDEP addresses LAs for natural background sources (see page 25 of the TMDL document).

Assessment: EPA concludes that the TMDL document sufficiently addresses the calculation of the LAs, as demonstrated by the foregoing and by the TMDL’s administrative record.

5. Wasteload Allocations (WLAs)

EPA regulations require that a TMDL include WLAs, which identify the portion of the loading capacity allocated to existing and future point sources (40 C.F.R. § 130.2(h)). If no point sources are present or if the TMDL recommends a zero WLA for point sources, the WLA must be expressed as zero. If the TMDL recommends a zero WLA after considering all pollutant sources, there must be a discussion of the reasoning behind this decision, since a zero WLA implies an allocation only to nonpoint sources and background will result in attainment of the applicable water quality standard, and all point sources will be removed.

In preparing the wasteload allocations, it is not necessary that each individual point source be assigned a portion of the allocation of pollutant loading capacity. When the source is a minor discharger of the pollutant of concern or if the source is contained within an aggregated general permit, an aggregated WLA can be assigned to the group of facilities. But it is necessary to allocate the loading capacity among individual point sources as necessary to meet the water quality standard.

The TMDL submittal should also discuss whether a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur. In such cases, the State/Tribe will need to demonstrate reasonable assurance that the nonpoint source reductions will occur within a reasonable time.

MassDEP assigned to the WLA those point sources (1) that “discharge” pollutants to waters of the United States within the meaning of the Act and (2) that are subject to the NPDES permitting program (existing and future); it allocated sources that did not meet these two criteria to the LA. This approach is reasonable and is consistent with the Act and implementing regulations. EPA interprets 40 CFR § 130.2(h) to require that allocations for NPDES-regulated discharges of stormwater be included in the waste load component of the TMDL. Areas of the Wareham River Estuary System watershed that contain EPA designated “urbanized areas” and are required to

obtain coverage under the NPDES Phase II General Permit for stormwater discharges from Small Municipal Separate Storm Sewer Systems (MS4s). In addition, there are directly connected impervious areas (DCIAs) that discharge stormwater directly to waterbodies via a conveyance system such as a swale, pipe, or ditch throughout the entire watershed. This TMDL treats stormwater discharge from all DCIA (even those outside of regulated urbanized areas) as part of a waste load allocation. The WLA consists of the stormwater DCIA contribution and the Wareham Wastewater Control Facility Outfall point source.

Assessment: EPA concludes that the TMDL document sufficiently addresses the calculation of the WLAs, as demonstrated by the foregoing and by the TMDL's administrative record.¹

6. Margin of Safety (MOS)

The statute and regulations require that a TMDL include a margin of safety to account for any lack of knowledge concerning the relationship between load and wasteload allocations and water quality (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1)). EPA guidance explains that the MOS may be implicit, i.e., incorporated into the TMDL through conservative assumptions in the analysis, or explicit, i.e., expressed in the TMDL as loadings set aside for the MOS. If the MOS is implicit, the conservative assumptions in the analysis that account for the MOS must be described. If the MOS is explicit, the loading set aside for the MOS must be identified.

MassDEP employs an implicit MOS in this TMDL, described in the TMDL document on pages 28-31. There are several factors that contribute to the margin of safety inherent in the approach used to develop this TMDL including:

1) Use of conservative data in the Linked Model as follows:

- Nitrogen concentrations in the watershed that were used in the model are conservative because the model assumes 100% of the groundwater discharge load enters the embayment, and stream flow entering the embayment was directly measured to determine attenuation;
- Agreement between the modeled and observed values has been approximately

¹ The categorization of the pollutant sources on Cape Cod (*i.e.*, whether a particular source, or category of sources, is required as a matter of law to be placed within the WLA or LA) has been the subject of recent litigation. On August 24, 2010, CLF filed a complaint in the United States District Court for the District of Massachusetts, captioned *Conservation Law Foundation et al. v. United States Environmental Protection Agency, et al.*, Action No. 1:10-cv-11455, challenging EPA's approval of thirteen (13) Total Maximum Daily Load determinations submitted to EPA by the Commonwealth of Massachusetts under section 303(d), 33 U.S.C. § 1313(d), of the Clean Water Act, 33 U.S.C. §§ 1251-1387, as arbitrary and capricious, an abuse of discretion, and in violation of the Administrative Procedure Act, 5 U.S.C. § 706(2). EPA's positions on categorization, margin of safety, seasonal variation and other matters raised in the litigation, including climate change, have been described in the Agency's filings in that case; have been specifically considered and relied upon by EPA for the purpose of these TMDL approvals; and accordingly, have been incorporated into the TMDL's administrative record. Additionally, EPA has considered MassDEP's correspondence of April 3, 2015, regarding these issues, and EPA's analysis thereof has also been included in the administrative record.

- 95%;
 - Water column nitrogen validation dataset is conservative with high or low measurements marked as outliers;
 - Reductions in benthic regeneration of nitrogen are most likely underestimates based on a reduced deposition of PON, due to lower primary production rates under the reduced N loading in these systems; and
- 2) **Conservative sentinel station/target threshold nitrogen concentrations.** The target nitrogen concentration was chosen based on sites that had stable eelgrass or benthic animal (infaunal) communities, and not those just starting to show impairment, which would have slightly higher N concentration. Meeting the target threshold N concentrations at the sentinel stations will result in reductions of N concentrations in the rest of the system; and
- 3) **Conservative approach.** The target loads were based on tidally averaged N concentrations on the outgoing tide, which is the worst-case condition because that is when the N concentrations are the highest. The N concentrations will be lower on the flood tides and therefore this approach is conservative.

Assessment: EPA concludes that the approach used in developing the TMDL provides for an adequate implicit MOS, as demonstrated by the foregoing and by the TMDL’s administrative record.

7. Seasonal Variation

The statute and regulations require that a TMDL be established with consideration of seasonal variations. The method chosen for including seasonal variations in the TMDL must be described (CWA § 303(d)(1)(C), 40 C.F.R. § 130.7(c)(1).

The TMDLs for the water body segments identified in the document are based on achieving the nitrogen loads during the most critical time period, i.e., the summer growing season. Since the other seasons are less sensitive to nitrogen loading, the TMDLs are protective of all seasons throughout the year. Seasonal variation is addressed on page 31 of the TMDL document.

Assessment: Since the other seasons are less sensitive to nitrogen loading, EPA concludes that the TMDL is protective during all seasons throughout the year.

8. Monitoring Plan

EPA’s 1991 document, Guidance for Water Quality-Based Decisions: The TMDL Process (EPA 440/4-91-001), and EPA’s 2006 guidance, Clarification Regarding “Phased” Total Maximum Daily Loads, recommend a monitoring plan when a TMDL is developed using the phased approach. The guidance indicates that a State may use the phased approach for situations where TMDLs need to

be developed despite significant data uncertainty and where the State expects that the loading capacity and allocation scheme will be revised in the near future. EPA's guidance provides that a TMDL developed under the phased approach should include, in addition to the other TMDL elements, a monitoring plan that describes the additional data to be collected, and a scheduled timeframe for revision of the TMDL.

The TMDL document presents three forms of monitoring that would be useful to determine progress towards achieving compliance with the TMDL (page 37 of the TMDL document). MassDEP's position is that TMDL implementation will be conducted through an iterative process where adjustments may be needed in the future. The three forms of monitoring include: 1) tracking implementation progress as approved by MassDEP in the town's Comprehensive Wastewater Management Plan (CWMP), 2) monitoring water quality and habitat conditions in the estuaries, including but not limited to, the sentinel stations identified in the MEP Technical Report, and 3) monitoring and tracking the extent of eelgrass habitat. Relative to water quality MassDEP believes that an ambient monitoring program much reduced from the data collection activities needed to properly assess conditions and to populate the model will be sufficient to determine actual compliance with water quality standards. Although more specific details need to be developed on a case-by-case basis, MassDEP believes that about half the current effort (using the same data collection procedures) would be sufficient to monitor compliance over time and to observe trends in water quality changes. In addition, the benthic habitat and infaunal communities would require periodic monitoring on a frequency of about 5+ years. Existing monitoring conducted by MassDEP for eelgrass should continue to observe any changes that may occur to eelgrass populations as a result of restoration efforts.

Assessment: EPA concludes that the anticipated ambient water quality monitoring program approved in the CWMP by MassDEP is sufficient to evaluate the adequacy of the TMDL and attainment of water quality standards, although is not a required element of EPA's TMDL approval process.

9. Implementation Plans

On August 8, 1997, Bob Perciasepe (EPA Assistant Administrator for the Office of Water) issued a memorandum, "New Policies for Establishing and Implementing Total Maximum Daily Loads (TMDLs)," that directs Regions to work in partnership with States/Tribes to achieve nonpoint source load allocations established for 303(d)-listed waters impaired solely or primarily by nonpoint sources. To this end, the memorandum asks that Regions assist States/Tribes in developing implementation plans that include reasonable assurances that the nonpoint source load allocations established in TMDLs for waters impaired solely or primarily by nonpoint sources will in fact be achieved. The memorandum also includes a discussion of renewed focus on the public participation process and recognition of other relevant watershed management processes used in the TMDL process. Although implementation plans are not approved by EPA, they help establish the basis for EPA's approval of TMDLs.

The implementation plan for the total nitrogen TMDL for the Wareham River Estuarine System is

described on pages 33-36 of the TMDL document. MassDEP has provided the following implementation plan recommendations:

- **Septic system** loading from private residences is a significant contributor to the controllable N load, therefore as part of the Comprehensive Wastewater Management Plan (CWMP) the town should assess the most cost-effective options for achieving the target N watershed loads, including but not limited to, sewerage and treatment for N control of sewage and septage at either centralized or de-centralized locations and denitrifying systems for all private residences. An approximately 79% reduction in attenuated septic loads from present conditions (in addition to WWTF load reductions) is required in the septic load to the system to achieve the threshold requirements. This septic load change will result in a 30% decrease in the total watershed load to the Wareham River Estuary System.
- **WWTF and Outfall:** the Wareham Wastewater Control Facility load will require reduction to 4,300 kg N/year (11.78 kg N/day), from the MEP estimated present discharge of 6,761 kg N/year (18.52 kg N/day). The CWMP should assess the most cost-effective options to meet this reduction in WWTF loading.
- **Stormwater runoff:** EPA and MassDEP authorized most of the watershed communities within the Wareham River Estuary System watershed for coverage under the NPDES Phase II General Permit for Stormwater Discharges from Small Municipal Separate Storm Sewer Systems (MS4s) in 2003. EPA and MassDEP reissued the MS4 permit effective July 1, 2018 (with modification effective January 6, 2021). The NPDES permits issued in Massachusetts do not establish numeric effluent limitations for stormwater discharges, rather, they establish narrative requirements, including best management practices, to meet the following six minimum control measures and to meet the Massachusetts Surface Water Quality Standards.
 1. Public education and outreach particularly on the proper disposal of pet waste,
 2. Public participation/involvement,
 3. Illicit discharge detection and elimination,
 4. Construction site runoff control,
 5. Post construction runoff control, and
 6. Pollution prevention/good housekeeping.

As part of their applications for Phase II permit coverage, communities must identify the best management practices they will use to comply with each of these six minimum control measures and the measurable goals they have set for each measure. Therefore, compliance with the requirements of the Phase II stormwater permit in the Wareham River Estuary System watershed towns will contribute to the goal of reducing the N load as prescribed in this TMDL for the estuarine system watershed.

- **Climate change** should be addressed through TMDL implementation with an adaptive management approach in mind. Adjustments can be made as environmental conditions, pollutant sources, or other factors change over time. The Massachusetts Office of Coastal

Zone Management has developed a StormSmart Coasts Program (2008) to help coastal communities address impacts and effects of erosion, storm surge, and flooding, which are increasing due to climate change.

EPA concludes that the approach taken by MassDEP is reasonable because of the resources available to the towns to address nitrogen such as the CWMP, additional Linked Model runs at nominal expense, assessment of cost-effective options for reducing loadings from individual on-site subsurface wastewater disposal systems, as well as reductions in stormwater runoff and/or fertilizer use within the watershed through the establishment of local by-laws and/or the implementation of stormwater Best Management Practices. MassDEP's MEP Implementation Guidance report <http://www.mass.gov/dep/water/resources/coastalr.htm#guidance> provides N loading reduction strategies that are available to Falmouth that could be incorporated into the implementation plans.

Assessment: MassDEP has addressed the implementation plan. Although EPA is not approving the implementation plan, EPA has concluded that it outlines a reasonable approach to implementation, as demonstrated by the foregoing and by the TMDL's administrative record.

10. Reasonable Assurances

EPA guidance calls for reasonable assurances when TMDLs are developed for waters impaired by both point and nonpoint sources. In a water impaired by both point and nonpoint sources, where a point source is given a less stringent wasteload allocation based on an assumption that nonpoint source load reductions will occur, reasonable assurance that the nonpoint source reductions will happen must be explained in order for the TMDL to be approvable. This information is necessary for EPA to determine that the load and wasteload allocations will achieve water quality standards.

In a water impaired solely by nonpoint sources, reasonable assurances that load reductions will be achieved are not required in order for a TMDL to be approvable. However, for such nonpoint source-only waters, States/Tribes are strongly encouraged to provide reasonable assurances regarding achievement of load allocations in the implementation plans described in section 9, above. As described in the August 8, 1997, Perciasepe memorandum, such reasonable assurances should be included in State/Tribe implementation plans and "may be non-regulatory, regulatory, or incentive-based, consistent with applicable laws and programs."

MassDEP explains that a combination of regulatory and non-regulatory program support in Massachusetts will provide reasonable assurances that both point and nonpoint allocations will be achieved, including regulatory enforcement, technical assistance, availability of financial incentives, and state and federal programs for pollution control. MassDEP possesses the statutory and regulatory authority, under the Massachusetts Clean Waters Act and Massachusetts Surface Water Quality Standards, to implement and enforce the provisions of the TMDL through its many permitting programs, including requirements for N loading reductions from on-site subsurface wastewater disposal systems. MassDEP addresses the

concept of reasonable assurance insofar as it relates to overall TMDL implementation on page 38 of the TMDL document.

The Towns of Wareham, Plymouth, and Carver have demonstrated this commitment through the comprehensive wastewater planning initiated well before the generation of the TMDL. The towns expect to use the information in this TMDL to generate support from their citizens to take the necessary steps to remedy existing problems related to N loading from wastewater treatment facility discharge, on-site subsurface wastewater disposal systems, stormwater, and runoff (including fertilizers) and to prevent any future degradation of these valuable resources. Moreover, reasonable assurances that the TMDL will be implemented include enforcement of regulations, availability of financial incentives and local, state, and federal programs for pollution control. Stormwater NPDES permit coverage will address discharges from municipally owned stormwater drainage systems. Enforcement of regulations controlling nonpoint discharges include local implementation of the Commonwealth's Wetlands Protection Act and Rivers Protection Act; Title 5 regulations for on-site subsurface wastewater disposal systems and other local regulations.

Assessment: MassDEP has described a number of programs that provide reasonable assurance that WQS will be met.

11. Public Participation

EPA policy is that there must be full and meaningful public participation in the TMDL development process. Each State/Tribe must, therefore, provide for public participation consistent with its own continuing planning process and public participation requirements (40 C.F.R. § 130.7(c)(1)(ii)). In guidance, EPA has explained that final TMDLs submitted to EPA for review and approval must describe the State/Tribe's public participation process, including a summary of significant comments and the State/Tribe's responses to those comments. When EPA establishes a TMDL, EPA regulations require EPA to publish a notice seeking public comment (40 C.F.R. § 130.7(d)(2)).

Inadequate public participation could be a basis for disapproving a TMDL; however, where EPA determines that a State/Tribe has not provided adequate public participation, EPA may defer its approval action until adequate public participation has been provided for, either by the State/Tribe or by EPA.

The public participation process for the Wareham River TMDL is described on page 39 of the TMDL document. MassDEP publicly announced the draft TMDL, and copies were distributed to key stakeholders. A public meeting to present the results of and answer questions about this TMDL was held on November 28, 2023¹, via Zoom with a physical meeting room in the Wareham Town Hall where attendees were able to access the virtual meeting. Comments received at the public meeting and received in writing within the 30-day comment period were

¹ Note the TMDL submission states a public information session was hosted November 28th, 2028, corrected here to the correct year of 2023.

considered by MassDEP. The attendance list, public comments from the meeting, written comments received by MassDEP, and the MassDEP responses are included in Appendix E of the TMDL document. MassDEP fully addressed all comments received in Appendix E of the TMDL document.

Assessment: EPA concludes that MassDEP has done a sufficient job of involving the public in the development of the TMDL, provided adequate opportunities for the public to comment, and has addressed the comments received as set forth in the response to comments section of the TMDL document.

12. Submittal Letter

A submittal letter should be included with the TMDL analytical document and should specify whether the TMDL is being submitted for a technical review or is a final submittal. Each final TMDL submitted to EPA must be accompanied by a submittal letter that explicitly states that the submittal is a final TMDL submitted under Section 303(d) of the Clean Water Act for EPA review and approval. This clearly establishes the State/Tribe's intent to submit, and EPA's duty to review, the TMDL under the statute. The submittal letter, whether for technical review or final submittal, should contain such information as the name and location of the waterbody, the pollutant(s) of concern, and the priority ranking of the waterbody.

Assessment: On May 7, 2024, MassDEP submitted the Final Wareham River Estuary System TMDL For Total Nitrogen (Control #549.1) and associated documents for EPA approval. The documents contained all of the elements necessary to approve the TMDL.

Attachment 1: Wareham River Estuary System Total Nitrogen TMDLs (Appendix D of TMDL document)

MassDEP Assessment Unit Name & ID	MassDEP AU Type & Class	MEP Watershed	MassDEP Impairment Parameters Associated with the TMDL	Action Type	TMDL <i>kg N/day</i>
Wareham River MA95-03	Estuary <i>Class SA</i>	Wareham River (Lower)	- Total Nitrogen - Chlorophyll-a - Estuarine Bioassessments	Restorative TMDL	75.80
		Crab Cove			
		Marks Cove			
Agawam River MA95-29	Estuary <i>Class SB</i>	Wareham River (Upper)	- Total Nitrogen - Algae - Nutrient/Eutrophication Biological Indicators	Restorative TMDL	20.92
Agawam River MA95-28	Freshwater <i>Class B\WWF</i>	Agawam River	-	Protective TMDL ¹	22.11
Wankinco River MA95-50	Estuary <i>Class SA</i>	Wankinco River	-	Protective TMDL ¹	25.85
Broad Marsh River MA95-49	Estuary <i>Class SA</i>	Broad Marsh River	-	Protective TMDL ¹	17.95
Crooked River MA95-51	Estuary <i>Class SA</i>	Crooked River	-	Protective TMDL ¹	2.88
System Total:			165.52		

¹ Pollution Protection TMDLs (kg N/day) for community planning and to prevent further downstream impairment.