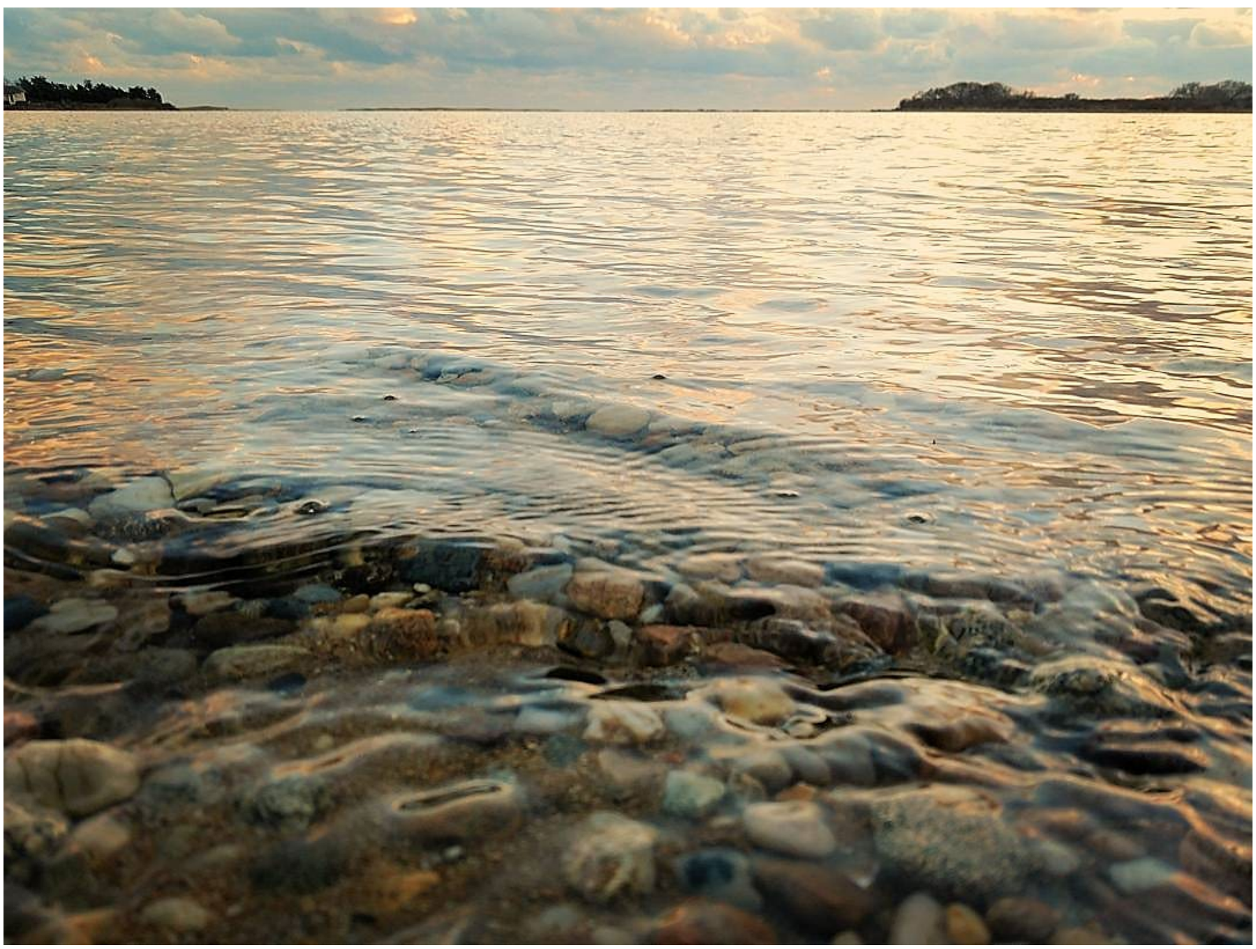
MVC Policy for DRI Review
Water Quality Management

This policy gives guidance to applicants seeking approval of Development of Regional Impact Projects (DRI Projects) by the Martha's Vineyard Commission with respect to water quality. The aim is to ensure that new DRI Projects do not cause excessive nitrogen loading and further deterioration of water quality in the Vineyard's fragile coastal ponds. This document describes the procedure to determine the acceptable level of nitrogen loading and how excess levels can be mitigated. It also sets out other measures to ensure pond water quality. This document also deals with freshwater ponds, groundwater, and large water withdrawals.



Edgartown Great Pond

Water Quality Management Policy
Effective Date: May 4, 2018

This policy is one of a series prepared to help Applicants and members of the public understand how the Martha's Vineyard Commission evaluates proposed Developments of Regional Impact (DRI), as mandated by its enabling legislation, Chapter 831 of the Acts of 1977 as amended.

The Commission is mandated to weigh the benefits and detriments of certain proposals to determine whether they should be approved, approved with conditions, or denied. Consult the Commission's website (www.mvcommission.org/DRI) or office (508-693-3453) to obtain the other documents. This policy reflects MVC practices in reviewing subdivisions and development over the past generation. It is set forth in order to assist Applicants in preparing proposals that address the Commission's concerns.

The Commission will use this policy during review of the benefits and detriments of the proposal (used a basis for approval or denial) and to formulate conditions that may be attached to the approval of an application. It should therefore be used by the Applicant to help design proposals and could serve as the basis of special provisions, or "offers", to offset anticipated detriments. Applicants are invited to consult the MVC's DRI Coordinator and Commission staff for help in identifying which policies apply to their Project.

This policy is generally a good indication of the Commission's concerns and can help the Commission evaluate the merits of a proposal. However, the Commission weighs the overall benefits and detriments of all aspects of each proposal on its own merits. Based on the particular circumstances of each proposal, the Commission could deny a Project that respects some or even all of the policy or might approve one that does not meet all parts of the policy. The Commission recognizes that there might be special circumstances whereby deviations from the policy are appropriate.

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1. POLICY DESCRIPTION, GOALS AND OBJECTIVES

1.1 The Importance of Coastal Ponds

Martha's Vineyard is ringed by Great Ponds – coastal saltwater ponds larger than 10 acres in area – that are vital to the Island's environment, character and economy. The 15 tidal and 8 brackish ponds comprise a total of over 10 square miles of waters.

- These ponds are highly productive of shellfish (e.g. bay scallops, soft-shelled clams, oysters, quahogs) and finfish (e.g. herring, tautog, Atlantic cod, tomcod and winter flounder), important to our commercial fishing industry.
- They offer a wide range of recreational opportunities, including boating and sport fishing, so important to the Vineyard's visitor-based economy.
- They have over 290 miles of shoreline, important environmental resources, favorite spots for beach activities, prime locations for real estate and viewsheds for many to enjoy.

The future health of our ponds is dependent on maintaining water quality.

1.2 The Threat of Excess Nitrogen

Over the past generation, increasing nutrient inputs in each watershed – in particular from housing and commercial development – has led to deterioration in the water quality in the Vineyard's coastal ponds. (A pond's watershed is the area of land that drains into the pond, either through runoff or groundwater flow.) Nitrogen is a nutrient that, in limited amounts, is important to supporting life in a pond. But when excessive nitrogen is produced in the coastal pond's watershed – from precipitation, stormwater runoff, septic systems, and fertilizer – it ends up in the pond and can destroy important aquatic life.

In a coastal pond, excess nitrogen has some or all of the following effects:

- Microscopic plants living in the water, called phytoplankton, increase dramatically, causing the water to become cloudy and, in extreme cases, green or brown.
- Slime algae increases on the surfaces of pilings, rocks, and eelgrass blades.
- Drift algae, particularly the bright green types, grow to excess, break loose, and wash into shore, or into eelgrass beds where they collect in unhealthy and unsightly piles.
- The growth of microscopic plants reduces light penetration to plants like eelgrass, which can no longer photosynthesize and therefore decline. The presence of healthy eelgrass is an important indicator of healthy water. In the past 20 years, for instance, eelgrass beds have become stressed and have nearly disappeared from, or are in decline in, Sengekontacket Pond, Lake Tashmoo and Lagoon Pond.[1]
- The excess plant material takes oxygen out of the water, both at night during respiration and as they die and decay. This lack of oxygen leads to stress and death of marine organisms by reducing fish habitat, by killing immobile organisms like quahogs and by causing chemical reactions in the bottom sediment that release more nutrients.

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[1] Observational data in support of the conclusion that Island ponds are suffering from excessive nitrogen is included in the MEP studies. For instance, these reports detail the extent of eelgrass in the ponds and the extent of shellfish production. Some of this data is set out at **Appendix 5**. Additional data (and the MEP Reports themselves) can be accessed via the links set out in **Appendix 7**. For those ponds for which MEP studies have not be undertaken or completed, data will be referenced when available.

- The pond's ecosystem shifts to one where filter feeders (clams, oysters and scallops) are replaced by organisms that eat decaying plants (worms and snails). Such a transition can destroy recreational and commercial fishing and shell fishing opportunities.

The ultimate result can be detrimental changes in water quality and the buildup of invasive weed and algal growth causing fish kills, closed beaches, destroyed productive shellfish areas; creating aesthetically displeasing waters that adversely affect the valuable tourist industry and coastal and other property values; and raising potential human health concerns.[2] (For more background information, please consult the Commission's website at www.mvcommission.org.)

1.3 Consideration of the Nitrogen Issue

The Massachusetts Estuaries Project (**MEP**) began to evaluate coastal water quality to determine the level of nitrogen impact and the necessary steps to address the issue of excess nitrogen in Massachusetts coastal ponds and estuaries[3]. The MEP has completed studies of most of the Island's ponds, and (with limited exceptions) the data and analysis from those studies forms the basis of this policy. The conclusion reached in respect of most Island ponds is that the nitrogen loading in those ponds currently presents the threats noted above.

Although existing DEP regulations are designed to protect human health, they do not adequately protect coastal ponds. Wastewater coming out of a septic tank and leaching field may have a nitrogen level of 25-30 parts per million (ppm) that is diluted on site to the point that it meets DEP Drinking Water Standards (10 ppm), yet still exceeds the usually lower limit required to protect the health of coastal ponds. The Commission, in promulgating this policy, seeks to preserve and remediate Island pond waters and, accordingly, seeks greater nitrogen reduction than required by the Commonwealth under local Board of Health regulations

1.4 Policy Goals and Approach

The overall goal of this Water Quality Management Policy is to improve water quality in the Vineyard's fragile coastal ponds, most of which have been found to be impacted by excess nitrogen. The goal is achieved by calculating a Project's nitrogen load and providing guidance toward ensuring that the Project will not exceed load limits and, in some cases, requiring the mitigation of excessive nitrogen loading. The long-term goal of this policy is to return Island pond waters to a healthy condition.

The approach adopted by the Commission in this policy addresses multiple considerations. On the one hand, the policy seeks to reduce the rate of continued pond impairment as a result of nitrogen loading caused by new development. New technologies, as well as financial arrangements (ie mitigation fees) are

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[2] It is now established that excess amounts of nitrogen, in the form of oxides, have the potential to damage human health, particularly in infants, young children, pregnant women and some people with compromised immune systems who consume nitrates in excess of established Safe Drinking Water Standards. In addition, the presence of excess nitrogen in water resources contributes to undesirable algal and aquatic plant growth, destroying wildlife habitat and degrading the waters for shell fishing, recreation and other public purposes. Excess nitrogen can also result in harmful algal blooms (HABs) that are toxic and create a potential public health issue for swimmers.

[3] In this document, the term 'coastal pond' is used interchangeably with the term 'pond' and includes salt and brackish water bodies that may not technically be considered ponds, such as Oak Bluffs Harbor and Cape Pogue. For the purposes of this document, the term 'coastal pond' has the same meaning as 'estuary'. Fresh water ponds are specifically referred to as "fresh water ponds" or "fresh surface waters" in all instances.

embraced which provide for flexibility and which will facilitate this goal. At the same time, the Commission acknowledges – and the policy reflects – that there are technology and cost limitations which make absolute water quality improvements to meet nitrogen targets impractical at this time. Accordingly, the Commission intends to review this policy in the next 2-3 years. It is anticipated that the interim period will see new technologies and associated cost reductions.

The application of this policy is, of necessity, confined to new developments with regional impact. Accordingly, its effect will be limited to the fraction of the total new development in each watershed that is reviewed by the Commission. The Commission encourages Island Towns to adopt local programs (and programs in cooperation with Towns with which it shares a watershed) the goal of which is to reduce the amount of nitrogen entering our ponds.

It should be noted, however, that this policy is not the only initiative whose goal is the remediation of Island ponds. For instance, new nitrogen reducing septic systems are being tested on Island for efficacy; permeable reactive barriers are being constructed in appropriate locations; phragmites harvesting is being investigated for its nitrogen reducing properties; targeted shellfish propagation operations are underway; pond dredging and flushing projects are planned; and extensions to sewer plants are being planned. As well, the recently adopted Island-wide fertilizer regulations are designed to minimize the effect of pond impairment resulting from the use of fertilizers.

1.5 Policy Objectives

The following are general objectives of this policy.

- Ensure that the water quality in Martha's Vineyard coastal ponds continues to provide a sustainable basis for recreational use and for the commercial and recreational harvest of fish and shellfish.
- Maintain and improve eelgrass beds and infaunal habitat in tidal coastal ponds or re-establish them where those were present in the recent past.
- Ensure that the overall nitrogen loading in each watershed is kept below the critical threshold needed to maintain or restore eelgrass in tidal ponds and to maintain water quality in the brackish ponds.
- Establish nitrogen-loading limits that are appropriate to the seriousness of the impairment of the ponds.

1.6 Strategies

In broad terms, the following strategies may be employed in order to meet the nitrogen load limits set out in this policy.

- Utilize available technology to reduce the nitrogen concentration in wastewater effluent.[4]
- Use landscaping techniques to maximize natural nitrogen absorption and fertilizer practices that minimize the use of nitrogen.
- Use low impact development best management practices (BMP) for stormwater.

[4] The Commission acknowledges the rapidly evolving nature of nitrogen mitigation technologies. This policy will be reviewed in approximately 2-3 years to assess how technological (and other) change may suggest policy revisions.

2. COASTAL PONDS: EXISTING CONDITIONS, DATA, AND STANDARDS

2.1 MEP Data Collection and Analysis Process

The MEP undertook comprehensive studies to understand the current nitrogen load in the Island's ponds. These studies first determined how ground and surface waters naturally flowed in order to establish the geographic areas contributing to nutrients within each pond. The boundaries of the Island's watersheds are identified in the map at **Appendix 1**.

The studies then identified what the nutrient sources are and, after collecting water samples from each pond in multiple locations and analyzing the samples collected, determined what the current nutrient load for each pond is. The studies then set out how great a nutrient load each pond can tolerate without dramatically changing its character and usages. Finally, the MEP generated reports that considered the health of each individual pond. In most cases, the reports concluded that it is necessary to remove a significant percentage of the nutrient loadings coming from a pond's watershed in order to restore ponds to a healthy state.

2.2 Nitrogen Load Limits

Table A, following, lists the Nitrogen Load Limit for most of the Island's coastal ponds and watersheds.[5] As noted above, these limits were calculated using a model developed by the MEP. (For those ponds for which the MEP studies have not be undertaken or completed, the formula developed by the Buzzard's Bay National Estuaries Project is used. As additional MEP studies are concluded for remaining Island ponds, the relevant data will be incorporated into this policy.)

Note that nitrogen conditions vary from pond to pond due to the total acreage and topography of the contributing watershed, the size of the pond itself, the amount of development in each watershed, and the degree of tidal flushing. For example, some ponds such as Sengekontacket are fully tidal whereas others, such as Oyster Pond, are only opened to the sea for a few weeks each year.

[5] There is no Nitrogen Load Limit for watersheds that drain directly to the ocean without first passing through a coastal pond due to the massive volume of ocean water that dilutes any nitrogen that might flow from land into the ocean.

Table A: Coastal Ponds Data[6,7]

Column: 1		2	3	4	5	6	7
Pond System		***Watershed Area (acres)***	***MEP (or Buzzards Bay) N Load Limit (kg)***	***Load Reduction Required[8]***	***N allowed per MEP (kg/acre/ yr)***	***Nitrogen Impairment Multiplier[9]***	***Adjusted Nitrogen Load Limit (kg/acre/yr)***
Cape Poge		816	45,500	0%	55.76	1	55.76
Chilmark Pond		3,137	5,400	14%	1.72	0.86	1.48
Edgartown Great Pond		4,505	7,686	18%	1.71	0.82	1.40
Farm Pond		402	1,604	26%	3.99	0.74	2.95
James Pond		400	200	67%	0.50	0.33	0.17
Katama Bay[10]		4,500	54,700	0%	12.16	1	12.16
Lagoon Pond		3,889	11,177	35%	2.87	0.65	1.87
Menemsha Pond		1,840	2,475	47%	1.35	0.53	0.72
Oak Bluffs Harbor[11]		382	6,026	25%	15.77	0.75	11.83
Oyster Pond		2,800	1,800	50%	0.64	0.5	0.32
Pocha Pond		900	5,680	0%	6.31	1	6.31
Sengekontacket Pond		4,440	11,051	19 %	2.49	0.81	2.02
Squibnocket Pond		1,229	1,058	13%	0.86	0.87	0.75
Lake Tashmoo		2,658	6,244	32%	2.35	0.68	1.60
Tisbury Great Pond		11,102	13,578	19%	1.22	0.81	0.99

[6] Data included in the orange blocks is derived from the MEP Reports. Data in the white blocks is derived from the Buzzards Bay studies.
[7] Additional data based on physical observations of the ponds is set out at **Appendix 5**.
[8] Load reduction required (for ponds noted in the orange blocks) is taken from the MEP Reports, which note additional considerations such as existing sewer infrastructure capacity, varying nitrogen levels within different areas of a pond (to the extent measurements were collected), etc). Most of the stated pond reduction requirements do not reflect such variations within the pond system. For instance, Lower Chilmark Pond requires a 22% reduction, while the entire Chilmark Pond system reduction requirement is only 14%. The Commission may account for these variances in its calculations when focusing on a specific project locus.
[9] The Nitrogen Impairment Multiplier is calculated having regard to the amount by which the current nitrogen load for a pond exceeds the load limit for that pond (ie the load reduction required). For example, if a pond exceeds its limit by 26%, the Nitrogen Impairment Multiplier is .74.
[10] The Buzzards Bay methodology is not as refined as the MEP model. The results of the Buzzards Bay study, particularly in the case in Katama Bay, may overstate the load limit. Katama Bay does not have any eelgrass although the data would indicate that it *should.* Because of the high value of shellfishing in these waters, care should be taken to minimize additional nitrogen load. Further study should be undertaken so as to obtain data to provide more meaningful guidance.
[11] Includes Sunset Lake.

3. WATER QUALITY MANAGEMENT - NITROGEN

3.1 Policy Statement

Each DRI Project, including pre-existing elements of a DRI Project, should operate at or below the Adjusted Nitrogen Load Limit (Table 7, column 7) for that Project after it is complete. Where a DRI Project cannot be connected to a sewer system (see below at section 3.4) and where a Title 5 Septic System is not sufficient to enable the Project to meet the Adjusted Nitrogen Load Limit, the applicant shall incorporate an Innovative Alternative System and/or a Denitrifying Toilet as permitted by Massachusetts DEP and the local Board of Health to reduce the Project's nitrogen load.

3.2 Mitigation Strategies

If a DRI Project which incorporates a Title 5 Septic System and/or an Innovative Alternative System and/or a Denitrifying Toilet will not operate at or below the Adjusted Nitrogen Load Limit for that Project after it is complete, the applicant may utilize any of the following mitigation strategies to bring the Project within the limit.

A. On-Site Nitrogen Load Reduction

- The MVC may, in its discretion, allow the use of a Denitrification Test System, provided the applicant commits to a comprehensive testing and monitoring program. If the Denitrification Test System in situ proves to be unable to meet the targeted nitrogen effluent concentration for that system, further mitigation may be required. In some circumstances the MVC may require that the applicant post a bond to ensure the applicant's financial ability to install a system capable of removing the nitrogen in excess of the targeted effluent concentration (or otherwise ensure such removal).

B. Off-site Mitigation

The projected nitrogen in excess of the Adjusted Nitrogen Load Limit may be treated as reduced to the extent that the nitrogen load is reduced at another site within the same watershed provided the groundwater from the mitigation site enters the pond at a point which is farther from the point where pond waters flow to the sea than the development site is from such a point or, subject to LUPC approval, in a segment of the pond that has similar or worse water quality conditions. This 'offset' may be achieved by either of the following strategies:

- Permanently restricting a separate property within the watershed from any development that would contribute nitrogen load to the watershed. This could be achieved by placing a permanent conservation restriction (or other permanent legal restriction) on the mitigation site, provided the site currently contributes no nitrogen. The amount available for offset from such a restriction would be the Adjusted Nitrogen Load Limit for that site.
- Reducing the nitrogen load on another site(s) within the watershed by connecting the mitigation site to a sewer system or by installing an Innovative Alternative System or, with the Commission's consent, a Denitrification Test System at the mitigation site.

C. Monetary Mitigation

- If it is not possible to reduce the nitrogen load of a DRI Project to meet the Adjusted Nitrogen Load Limit, either on site or at a mitigation site, the Commission may consider a monetary contribution.

For a site that has not yet been developed, the mitigation payment will be calculated having regard to the Project's projected nitrogen load in excess of the Adjusted Nitrogen Load Limit. If a site is already developed, the payment will be calculated having regard to the difference between the Project's projected nitrogen load and (i) the Adjusted Nitrogen Load Limit or (ii) the current nitrogen load of the site), whichever difference is greater.

- The amount of the payment will be calculated in accordance with **Appendix 2**.
- The wastewater treatment system forming the assumption on which the mitigation payment is calculated does not need to be installed by the developer.
- The Applicant shall pay the monetary mitigation before an occupancy permit can be issued for the DRI Project.[12]
- Mitigation payments shall be used exclusively for initiatives that the Commission determines will contribute to improving the water quality in the pond watershed within which the Project is located, and may be accumulated and dispersed in the discretion of the Commission. Possible uses of funds could be for the expansion of the sewage infrastructure, increasing or promoting tidal flushing, for the support of aquaculture, as a contribution towards subsidies for the installation of Denitrification Test Systems on other sites in the same watershed and same Town as the DRI Project, for the installation and maintenance of a permeable reactive barrier (PRB) or other project that would decrease the amount of nitrogen reaching the pond, or for a project which improves the pond's ability to flush or process nitrogen.
- Funds will be paid to the Commission maintained in an escrow account until dispersed by vote of the Commission.

3.3 Maintenance Agreements for IA Systems and Denitrification Test Systems

To assure satisfactory performance, all IA Systems and Denitrification Test Systems require ongoing maintenance and monitoring. If a DRI Project incorporates an IA System or a Denitrification Test System, the applicant shall have a maintenance and monitoring agreement for the system. The agreement must be with the manufacturer or a certified operator for that system, and it must remain in force over the design life of the system. A copy of the maintenance agreement, as well as all test results, shall be provided to the local Board of Health and to the Commission. In addition:

A. System owners must have in place for the life of the System a contract with a certified operator licensed in Massachusetts for the maintenance, monitoring and testing of the System.[13] Annual maintenance certification from the wastewater operator and test results showing the total nitrogen content of the effluent on the required sampling schedule (see B, below) must be provided to the Commission and the local Board of Health. Testing is required throughout the System design lifetime.

B. Testing (including sample analysis) and monitoring of I/A Systems and Denitrification Test Systems must be performed in accordance with applicable DEP and local Board of Health regulations. To the extent that testing and monitoring protocols for the system approved for the DRI Project are not specified by DEP or local Board of Health regulations, effluent testing must be performed annually in the case of IA Systems and, in the case of Denitrification Test Systems, quarterly until the system meets the required nitrogen concentration for four consecutive quarters. Thereafter, effluent testing must be performed annually.

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[12] For subdivision projects, the Commission may allow a monetary mitigation payment to be deferred until (and as a condition of) the sale of the unit in the subdivision that triggers the excess.
[13] At the Commission's discretion, the applicant may contract with a Town Board of Health to perform any such work.

C. If an annual test fails to meet the standard, a retest is required. Continued failure to meet the nitrogen concentration standard will require a return to quarterly testing until 4 consecutive tests meet the required concentration. This paragraph applies to both IA Systems and Denitrification Test Systems.

D. In the case of Systems which are limited to or principally intended for seasonal use, the Commission may require that the System be activated prior to such use to ensure maximum efficiency of the System when sustained use is planned.

E. If, after any attempted modifications, the system does not meet the required standard for nitrogen concentration after four consecutive quarterly test results, it will be deemed to have failed. A failed system must be upgraded with additional system components or replaced with a new system so as to enable the Project to meet the applicable Adjusted Nitrogen Load Limit. Alternatively, a mitigation strategy in accordance with this policy may be used.

3.4 DRI Projects Situated in Planned Sewer Service Areas

A. A DRI Project located in a proposed sewer area (whether for sewer plant extension or for new sewer plant) may be approved without meeting the Adjusted Nitrogen Load Limit (for wastewater only) if all of the following conditions are met: (i) the sewer project has been designed; (ii) the sewer project has received all necessary DEP permits and approvals; (iii) the sewer project is firm funded (ie the source of funds to construct the plant has been secured, either through grants or funding approved at a Town Meeting such as bonds, loans, or taxes) or any combination; and (iv) sewer service is expected to be available to the DRI project site within 2 years of the date of the DRI decision.[14]

B. An applicant for such Project shall create an escrow account in an amount equal to the estimated cost to connect to the sewer system. The cost shall include any betterment fee and the costs of physical connection, as may be applicable under Town requirements.

C. Applicants must connect to a sewer system within 150 days of availability of the system for hookup to the Project site.

3.5 Agricultural DRI Projects

Agriculture is a desirable land use offering open space and visual benefits to the community, supplying high quality locally produced food and stimulating the base of the economy. Considering the Commission's desire to promote agricultural use as an aspect of the local landscape, agricultural DRI Projects are not required to meet nitrogen-loading limits if sufficient documentation is provided to assure that environmental impacts are minimized. Agricultural DRI Projects are required to provide a detailed plan designed to minimize their nitrogen load including the following components of good management:

A. A farm plan prepared by the USDA Natural Resource Conservation Service (NRCS) and addressing nutrient management and, if appropriate, livestock management with sufficient detail to clearly indicate that impacts to the environment from the operation are minimized and mitigated.

[14] The Commission may approve Projects under this section if the expected availability of sewer service is estimated to be later than 2 years and may impose conditions to mitigate the excess nitrogen load generated during the interim.

B. The Applicant will commit to either being certified as an organic grower or to meet the following nitrogen reduction and water quality protection techniques:
   - Soil nutrient analyses for each field to grow row crops are followed for both total fertilizer application and for side dress application rates (see **Appendix 6**).
   - Total annual nitrogen application rates will not exceed the recommended maximum agronomic rate for the crop grown.
   - Legume-grass mixes are used for all pasture and hayland plantings such that nitrogen fertilizer is only applied in the year of seeding.
   - Livestock will be grazed using intensive rotational grazing techniques and stocking rates will be followed as prescribed by the NRCS farm plan.
   - A plan for permanently vegetated buffers, grass filter strips or swales is prepared and followed to separate all farm fields from wetlands.
   - Manure storage will be designed to minimize leachate loss either by an NRCS designed manure pit or by locating the pile to minimize runoff, surrounding the pile with hay bales and securely covering the pile with a tarp.
   - An Integrated Pest Management Plan is prepared for row crops and followed to minimize the use of pesticides.

C. The following DRI Projects, while of an agricultural nature, pose substantial environmental risks and will be reviewed in detail and nitrogen management may be required:
   - Turf farms producing sod for the landscaping industry
   - Livestock yards for finishing animals
   - Finfish farms
   - Components of an agricultural composting proposal utilizing offsite organic materials including bio solids, leaves, landscape clippings and materials, wood chips etc. will be reviewed in detail and nitrogen management may be required.

D. Facilities for storing, processing and sale of farm products will be reviewed in detail and nitrogen management may be required.

4. NITROGEN CALCULATION AND MITIGATION DESIGN

4.1 General

This section describes the keys steps for designing a DRI Project in accordance with this policy. Applicants are encouraged to consult the Commission staff for assistance in applying this policy to their Projects. The steps are:

- Step 1: Calculate the Nitrogen Load Limit for the Project – see section 4.2
- Step 2: Calculate the Adjusted Nitrogen Load Limit for the Project – see section 4.3
- Step 3: Determine the total untreated nitrogen output of the Project – see section 4.4
- Step 4: Modify the Project, if necessary, to meet the Adjusted Nitrogen Load Limit – see section 4.5
- Step 5: Offset any excess nitrogen load with one or more mitigation strategies – see section 4.6

4.2 Step 1 - Calculate the Nitrogen Load Limit

The Nitrogen Load Limit is calculated by multiplying the nitrogen allocation per acre for the applicable pond, as set out in column 5 of Table A, by the total number of acres included in the DRI Project site.

- For example, a 10-acre property in the Lagoon Pond watershed would have a Nitrogen Load Limit of 28.7kg: [column 5 from Table A * 10]

4.3 Step 2 - Calculate the Adjusted Nitrogen Load Limit

The Adjusted Nitrogen Load Limit is calculated by multiplying the Nitrogen Load Limit by the applicable Nitrogen Impairment Multiplier as set forth in column 6 of Table A. (Application of the Nitrogen Impairment Multiplier effectively reduces the allowable nitrogen.[15])

The Nitrogen Impairment Multiplier is established by considering the current condition of each pond. For example the load reduction required for Lagoon Pond is 35% and, accordingly, the Nitrogen Impairment Multiplier is 0.65.

- The same 10-acre DRI Project in Lagoon Pond would have an Adjusted Nitrogen Load Limit of 18.7kg: [28.7kg Nitrogen Load Limit * 0.65 Nitrogen Impairment Multiplier].

The Nitrogen Impairment Multiplier differs among ponds in recognition that the nitrogen load issue is more urgent in some ponds than others and that, therefore, greater efforts need to be made to reduce the load in such ponds. Accordingly, the Nitrogen Impairment Multiplier has been determined having regard to the relative level of impairment of each pond.

[15] Over time as a pond's nitrogen level improves and with subsequent reviews of this policy, the Nitrogen Impairment Multiplier may be adjusted.

4.4 Step 3 - Determine the Total Nitrogen Output of the Project

To determine the total untreated nitrogen output of a Project, the framework and data set out in **Appendices 3 and 4** will be used. Untreated nitrogen that must be accounted for includes nitrogen from wastewater as well as from lawns and landscaping and stormwater sources.

4.5 Step 4 – Modify the Project to meet the Adjusted Nitrogen Load Limit

If the total untreated nitrogen output of the DRI Project exceeds the Adjusted Nitrogen Load Limit, the applicant may elect to modify the Project proposal by, for instance, reducing the size of the Project (ie the number of Bedrooms or the floor space) or changing the proposed uses to uses that are less nitrogen intensive.

4.6 Step 5 – Incorporate Mitigation Strategies

If a DRI Project cannot meet the Adjusted Nitrogen Load Limit, the Commission may consider a mitigation proposal to offset the excess nitrogen load – see section 3.2.

5. PERFORMANCE STANDARDS – FRESH SURFACE WATERS AND GROUNDWATER

The following performance standards apply to DRI Projects that may impact fresh surface waters and groundwater.

5.1 Location of Leaching Systems

No subsurface wastewater disposal systems should be located within 300 feet of the high-water mark of a fresh water pond shoreline. Setting wastewater leaching systems back from the shore allows increased soil adsorption, which limits phosphorus entering the ponds. The applicant may demonstrate by a groundwater study that the groundwater flow from the proposed site does not flow to the fresh water pond or to a tributary to the fresh water pond. Wastewater treatment may be used to remove nutrients (principally phosphorus) from the wastewater if a Project must be located within the 300-foot setback. Applicants are encouraged to use wastewater disposal systems that utilize effluent drip irrigation or other "B horizon" effluent disposal to maximize phosphorus uptake in the soil. The Commission may require a phosphorus loading evaluation to assure that the Project as proposed will not have a detrimental impact on the fresh water pond.

5.2 Infiltration Areas

Runoff generated by the DRI Project must be infiltrated outside a 300-foot set back. Infiltration through vegetated areas is preferred. A topographic survey and design must be provided to support the capacity of the proposed infiltration area to meet the 25-year, 24-hour storm standard.

5.3 Protect Private Drinking Water Wells from Nitrogen

In general, wastewater treatment systems should be situated well clear of drinking water wells. For all DRI Projects that are in areas where private wells are in use, a nitrogen mass balance approach shall be used to determine the expected total nitrogen concentration in the groundwater as a result of the proposed Project. (A nitrogen mass balance calculation provides a nitrogen concentration analysis by dividing nitrogen output by the applicable recharge rate.) The target concentration shall be no greater than 5 milligrams per liter (parts per million) at the property line.[16] The nitrogen calculation shall be determined as set out in **Appendix 4**. A recharge rate of 28.7 inches may be used in outwash areas as identified in the US Geological Survey Map. Elsewhere, a rate of 22.2 inches will be used.
The Commission may require the applicant to establish test wells to measure potential contamination and to remediate any unsafe drinking water situation that the Commission finds to have been the result of the proposed Project.

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[16] Although the drinking water standard for nitrate is 10ppm, this policy adopts a more conservative approach and uses a 5ppm target for nitrogen concentration at the property line to protect down-gradient wells. This approach is appropriate in light of uncertainties in determining both the nitrogen reduction that occurs in the wastewater effluent leaching process, as well as the amount of dispersion and dilution that occurs once the effluent reaches the groundwater. In addition, it accommodates the possibility that the groundwater that receives the wastewater may already be carrying nitrogen from up-gradient wastewater systems.

5.4 Groundwater Withdrawal

A. DRI Projects must (i) incorporate water-conserving techniques to reduce water consumption, (ii) minimize the area of irrigated turf, and (iii) reuse wastewater effluent, roof water and/or stormwater for landscape irrigation, in each case where feasible.

B. DRI Projects that will require in excess of 50% of the annual recharge for their lot area over the course of a year or an average amount in excess of 10,000 gallons per day for a period of 30 days or more shall demonstrate by a suitably designed hydrogeological study that the Project as proposed will not (i) adversely affect groundwater levels in existing wells in the vicinity, (ii) cause intrusion of saltwater into or otherwise harm the aquifer or (iii) impact the hydrology of nearby fresh surface waters or wetlands. Groundwater recharge is assumed to be 28.7 inches per year for Projects situated within the outwash deposits identified in the Massachusetts surficial geology map and 22.2 inches per year on average as per the USGS in all other locations. If observation wells are required, they shall be as described in the MVC document titled "Suggested Observation Well Specifications" (2003).

C. Plans submitted for the Project must identify the location of the Project well and any abutting property's wells that are within 500 feet of the Project property line.

6. GENERAL REQUIREMENTS AND DOCUMENTATION

Requirements in this section apply to all DRI Projects impacting coastal ponds, fresh surface waters or groundwater.

6.1 DRI Projects Must Meet Existing Regulations

All DRI Projects must meet applicable Town and DEP regulations including:

- Board of Health regulations, Title 5 regulations or other bylaws or regulations (including Coastal District DCPC regulations) adopted by the Town where the Project is located.
- DEP approved Town regulations for Zone II Areas of Contribution of public supply wells and areas of private wells.

6.2 Stormwater Best Management Practices:

DRI Projects must be designed, as applicable, in accordance with the principles set out in the US DEP's *Coastal Stormwater Management Through Green Infrastructure - A Handbook for Municipalities, December 2014,* incorporating green infrastructure best management practices. In addition to other applicable practices:

- Stormwater must be dispersed into natural vegetation and/or infiltration systems (e.g. vegetated swales, bio-swales, and rooftop vegetated areas) sized to handle the 25-year, 24-hour storm standard, unless demonstrably not feasible.
- In areas of private wells or within Nitrogen Sensitive Watersheds, impervious surfaces must be kept to a minimum. Roadway dimensions must be kept to the minimum necessary for public safety in order to further reduce impervious surfaces.

6.3 Landscaping Practices:

Applicants shall implement the following nitrogen-reduction landscaping practices:

- Maintained landscape areas (fertilized lawns and gardens) must be limited to a maximum area of 10% of the property area up to 4000 square feet.
- Only slow release, water-insoluble nitrogen source fertilizers may be used in the maintenance of landscaping.
- Impervious surfaces for parking, buildings and other purposes must be limited to a maximum of 25% of the site area. If the DRI Project is within a Zone 2 area, the limit is 2500 square feet or 15% of the lot area, whichever is greater.
- Landscape plans must use native or low maintenance, drought tolerant species that are non-invasive to minimize the application of nitrogen, pesticides and water to landscapes.

6.4 Hazardous Materials and Wastes

LUPC may require a Chapter 21E site assessment where previous uses at the Project site have included the handling of hazardous materials or production of hazardous wastes. DRI Projects that will use or store hazardous materials that are not individually packaged in household size quantities or that will produce hazardous wastes are required to provide a hazardous materials handling and loss of product plan sufficiently detailed to assure that environmental impacts are minimized. In wellhead protection areas, uses having a substantial risk of environmental contamination are required to install mechanical flow shut off valves between the stormwater basin and the leaching area.

6.5 General Project Requirements

For all DRI Projects, applicants shall provide a Project description in sufficient detail to enable thorough Commission review. The necessary accompanying designs, calculations and plans will be determined by LUPC in each case. For most DRI Projects, the following apply (in addition to required documentation described elsewhere in this document):

A. Plans must:
  - Indicate land contours at a suitable scale and interval before and after construction.
  - Indicate and describe in detail all water-related infrastructure including design and sizing assumptions. ('Water-related infrastructure' includes any wastewater treatment system, infiltration system components and other stormwater containment equipment, and drinking water equipment.)
  - Indicate all sensitive receptors within 500 feet of the Project boundaries including coastal and freshwater wetlands, surface waters, and private and public wells.
  - Describe in detail best management practices to minimize erosion and sedimentation during and after construction.

B. For DRI Projects that may pose substantial risk to water resources, the LUPC may require the applicant to provide on-site groundwater elevation information sufficient to determine the direction of groundwater flow. If required, the document titled "Suggested Observation Well Specifications" (2003) shall be followed unless waivers are granted by LUPC. In addition, where circumstances are deemed to warrant it, the Commission may require the Applicant to install groundwater monitoring wells and to provide test results to the Commission as may be required.

C. Within 1 year of the installation of water-related infrastructure (see above at section 6.5.A.), a professional civil engineer shall inspect the structure and submit a letter to MVC certifying that its installation and performance meet the approved design and performance standard.

D. Unless the LUPC otherwise permits, no part of a DRI Project may be situated within 100 feet from mean high water or high water mark, as relevant, of a coastal or inland wetland. This 100-foot buffer zone must be undisturbed and must be so indicated on all plans. Any plan for maintaining view cuts through the buffer area must emphasize retention of the integrity of the area for filtration and infiltration of runoff.

E. DRI Projects situated on undeveloped land may be required to conduct an inventory of natural resources, including the identification of vernal pools.

7. Definitions

Adjusted Nitrogen Load Limit: the maximum allowable nitrogen load for a particular DRI Project after applying the Nitrogen Impairment Factor.

Bedroom: any room or other area that the applicable Board of Health considers to be a bedroom for the purpose of determining the wastewater flow rate used to size a residential wastewater disposal system.

Denitrification Test System: an on-site denitrification wastewater treatment system, which is approved by the DEP either for provisional use or pilot testing, designed to remove a greater amount of nitrogen than a Title 5 Septic System. See 310 CMR 280 et seq and also https://www.mass.gov/guides/title-5-innovativealternative-technology-approval-letters.

Denitrifying Toilet: a composting, urine diverting, incinerating toilet or other toilet approved for general use by the DEP that reduces nitrogen output by not less than 80%.

DEP: the Massachusetts Department of Environmental Protection.

DRI Project (or Project): a project referred to (and, in the case of concurrence and discretionary referrals, also accepted by) the Commission as a 'Development of Regional Impact'.

Innovative Alternative System (or IA System): an on-site denitrification wastewater treatment system approved for general use by the Mass DEP that is designed to remove a greater amount of nitrogen than a Title 5 Septic System.

LUPC: the Land Use Planning Committee of the Commission.

Nitrogen Load Limit: the maximum allowable nitrogen load for a particular DRI Project before applying the Nitrogen Impairment Factor. For clarification, the Nitrogen Load Limit refers only to controllable sources of nitrogen (including wastewater, lawns and landscaping and stormwater). Environmental, precipitation and stormwater sources of nitrogen beyond human control are excluded from the calculation of the Nitrogen Load Limit (and, accordingly, the Adjusted Nitrogen Load Limit).

Nitrogen Impairment Multiplier: the factor, determined having regard to the relative level of impairment of the applicable pond and set out in **Table A**, which, when applied to the Nitrogen Load Limit reduces the maximum allowable nitrogen load for a DRI Project.

Nitrogen Sensitive Watershed: a watershed, the boundaries of which are indicated on **Appendix 1**, in respect of which groundwater flows into a pond which has a nitrogen load reduction required in excess of 0% as set out in Table A.

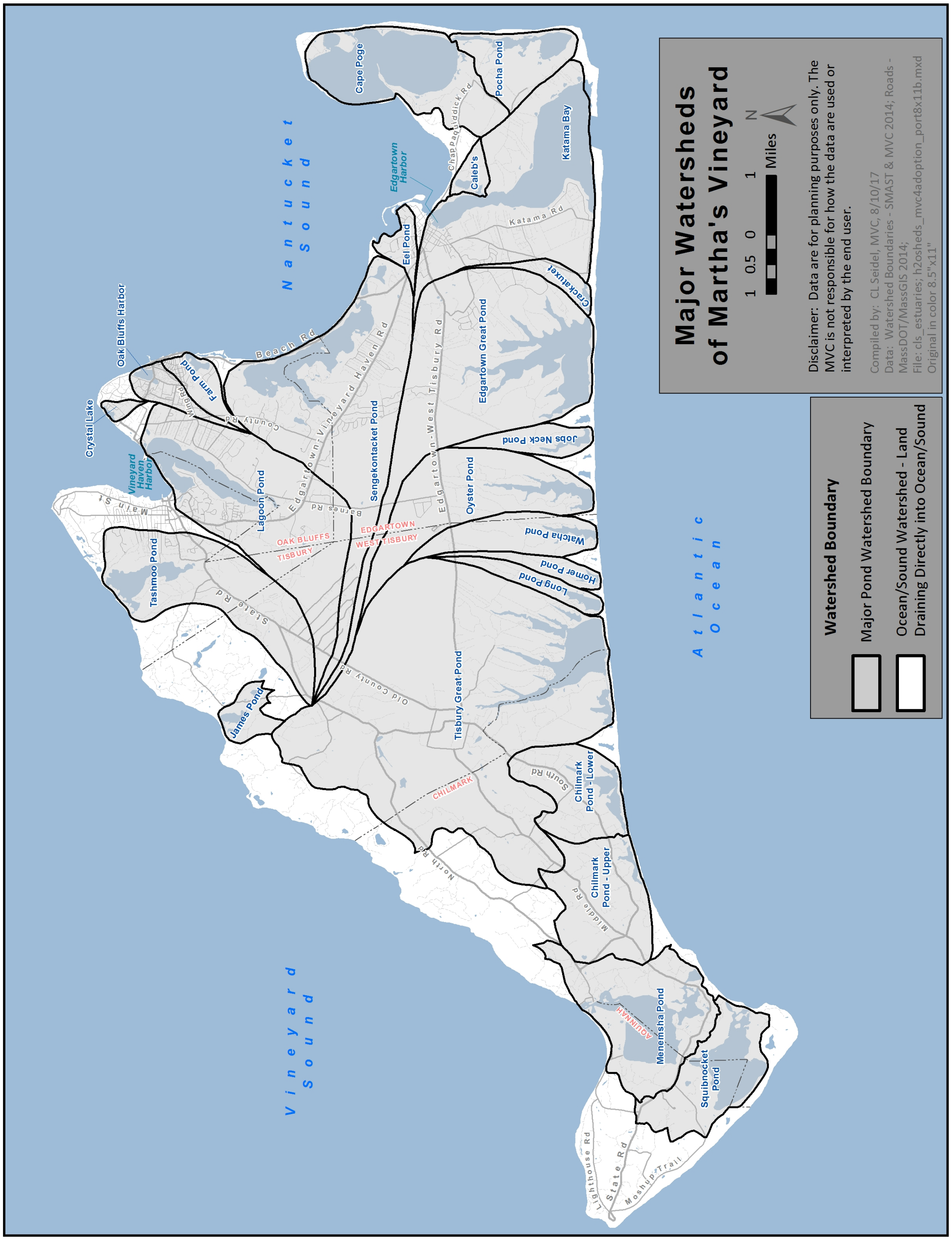
MEP: Massachusetts Estuaries Project, a collaborative effort between the Executive Office of Environmental Affairs (through the DEP) and the University of Massachusetts School of Marine Science and Technology, with partial project funding provided by the Town in which the pond is located.

Package Treatment Plant means a facility used to treat wastewater in small communities or on individual properties and generally refers to a system which treats in excess of 10,000 gallons of wastewater/day.

Title 5 Septic System (**or Title 5 System)** means a septic system approved and certified by the DEP under the State Environmental Code, Title 5, as capable of maintaining established sanitation standards and which removes a portion of the wastewater-based nitrogen entering the system.

APPENDIX 1

Watersheds Map



APPENDIX 2
Monetary Mitigation Calculation

As set out in section 3.2, for a DRI Project site that has not yet been developed, the mitigation payment will be calculated having regard to the Project's projected nitrogen load in excess of the Adjusted Nitrogen Load Limit. If a site is already developed, the payment will be calculated having regard to the difference between the DRI Project's projected nitrogen load and (i) the Adjusted Nitrogen Load Limit or (ii) the current nitrogen load of the site (calculated having regard to the current septic facilities, and water usage, landscaping and stormwater considerations), whichever difference is greater.

The payment amount will be an amount equivalent to the capital and operating costs of an IA System (or IA Systems or allocated portion of an IA System), sufficient to reduce the nitrogen load of the Project to the Adjusted Nitrogen Load Limit.

1. Total lifetime capital and operating costs (for mitigation fee purposes)

Calculation is based on a Nitrex IA System[17] using the following assumptions:

- Capital costs (system equipment sized for a 3-5 Bedroom house, plus installation, assuming no surveying, minimal or no landscaping and excluding septic tank and leaching field) - $27,000
- Operating costs (maintenance/repair, annual inspection/testing, electricity) - $365/yr
- Useful life of major capital equipment - 40 years

Total lifetime costs: $41,600

2. Nitrogen Calculation - Residential[18]

- **Title 5 Septic System nitrogen reduction** – N concentration after treatment at 26.25 mg/litre
    - Total weight[19] of nitrogen discharge based on water usage of 67,700 gal/yr[20] is 6.1kg N/yr.
- Nitrex IA System nitrogen reduction – N concentration after treatment at 12 mg/liter
    - Total weight[21] of nitrogen discharge based on water usage of 67,700 gal/yr is 2.8kg N/yr.
- A Nitrex IA System in substitution for a Title 5 Septic System will generate incremental nitrogen removal of 3.3 kg/yr over the Title 5 Septic System load.

3. Cost of Nitrogen Removal

- Cost per kilogram of N reduction of an IA System over Title 5 Septic System is: the IA System cost over the 40-year system lifetime divided by the total nitrogen removal over the lifetime

  $41,600/(3.3 *40) kilos = $315/kilo

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[17] Reference to the Nitrex IA System for mitigation fee purposes is not an endorsement of this system by the Commission. The Nitrex IA System is used here to provide illustrative costs for a DEP approved IA System.

[18] Commercial mitigation fee is calculated using the same principles. Water usage is as set out in **Table C of Appendix 4**.

[19] The Title 5 Septic System weight of N per average water usage is calculated as: 67,700 * 0.9 * 3.785 l/gal * 26.25 mg/l/1,000,000 = 6.1/yr.

[20] Water usage figure represents an average of available down-Island data (and also approximates MEP Report assumptions for up-Island towns where water usage data is not available.) This figure will apply to any residential structure with 5 or fewer Bedrooms. Additional Bedrooms will increase the water usage figure pro rata. The Commission may determine to use an alternate water usage figure on request by an Applicant on presentation of adequate documentation.

[21] The Nitrex IA System weight of N per average water usage is calculated as: 67,700 * 0.9 * 3.785 l/gal * 12 mg/l/1,000,000 = 2.8kg/yr.

4. Hypothetical Example Calculation

A hypothetical DRI Project comprising 10 residential units (each with 3 or 4 Bedrooms) on 12 acres in the R-50 district in the Tisbury portion of the Tashmoo watershed. Calculation of the mitigation fee must account for the following components of nitrogen increase resulting from the Project: wastewater, stormwater runoff and landscaping.

Step 1: calculate the Adjusted Nitrogen Load Limit for the 12-acre property:

12 acres * 2.35 kg/acre * 0.68 impairment factor = 19.2 kg/yr (or 767 kg over the 40-year system lifetime)

Step 2: calculate the Project's proposed ***wastewater*** load:

Working Hypothetical Assumptions

- Title 5 Septic System proposed.
- Annual water usage is 67,700 gal/yr, of which 10% is outdoor use.

Wastewater = (10 units * 67,700 gal/yr * 0.9 * 3.785 liter/gal *26.25 mg/liter)/1,000,000 = 60.54 kg/yr (or 2421.6 kg over the 40-year system lifetime)

Step 3: calculate the Project's proposed ***stormwater*** load:

Working Hypothetical Assumptions

- Houses are assumed to average 1500 sq ft with roof water directed to vegetated areas rather than drywells.
- Driveways are assumed to be RAP and to average 1000 sq ft per lot.
- The total length of subdivision roads is assumed to be 500' x 12' (or 6000 sq ft).
- All roads and drives are assumed to direct runoff into vegetated areas.

Further detail regarding the calculation of nitrogen from stormwater is set out in **Appendix 4**, section 4.

Roof water = (1500 sq ft * 10 units * 46.9"/12"/ ft * 0.9 leaching * 28.3 liters/cu ft * 0.38 mg/liter)/1,000,000 mg/kg = 0.57 kg * 40 years = 22.7 kg

Road and drive runoff = ((1000 * 10 + 6,000 sq ft) * 46.9/12 * 0.65 * 28.3 * 0.75)/1,000,000 = 0.86 kg * 40 years = 34.5 kg

Step 4: calculate the Project's proposed ***landscaping*** load:

Working Hypothetical Assumptions

- Landscaping for the 10 units is assumed to average 2500 sq ft per lot.
- Fertilization occurs at the rate of 3 lbs of actual nitrogen per 1000 sq ft using slow release sources.

Further detail regarding the calculation of nitrogen from landscaping is set out in **Appendix 4**, section 3.

Landscaping = (25,000 sq ft * 3 lbs/1000 sq ft * 0.2 leaching)/2.205 lb/kg = 6.8 kg * 40 years = 272.1kg

Step 5: calculate total N load from Project (over 40-year system lifetime):

Total = 2421.6 kg + 22.7 kg + 34.5 kg + 272.1 kg = 2751 kg

Step 6: calculate the amount by which the Project's proposed load exceeds the Adjusted Nitrogen Load Limit (over the 40-year system lifetime):

2751 kg – 767 kg = 1984 kg

Step 7: calculate the mitigation fee

1984 kg * $315/kg = $624,960

Note: standard equivalents are used.

I kg = 2.205 lbs

1 gal = 3.785 liters

APPENDIX 3
Nitrogen Output by Wastewater Treatment System Type

All wastewater treatment systems generate effluent containing nitrogen even if only in negligible amounts. Wastewater disposal systems and their respective nitrogen outputs are identified below

Table B
Wastewater Treatment System Nitrogen Output

Wastewater Treatment System	N Output (mg/l)
Town sewer[22]	3
Title 5 Septic System	26.25[23]
Innovative Alternative System (such as Nitrex)	12-19
Denitrifying Toilets (including Composting, Urine Diverting and Incinerating Toilets)	<7
Other[24]	TBD

[22] Discharge permits for the towns of Edgartown, Oak Bluffs and Tisbury target nitrogen effluent at 7mg/l while allowing up to 10mg/l. Actual nitrogen discharge from these sewage treatment plants is approximately 2-3mg/l. For the purpose of calculating Adjusted Maximum Nitrogen Load, the discharge is assumed to be 3mg/l.
[23] This data is taken from the MEP reports.
[24] Other nitrogen reducing wastewater treatment technologies (including Denitrification Test Systems) will be assigned a nitrogen output on presentation of adequate documentation.

APPENDIX 4
Total Nitrogen Calculation for Residential and Non-Residential DRI Projects

When calculating total nitrogen output for a DRI Project, consideration must include nitrogen from wastewater (see sections 1 and 2 below), lawns and landscaping (see section 3 below), stormwater (see section 4 below) and nitrogen attenuation, as applicable (see section 5 below).

1. Wastewater Nitrogen Output – Residential Development

The following formula is used to determine the annual residential wastewater nitrogen load:

(67,700gal/year[25] * 3.785 liters/gal * 0.9[26] * [system nitrogen output from **Appendix 3**] /1,000,000[27]

NOTE: The Commission may consider an alternative usage assumption provided the applicant submits credible supporting documentation or a compelling rationale.

2. Wastewater Nitrogen Output – Non-Residential Development

The applicant shall calculate the average annual wastewater flow for a DRI Project at (a) 60% of Title 5 wastewater design flow and (b) 90% of the water usage figures (see below), if available. The applicant may propose an alternative wastewater flow calculation method provided it is supported by clear and well-documented evidence that the water usage rates proposed are more appropriate. The Commission shall determine the appropriate method for the Project. The methods set out at (a) and (b) above shall also be used to determine nitrogen concentration in the groundwater and water withdrawal requirements for all Projects.

Table C
Water Use Rates for Non-Residential Uses[28]

General Use	Assessor's Code	Water Use in gal/1000sq'/day
Retail	32 & 33	55
Office	34	115
Supermarkets	324	76
Restaurants	326	275
Warehouse	31	10
Inns	302	116
Hotels	300 & 301	135
Mixed Use		100

Uses not included above may, with the concurrence of the LUPC, apply 60% of the Title 5 Septic System design flow or other acceptable wastewater flow determination.

[25] This number represents annual water usage – see fn 19.
[26] Factor of 0.9 is applied to account for assumed water usage attributable to landscaping.
[27] Essentially, this formula takes the water usage in gallons, converts it to liters, then deducts from that usage an estimate of water usage attributed to landscaping. It then multiplies that amount by the N reducing capacity of the septic system proposed. It then converts the result to an annual figure and, finally, divides by 1M to obtain a nitrogen output result in mg.
[28] This data is based on the Commission's review of down-Island Town water meter records for non-residential concerns.

3. Nitrogen from Lawns and Landscaping (Residential and Non-Residential)

The landscaped area is assumed to include the entire property exclusive of the footprint of any building/structure and any parking area, but not including any area clearly designated on the plans to remain permanently natural and un-landscaped. Included areas are assumed to receive 3.0 lb/1000sq'/yr of which 20% will leach to the groundwater. (The LUPC may recommend to the Commission a different rate for landscaped areas if the applicant supplies supporting documentation for the alternative.) Landscape plans form a binding part of the Project approval and may not be subsequently increased without the approval of the modification by the Commission.

4. Nitrogen from Stormwater (Residential and Non-Residential)

A. Runoff from impervious surfaces such as roofs, driveways and subdivision roads are concentrated sources of nitrogen. As a result, the nitrogen contained within the runoff is more likely to bypass vegetation and contribute to groundwater nitrogen than rainfall on naturally vegetated areas.

B. Stormwater nitrogen sources shall be calculated for all Projects if the impervious surfaces comprise more than 10% of the property area or, in the case of residential Projects, the Project site exceeds 10 acres. Impervious surfaces include the footprint of all structures and all driveways, parking areas and roads whether paved or not. For small residential DRI Projects (where the Project site is less than 10 acres) the LUPC may allow a reduced nitrogen load provided stormwater runoff will be infiltrated through vegetated areas.

C. For DRI Projects where infiltration of stormwater is proposed through a vegetated area sized to accommodate 25-year storm events, the calculated stormwater volume for all impervious areas (paved and roof) shall be based on 90% of the annual precipitation applied to the impervious area. Runoff volume for roads and parking areas that are surfaced with hardener, gravel or RAP shall be based on 65% of the annual precipitation applied to this area. Annual precipitation is assumed to be 46.9 inches. The nitrogen concentration shall be assumed to be 0.75 mg/l for paved areas and 0.38 mg/l for roof water.

D. For DRI Projects with impervious areas utilizing stormwater catch basins and infiltration systems or similar systems, the calculated stormwater flow will be 90% of the annual precipitation and the nitrogen concentration in the recharging water shall be assumed to be 1.5 mg/l for paved areas and 0.75 mg/l for roof areas that are infiltrated using dry wells, infiltrator units or other rapid infiltration technology. If roof water can be infiltrated through vegetated areas, the method set out in B above shall be used to calculate the nitrogen load.

E. Alternatively, stormwater volume may be calculated using accepted methodologies such as TR-20 (Computer Program for Project Formulation-Hydrology, USDA SCS 1983), TR-55 (Urban Hydrology for Small Watersheds, USDA SCS, 1986) or TR-55 Microcomputer Program Version 2.0, 1990 or updated versions of these methods. The nitrogen load will then be calculated using this volume and the appropriate nitrogen concentrations as above.

5. Nitrogen Attenuation

Nitrogen loading may be attenuated from DRI Projects where a fresh water wetland is situated between the development site and the nitrogen-loaded pond. The attenuation that may be allowed is up to 50% of the

Adjusted Maximum Nitrogen Load. The fresh water wetland must be clearly situated in the groundwater flow path. If the applicant seeks to incorporate attenuation, the Commission may require that a hydrological study be performed to demonstrate that the nitrogen bearing groundwater will pass through the fresh wetland and to estimate the percent attenuation.

6. Nitrogen Mass Balance

Note that, regardless of whether above final calculation is at or below the Adjusted Maximum Nitrogen Load, the nitrogen mass balance must be calculated to assure that the nitrogen concentration will be less than 5ppm in groundwater at the property line where private wells are in use. See section 5.3.

APPENDIX 5
Observational Pond Data

Pond	Observational Notes
Cape Poge	Eelgrass present; shellfish production in decline
Chilmark Pond	No historical eelgrass
Edgartown Great Pond	Eelgrass comes and goes [The Town has plans to sewer enough houses to offset the current and projected load excess. The load limit will be reviewed when sufficient additional systems are connected to the sewer system.]
Farm Pond	Eelgrass present although stressed
James Pond	No eelgrass present; heavy blooms of microscopic algae are common
Katama Pond	No eelgrass except during south shore opening; current aquaculture and wild shellfish resource
Lagoon Pond	Eelgrass present although stressed; no eelgrass in the West Arm
Menemsha Pond	Eelgrass present
Oak Bluffs Harbor (including Sunset Lake)	Sunset Lake is characterized by regular algae blooms; tidal exchange with Sunset Lake is restricted by the culvert under New York Ave.
Oyster Pond	No eelgrass present
Pocha Pond	No eelgrass; organic mud bottom
Sengekontacket Pond	Eelgrass present in Majors Cove and Trapp's Pond; current shellfish resource
Squibnocket Pond	No eelgrass present; brackish water; tidal flushing is limited; oysters present
Tashmoo Pond	Eelgrass present although stressed
Tisbury Great Pond	No eelgrass; large watershed contributes substantial nitrogen from acid rain

APPENDIX 6
Standard Agronomic Fertilization Rates

Crop	Nitrogen (lbs/acre)
Asparagus, establishment	60–80
Asparagus, maintenance	80–100
Beans/ Peas	80–100
Beets	100–120
Blueberry, establishment	10–30
Blueberry, maintenance	30–60
Broccoli/Brussels sprouts/Cauliflower	80–100
Cabbage	100–150
Cantaloupe/Watermelon	60–80
Corn, sweet	140–180
Cucumbers	80–140
Kale/Mustard/Spinach	100–120
Okra	80–100
Pepper	80–130
Potato, Irish	100–150
Radish	80–100
Rape/Canola	120–140
Raspberry/Blackberry, establishment	30–60
Raspberry/Blackberry, maintenance	80–100
Squash/Pumpkin	90–120
Strawberry, establishment	30–60
Strawberry, maintenance	60–80
Sweet potato	60–90
Tomato	90–120
Turnip	100–120
Vegetables, other	80–100
Pasture- grass	40 pounds
Hay- grass	40 pounds
re-seeding year only, at 40 pounds	

APPENDIX 7
Links to MEP Reports

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Chilmark Pond Embayment System, Chilmark, MA - 2015 file size9MB

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Edgartown Great Pond System, Edgartown, MA - 2008 file size5MB

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Farm Pond System, Oak Bluffs, MA - 2010 file size4MB

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Lagoon Pond Embayment System, Oak Bluffs & Tisbury, MA - 2010 file size9MB

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for the Oak Bluffs Harbor System, Oak Bluffs, MA - 2013 file size5MB

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Sengekontacket Pond System, Oak Bluffs & Edgartown, MA - 2011 file size13MB

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Lake Tashmoo Estuary, Tisbury, West Tisbury, and Oak Bluffs, MA file size15MB

Linked Watershed-Embayment Model to Determine Critical Nitrogen Loading Thresholds for Tisbury Great Pond/Black Point Pond System, Chilmark & West Tisbury, MA - 2013 file size7MB

The MEP web site where the Reports are located is at: http://www.mass.gov/eea/agencies/massdep/water/watersheds/the-massachusetts-estuaries-project-and-reports.html

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