Attachment E

Total Nitrogen

Applicable nitrogen licensing criteria

Maine law 38 M.R.S. §464. *Classification of Maine Waters,* states in part as follows:

"4. General provisions. The classification system for surface waters established by this article shall be subject to the following provisions." 38, M.R.S. §464(4)(F) further states in part: "F. The antidegradation policy of the State is governed by the following provisions."

38 M.R.S. §464(4)(F)(3) states:

> "3. The department may only issue a discharge license pursuant to section 414-A or approve water quality certification pursuant to the Federal Water Pollution Control Act, Section 401, Public Law 92-500, as amended, if the standards of classification of the water body and the requirements of this paragraph are met. The department may issue a discharge license or approve water quality certification for a project affecting a water body in which the standards of classification are not met if the project does not cause or contribute to the failure of the water body to meet the standards of classification."

38 M.R.S. §464(f)(5) states:

> "5. The department may only issue a discharge license pursuant to section 414-A or approve water quality certification pursuant to the United States Clean Water Act, Section 401, Public Law 92-500, as amended, which would result in lowering the existing quality of any water body after making a finding, following opportunity for public participation, that the action is necessary to achieve important economic or social benefits to the State and when the action is in conformance with subparagraph (3). That finding must be made following procedures established by rule of the board."

Maine law 38 M.R.S. §414-A. *Conditions of licenses,* states in part as follows:

"1. Generally. The Department shall issue a license for a discharge of pollutants only if it finds that:" 38 M.R.S. §414-A(D) states (emphasis added):

> "D. The discharge will be subject to effluent limitations that require application of the best practicable treatment. "Effluent limitations" means any restriction or prohibition including, but not limited to, effluent limitations, standards of performance for new sources, toxic effluent standards and other discharge criteria regulating rates, quantities and concentrations of physical, chemical, biological and other constituents that are discharged directly or indirectly into waters of the State. "Best practicable treatment" means the methods of reduction, treatment, control and handling of pollutants, including process methods, and the

application of best conventional pollutant control technology or best available technology economically achievable, for a category or class of discharge sources that the department determines are best calculated to protect and improve the quality of the receiving water and that are consistent with the requirements of the Federal Water Pollution Control Act, as amended, and published in 40 Code of Federal Regulations. If no applicable standards exist for a specific activity or discharge, the department must establish limits on a case-by-case basis using best professional judgment, after consultation with the applicant and other interested parties of record. In determining best practicable treatment for each category or class, the department shall consider the existing state of technology, the effectiveness of the available alternatives for control of the type of discharge and the economic feasibility of such alternatives."

Department Staff Discussion of Total Nitrogen

Nitrogen is generally the limiting nutrient for primary productivity in marine waters. Discharges of excess quantities of immediately bioavailable nitrogen can cause algal blooms in the receiving waters, which can lead to negative impacts to dissolved oxygen levels. Immediately bioavailable nitrogen typically consists of dissolved inorganic forms, including nitrate (NO_3^-), nitrite (NO_2^-), and ammonium (NH_4^+). Total kjeldahl nitrogen (TKN) is the sum of organic nitrogen, ammonia (NH_3), and ammonium (NH_4^+). To calculate Total Nitrogen (TN), the concentrations of nitrate and nitrite are determined and added to TKN. With the exception of ammonia, nitrogen is not acutely toxic; thus, at this time, the Department considers a far-field dilution model to be most appropriate when evaluating the more systemic types of influences associated with nitrogen in the marine environment.

Currently there are no state or federally promulgated best practicable treatment (BPT) standards for land-based recirculating aquaculture system (RAS) facilities and the State of Maine has not promulgated numeric ambient water quality criteria for total nitrogen. Since 2015, on a case-by-case basis, Maine DEP staff have been completing reasonable potential analyses (RP) upon renewal of wastewater discharge licenses for those facilities that discharge nitrogen directly to marine waters of the state. To date, the Department's RP assessments have generally utilized two total nitrogen (TN) threshold values to address aquatic life use of Maine's marine waters that the Department staff believe are appropriate here:

- 0.32 mg/L for protection of eelgrass, when historically mapped as present within close proximity to the discharge in question; and

- 0.45 mg/L for protection of dissolved oxygen, when eelgrass has not been historically mapped within close proximity to the discharge in question.

Maine DEP's definition of "close proximity" has been eelgrass located approximately 0.5 km from the wastewater outfall, or as informed by best professional judgement (BPJ) based on known eelgrass resources. The TN threshold value currently used in Maine's marine wastewater permits for protection of eelgrass was a concentration used regionally by United States Environmental Protection Agency (USEPA) permitting staff. The USEPA decision to use 0.32 mg/L was due to its numerical midpoint between 0.34 mg/L, a concentration deemed protective of eelgrass by the Massachusetts Estuary Project, and 0.30 mg/L, an average concentration from the lower Piscataqua River where Maine DEP observed epiphytic growth on eelgrass that resulted in a 2012 impaired waters listing due to eelgrass loss. The TN threshold value used for dissolved oxygen originates from a New Hampshire Department of Environmental Services (NH DES) guidance document for the Great Bay estuary (NH DES 2009), and was utilized in an EPA-issued wastewater discharge license in the Taunton River estuary in Massachusetts (EPA 2015).

Despite historically mapped eelgrass (1992 and 2003) beds as close to the proposed discharge as 0.5 kilometers (0.3 miles), based on a 2019 summer Department survey, the nearest eelgrass to the proposed discharge is currently approximately 4 kilometers (2.5 miles) to the southwest along the southerly shore of Northport. Given the absence of mapped eelgrass in close proximity to the proposed discharge and the moderately high light attenuation occurring in the water column as measured at nearby eelgrass habitat based on suspended solids and dissolved organic matter, the Department is utilizing a critical nitrogen threshold value of 0.45 mg/L and a far-field dilution factor of 300:1 to evaluate the impact of the proposed discharge on dissolved oxygen in the vicinity of the proposed discharge location. For the closest eelgrass bed, the Department is utilizing a critical nitrogen threshold value of 0.32 mg/L and a dilution factor of 1000:1 to evaluate the impact on the eelgrass bed. Both environment response indicators are being evaluated for total nitrogen given the geographic differences in the dilution factors associated with each environmental response indicator. The Department staff utilizes a weight of evidence approach to determine attainment of water quality standards and places a greater weight on ambient water chemistry and biological data, including dissolved oxygen, pH, and chlorophyll *a* to determine whether the discharge, if permitted, will cause or contribute to violations of water quality.

Department Staff Discussion of Antidegradation

The State of Maine's antidegradation policy states that water quality that exceeds the minimum applicable standards will be managed by the Department for the environmental, economic and social benefit of the State. *See* 38 M.R.S. §§414-A(1)(C), 464(4)(F)(5). Where a new or increased discharge is proposed, the Department will determine whether the discharge will result in a lowering of existing water quality. For purposes of evaluating and applying the statutory antidegradation standard, the Department staff generally considers the following case-by-case basis consistent with its historical practice and best experience and judgment as reflected in its nonbinding Waste Discharge Program Guidance dated June 13, 2001:

- "New discharge" means a discharge that does not now exist or that is not currently licensed.

- "Increased discharge" means a discharge that would add one or more new pollutants to an existing effluent, increase existing levels of pollutants in an effluent, or cause an effluent to exceed one or more of its current licensed discharge flow or effluent limits, after the application of applicable best practicable treatment technology, as defined at 38 MRSA § 414-A(1)(D), or new source performance standards to the discharge.

- "Existing water quality" means the water quality that would exist under critical water quality conditions. Critical water quality conditions include, but are not limited to, conditions of low flow, high water temperature, maximum loading from point source and non-point source discharges, and conditions of acute and chronic effluent toxicity.

In making a determination as to whether a new or increased discharge will result in a lowering of existing water quality pursuant to the statutory standard, the Department staff generally considers the following case-by-case basis consistent with its historical practice and best experience and judgment as reflected in its nonbinding Waste Discharge Program Guidance dated June 13, 2001:

- The predicted change in ambient water quality, concentrations of chemical pollutants, or mass loading of pollutants under critical water quality conditions.

- The predicted consumption of the remaining assimilative capacity of the receiving water. The remaining assimilative capacity is the increment of existing water quality above the minimum standards of the assigned classification under critical water quality conditions.

- The predicted change in the ability of the receiving water to support aquatic life and to meet applicable aquatic life and habitat criteria.

- The possible additive or synergistic effects of the discharge in combination with other existing discharges.

- The cumulative lowering over time of water quality resulting from the proposed discharge in combination with previously approved discharges.

Based on the above considerations, the Department staff generally makes a case-by-case determination as to whether a new or increased discharge will result in a lowering of existing water quality. However, where the new or increased discharge will consume 20% or more of the remaining assimilative capacity for dissolved oxygen or other water quality parameter, the resulting lowering of water quality will generally be considered by Department staff to be lowered based upon the Department staff's historical practice and best experience and judgment.

Where the Department determines that a new or increased discharge will result in a lowering of existing water quality, the Department will then determine whether the lowering of water quality is necessary to achieve important economic or social benefits to the State. *See* 38 M.R.S. §§414-A(1)(C), 464(4)(F)(5). In making this determination pursuant to the statutory standard, the Department staff generally considers the following on a case-by-case basis consistent with its historical practice and best experience and judgment as reflected in its nonbinding Waste Discharge Program Guidance dated June 13, 2001:

- Whether the lowering of water quality is necessary to accommodate new or increased commercial activity or industrial production while providing that (1) the discharge consistently complies with applicable effluent limitations requiring application of best practicable treatment or new source performance standards and (2) any existing treatment facility is appropriate and is optimally maintained.

- The economic and social benefits that would result from the lowering of water quality. These benefits may include, but are not limited to, increases in employment, increases in local or regional income or purchasing power, increases in the community tax base, correction of an environmental or public health problem or nuisance situation (e.g., removal of overboard discharges or failing or substandard septic systems) and improved community stability. In the case of a lowering of water quality due to community growth, benefits may include an assessment of the economic and social consequences that would result if the new or increased discharge and the resulting lowering of water quality were not approved.

- The technical availability, economic feasibility, and environmental effectiveness of alternatives that could reduce or eliminate the lowering of water quality. Alternatives may include, but are not limited to, alternative discharge locations, non-discharging alternatives, alternative methods of production, improved process controls, waste water minimization technologies, improved waste water treatment facility operation and maintenance, alternative waste water treatment methodologies, and advanced treatment beyond applicable technology requirements.

Department Staff Discussion of the Remaining Assimilative Capacity

Between June and September of 2019, the Department staff conducted four ambient water quality monitoring events at six sites in Belfast Bay and Penobscot Bay to determine ambient concentrations of total nitrogen in addition to many other parameters. See the attached map for the location of the sampling sites. To establish "existing water quality" for the purposes of evaluating the impact of nitrogen being discharged from the proposed Nordic facility, the Department staff considered averaged data from sampling sites BB02 and PB03 to be most representative of existing water quality conditions at the proposed outfall location. The Department staff has taken an arithmetic mean of the surface total nitrogen values obtained in 2019 and calculated and utilized a background concentration of 0.25 mg/L as representative of Belfast Bay. Therefore, the total nitrogen discharge threshold that will not consume more than 20% of the remaining assimilative capacity can be calculated as follows:

Department Staff Analysis of Dissolved Oxygen as the Environmental Response Indicator

Given:

Critical water quality threshold - 0.45 mg/L
Background concentration – 0.25 mg/l
Applicant's proposed discharge concentration of total nitrogen – 23 mg/L
Far field factor: 300:1 (calculated by the applicant)

Find: Proposed effluent limitation

0.45 mg/L – 0.25 mg/L = 0.20 mg/l (remaining assimilative capacity)

(0.20 mg/L) (0.2) = 0.040 mg/L (20% of the remaining assimilative capacity)

(300)(0.040 mg/L) = 12 mg/L

(7.7 MGD)(8.34 lbs/gal)(12 mg/L) = 770 lbs/day. (This is the figure that Department staff believes, based upon its review and analysis to date, is the limit that would avoid the need to make supported findings pursuant to 38 M.R.S. §464(4)(F)(5).

Based on the Department staff's review and analysis to date, the proposed discharge concentration of 23 mg/L would not meet the default antidegradation licensing criteria threshold of 12 mg/L at full flow. This is because, in the Department staff's view based on its review and analysis to date, the proposed discharge value of 23 mg/L would consume 38% of the remaining assimilative capacity of the receiving water. According to the state's antidegradation policy, and the staff's historical practice and best professional experience and judgment, this would be considered a lowering of water quality and the applicant would only be able to meet the standard if it established and the Department made the findings required by 38 M.R.S. §464(4)(F)(5).

Department Staff Analysis of Eelgrass as the Environmental Response Indicator

Given:

Critical water quality threshold - 0.32 mg/L
Background concentration – 0.25 mg/l
Applicant's proposed discharge concentration – 23 mg/L
Dilution factor: 1,000:1 (at location of the Northport eelgrass bed, DEP station PB02)

Find: Proposed effluent limitation

0.32 mg/L – 0.25 mg/L = 0.07 mg/l (remaining assimilative capacity)

(0.07 mg/L) (0.2) = 0.014 mg/L (20% of the remaining assimilative capacity)

(1,000)(0.014 mg/L) = 14 mg/L

(7.7 MGD)(8.34 lbs/gal)(14 mg/L) = 899 lbs/day. (This is the figure that Department staff believes, based upon its review and analysis to date, is the limit that would avoid the need to make supported findings pursuant to 38 M.R.S. §464(4)(F)(5).

Based on the Department staff's review and analysis to date, the proposed discharge concentration of 23 mg/L would not meet the default antidegradation licensing criteria threshold of 14 mg/L at full flow. This is because, in the Department staff's view based on its review and analysis to date, the proposed discharge value of 23 mg/L would consume 33% of the remaining assimilative capacity of the receiving water. . According to the state's antidegradation policy, and the staff's historical practice and best professional experience and judgment, this would be considered a lowering of water quality and the applicant would only be able to meet the standard if it established and the Department made the findings required by 38 M.R.S. §464(4)(F)(5).

Therefore, if a permit were to be granted, and absent supported findings contemplated by 38 M.R.S. §464(4)(F)(5), the most stringent discharge concentration that would protect both dissolved oxygen and eelgrass as the environmental response indicators would be 12 mg/L based on the dissolved oxygen analysis at a full flow of 7.7 MGD.