

2023

# NITROGEN BACKGROUND CONCENTRATION EVALUATION

prepared by  
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**Nordic's waste water discharge license is still in existence, has not been suspended and according to their permit:**

*“On or before December 31st of each year, Nordic will submit a report prepared by MRF to MEDEP which will summarize the data collected, noting any trends or anomalies in addition to all supporting and source materials used in the report's preparation which includes but is not limited to; Excel files of sonde and Secchi data, grab sample and QC data, and field observations from data sheets. Reports will also contain some calibration information and an explanation of all data flags, omissions, or missing data. Grab sample and associated quality control data will be submitted in Electronic Data Delivery (EDD) format to the DEP's online submission portal: Environmental and Geographic Analysis Database (EGAD).”*

This Nitrogen Background Concentration Evaluation report is an evaluation of the submission on behalf of Nordic Aquafarms ME0002771/W009200-6F-A-N by Ed Cotter to Gregg Wood on December 27, 2022. The report sent to the DEP was written as partial fulfillment of the requirements detailed in Nordic Aquafarm's MEPDES Permit #ME0002771, Waste Water Discharge License, Special Condition G. This Nitrogen Background Concentration Evaluation review included all data submitted to Gregg Wood with particular emphasis on the Nitrogen data, the Nitrogen data narratives and also the Electronic Data Deliverable (EDD) submitted in the above referenced report including narrative and data tables provided by Matthew Nixon, Owner/Founder, Muddy River Farm Aquaponics, LLC.[1]

In summary the review of data finds that concerns exist with the quality of the Nitrogen data provided by Eastern Analytical. Concerns include the minimum reporting level for nitrate/nitrite, adherence to the method required and the Quality Control Project Plan provided in testimony, and the values of quality control data. The quality of data that relates to nitrogen discharge has been a concern throughout the permitting process; intervenors wish to assure that there is minimal degradation of marine waters and wish that data going forward meets a high level of quality as defined in the Quality Assurance Project Plan.

**[1]For five predetermined sites in Western Penobscot Bay. The report also includes data from field measurements, water column profiles at each Station and sampling date, in addition to parameter reports developed and provided by Eastern Analytical, Inc of Concord, NH.**

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The quality of measurements of nitrogen is important. Intervenors have contested the DEP's allowable amount of discharge of Nitrogen during the permitting and appeals process; making accurate analytical procedures to measure nitrogen before and after discharge critical to permitting limits.

*As an example, intervenors have argued that the modelling data provided and the agreed process to evaluate allowable nitrogen discharge during formal public testimony suggests that nitrogen in the Nordic discharge will exceed acceptable levels. DEP staff, using the state anti-degradation as a criteria, predicted that the Nordic 23 mg/l Total Nitrogen effluent concentration would consume 38% of the remaining assimilative capacity of the receiving water and that a 12 mg/l Total Nitrogen effluent concentration is the largest allowable concentration to achieve state's limit of 20% remaining capacity. The DEP staff allowable discharge number of 12 mg/l was refuted the day before the public BEP meeting. Intervenors believe that the modeling data was misused and misinterpreted in Nordic's favor during that last day and the BEP allowed that 21 mg/l should be the maximum allowable effluent concentration. 23 mg/l is still 8% more than the BEP allowed 21 mg/l and Nordic has not demonstrated that 21 mg/l is attainable. The point is that these discrepancies regarding Nitrogen levels in the discharge leave considerable doubt about what Nitrogen values will be present in the effluent to Belfast waters and what levels are safe for our marine environment.*

Nordic, as a permit condition, is required to perform background analysis and provide data for the purposes of a further refinement/study of the risks of contamination to marine life. The accuracy of nitrogen being tested before and after construction is important.

Accurate analytical testing of total Nitrogen is also important to determine background levels. Accurate analytical testing will also become important if the facility is built and scientists wish to evaluate the effects of nitrogen discharge. Understanding the background concentration is important, because the anti-degradation rule uses background levels in the calculation of remaining assimilative capacity. Assimilative capacity is determined by subtracting the background concentration from a critical water quality threshold. This remaining assimilative capacity is multiplied by 20% to determine the allowable concentration of nitrogen.

**The lower the background concentration, the higher the amount of added nitrogen that can be allowed.**

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As a point of reference:

The Maine DEP utilizes two total Nitrogen (TN) threshold values to address aquatic life use of Maine's marine waters:

- 0.45 mg/l for protection of dissolved oxygen, when eelgrass has not been historically mapped
- 0.32 mg/l for protection of eelgrass, when historically mapped.

The DEP has independently determined that the background concentration of nitrogen is 0.25mg/l. There is significant data provided in testimony that Normandeau test results demonstrate that background levels of nitrogen often exceed this value as well.

Here are specific concerns with the quality of the nitrogen data provided in the Nordic report to the DEP. These include:

1. The minimum reportable level is being confused with a minimum detection level and doing so can suggest that nitrogen may exist at lower levels than can be accurately recorded,
2. The minimum reportable level for nitrogen in this data set is insufficient,
3. The Quality Assurance Project Plan for submitted method 353.2 was not properly followed,
4. Critical quality control parameters are not included in the EDD and the one for spiked laboratory control sample was 10x over the range of interest.

**Each concern is addressed below.**

### **1. The minimum reportable level is being confused with a minimum detection level and suggesting that nitrogen may be at lower levels than can be accurately recorded.**

The Nordic data is confusing a MDL with RL

The narrative data tables provided by Matthew Nixon, Owner/Founder, Muddy River Farm Aquaponics, LLC in the December 12 2022 letter of James Crowley "U", is used to mean less than MDL. Under definitions, MuddyRiver has provided this statement:

"U Under Detectable Limit (See MDL)

MDL Method Detection Limit – A statistical value derived from a study designed to provide the lowest concentration that will be detected 99% of the time. Values between the MDL and RL are estimated (see J qualifier as referenced in Appendix C).

The analytical method requires that a RL be used as the lowest accurate level of concentration, as any data based on any MDL level is technically only an estimate and not valuable for accurate evaluations. By reporting all data as under the MDL (U) as opposed to the RL may be providing a false sense of how low the existing total nitrogen levels are. The Electronic Data Deliverable (EDD) provided in the data tables provides a MDL as 0.0041 mg/l. This is a very low number compared to the .25 mg/l previously reported as a background. It must be clear that only the RL can be used as a lower limit for accurate data reporting and we must assume that the “U” in the EDD means less the RL, since to measure an accurate concentration of a substance, the RL is the proper low level limit to use.

(Nordic has utilized to its advantage this confusion of limits in the past when measuring mercury in the sediments and reported concentration as less than MDL values)

## 2. The minimum reportable level for nitrogen in this data set is insufficient.

Total Nitrogen=TKN+(Nitrate+Nitrite)

TKN=Total Organic Nitrogen+Total Ammonia

The data provided by Eastern analytical reports all the following Reporting Limits(RL) with the following analytes:

| <u>Analyte</u>      | <u>RL</u> |
|---------------------|-----------|
| Ammonia -N          | 0.05 mg/l |
| TKN -               | 5.0 mg/l  |
| Nitrate/Nitrite N - | 0.5 mg/l  |
| Total Nitrogen      | 5.0mg/l   |

- The Eastern Analytical data reports Nitrate + Nitrite RL as 0.5 mg/l This number is higher than either of the threshold levels (0.45 mg/l, 0.32 mg/l and previous background concentrations of 0.25 mg/l). Nitrate is likely the major component of Nitrogen (as provided in Nordic testimony and permit application) in the NORDIC final effluent.
- Since concentrations of nitrogen in the 0.32 mg/l range are important for the protection of eelgrass, the RL’s provided in this data suggest that if the Nitrate/Nitrite level was indeed 0.32 mg/l that a “U” would be the result.
- The Eastern Analytical data reports a TKN RL of 5/mg/l. This is more than 10x the environmental threshold concern levels accepted by the DEP (0.32 mg/l for protection of eelgrass). TKN represents the sum of ammonia and organic nitrogen.

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- The Eastern Analytical data reports the Ammonia RL as 0.05 mg/l This is an excellent RL, however it is combined into the TKN value and leaves significant concern about the level of organic Nitrogen. Ammonia levels are toxic to the salmon and a likely converted to nitrates as part of the treatment process.

The many “U” results would imply that there is undetected Nitrogen in the background, when indeed levels of interest may indeed exist.

### **3. The Quality Assurance Project Plan for submitted method 353.2 was not properly followed.**

According to the Quality Assurance Project Plan (QAPP) Nordic Aquafarms submitted by 2/23/21, M. Nixon, labeled MWQLSOPNOX the Nitrate/Nitrite N method 353.2 is used to analyze filtered water at concentrations up to 0.4 mg/l. Concentrations higher than 0.4 mg/l must be diluted before analysis. Further, the Quality Assurance Program Plan (QAPP) calls for Linearity to be achieved by calibrating with sample concentrations of 0.05 to 0.4 mg/l. Stating a RL of 0.5mg/l is not consistent with the QAPP provided by Nordic. If calibration data is required below 0.4 mg/l, a RL of 0.5mg/l is inappropriate, leaving a question about linearity and sensitivity to nitrate/nitrite measurements.

The DEP should request calibration data collected during the analytical sequence. If a dilution is involved the EDD should indicate this. The RL of 0.5 mg/l is higher than the highest calibration concentration and may fall outside of the linearity requirement.

### **4. Critical quality control parameters are not included in the EDD and the one for spiked laboratory control sample was 10x over the range of interest.**

The laboratory control sample (LCS) requirement in the QAPP that assures that a spiked sample that is introduced with field samples to be analyzed during the testing process has a percent recovery that is high enough to assure that interferences or sample preservation is not a cause of inaccurate results. Since a known result can be expected, this LCS provides some indication of accuracy of results. These LCS concentrations should be concentrations in the range of interest. The LCS control samples that were submitted to the DEP with the samples had a concentration of 5 mg/l for Nitrate/Nitrite N. Not only is this concentration some 10X a level of interest, the method calls for results above 0.4 mg/l to be diluted before measurement. There is no DILUTION\_FACTOR data provided. Using a quality control sample at 10x the RL when the data levels of concern are below 0.5mg/l of nitrate/nitrite is not appropriate.

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## CONCLUSION

As we go forward to evaluate the effect of a NORDIC release of nitrogen to marine waters, the quality of data is important. Nordic has an obligation to meet the Quality Assurance Project Plan for analytical data submitted as part of its application for permit. The background data provided in the recent submittal to the DEP (**ME0002771/W009200-6F-A-N** by Ed Cotter to Gregg Wood on December 27, 2022) does not meet the provisions of the Quality Assurance Project Plan. Reportable Limit sensitivity is not sufficiently low to measure nitrate/nitrite at levels required to assure marine classifications can comply with anti-degradation standards. Measurement units are confused. Measurement quality objectives associated with the method analytical sequence are either not provided in the EDD or are at wrong concentrations. Good studies should rely on quality data and not estimated levels that lack documented quality control data consistent with the required method 535.2 SOP's. The sampling and analysis and report submitted on behalf of Nordic Aquafarms **ME0002771/W009200-6F-A-N** by Ed Cotter to Gregg Wood on December 27, 2022 should be redone.

