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September 11, 2020

Via Electronic Mail Only
Hon. Presiding Officer Duchesne and Board of Environmental Protection
c/o Cynthia S. Bertocci, Executive Analyst Board of Environmental Protection
17 State House Station
Augusta, Maine 04333

RE: Draft Board Order re: MEPDES

Dear Presiding Officer Duchesne and Members of the Board:

Attached please find the response of Upstream Watch to the MEPDES and Waste Discharge Draft Order and Permit dated August 13, 2020.

Upstream Watch anticipates and is grateful for the Board's tireless and careful review of this material and its implications.

Very truly yours,

David B. Losee

cc: Certification List attached

STATE OF MAINE
DEPARTMENT OF ENVIRONMENTAL PROTECTION
BOARD OF ENVIRONMENTAL PROTECTION

	IN THE MATTER OF
	:
NORDIC AQUAFARMS, INC.	:APPLICATIONS FOR AIR EMISSION,
Belfast and Northport	:SITE LOCATION OF DEVELOPMENT,
Waldo County, Maine	:NATURAL RESOURCES PROTECTION
	:ACT, and MAINE POLLUTANT
	:DISCHARGE ELIMINATION SYSTEM
	:(MEPDES)/WASTE DISCHARGE
A-1146-71-A-N	:LICENSE
L-28319-26-A-N	:
L-28319-TG-B-N	:**RESPONSE OF UPSTREAM WATCH TO**
L-28319-4E-C-N	:**DRAFT BOARD ORDER**
L-28319-L6-D-N	:**RE: MEPDES AND WASTE DISCHARGE**
L-28319-TW-E-N	:
W-009200-6F-A-N	:
	:
	: SEPTEMBER 11, 2020

In the quest to conserve a vital resource – the nation's waters – Congress has enlisted the federal, state, and local governments under the Clean Water Act ("the Act") 33 U.S.C. 1251 through 1388, in a regulatory approach sometimes called "cooperative federalism." This effort involves a type of regulation that takes the form of a "permit" issued by a federal agency (or a state agency with federal oversight) at specified intervals to the regulated entity. Such permits authorize discharges of pollution into waterways, which the Act otherwise prohibits. *Md. Dep't of Env't v. Cnty. Comm'rs of Carroll Cnty.*, 465 Md. 169, 182 (Md. Ct. Spec. App. 2019). The Act generally prohibits "any person" from discharging pollutants from a point source into a waterway. 33 U.S.C. § 1311(a).[1] Accordingly, the

[1] Under the Act, "person" includes "an individual, corporation, partnership, association, State, municipality, commission, or political subdivision of a State, or any interstate body." 33 U.S.C. § 1362(5).

statute requires a permit for the discharge of pollutants into a water body from a point source under specified conditions.[2] The Act establishes the National Pollution Discharge Elimination System ("NPDES") to govern such permits. 33 U.S.C. § 1342. The EPA is authorized to issue and enforce these permits. 33 U.S.C. §§ 1319, 1342(a)(1). The EPA may also delegate that authority to a state so long as the state's law establishes a parallel permitting program consistent with the Act. 33 U.S.C. § 1342(b). The EPA has delegated such authority to most states, including Maine.

The Maine "MEPDES" process allows citizens to apply for permits to discharge substances into the waters of the United States contained within or adjacent to the State of Maine. MEPDES is the Maine adaption of the federal Clean Water Act under which water discharge permitting authority is delegated to the Maine DEP, conditioned upon compliance with the federal act and the intent of the Congress.

AN APPLICANT MUST SATISFY THE APPLICATION REQUIREMENTS

The MEPDES permit application process provides criteria the applicant must demonstrate it will meet in order to be awarded a permit to discharge anything into the waters of the United States. The applicant must make that demonstration in its application. This demonstration is a mandatory precedent to the issuance of a permit. The courts support this view. Consider the U.S. Court of Appeals for the 5th Circuit in *Hornsby v. Allen*, 326 F. 2nd 605 (1964):

> Thus, when a …governmental body grants a license it is an adjudication that the applicant has satisfactorily complied with the prescribed standards for the award of

[2] "Discharge of a pollutant" means "any addition of any pollutant to navigable waters from any point source [or] any addition of any pollutant to the waters of the contiguous zone or the ocean from any point source other than a vessel or other floating craft." 33 U.S.C. § 1362(12)

that license. Similarly, the denial of a license is based on an adjudication that the applicant has not satisfied those qualifications and requirements. …

Since licensing consists in the determination of factual issues and the application of legal criteria to them — a judicial act — the fundamental requirements of due process are applicable to it. Due process in administrative proceedings of a judicial nature has been said generally to be conformity to fair practices of Anglo-Saxon jurisprudence, see Tadano v. Manney, 160 F.2d 665, 667 (9th Cir. 1947), which is usually equated with adequate notice and a fair hearing, see Opp Cotton Mills v. Administrator, 312 U.S. 126, 61 S.Ct. 524, 85 L.Ed. 624 (1941). Although strict adherence to the common-law rules of evidence at the hearing is not required, see Crowell v. Benson, 285 U.S. 22, 48, 52 S.Ct. 285, 76 L.Ed. 598 (1932), the parties must generally be allowed an opportunity to know the claims of the opposing party, Morgan v. United States, 304 U.S. 1, 58 S.Ct. 773, 82 L.Ed. 1129 (1938), to present evidence to support their contentions, see id. 304 U.S. at 18, 58 S.Ct. at 776, 82 L.Ed. 1129, and to cross-examine witnesses for the other side, Reilly v. Pinkus, 338 U.S. 269, 70 S.Ct. 110, 94 L.Ed. 63 (1949). Thus, it is not proper to admit *ex parte* evidence, given by witnesses not under oath and not subject to cross-examination by the opposing party. Southern Stevedoring Co. v. Voris, 190 F.2d 275 (5th Cir. 1951); see Chin Quong Mew ex rel. Chin Bark Keung v. Tillinghast, 30 F.2d 684 (1st Cir. 1929). *A fortiori,* the deciding authority may not base its decision on evidence which has not been specifically brought before it, United States v. Abilene So. Ry., 265 U.S. 274, 44 S.Ct. 565, 68 L.Ed. 1016 (1924); the findings must conform to the evidence adduced at the hearing, Tadano v. Manney, 160 F.2d 665 (9th Cir. 1947). Furthermore, the Supreme Court has said that an administrative order "cannot be upheld merely because findings might have been made and considerations disclosed which would justify its order * * *. There must be such a responsible finding." SEC v. Chenery Corp., 318 U.S. 80, 63 S.Ct. 454, 87 L.Ed. 626 (1943). *Hornsby v. Allen*, 326 F.2d 605, 608-9 (5th Cir. 1964).

An applicant's duty to fully comply with the MEPDES application requirements is explained in the EPA regulations, applicable to the states and found at 40 CFR 122.21:

> **(h)** ***Duty to provide information.*** The permittee shall furnish to the Director, within a reasonable time, any information which the Director may request to determine whether cause exists for modifying, revoking and reissuing, or terminating this permit or to determine compliance with this permit. The permittee shall also furnish to the Director upon request, copies of records required to be kept by this permit.
>
> **(8)** ***Other information.*** Where the permittee becomes aware that it failed to submit any relevant facts in a permit application, or submitted incorrect information in a permit application or in any report to the Director, it shall promptly submit such facts or information. (Clean Water Act) (33 U.S.C. 1251 *et seq.*)

APPLICATION REQUIREMENTS MUST BE DISTINGUISHED FROM PERMIT CONDITIONS. DEFINITION OF "PERMIT CONDITION".

Permit condition means a statement or stipulation which is issued with a permit and which must be complied with. And a Permit refers to a written or oral authorization to do something. It is a certificate or document evidencing permission, a license.

So, an application requirement is not the same thing as a permit condition. The former precedes the issuance of a permit and its absence precludes the issuance of a permit; the latter follows the issuance of a permit and characterizes the permit's use. They are not the same and they are not interchangeable. (Emphasis supplied.)

In its review of the MEPDES application by Nordic Aquafarms, Inc., the BEP proposes to allow compliance with application requirements by means of after-the-fact permit conditions. See below. That is as illogical as it is illegal. When an application calls for a demonstration that certain environmental criteria will not be exceeded by operation of the proposed facility, the applicant must demonstrate that constraint as part of the application. It is unlawful and useless to allow the applicant to satisfy application criteria after the facility is completed to determine whether the applicant was telling the truth. That fails to protect the environment and fails to protect American citizens, denies citizens equal protection of the laws and denies citizens due process.

Worse, the BEP presumes to waive compliance with the application criteria in favor of after-the-fact compliance by permit condition. BEP appears to allow a waiver regarding certain application criteria and not regarding others. There are no published criteria or regulations regarding who can be awarded the waiver privilege of compliance-after-the-fact or allowing a waiver to be granted at all. As a result, the BEP seems to believe it can award waivers to the politically connected, like Nordic Aquafarms, Inc, endorsed by U. S. Senators Collins and King, Governors LePage and Mills, Congresswoman Pingree, and the Belfast City Council, and elect to deny such waivers to the politically unpopular. This is yet another reason why issuance of waivers of application requirements is illegal.

WE ARE A GOVERNMENT OF LAWS AND NOT OF MEN

John Adams enshrined the concept of "a government of laws, not of men," in the 1780 Massachusetts state constitution, but his words expressed a firm conviction held throughout the 13 colonies in the years leading to the American Revolution. Maine endorsed the concept 5 years later upon admission to the union.

It was a powerful idea because it conveyed a fundamental truth: Government should be based on clearly written laws, consented to by those to be governed by them, and not on the unpredictable will of one man or even a few men.

Adams meant that in a free society government rules must be fixed and understandable. Laws may not be so complicated that they prevent average citizens from exercising basic liberties. Nor may government rules be formulated or changed by whim.

When laws use vague terms, provide regulators with open-ended discretion, and leave nearly all guessing what these laws mean, everyone suffers. Political professionals and local grassroots organizations alike need a government of laws, not of men, to secure their due process and equal protection rights.

Bright line rules that limit the reach of creative bureaucrats and ambitious regulators preserve the due process rights of everyone. Americans have long maintained vigilance against power shifting from laws to men.

. "It is to be regretted that the rich and powerful too often bend the acts of government to their own selfish purposes." - Andrew Jackson

THE UNBRIDLED DISCRETION TO AWARD WAIVERS OF PERMIT REQUIREMENTS DENIES CITIZENS EQUAL PROTECTION OF THE LAWS. EQUAL PROTECTION OF THE LAWS MEANS EQUAL APPLICATION OF THE LAWS

The Fifth Amendment's Due Process Clause requires the United States government to provide equal protection under the laws. The Fourteenth Amendment's Equal Protection Clause requires states to provide equal protection under the laws.

The **Equal Protection Clause** is from the text of the **Fourteenth Amendment** to the United States Constitution. The clause, which took effect in 1868, provides "nor shall any State [...] deny to any person within its **jurisdiction** the equal protection of the laws". Equal Protection refers to the idea that a governmental body may not deny people equal protection of its governing laws. Equal protection forces a state to govern impartially—not draw distinctions between individuals solely on differences that are irrelevant to a legitimate governmental objective. Thus, the equal protection clause is crucial to the protection of civil rights.

The unbridled discretion to grant waivers of permit requirements is *ipso facto* a denial of equal protection of the laws and cannot stand.

ARBITRARY OR CAPRICIOUS

That unbridled discretion is also a violation of due process.

Government actions that are arbitrary or capricious are by their very nature a violation of due process. The Courts have discussed the concepts of arbitrary and capricious:

> Arbitrary and capricious is “Absence of a rational connection between the facts found and the choice made. Natural Resources. v. U.S., 966 F.2d 1292, 97, (9th Cir.'92). A clear error of judgment; an action not based upon consideration of relevant factors and so is arbitrary, capricious, an abuse of discretion or otherwise not in accordance with law or if it was taken without observance of procedure required by law. 5 USC. 706(2)(A) (1988).
>
> When a judge makes a decision without reasonable grounds or adequate consideration of the circumstances, it is said to be arbitrary and capricious and can be invalidated by an appellate court on that ground.”

STATE ACTION

Denial of equal protection can only be accomplished by state action.

The MEPDES Order and draft MEPDES Permit are, collectively, state action.

> The Fourteenth Amendment, by its terms, limits discrimination only by governmental entities, … 379 U.S. 294 (1961). As the Court has noted, "the action inhibited by the first section of the Fourteenth Amendment is only such action as may fairly be said to be that of the States...419 U.S. 345 (1974).

The fact that the "state action" category is not limited to situations in which state law affirmatively authorizes discriminatory action was made clearer in *Yick Wo v. Hopkins*,118 U.S. 356 (1886) in which the Court found unconstitutional state action in the discriminatory administration of an ordinance that was fair and non-discriminatory on its face. Not even the fact that the actions of the state agents are illegal under state law makes the action unattributable to the state for purposes of the Fourteenth Amendment. "Misuse of power, possessed by virtue of state law and made possible only because the wrongdoer is clothed with the authority of state law, is action taken 'under color of ' state law." 319 U.S.299 (1941) (Emphasis supplied) When the denial of equal protection is not commanded by law or by administrative regulation but is nonetheless accomplished through (government) enforcement of "custom" 398 U.S. 144 (1970) or through hortatory admonitions by public officials to private parties to act in a discriminatory manner, 373 U.S. 267 (1963) the action is state action.

NORDIC AQUAFARMS DID NOT SATISFY THE APPLICATION CRITERIA OF STATE OR FEDERAL LAW

Nordic Aquafarms, Inc. failed or refused to comply with the federal application requirements of 40 CFR 122.21, et seq. and failed to comply with the state application criteria of Title 38, Chapter 3, section 521. Nordic Aquafarms failed or refused to provide to DEP the materials and analysis required by the MEPDES application. This has been known to DEP since December of 2019 when Intervenor, Upstream Watch presented to DEP and entered into the record, a "compliance matrix" prepared by Michael Lannan, President of

Tech Environmental, a consultant to Upstream Watch and the Intervenor Representative for Intervenor, Northport Village Corporation. These deficiencies have been recited to DEP and to the BEP several times and in several ways, and in the following pages Upstream Watch recounts them, for the record, yet again. Awarding an MEPDES permit to Nordic Aquafarms, Inc. in the face of a deficient application is illegal. That illegality is not overcome by the BEP's attempt to conflate the application requirements with permit conditions; That merely compounds the illegality. A partial enumeration of the incomplete items in Nordic's application follows.

NORDIC'S APPLICATION IS INCOMPLETE

NORDIC'S APPLICATION RELIES ON MODELS WITHOUT VERIFYING DATA

Unverified models have been provided by the applicant to determine that temperature and anti-degradation standards are met. These models provided by the applicant under oath demonstrate the applicant does not meet temperature and anti-degradation standards of the Clean Water Act.

The applicant has not provided data needed to verify their models. The record shows Nordic Aquafarms (NAF) was aware of this need to collect verifying data over a year ago. There has been time to collect this data, yet the applicant has failed or refused to do so. The following must be provided by the applicant before a permit is issued:

a. Temperature profiles at the point of the outfall,

b. More exact size of the mixing zone (near field dilution)

c. Far field dilution that includes:

    i. tidal fluctuations,

    ii. secondary circulation patterns and

    iii. wind shear over multiple seasons and varied conditions.

iv. More complete monitoring for stratification and baseline nutrient,

v. BOD,

vi. marine biotics.

WILL LOWER WATER QUALITY: ANTIDEGRIDATION

Conclusions and Findings

The Board has made the following conclusions and findings:

1. *The discharge, either by itself or in combination with other discharges, will not lower the quality of any classified body of water below its classification.*

2. *The discharge, either by itself or in combination with other discharges, will not lower the quality of any unclassified body of water below the classification which the Department expects to adopt in accordance with State law.*

Tidal Water Thermal Discharges.

MRSA Chapter 582: REGULATIONS RELATING TO TEMPERATURE

"No discharge of pollutants shall cause the monthly mean of the daily maximum ambient temperatures in any tidal body of water, as measured outside the mixing zone, to be raised more than 4 degrees Fahrenheit, nor more than 1.5 degrees Fahrenheit from June 1 to September 1. In no event shall any discharge cause the temperature of any tidal waters to exceed 85 degrees Fahrenheit at any point outside a mixing zone established by the Board."

DEP staff calculations are too conservative and inaccurate:

Department staff have reviewed and analyzed the applicant's proposal from the standpoint of applicable temperature criteria and note the following:

The DEP assumed the following information for the applicant's proposed discharge at the full flow of 7.7 MGD: and concluded:

- Using the highest discharge temperature 18°C (64.4°F). (The temperature of 18°C is the highest discharge temperature identified by the applicant in its application.)
- Using the mean of the daily maximum ambient temperature – non summer 1.3°C (34.3°F), in the month of March. (Ambient temperatures are coldest in the month of March.)
- Using the mean daily maximum ambient temperature - summer 10°C (50.0°F) in the month of June. (Ambient temperatures are warmest in the month of June.).

The DEP calculations used measurements for the water temperature in Belfast, Maine provided by the daily satellite readings provided by the NOAA. The temperatures given are the sea surface temperature (SST) which is most relevant to **recreational users**. These are surface temperatures. The discharge will be at 35 feet of depth. Using lower temperatures from below the surface has the effect of increasing the delta T.

As an example, if the June mean temperature used in the calculation was 48 degrees instead of 50 degrees F, the calculated Delta T would be:

((64.4F)(7.7 mgd)+ (48F) (69.3mgd))/77mdg =49.64 F The Delta T is 49.64F-48F = 1.64 Degrees. <u>This would be a violation.</u>

If the modeling dilution factor varied by 10% with a 9:1 dilution factor instead of a 10:1 dilution factor (8 parts ambient and 1 part effluent) the delta T would calculate as follows:

((64.4F)(7.7 mgd)+(50F)(61.6))/69.3mgd = 51.59F The Delta T is 51.59F-50 F=1.69 Degree. <u>This would be a violation.</u>

Before a permit is issued the applicant must verify real temperatures with collected data at the <u>actual</u> discharge point.

The CORMIX near field model used to predict the near field dilution must be verified with real time data collected over varying conditions. Global sea temperatures are increasing and our region is increasing at a faster rate than others. This is additional reason to take into account the temperature rise in our shallow bay as a result of the effluent discharge temperature. To put the effluent temperature rise into context: The average amount of heat transferred to the bay every day from this discharge would be the equivalent of the heat produced by burning 10,000 gallons of gasoline a day or the electric energy consumed by 10,000 homes a day. To wait until the CAAP is built and finished and running to test and monitor the temperature increase is too late.

Data in the record is meager and fails to verify that the state Tidal Water Thermal Discharge Standard can be met. Nordic is again using unverified models. The NAF discharge temperature should be verified with additional data collected over several seasons, taking into account anomalies in the currents and wind, and sub-circulations within the bay. We refer to the testimony by Dr. Pettigrew and Dr. Aveni-Deforge insisting that additional data must be collected before any model might be verified and thereby it might be possible to reasonably predict effects of the effluent on the bay.

The record contains little monitored data for nutrients, oxygen, and stratification A permit should not be awarded until an annual cycle of monitoring and updated modeling has reasonably demonstrated that water quality objectives will be met by NAF's proposed discharge plans. After the fact modeling is too late. Verified pre-permit modeling is crucial to ensure that water quality objectives will be met. The potential impacts on habitats, fisheries, and recreation in Penobscot Bay can be significant. Since filing the application Nordic has had ample time to perform these studies. Nordic has chosen not to perform them. Nordic should not be allowed to benefit from its failure.

3. *The provisions of the State's anti-degradation policy, Classification of Maine waters, 38 M.R.S. § 464(4)(F), will be met, in that:*

(a)Existing in-stream water uses and the level of water quality necessary to protect and maintain those existing uses will be maintained and protected;

(b)Where high quality waters of the State constitute an outstanding national resource, that water quality will be maintained and protected;

(c)Where the standards of classification of the receiving waterbody are not met, the discharge will not cause or contribute to the failure of the waterbody to meet the standards of classification;

(d)Where the actual quality of any classified receiving waterbody exceeds the minimum standards of the next highest classification that higher water quality will be maintained and protected; and

(e) Where a discharge will result in lowering the existing water quality of any waterbody, the Department has made the finding, following opportunity for public participation, that this action is necessary to achieve important economic or social benefits to the State.

THE STATE OF MAINE CANNOT "FIND" THAT THE ACTION (LOWERING WATER QUALITY) IS NECESSARY FOLLOWING AN OPPORTUNITY FOR PUBLIC PARTICIPATION WHEN THERE HAS BEEN NO OPPORTUNITY FOR PUBLIC PARTICIPATION. THAT IS THE LAW. A FINDING WITHOUT THE MANDATORY PUBLIC HEARING CANNOT STAND.

Abuse of this condition provides an opportunity to side-step all regulatory requirements making a sham out of this process which needs scientific objectivity to protect the Belfast Bay.

The Models provided under oath by Nordic demonstrate Nordic does not meet antidegradation standards that Maine has promulgated to demonstrate compliance with the Clean Water Act.

For purposes of the antidegradation licensing criteria the DEP staff have accepted from Nordic an unverified model and then an incorrectly evaluated and illegally entered dilution ratio. Under oath, in writing and in public hearings subject to cross examination and rebuttal, Nordic asserted that a 300:1 dilution factor is supported by modelling and should be

used for far field dilution calculations. As shown below, using the dilution factors provided under oath by Nordic, a 300:1 dilution factor should be used for far field dilution. Therefore, the anti-degradation licensing criteria will NOT be met.

In this proceeding, the applicant utilized a hydrodynamic model referred to as the ADvanced CIRculation (ADCIRC) model to estimate the far-field dilution factors for the proposed discharge to Belfast Bay. The ADCIRC model was originally developed for coastal flood hazard studies in the larger Penobscot Bay and has many of the dynamic physical attributes of the bay already built into the model. The applicant evaluated a particle tracking output from the model to evaluate the far field dilution factor in close proximity to the proposed discharge over 4 tide cycles (two days) and determined that a far-field dilution factor for 4 assessing impacts to dissolved oxygen is 300:1. For potential impacts to the closest eelgrass bed located 4 kilometers (2.5 miles) to the southwest of the proposed discharge along the southern shore of Northport as mapped by the Department, the dilution factor of 1,000:1 was based on the Department's best professional judgment.

Using these numbers, recommended nitrogen values should be calculated as follows:

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 licensing criteria analysis to date, the proposed discharge concentration of 23 mg/L does not meet the default antidegradation licensing criteria threshold of 12 mg/L at full flow. This is because, 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). That statute requires a public hearing. The Department cannot make those findings without first conducting a public hearing, which it has not done.

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 is the limit that would avoid the need to make supported findings pursuant to 38 M.R.S. §464(4)(F)(5).

Based on this licensing criteria 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 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 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.

Based on the default antidegradation licensing criteria, the limiting discharge threshold is 12 mg/L. This 12 mg/L threshold would result in the consumption of no more than 20% of the remaining assimilative capacity of the receiving water.

According to the state's antidegradation policy, and based upon the Department staff's historical practice and best professional experience and judgment, consuming more than 20% of the remaining assimilative capacity of the receiving water is 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 Maine law, 38 M.R.S. §464(4)(F)(5).

Please refer to Appendix A for a more comprehensive discussion of the dilution factor used by models to predict the anti-degradation licensing determination. DEP staff seems to have accepted the need to reinterpret what has been provided multiple times under

oath that Figure 2 (modeled dilution factors provided by NAF) supports a dilution of 300:1 for the 50% area. It was only after it was determined that a 300:1 dilution is not sufficient to address the assimilation/anti-degradation standard did a new interpretation of what the steady state equilibrium dilution would be for 50% of the affected area. DEP testimony refers to a need to provide a less conservative interpretation of the Figure 2.

Until 300:1 was found to be insufficient dilution to meet regulatory standards, professional review of Figure 2 appeared to determine the dilution value at the tail end of the curve, the point where equilibrium and a steady state takes place. It is the long-term dilution that we seek to determine, not an arbitrary time at 5 days, or 10 days, or a fortnight. Indeed, the way Upstream has viewed this figure is precisely that: <u>what is the steady state dilution that the model is predicting?</u> The curve is clearly approaching a 300:1 (the 2.5 value) as the number of days increase. This is the way NAF originally characterized the Figure 2 for 50% of the area under consideration, and this is what Upstream believes is the most reasonable way to interpret this data, and since it reflects steady state – what we have to live with – it is the only practical way to look at it.

Upstream wishes to make clear that we continue to stand by our relevant pre-filed and direct testimony as it relates to the use of models to predict the water quality impacts of NAF's effluents. Among our stated concerns on the record are that:

1) The CORMIX and ADCIRC models are not the appropriate tools to use for the determination of mixing factors at and near the site of discharge because of their inability to fully take into account the complexity of the site with respect to the effects of winds, current speeds and direction differentiated by depth, the local tidal regime, and the local finer scale shoreline configuration.

2) Sufficient onsite monitoring data are lacking to characterize local site-specific conditions with respect to water column temperature, density, current speeds and direction, and

background levels of pollutants of interest. This information needs to be collected over multiple seasons and at strategically identified locations and is necessary to properly provide input to and validate any models. Although Nordic has had plenty of time to do so since it filed its application, **Nordic has failed to provide local, site specific data. The utility, reliability and accuracy of models is thus compromised, making their results uncertain and unreliable**. This renders the modeling exercise, that has been conducted by NAF, wholly unsuitable for the purpose of determining dilution factors which will be used for setting precise discharge concentrations, especially when as here the model is predicting impacts that are on the cusp of or exceed the State's relevant benchmark standards.

For the reasons stated above, Upstream's appended comments should not be construed as an endorsement or acceptance of the use of NAF's modeling for establishing regulatory limits. Upstream's comments critique the way in which NAF's dilution factor modeling was applied and interpreted but also make recommendations on using that modeling to establish a more accurate and appropriate dilution factor than the one discussed at the BEP's deliberative session. Appendix A comments provide a broad perspective and some specific recommendations on the use of NAF's modeling results to establish dilution factors. Additional comments focus more specifically on the use of NAF Figure 2 of Attachment 23 of Nathan Dill's prefiled testimony to determine a sounder and more representative dilution factor. Additional comments explain the necessity of evaluating the dilution near the discrete receptors rather than assimilation capacity of the Bay as a whole.

To date, Nordic has provided little monitored data for nutrients, oxygen, and stratification and what little data Nordic has provided demonstrates potential current and future problems with meeting water quality objectives. A permit should not be awarded until an annual cycle of monitoring and updated modeling can reasonably demonstrate that water quality objectives will be met by NAF's proposed discharge plans. After the fact modeling is too late. Verified modeling is crucial to ensure that water quality objectives will

be met. The potential impacts on habitats, fisheries, and recreation in Penobscot Bay are significant.

4. The discharge will be subject to effluent limitations that require application of best practicable treatment as defined in 38 M.R.S. § 414-A(1)(D).

Along the lines of the CAAP ELG, a NPDES permit should also contain requirements to address implementing requirements under the CWA Total Maximum Daily Load (TMDL) programs. This draft permit does not. A TMDL should be a calculation of the greatest amount of a pollutant that a waterbody can receive without exceeding water quality standards. It is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the state has designated. The calculation must also account for seasonal variation in water quality. Without a TMDL calculation DEP is at best guessing about the impact of the discharge on Penobscot Bay.

As provided under **Section 4. Application for a permit.** [see 40 CFR 122.21], Upstream has repeatedly requested that water quality based effluent standards WQBES be developed.

Steps necessary to provide WQBES include inventories of natural resources in the area that may be affected, coupled with verified modeling of how the effluent will be distributed in the bay. Clearly, resources have not been completely inventoried over a span of multiple seasons. Most concerning is the lack of understanding of how the effluent will be distributed in the bay.

AFTER THE FACT TESTING IS ILLEGAL AND THEREFORE UNACCEPTABLE

This draft permit implies that after the fact monitoring and verification is sufficient and that construction with its digging and removal 20-30’ of soil over 35 acres of land and

dredging of coastal areas will be performed before the models are verified. That is as illogical as it is illegal. The Draft Permit does not provide consequences for failures to verify models or comply with permit conditions. An example is the dye study and other investigations necessary to determine actual flow in the Upper West Penobscot Bay into which the wastewater will be discharged:

> **DYE STUDY** ***Within 12 months of the effective date of this permit, the permittee must submit a plan to the Department for review and approval that includes a scope of work and schedule to conduct a dye study to ensure the accuracy of the analysis of the mixing characteristics of the effluent being discharged with the receiving water. Within 6 months of the facility being capable of discharging 7.7 MGD, the permittee must conduct a dye study to assess in practice the mixing characteristics of the treated effluent and the receiving water. The dye study must be conducted in July or August and at multiple tidal stages. Within 6 months of completion of the dye study, the permittee must submit a report to the Department that characterizes the mixing conditions in the receiving water and depicts the radial propagation of measured dilution factors associated with the discharge, to the point where the dye concentration is below the instrument detection level.***

Again, there are no consequences if the dye tests show non-conformance with the permit or misrepresentation in the process of obtaining a permit. What if the first dye test does not verify the near and far field models? Since a significant concern for the far field dilution consists of secondary circulation pattern and currents not limited to tides, where will the dye tests be performed? Upstream has consistently requested that the dye test be designed AND implemented prior to the permit. To perform a dye test after the facility has already been constructed is too late and can only reveal how much illegal pollution we will suffer. For the record, Upstream only suggested a dye test **prior** to granting a permit.

Prior to permitting, the applicant must undertake additional, scientifically rigorous, Penobscot Bay circulation modeling that confidently predicts effluent movement through

Penobscot Bay to determine the least environmentally damaging alternative for discharge. Current models provided by NAF fail to provide data to verify their accuracy of models and fail to take into account secondary circulation, wind shear, stratification, and other anomalies associated with the Bay. In other words, Nordic is guessing, and asks us to go along.

Prior to permitting, the size and location of the discharge "plume" must be defined with a rigorous, year-round study. There is no dispute that effluent will permanently affect water conditions within an unestablished distance of the outfall. This is a permanent change to the environment so understanding the plume dynamics and existing conditions in the receiving water is critical to evaluate any project-related changes in the water column in near-field communities and to evaluate the environmental consequences of the project.

As a condition of approval, prior to granting a permit, protocols for intensive internal system water quality monitoring must be available for third party review, and results of on-going internal systemic monitoring must be made available for third party analysis.

A central component of rationally evaluating potential environmental impacts at the proposed site is the release of nutrients into the water column and their dispersal and dilution thereafter. Three important factors exist for evaluating the discharge into the local environment:

- local physical oceanographic conditions;
- local background water quality; and
- wastewater composition.

Correct modeling must include four seasons and be conducted before authorizing a MEPDES Permit.

NAF's current data is based on models that for far-field are only 2D and that do not take into account wind shear, secondary circulation, or currents in the bay. Verification of the models are is based on very limited old data and at anomaly sites near a large methane

pock area. Dr. Pettigrew provides data that shows that NAF has even falsely predicted the direction of movement of the effluent. Pettigrew and Aveni-Deforge both testify that there is need for a yearlong study; this statement is also supported by NAF's own scientists, see testimonies of Dill and refer to Ramboll recommendations.

Dr. Pettigrew summarizes:

"The 2D ADCIRC model was implemented in a limited manner, *forced only by astronomic tides along the open boundary and a constant freshwater discharge from the Penobscot river* to the north of the study domain. Point-sourced validation of water levels were performed under idealized summer conditions. No additional validation was performed."

The particle tracking model was forced solely by the velocity fields produced by the 2D ADCIRC model under several major assumptions. Currents were vertically averaged and did not agree with known observations, *constant values* were prescribed for effluent flow rate and horizontal eddy diffusivity, while wind fields and waves were excluded entirely.

RANSOM acknowledges the need for significant data collection efforts before substantial model validation is possible. Dr Pettigrew agrees strongly with this position and suggests that a yearlong oceanographic observing effort should be fielded at least at the discharge and intake locations. These observations need to be combined with a full 3-dimensional ocean numerical model that can dynamically simulate the Penobscot Bay circulation and particle tracking."

Dr. Aveni-Deforge Summarizes:

"My testimony asserts that existing knowledge of site water quality and physical oceanography is insufficient to have confidence in our understanding of baseline environmental conditions or how the process wastewater will interact with the environment. Consequently, a rational, evidence-based decision on the impacts of the proposed action cannot be made. Similarly, the future monitoring program proposed

by NAF would not have enough baseline data of the pre-project environment at and near the project site to evaluate environmental impacts."

Modelling currents according to Dr. Neal Pettigrew:

RANSOM Consulting Inc. used a steady-state mixing model and a 2D (vertically averaged) circulation model based on the shallow water equations to estimate the effects of 7.7 million gallons per day of wastewater discharged between Little River and Islesboro Island. The modeling done at this point does not appear to be sufficient to accurately examine the outcomes of the proposed wastewater discharge on the local and far-field regions of Penobscot Bay. As RANSOM states, the steady-state mixing model has limited applications for very short periods of less than an hour or so due to changing tidal currents. In addition, an unreasonable assumption of ambient current speed at the depth of 11.5 m (near bottom discharge) was an order of magnitude too large. This choice would significantly overestimate the mixing and dilution calculations. RANSOM has used a 2D (only 2 dimensional) ADCIRC model based on vertically averaged shallow water equations. In other words, the method assumes that the density is constant over the entire water column, and the velocity is vertically averaged. In the vast majority of Penobscot Bay, the density and currents are functions of depth in all seasons. In addition, the modelers considered only forcing by tidal height from the outer boundary of the bay and *constant* freshwater inflow from the Penobscot River. They ignored wind forces and waves, suggesting that this omission would only reduce calculated turbulence and thus make their calculations more "conservative". RANSOM's 2D model shows the mean flow to be southward (seaward) in the proposed discharge region. However, observed oceanography current data in Penobscot Bay and 3D models including observed wind forcing show that the vertically averaged mean subtidal circulation flows northward in the discharge region and this flow turns clockwise (anticyclonic)

around the north point of Islesboro and joins the southward flow on the east side of Islesboro. Data, including drifters, have shown clockwise flows around Vinalhaven Island as well, and with strong winds from the SW or NW. 3D modeling has shown that even the surface mean flow is essentially clockwise around Islesboro. In fact, in the absence of winds one expects estuaries and bays connected to a river at its head, to have "outflow" at the surface and "inflow" in the lower layer.

Without access to current data, RANSOM used only tidal height data to validate their 2D ADCIRC model. Tidal heights are very easy to simulate, and thus do not make a strong case for their model validation.

Since the location of the proposed wastewater discharge is planned at a depth of 11.5 m, and also very near to the bottom, this discharge is likely to occur in very slow mean flow and the flushing time could be much greater than suggested by RANSOM. In addition, the local circulation will be altered by the strong pumping of discharge and intake. I suggest that the best method of understanding the potential effects of NAF Aquafarms' proposal would be a year-long oceanographic experiment at the discharge and intake locations and a high quality 3D numerical ocean model with horizontal mesh scales of 25 m or smaller. (Of course, Nordic filed its application in October 2018. Nordic has had plenty of time to perform these and other analyses but has elected not to do so.)

Most numerical models of Penobscot Bay (e.g. Humphreys and Pearce, 1981; Burgund,1995; Xue, et al., 1999) have shown landward transport (vertically and horizontally averaged currents) west of Islesboro and seaward east of Islesboro. In the cases of strong wind stress from the west (in years 1 and 2) the Princeton Ocean Model (POM) showed surface currents moving landward west of Islesboro and turning clockwise at the north point of the island and joining the seaward currents on the east side of Islesboro.

Salinity records from buoys and boat surveys (not shown) suggest that the river water flows seaward preferentially on the eastern side of Islesboro and fresh waters from the river generally do not appear in the surface waters of the outflow east of Vinalhaven

Island. Thus, the primary exit route of Penobscot Bay River water appears to be east of Islesboro, and west of Vinalhaven, with a lesser amount of river-freshened water confined to a shallow layer on the west side of Islesboro. One would expect that outflow from the Passagassawakeag River would contribute to the freshened waters observed west of Islesboro. Both POM and early testing of our developing FVCOM model show that significant winds from the NE or SE can shift the river outflow to the west side of Islesboro.

Dr. Kyle Aveni-Deforge adds from testimony to the BEP[3]:

> "The applicant is relying on the present dispersal model to forecast good dilution of the proposed discharge and evaluate environmental risk. Because the dispersal model is not strongly driven by on-site measurements, the applicant may be underestimating the risk of discharge to the local environment. In fact, the only data I have been able to find for the peri-Islesboro currents indicates that net flow, in the 1970's through 1990s, had a residual clockwise flow. The risks associated with underestimating the dilution and dispersal of the outfall could have consequences to a variety of ecosystem functions and services, affecting the stability of local ecosystems as well as how humans can take advantage of the environment."

There is no reason for performing a dye study after a five hundred million-dollar facility has been completed and has begun to discharge waste from its operations. Suppose the dye study were performed at that time and it showed what Upstream Watch has asserted all along, the flows are not deep and they do not quickly carry the effluent out to sea but rather they circulate the waste around and around for two weeks painting the shores of Northport, Islesboro, Belfast and Searsport with the discharged waste. What then? There is no remedy. The discharge and distribution of pollutants will have become a permanent degradation to Penobscot Bay, lowering property values, destroying fishing and lobstering,

[3] See Comments from Dr. Kyle Aveni-Deforge on behalf of Upstream attached hereto as Appendix B.

and increasing algae growth. The applicant and DEP should be on notice that if such events occur and Upstream Watch asks a court to shut down the plant until it can comply, the applicant cannot be heard to claim "it's too late, its built, the equities favor us". This document will be shown to the court to demonstrate that with the complicity of DEP the applicant built without meeting the requirement that it demonstrate it can comply with the Clean Water Act before a permit is issued, and having taken that risk it must now be enjoined from further operation.

PROPOSED PERMIT CONDITIONS ARE INSUFFICIENT

The following permit conditions are insufficient:

1) DEP's permit establishes technology-based numeric limitations for flow, biochemical oxygen demand (BOD), total suspended solids (TSS) and pH;

Many of the parameters associated with the NAF effluent are experimental in nature, (unique feed, unique RAS, unique treatment, size of operation, uncertain marine water flow parameters and recirculation uncertainties, etc.) Nordic has not disclosed to DEP sufficient information to assess and develop technology based effluent limitations. Nordic has never built or operated a facility of this size and nature.

2) DEP's permit establishes a requirement to seasonally (May – October) monitor the effluent for total phosphorus, total ammonia, total kjeldahl nitrogen, nitrate + nitrite nitrogen;

A seasonal requirement does not address the potential for high daily concentrations and/or total amounts of nitrogen in the effluent. Monitoring for these substances must be performed more frequently (such as daily) because the acceptable concentration in the draft permit of the nitrogen in the effluent is set to be at the maximum allowable amount to address anti degradation standards. Nordic has provided documentation in the hearings that prove that

factors of three in the nitrogen concentration can be expected. In other words, we can expect, based on Nordic's own testimony, variations 3X the limit amount.

3) DEP's permit establishes a monthly average water quality-based mass limitation for total nitrogen;

As in #2 (above), a monthly average does not address the possibility of large concentrations or "slugs" of nitrogen that could exist for significant periods of time. The concentration values must be enforceable. The proposed Monitoring program provided by NAF is not sufficient either in what will be monitored nor the frequency. DEP must provide an enforceable concentration-based standard that would provide assurances that large slugs of contaminants cannot be released and provide additional assurances any spills or contingency failures will be observed and monitored. As an example, NAF's Sashimi Royal shows factors of 3 variation in N discharge day to day.

Along the lines of the CAAP ELG, a NPDES permit must also contain requirements to address other considerations, such as implementing requirements under the CWA Total Maximum Daily Load (TMDL) programs. A TMDL should be a calculation of the greatest amount of a pollutant that a waterbody can receive without exceeding water quality standards. It is the sum of the allowable loads of a single pollutant from all contributing point and non-point sources. The calculation must include a margin of safety to ensure that the waterbody can be used for the purposes the state has designated. The calculation must also account for seasonal variation in water quality. Nordic has failed to provide a complete multi-season evaluation of water quality parameters in the bay and this evaluation should be done before being asked to monitor after the fact.

4) DEP's permit establishes a requirement for the permittee to conduct a dye study to more accurately determine the mixing characteristics of the treated effluent discharge from the facility with the receiving water;

Performing a dye test after the fact is irrelevant. Dye tests from the dispersion point, at depth, or at depths, would more accurately verify the near and far field dispersion models

before a permit is issued and construction started. Existing incomplete models provided by the applicant suggest NAF just barely satisfies both the DEP temperature and anti-degradation standards. There is no set consequence to dye test results. What happens when the applicant actually performs the dye test after construction and the tests show the flow is as Upstream claims, not as the applicant claims? What then? The dye tests must be performed before any permit is issued because the dye tests will provide confirmation or a failure to confirm applicant's flow assertions. The applicant has had plenty of time to perform the dye tests. The Board should not give applicant additional time and allow it to build without the test results; the Board should apply a negative inference because the applicant failed to do what it could have done and ultimately must do to assure the Board their assertions are correct. Upstream Watch has provided significantly more information about the inadequacy of the existing models than elsewhere in the record urging and demonstrating that a dye test should be only part of the verification process of the models and needs to take place BEFORE a permit is granted. Additional necessary data includes temperature and current information that is gathered by sensors placed from buoys and at different depths and locations in the Belfast Bay.

5) A requirement to conduct seasonal (May – October) ambient water quality monitoring at five (5) stations in Belfast Bay;

There is no enforceable consequence to findings from this monitoring; it is after the fact. What will happen if, as Upstream predicts, after the fact monitoring shows that ambient water quality is significantly worse? The project will have been built. The forest will have been destroyed. The illegal polluting imposition on the Bay will be permanent.

MONITORING PROPOSED IN THE DRAFT PERMIT IS INSUFFICIENT

SPECIAL CONDITIONS

A. EFFLUENT LIMITATIONS AND MONITORING REQUIREMENTS

There is no daily maximum for the concentration of total Nitrogen. Monthly and even weekly averages allow the possibility of concentrations greater than 21 mg/l of nitrogen to be discharged for extended periods of time, meaning that harmful anti degradation slugs of nitrogen could be discharged during times of unusual current events in the bay.

The TSS test should also address the Micro-Filtration (0.4 µm pore size) in Membrane Bio-Reactors (MBR). Particle size analysis needs to be verified as an indicator of the effectiveness of the MBBR system and also to assure that at least bacteria are being removed, as virus size is typically less than 0.1 um and thus will pass through Nordic's filters untouched. The ability to consistently meet the very small pore size 0.4 um of these filters needs to be addressed.

The application summary is contradictory regarding nitrogen and phosphorus removal percentages.

With the treatment system described above, the permittee anticipates removal rates as follows:

- Biochemical oxygen demand & total suspended solids (BOD & TSS) – 99%
- Total nitrogen – 99%
- Total phosphorus – 85%.

If indeed 99% of the nitrogen is removed and assuming the 1:1.1 feed conversion is applied, the maximum daily limit for nitrogen is in error. 99% removal of nitrogen should only allow 15.85 lbs/day. This is a significant difference than the 1348 lbs/day.

Phosphorus removal has been described as 99% in previous application materials and testimony.

It is not sufficient to monitor only at the pipe outfall. Nitrogen concentrations should be measured to verify the far field dispersion predicted by NAF models (which Upstream believes should be based upon the 300:1 dilution ratio provided by NAF under oath).

Temperature in the bay also needs to be field measured at different depths and locations as the DEP has accepted a favorable temperature increase from NAF surface temperature alone and an unverified dilution ratio in the mixing zone. Should temperature readings or Nitrogen levels exceed the levels predicted by NAF models, the effluent discharge volume, temperature, pore size, and nitrogen concentration must be immediately amended to lower values.

The procedures for monitoring disease are insufficient. Methods, diseases, detection limits are not provided. They must be provided in sufficient detail to be useful for this purpose. The permittee must comply with Maine Department of Inland Fisheries and Wildlife (MDIFW) (freshwater facilities) and Maine Department of Marine Resources (MEDMR) (salmon & marine facilities) fish health laws (12 MRS, § 6071 and 12 MRS, §§10051, 10105, 12507 and 12509, as amended). The cited laws include requirements for notification to the appropriate agency within 24-hours of pathogen detection. In addition to the requirements of the MDIFW and MEDMR rules, the permittee shall notify the Department in writing within 24 hours following pathogen detection, with information on the disease/pathogen, necessary control measures, and the contact information for the veterinarian(s) involved .

Maine IFW rules define authority, licensure of eggs and importation etc., but do not cover testing for diseases. Many of the concerns expressed by Upstream on disease are not addressed. As an example, 12 MRS 10105 “For dead fish or wildlife, dispose of that fish or wildlife in any manner considered appropriate by the commissioner.” This requirement is

subjective. In the “age of Covid 19”, any fish death due to viruses must be managed in a pre-prescribed manner, including reporting to the public, fisheries, Maine DEP, and Maine CDC, and handled to disposal under supervision to prevent any transmission of the viruses. Further, should a mass die-off due to viruses occur, Nordic must not only report to the CDC but must cede control of the facility to State Health and Environmental officials until in the opinion of the Maine CDC. The viral crisis has passed.

No monitoring plan is provided for virus and bacterial contamination in the discharge.

We are experiencing a Worldwide pandemic of Covid-19, spread from animals to humans in China. This cannot be repeated in Maine. Detailed sampling criteria, enforceable limits, and analytical protocols including reporting and control of the site need to be developed. Examples of concerns include: Do we need to name these?

- Infectious salmon anemia (ISA) or ISAv (v for virus) is endemic to the Atlantic.
- Infectious Pancreatic Necrosis (IPN) or IPNv is endemic to Atlantic Canada and therefore probably Maine as well.
- *Aeromonas salmonicida* is also common in the North.

DEP must IMPOSE enforceable concentration-based standards.

The application provides maximum daily amounts and concentrations for: TSS, BOD, Total Nitrogen, Total Phosphorus, Ammonia, pH, Temperature (summer/winter), and salinity. The concentration and amount values must be enforceable. One example would be the slug-like discharge of the total daily amount of nitrogen in a small percentage of the discharge. Large concentration discharges may produce much larger impacts on the resources. Discharge limitations in NAF's MEPDES permit need to reflect its level of production to assure the minimization of pollutant discharges.

The proposed discharge limitations contained in NAF's MEPDES permit application are based on full production at the facility (Phase 2 levels). During its first years of operation (Phase 1), the facility will be operating at approximately 50% capacity and discharge limits should be adjusted accordingly. Otherwise, there is no incentive for NAF to operate its controls at their designed efficiency levels.

Discharge limits need to reflect both the concentration of effluents and the volume of effluents at that concentration, with maximum total weight of daily discharge amounts with the corresponding maximum concentrations allowed. A monitoring program needs to be developed with a high frequency of concentrations and volume reporting.

All monitoring should include an opportunity for the public to split samples with those taking the samples. Citizens must be given enforcement rights and opportunities should DEP fail to do so.

O&M AND DISEASE CONTROL

OPERATION & MAINTENANCE PLAN

NAF's Operation and Maintenance Plan is inadequate. The following section on Disease Control identifies concerns that should be specifically addressed in the operation and maintenance planning.

The NAF RAS is continually changing, reflecting the risks associated with a Technology Based Effluent Standard Approach. A good example is the new modification that the MBR filters for intake and effluent will now be 40 nanometers instead of 400 nanometers (0.4 microns). This is a big change in the treatment process as filtering at this level presents significant new technological variables in treatment - namely clogging of the filter, pressures and pump changes, and the potential need for by-pass. The 40 nanometers size is presumably offered due to concerns of virus mitigation. 40 nanometers will not remove viruses that typically are less than 1 nanometer. Even at 40 nanometers NAF will be

unable to stop the free transmission of viruses from the outside into their system where they will be concentrated and freely discharged back into the Bay. This free transmission of viruses is unacceptable. Note: the rapid acceptance of Net Pen Salmon has exacerbated the existence of virus and disease in Coastal Waters. By-Pass requirements, facilities and resultant conditions need to be studied and more thoroughly considered because the filters are likely to become clogged.

Many of the parameters associated with the NAF effluent are experimental in nature, (unique feed, unique RAS, unique treatment, size of operation, uncertain marine water flow parameters and recirculation uncertainties, etc.) Nordic must disclose to DEP sufficient information, even if proprietary to assess and develop technology based effluent limitations, develop proper effluent water quality-based effluent limits (WQBEL) and, finally, to determine final effluent limitations that meet technology and water quality standards and anti-backsliding requirements. WQBELs involve a site-specific evaluation of the discharge and its effect on the receiving water. A WQBEL is designed to protect the quality of the receiving water by ensuring that State water quality standards are met.

The permit should include what variation in percent removal of treatment can be expected and under what circumstances. As an example, if a nutrient is listed as 99% removal, and for one day they achieved 98% the amount of that nutrient in the effluent would double. The applicant has presented no plan for how to prevent or manage additional pollution. Same for a reduction to 95% or 75%, variability is not uncommon in large scale manufacturing operations.

At a 99% nitrogen removal rate, which is an impressive figure, Nordic's waste would take up nearly the allowable 20% of remaining effluent capacity of the bay (they will take up 19.8%).

If Nordic's systems or the systems that they will rely on to remove nitrogen experience difficulties resulting in only 4% decrease in effectiveness (still removing 95% of nitrogen), the concentration of nitrogen in the waste water will take up 99% of the remaining

assimilative capacity of the bay. Nordic is relying on the system to be nearly perfect all the time.

For this reason, if Nordic has a bad day, a leak, a system's maintenance is overdue etc. it is a very real possibility that they could take up the bay's entire capacity for nitrogen or more.

There is no plan to address any washing out of the fixed film media MBBR are known to encounter problems in some calcium rich wastewaters as calcium salts can precipitate on the carriers. This phenomenon, referred to as scaling, can result in clogged carriers, which sink to the bottom of the reactor - an effect that can be detrimental for the treatment process. The permit should describe how it will avoid each of these problems. The applicant should quantify and discuss what are the effects of oil and grease from salmon on the biofilms?

The application states that phosphorus removal is done by precipitation of phosphate and coagulation – flocculation of particulate phosphorus using a metal salt of calcium, aluminum or iron. The applicant should be asked to address the disadvantages of chemical phosphorus removal, the cost of chemicals, and the resultant relatively large sludge production that increases the cost of sludge treatment and exacerbates the problems and cost of sludge disposal. The applicant should be asked to address how MBBR can also provide biological phosphorus removal as an alternative to chemical treatment methods and reduce sludge production.

The STERAPORE Hollow Fiber Membrane Bio-Reactors will be subject to failures that will compromise the discharge waters. Most scientific articles demonstrate that membrane surface fouling and clogging phenomenon of MBR systems as chronic problems.

Clogging takes different forms. 'Sludging' refers to the filling of membrane channels with sludge solids and depends on process design (membrane module and aerator, pre-treatment). 'Ragging' (or 'braiding') is the blocking of membrane channels with particles agglomerated as long rag-like particles (Mason et al, 2010; Stefanski et al, 2011). While

effective in many wastewater treatment scenarios, membrane fouling is a recurring problem that has limited further development and application of MBRs [1]. To minimize the membrane fouling problem, a MBR is either run at critical permeate flux, which optimizes the aeration intensity to remove membrane particulates, or is frequently cleaned by physical or chemical methods. Both of these procedures are time-consuming and add to the fundamental processing costs; therefore, a more effective solution would be welcomed by wastewater engineers and plant operators. Previous studies have identified sludge concentration as a key factor contributing to membrane fouling. However, subsequent studies have shown that there are several sludge characteristics in addition to concentration that impact membrane fouling, including floc size, liquid viscosity, microbial extracellular polymeric substances (EPS) and soluble microbial products (SMP). The applicant failed to provide detailed responses to each of the above concerns.

Lastly, there is no discussion of other pollutant contaminants that could exist in discharges; at public hearings, the applicant said, without substantiation, that there could be no “toxic discharge”. Some currently marketed fish foods contain toxins. Without testing, without documentation, without disclosing its fish food, the applicant cannot assert that the current treatment system will remove any toxic contaminants in the effluent.

Applicant failed to provide any plan to respond to the event of an unpredicted outflow contamination. Applicants failures include:

- Preventive requirements, such as requirements to install process control alarms, containment structures, good housekeeping practices, and the like.
- Assurances that mistakes will not cause huge releases to the pristine bay.

Applicant has failed to provide any explanation of how errors in continuous flows will be contained before contaminant laden effluent is released to the bay. What happens, as in the case of Atlantic Sapphire, NAF is faced with a massive die-off of 200,000 diseased fish? If needed, will containment structures be provided to bypass discharge to the bay? The applicant’s plans provide no bypass discharge to the bay. The applicant’s plan failed to

show the location of containment structures and how they will function with the other plan components? The applicant failed to show a plan to address any additional need for storage or of the failure of the storage facility and what effect the use of those facilities may have on the process and character of the discharge.

Since no bypass is shown on the plans submitted for permitting, it is unknown how a catastrophic event in one of the tanks will be handled? Applicant has not disclosed how a failure or clog in the discharge pipe will be managed there is no contingency plan. Regulators will not know of a by-pass, intentional or inadvertent, unless frequent testing results of the effluent concentrations and particle size are provided.

The applicant has provided no bypass. The applicant has provided no plan for storage. The applicant has provided no plan in the event of a massive die-off.

The applicant has not disclosed how it intends to manage 7.7 million gallons of waste water/day in the event of a system failure, or if there is a need to clean out a tank The applicant has provided no evidence that its facility can maintain its wastewater discharge if a tank is forced to go offline.

Disease Control

As stated earlier, the IFW references do not address specific disease monitoring or analytical procedures to assure a wide spectrum of viral or bacteriological diseases are addressed.

For any chemical used in the process Nordic should have provided an analytical procedure and control method. As an example, Chlorine is not listed here, nor sodium thiosulphate which is typically used to negate excess chlorine. The use of chlorine and drugs can also have an effect on the MBBR and MBR filter systems, as these include

biological breakdown of nutrients and are sensitive to antibiological agents. As an example, the fish processing waste, that may typically use Chlorine as a disinfectant, goes directly into the final MBBR treatment facility. MBBR treatment is sometimes referred to as much art as science, since there is a careful balance of biological activity needed to reach the removal of nitrogen as submitted in the application.

Nordic failed or refused to address the following deficiencies:

- No survey of contagions that can be amplified;
- No updated screening for all known major pathogens by USA or Maine managers of hatcheries;
- No consideration for contagion modeling in effluent, i.e. numbers per gallon based on various scenarios of prevalence in the tanks;
- No mass mortality plan;
- No consideration of alternative production models that reduce impacts on environment, reduce antimicrobial use, etc. (i.e., aquifer only water source, zero effluent, etc.);
- No discussion of likely mortality rates nor causes;
- No discussion of fish attraction to warm effluent, permanent feature issues, as suggested by Dr. Podolsky (The “Birdfeeder” effect);
- No discussion of gyres concentrating contagions and effluent entertainment into river mouth as suggested by Dr. Pettigrew;
- No cap on antibiotic use to offset design issues such as surface water use;

- No local salmon eggs available. The Williamsburg Treaty was signed to prevent introduction of foreign eggs carrying known and unknown contagions not native to the region.

The draft permit fails to address any of these foregone concerns.

The draft permit also fails to address the following issues:

- Not all viral strains respond well to UV disinfection. For example, the infectious pancreatic necrosis (IPN) virus is hard to kill with UV. Additionally, the turbidity (i.e., lack of water clarity) in a waste stream negatively affects UV efficiency. Ultraviolet (UV) systems can lose up to 40% of their initial efficiency in one year's time, therefore the UV light bulbs must be changed frequently for full effect. The applicant has not provided a plan for monitoring the efficacy of the UV system.
- One must have at least two systems in serial as backup in case one of them fails. Prudence requires a non-UV backup system that relies on treatment with ozone and chlorine, for example. Ozone can only be used as an effective treatment technique with fresh water as its use on saltwater produces hypobromous acid (bromine gas in water) from the bromides that naturally occur in seawater. The use of Chlorine as a treatment technique introduces the problem of trihalomethane production. That would be an undesirable outcome, from a water quality standpoint. However, backup treatment is still needed.
- It will be very difficult to maintain the microbiota in a system that mixes or switches between fresh and salt water as the microbes that thrive in those two conditions differ greatly. If separate systems for fresh and saltwater are used, then ozone treatment can be used on the freshwater flows. If the fresh and saltwater will be mixed together, the permit must require Nordic to assess and control the impact of antimicrobials on bioreactor efficiency.
- In order to filter pathogenic bacteria from ocean water, one would need to filter that water through a 0.22 micrometer (um) filter, which would slow the pumping of the

water and would likely clog easily. No filter is stringent enough to filter out viral particles. A 0.1 um filter would not filter viruses, which are nanometers in diameter and would clog even more frequently. The residue cake from the clogged filters will need to be characterized to determine if it is hazardous, solid, or medical waste and then added to the facilities appropriate waste stream. The applicant has provided no plan for handling this waste.

- Parasites can also be an issue and are difficult to control. Parasites cannot be vaccinated against currently. The use of anti-parasite drugs (ivermectin is commonly used) is usually reserved for use after an outbreak is detected in a population. There is also a lot of concern about antimicrobials that are released into the environment causing an increase in antimicrobial resistance in pathogens of both animals and humans. A concentration limit must be imposed and monitoring in place to ensure compliance with the concentration standard.

The draft permit failed to address the forgoing concerns perhaps because Nordic never revealed them in the application.

Protection of Atlantic Salmon

Since the applicant has not applied for the ability to sell smolts, there should be a permit restriction prohibiting such sales.

FISH FOOD

Nordic claims that they are unable to provide and therefore analyze the fish feed they will use because they want to make that determination based on what's available at the time they commence operations in the U.S. However, Nordic is currently feeding salmon at their facility in Norway. They could analyze the feed that they find acceptable at their Norwegian facility, but they have chosen not to. The applicant has failed to demonstrate the employment of efficient feed management and feeding strategies that limit feed input to the

minimum amount reasonably necessary to achieve production goals and sustain targeted rates of aquatic animal growth. They have failed to provide a feed to fish ratio to assure waste minimization.

As feed conditions are determined there is a need to understand all contaminants and methods to test for contaminants and assurance that corrective measures exist if the fish feed is problematic. At present, no concentrations of contaminants have been requested or are approved Sourcing of fish food also affects the waste streams and the waste stream potential reuse.

There are multiple papers that suggest that some fish feeds used for land-based aquaculture have contained toxic chemicals. While the applicant claims that there will be no toxins in the feed they choose to use, the applicant refuses to reveal its fish feed selection. In addition, certification standards for fish feed have not been specifically referenced to provide assurance that the feed will not have toxins present; therefore only monitoring, after the fact, can provide assurances that toxins are not entering the waste effluent as a byproduct of the fish food. A permit condition must include provisions for monitoring the sludge waste and the pipe discharge waste for toxins.

Comprehensive screening analyses of waste streams are a documented process to assure a better understanding of the composition of the waste stream. There is no feed analysis and no known source of feed and there is no requirement through the MEPDES application to test for feed ingredients. Effluent testing should not be limited to nutrients, but periodically tested for 40 CFR part 136 defined parameters. Refer to Lists of methods by analyte from 40 CFR 136.3:

Table IA: Biological
Table IB: Inorganics
Table IC: Non-pesticide organics
Table ID: Pesticides

Table IE: Radiological (if deep aquifer water with radon is included as input)

Table IF: Pharmaceutical

Table IG: Pesticide active ingredients

Table IH: Ambient Biological

CONCLUSION

Applicant failed or refused to provide the data, studies and information necessary for anyone to determine if the proposed project can be constructed within the bounds of the Clean Water Act, including Maine's adaptation thereof. Instead of studies and resultant data, the applicant produced models without sufficient data to confirm the usefulness of the proffered models. That is not evidence. That is speculation and a permit cannot be awarded on speculaton. The DEP might be commended for construing the application in ways that assist the applicant but that is not DEP's job, nor is it helpful. The application, standing alone, clearly is deficient. It is inappropriate and contrary to the interests of the State of Maine for DEP to convert permit requirements into items requested of the applicant sometime in the future. Upstream Watch hopes that DEP will acknowledge that to be the case so that a court need not address the issue. It is best resolved at the administrative level, and Upstream Watch has every confidence that DEP and the Board will see the long-term consequences of this decision and require adherance to the Rules as Maine's people expect.

Respectfully Submitted, this 11th day of September, 2020.

INTERVENOR,
UPSTREAM WATCH

By 

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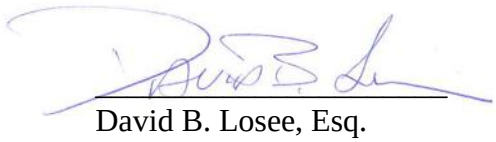
CERTIFICATION

I hereby certify that a copy of the foregoing was electronically mailed this 11th day of September, 2020 to those indicated on the attached Service List.



David B. Losee, Esq.

Appendix A

Responses to the DEP Procedure Order in Response to the Dilution Factor used to predict Anti-Degradation.

Included here are four (4) responses to the BEP procedural order 17 that have not been individually addressed, but instead ignored..

A.I.

To provide context for the comments that Upstream Watch/NVC is filing today on the issue of determining the appropriate dilution factor for establishing waste water discharge limitations for NAF, Upstream wishes to make clear that we continue to stand by our relevant pre-filed and direct testimony as it relates to the use of models to predict the water quality impacts of NAF's effluents. Among our stated concerns on the record are that:

3) The CORMIX and ADCIRC models are not the appropriate tools to use for the determination of mixing factors at and near the site of discharge because of their inability to fully take into account the complexity of the site with respect to the effects of winds, current speeds and direction differentiated by depth, the local tidal regime, and the local finer scale shoreline configuration.
4) Sufficient onsite monitoring data are lacking to characterize local site-specific conditions with respect to water column temperature, density, current speeds and direction, and background levels of pollutants of interest. This information, which needs to be collected over multiple seasons and at strategically identified locations, is necessary to properly provide input to and validate models. Failure to have local, site specific data reduces the utility, reliability and accuracy of models, greatly increasing the uncertainty of their results. This renders a modeling exercise, like the one that has been conducted by NAF, wholly unsuitable for the purpose of determining dilution factors which will be used for setting precise discharge concentrations, especially when the model is predicting impacts that are on the cusp of or exceed the State's relevant benchmark standards.

For the reasons stated above, Upstream's appended comments should not be construed as an endorsement or acceptance of the use of NAF's modeling for establishing regulatory limits. Upstream's comments critique the way in which NAF's dilution factor modeling was applied and interpreted but also make recommendations on using that modeling to establish a more appropriate dilution factor than the one discussed at the BEP's deliberative session Mr. Krueger's comments provide a broad perspective and some specific recommendations on the use of NAF's modeling results to establish dilution factors. Mr. Beacham's comments focus more specifically on the use of figure 2 of Attachment 23 of Nathan Dill's prefiled testimony to determine a sounder and more representative dilution factor. Mr. Aveni-Deforge's comments

explain the necessity of evaluating the dilution near the discrete receptors rather than assimilation of the bay as a whole.

Respectfully submitted by
Gary Gulezian, on behalf of Upstream Watch and Northport Village Corp

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● Past Chief of the Air Toxics and Radiation Branch of USEPA's Region 5 Office
● Past Chief of Regulatory Analysis Section of the Air and Radiation Division in the United States Environmental Protection Agency's Region 5 Office for the states of Illinois, Indiana, Ohio, Michigan, Minnesota, and Wisconsin
● SM Harvard University School of Public Health in Environmental Health Sciences
● AB Dartmouth in Biology with emphasis in aquatic biology

A.II.

In an email dated May 18, 2020 from Nathan Dill to Elizabeth Ransom, Mr. Dill makes the case that both the 300 to 1 and 530 to 1 dilution factors are incorrect because the the actual area of assimilation is all of Belfast Bay. Mr. Dill has estimated that the total area of nutrient assimilation will be much larger than he initially calculated, and that this much greater dilution means that the sensitive receptors located near the outfall pipe will not be threatened by Nordic Aquafarm's proposed nutrient discharge. There are two major problems with this rather desperate line of reasoning:

1) Averaging the nutrient concentrations over the entire Belfast Bay artificially dilutes the pollution released at the outfall site. While this entire area may interact with *some* nutrients, the tidal excursion that drives the far-field dilution model suggests that most of the discharge will remain in a narrow body of water between Islesboro, Belfast and Northport.

2) Discrete receptors do not interact with the spatially averaged water column of the Belfast Bay, they interact with water column at their specific location. The characteristics of the water that passes an individual point changes throughout the tidal cycle, and because of their nearshore and shallow water position with a lot of locally driven hydrodynamics. The (1.5 to 2.5 day old) nitrate released from the facility will interact with these receptors at much lower dilutions than are calculated at the bay scale.

Negative effects of nutrient discharge and accumulation in the water near the discharge pipe are likely to be typical of coastal eutrophication, including increased growth rates for phytoplankton, macroalgae and epiphytes, as well as increased organic matter in the sediments and biological oxygen demand. These may lead, directly or indirectly, to seagrass die-off.

Although Ransom Consulting calculates a much higher dilution factor in the tidal prism of Belfast Bay, this is incorrect for assessing biological responses. The concentration of nutrients in the water column near the sensitive receptors will not be changed. There is still a high chance of exceeding the thresholds for concern for maintaining habitat for submerged aquatic vegetation.

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- Post-Doctoral Fellow Hawaii Institute of Marine Biology, Kaneohe, HI 2007-2010
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A.III.

Response to 17th Procedural Order

Throughout the DEP/BEP hearings on the Nordic Aquafarm permit Upstream Watch has been mindful of the need for scientific and objective review of the application. Upstream has brought in credentialed scientists to cover areas of physical oceanography, chemistry, virology, biology, engineering and even finance. With regard specifically to the MEPDES permit, Upstream has consistently suggested that modeling is not an exact science. Indeed Upstream has even quoted George Box "All models are wrong, but some are useful". To address this concern of modeling limitations, Upstream has repeatedly in oral and written sworn testimony suggested the need for the collection of data to verify modeling. This data collection would be needed BEFORE a permit and should include multiple seasons. As the BEP is approaching final deliberations, there are really only two “standards” that Maine is consistently uses to evaluate discharges: temperature and assimilation/anti-degradation. In both cases modeling is suggesting environment risk, using the standards applied to other permits in Maine. In the case of temperature, models are suggesting that a 1.4 degree summer temperature rise compared to a 1.5 degree standard. This is a 6% variation only, using a CORMIX model that is less accurate than 6%. In the case of the assimilation/anti-degradation we are now seeing a large variation in dilution depending upon how the data is interpreted. On the record Nordic has predicted that dilution values for 50% of the affected area will have a dilution of 300:1 based upon a trajectory of a stabilized equilibrium. After this 300:1 dilution was found to be insufficient to meet the assimilation/anti-degradation standard, this dilution is now at the midnight hour being modified to 530:1. Upstream’s concern remains that the Nordic’s own models demonstrate that Nordic cannot meet Maine “standards” and that these models need to be further verified with collected data.

BEP procedural orders limit this discussion to the modeled dilution predicted by Nathan Dill's testimonies under oath and recent rebuttals of this testimony, specifically the interpretation of Figure 2 provided in his November 19, 2019 Exhibit 23. Please consider the following:

1. Interpretation of Figure 2 is critical to this conversation. To quote Exhibit 23 FarFieldDilutionMemo.docx November 3, 2019

"In order to evaluate dilution that is associated with the 2-day-old diluted effluent, the dilution within each of the control volumes described above was calculated for each hourly output from the particle tracking simulation and then areal distribution of the dilution within the 2-day-old region was evaluated by calculating the cumulative areas at various quantiles as indicated in Figure 2. For example, the red line on Figure 2 shows a time series of the dilution that is less than the dilution in 95% of the 2-day-old area region. In other words, less than 5% of the area of the region containing diluted effluent that is between 1.5-days-old and 2.5-days-old has a dilution of about 100 (10^2) or less. Likewise, 70% of the 2-day-old area has dilution greater than about 160 ($10^{2.2}$), 50% of the 2-day-old area has dilution greater than about 300 ($10^{2.5}$), and more than 10% of the 2-day-old area has dilution greater than about 3000 ($10^{3.5}$)."

DEP staff seem to have accepted the need to reinterpret what has been provided multiple times under oath that Figure 2 supports a dilution of 300:1 for the 50% area. It was only after it was determined that a 300:1 dilution is not sufficient to address the assimilation/anti-degradation standard did a new interpretation of what the steady state equilibrium dilution would be for 50% of the affected area. DEP testimony refers to a need to provide a less conservative interpretation of the Figure 2.

1) Until 300:1 was found to be insufficient dilution to meet regulatory standards, professional review of Figure 2 appeared determine the dilution value at the tail end of the curve, the point where equilibrium and a steady state takes place. It is the long term dilution that we seek to determine, not an arbitrary time at 5 days, or 10 days, or a fortnight. Indeed the way Upstream has viewed this figure is precisely that, what is the steady state dilution that the model is predicting. The curve is clearly approaching a 300:1 (the 2.5 value) as the number of days increase. This is way Dill originally characterized the Figure 2 for 50% of the area under consideration, and this is the way Upstream believes is a reasonable way to interpret this data.

2) Indeed if one only looked at the last five days and used the data from ATTACHMENT B Microsoft Excel Dilution Data File Nordic Aquafarms, Inc. Response to Procedural Order Seventeen File No.A-1146-71-A-N L-28319-26-A-N L-28319-TG-B-N L-28319-4E-C-N L-28319-L6-D-N L-28319-TW-E-N W-009200-6F-A-N, the median value is more like 2.7 or a dilution of about 440:1. The dilution trended for a long term dilution at the 50% area is more like 2.5 or 300:1 dilution.

3) The 300:1 dilution value is already conservative in that it represents a 50% of the area occurrence. This is still a sizable portion of the area to exceed a standard. Allowing a 50% of the area to reach a more stable equilibrium of 300:1 is already allowing a less

conservative interpretation of likely long-term dilution. Allowing a 50% of the area to be less than 300:1 is already generous.

a. There is reason to be concerned about the effect on assimilation and anti-degradation of the remaining 50% area that will see less dilution than the predicted 300:1.

4) The point of using these models of different % of the areas with predicted dilution is to view what the longer-term equilibrium value will be. The 25 day model for the different area % to reach equilibrium suggests that the lower dilutions tend to be reaching equilibrium (or a more steady state) at less than 50%. The 70% line (meaning 30% of the area will have a dilution less 160:1) is clearly showing a leveling out by 25 days. .

5) To arbitrarily pick a fortnight of time that includes a tidal variation (high low tides and tidal wave interference) before equilibrium is being reached in Figure 2 is a cherry picking of data in an attempt to provide a desired result. Indeed, the way that Dill and others have originally referenced Exhibit 23 was the statistical way to predict a steady state longer term dilution for a certain location over time. It is the end time that we seek, not the times before equilibrium is modeled. Dill's picking of a fortnight mean includes a tidally influenced dilution that is not predicted by the model to be of significance as the number of days increase. Depicted below as Exhibit 1 is a markup of Dill's Figure 2. Here, the approximate asymptotes of the data for each of the represented %areas are penciled in. The asymptote line represents the predicted endpoint of the final dilution value beyond the 25.45 days when the dilution as reached a steady state equilibrium.

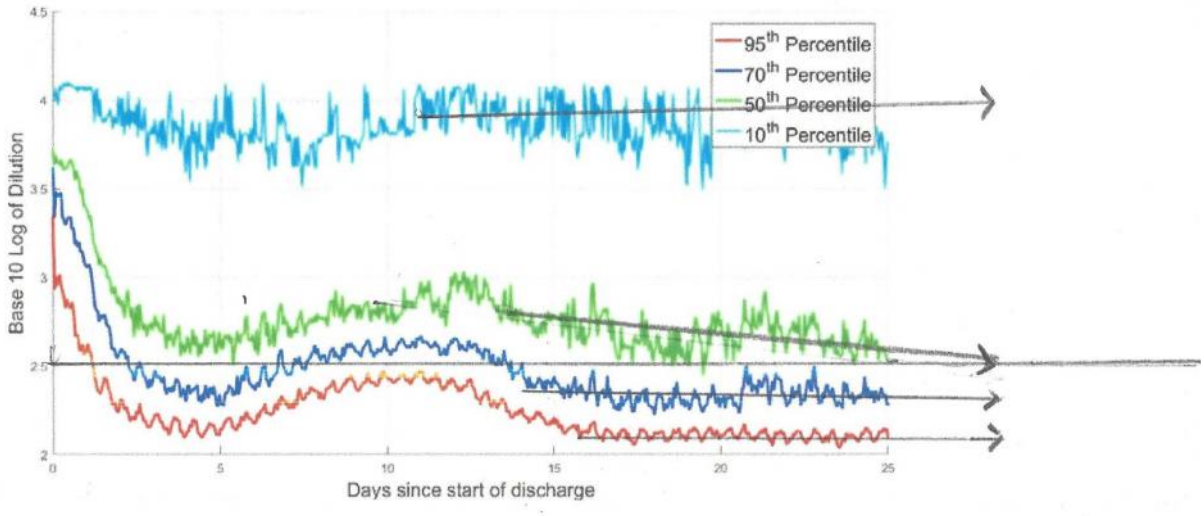

Exhibit 1 Asymptotic steady state predictions of time series areal dilution at the environmentally sensitive region containing diluted effluent with the median age of 1.5 – 2.5 days old. The $10^{2.5}$ line represents ~300:1 dilution for the Green 50th percentile.

2. Nordic testimony includes multiple references suggesting that collection of data would be needed to verify models. Upstream has provided under oath information suggesting that there is conflicting information regarding background nitrogen levels (as the application includes conflicting data on background levels), stratification (as Normandeau data suggests that stratification of oxygen demonstrates that the water column is not consistent top to bottom as a 2D model suggests), and most importantly data to support that wind, wind direction, secondary circulation patterns, and current movements need validation and that a 2D model (ADCIRC) is insufficient to protect eelgrass and public swimming areas. The DEP have used a lower background concentration than that provided by Normandeau which is a significant advantage to Nordic's ability to meet the assimilation standard. Assuming no stratification also provides a significant advantage to Nordic to meet this assimilation standard.

3.. During the testimony of DEP staff during deliberations, it was suggested that Dr Neal Pettigrew supported the use of dye testing after the construction to model the effluent of 7.7 million gallons/day. Dr. Pettigrew did NOT suggest that this would be sufficient by itself. Dr Pettigrew is a UMO professor of physical oceanography with an impressive knowledge of the ocean currents in Penobscot Bay and has stated for the record that he believes that wind/wind direction, secondary circulation patterns, and even the predicted current pattern provided used in the 2D model provided by Nordic need to be verified with data taken from the actual proposed discharge area. DEP staff have suggested that wind would only provide additional dilution. There is cause to believe that depending upon wind speeds and direction that there may be times when indeed less dilution will take place at the eelgrass location. This can only be verified by collection of data. The onus should be on the applicant to provide this evidence that a 2D model is sufficient for dilution characterization.

Conclusion

The 300:1 dilution entered as a professional interpretation of the steady state equilibrium of the expected dilution of 50% of the area is a reasonable and predictable dilution from the ADCIRC models. To include variations in the dilution reached before steady state equilibrium is not reasonable. If one cannot accept the model, then the model needs to be verified by collecting real data from the specific areas being modeled. One need to either accept the reasonable steady state dilution predicted by the model or collect data to verify that a different model characterization is warranted. Nordic has had ample time to perform this data collection, and even their own consultants have recommended under oath that additional data should be collected. Nordic could be collecting the data now. This data should also include additional testing of nitrogen and oxygen to confirm background levels and degree of stratification.

John Krueger

- BS/MS Massachusetts Institute of Technology in Chemical Engineering
- Past Director of Licensing & Enforcement and Past Director of Field Services at Maine DEP
- Retired Director of the DHS Health and Environmental Testing Laboratory (HETL)

● Retired Consultant for the Association of Public Health Laboratories, with numerous publications on Biomonitoring, Laboratory Data Interoperability.

● Retired Consultant for EPA Emergency Response Laboratory Network, through Computer Science Corporation

APPENDIX B

Kyle Aveni-Deforge
Ecological Monitoring and Analysis
126 Pinecrest Road
Durham, NC 27705

3 September 2020

State of Maine Board of Environmental Protection
17 State House Station
Augusta, ME 04333

Dearest Maine Department of Environmental Protection,

I am writing in response to your request for public comment on the Maine Department of Environmental Protection draft board order (ME0002771 W009200-6F-A-N) regarding the Maine Pollutant Discharge Elimination System Permit and waste discharge license for Nordic Aquafarms INC.'s proposed land based aquaculture facility in Belfast, ME.

Below you will find my brief comments on the draft permit. Where necessary for clarity, I refer to page and paragraph numbers, or figure and table numbers, of the draft board order and permit published on your website[1].

Source page 2 of 90: Permit Summary, items 2, 3, 4 and 5.

Page 2 of 90: Permit Summary, Item 2: The monitoring strategy proposes monitoring discharge only seasonally.

The applicant proposes significant nutrient discharge from the facility that comes very close to exceeding water quality conditions that promote aquatic life. The applicant has repeatedly revised their proposed dilution factor in order to comply with standards. Specific characteristics of the discharge are not known, and the farfield dilution model has been based exclusively on off-site data and assumed tidal flushing.

Due to the novel nature of the facility and the lack of verifiable information on the discharge, monitoring should be required throughout the year. This will support the purpose of understanding the impacts of the novel RAS on nearshore water quality. It will protect the applicant from pollution events that are caused by unmonitored effluent. It will protect the bay from the same. Further, without year-round monitoring it is not possible to comply with Page 3 of 20: Conclusions and Findings Items 1, 2 and 3.

[1] https://www.maine.gov/dep/ftp/projects/nordic/board-orders/Nordic-Draft-Board-Order-MEPDES-permit-8-13-2020.pdf accessed 3 September 2020.

Page 2 of 90: Permit Summary, Item 3: The proposed monitoring strategy uses monthly averages to determine compliance with waste discharge standards, using daily composited samples (Page 5 of 90, Special Conditions, A; table).

It is my personal experience that lab-based discharge standards do not provide operationally useful feedback. Depending on the lab location and logistics of sample delivery, chain of custody requirements and potential lab based delays, results from lab analysis may not be available for more than a week. Thus, making short-term decisions about plant operations and pollutant discharge is not effectively supported by lab analysis alone. The facility could suffer a system failure or efficiency drop and have unintentional discharge for weeks before identifying it. Further, to understand the impacts (and risks) of the novel RAS on the local environment daily composites are insufficient.

The environment does respond to long-term stressors (such as monthly mean pollutant discharge), but also to shorter term stressors (e.g. daily and hourly). Since little is presently known about discharge characteristics, nearshore environmental conditions and far-field dilution, establishing daily limits on nutrient release throughout the entire year is a first step toward regulating the facility's impact on the local environment. Why should the facility be permitted to have daily exceedances of discharges that may negatively affect the health of the bay? By imposing only monthly standards, the conditions of the permit risk degrading the local environment.

Without pre-existing information on the periodicity of nutrient discharge (tank cycling, harvest, feeding, equipment replacement, etc), continuous wastewater monitoring for parameters that can be precisely measured with real-time sensors (e.g. nitrate, dissolved oxygen, turbidity, pH, oxidative-reductive potential, conductivity) should also be measuring waste-stream characteristics. These measurements can be correlated with lab data that improve their utility for predicting discharge and scaled by instantaneous flow rates to estimate total discharge. Requiring continuous monitoring throughout the year will 1.) collect operational information that DEP can use to determine appropriate monitoring standards for this and other facilities 2.) help the facility operators meet environmental regulations, and responsibly plan facility expansion 3.) clarify the relationship between the facility's operation and any environmental changes in the Bay. This last point can serve to help tie changes to the proposed facility as well as demonstrate that local changes are unlikely to be related to discharge.

Page 2 of 90: Permit Summary, Item 3 (and page 8 of 90: Special Conditions, Item F): The proposed dye study is necessary because both the CORMIX and far-field dilution models were parameterized with off-site data. While it is clear that the CORMIX model cannot be evaluated until an actual plume can be released, the far-field dilution model can be validated without a discharge pipe by releasing dye at the proposed site.

As written, it does not appear that the permit requires the study to be completed before plant operation begins. However, mitigating the risk to the applicant, it would make sense to require a dye study to be conducted the first summer after final permit approval. This will allow the applicant to validate their far-field dilution model and demonstrate their ability to comply with environmental standards (permit requirements) prior to investing in developing the site. It is especially important, as the far-field model was based on off-site data, driven exclusively by tidal data, and the proposed dilution factor has been recalculated repeatedly in order to meet environmental standards.

Criteria for a successful dye study should be specifically stipulated or circumscribed by the special conditions so that there is an understanding of what criteria would be used to determine whether the model has been validated. (i.e. What happens if the dye study shows that the far-field dilution model has not captured the nature of the system?) It should also set out the framework for external review of the proposed study as well as the analysis, and selection of external reviewers should be done by DEP, not the applicant.

Page 8 of 90: Special Conditions, Part F, paragraph 2 (Within 6 months of facility being capable of discharging 7.7 mg/d)**.** As written, a study must be completed only once the facility reaches full production scale. This seems very risky for the applicant and the environment, but also very easy to avoid triggering the study: for example if the plant is only capable of discharging 7 mg/d the facility would never need to conduct such a dye study.

It would be prudent to require a dye study to validate the CORMIX as soon as the plant is able to discharge significant volumes of water from the discharge pipe. Again, validating the engineering model makes sense as soon as possible to protect the investments of the applicant, in the case that the assumptions made to simplify the parameter space of the mixing model were incorrect.

As specified in the special conditions, this/these proposed dye study/studies are insufficiently clear to provide guidance to protect the interests of the applicant or the DEP (or the environment).

Page 2 of 90: Permit Summary, Item 5: The proposed environmental monitoring program only requires environmental monitoring during summer months, and requires two observations per month on falling tides.

This pre-operation monitoring program is insufficient to document ambient conditions at the proposed outfall site. Data that have been used to parameterize models and characterize the project site have been largely based on off-site data. Observations of on-site conditions should be made by long-term deployment of continuously recording environmental sensors (pH, turbidity, dissolved oxygen, conductivity, temperature, chlorophyll a, as proposed). This system should be setup to cast, and collect profiles of environmental parameters across the depth of the water column. Continuous data should be validated with lab-analysis of grab samples for TSS/turbidity, chlorophyll phosphorous and nitrogen profiles collected at the surface and at

depth. I would recommend adding current monitors (acoustic Doppler current profiler or similar) to this sensor package to begin validating the anticipated flow rates at the discharge site.

Longer deployments of sensors capture natural environmental variability. As dial and tidal fluctuations of these parameters at the project site are undocumented, these are essential baseline data for providing pre-project conditions.

Both proposed nitrogen and thermal discharges are very close to permitted limits, thus the nature of mixing and far-field dilution are important to reaching permitted levels. The proposed discharge will operate continuously through the summer and winter, yet very little is know about summer conditions at the project site, and nothing is known about winter conditions and thermal profiles. Thus, the required monitoring plan should require that sensors be in place through the winter as well to establish background conditions.

Since the applicant is required to provide annual reports on patterns or deviations from baseline, it is critical to establish a baseline throughout the year to which new data can be quantitatively compared.

Official Copy for Filings *by 5:00 pm* to Robert Duchesne, Presiding Officer c/o Ruth Ann Burke

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