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# Th9b

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## STAFF REPORT: REGULAR CALENDAR

**Application No.:** 9-20-0488

**Applicant:** Nordic Aquafarms California, LLC

**Location:** Redwood Marine Terminal II outfall, 1.55 miles offshore of Samoa, Humboldt County

**Project Description:** Discharge up to 10.3 million gallons per day of wastewater from the Nordic Aquafarms onshore fish aquaculture facility via the existing Redwood Marine Terminal II outfall pipe.

**Staff Recommendation:** Approval with conditions

## SUMMARY OF STAFF RECOMMENDATION

Nordic Aquafarms California LLC (Nordic) proposes the discharge of up to 10.3 million gallons per day (MGD) of tertiary treated wastewater from the Nordic Aquafarms yellowtail kingfish (*Seriola lalandi*) onshore aquaculture facility in Samoa. A coastal development permit (CDP) for that onshore fish cultivation facility was approved by Humboldt County and has been appealed to the Commission (Appeal No. A-1-HUM-22-0063). Commission staff is preparing a recommendation in response to those appeals and will be bringing it to the Commission for consideration later this year or early next year. The treated wastewater that is the subject of this CDP application would be

discharged through the existing Redwood Marine Terminal II outfall pipe, which ends 1.55 miles offshore at a diffuser array. Nordic proposes to open an additional 56-60 diffuser ports on the existing array to accommodate its discharge.

The proposed discharge has the potential to adversely affect several coastal resources, including water quality and fisheries. However, a review of available information by Commission staff indicates that such effects would be unlikely. A dilution study commissioned by Nordic found that water quality targets for salinity, ammonia, and temperature would all be met within no more than five feet of the outfall pipe's diffuser array. The dilution study also found that nitrates, the largest constituent in the discharge, would reach the same concentrations as background coastal waters fifty percent of the time in the immediate vicinity of the diffuser. In the worst-case scenario model, which shows the discharge plume extent estimated to occur one percent of the time, the discharge plume with elevated nutrients may extend at the water surface up to 1.5 km away from the diffuser array. Even under this worst-case scenario, however, the plume would not be expected to enter Humboldt Bay or other sensitive marine areas. Moreover, the rapid dilution of nutrients expected to occur in coastal waters would reduce the likelihood of eutrophication, hypoxia, and harmful algal blooms.

However, although unlikely to occur as a result of the proposed discharge, harmful algal blooms could adversely impact coastal fisheries, require commercial or recreational fishery closures, and/or reduce water-based recreational activities. Therefore, to confirm that the modeling studies and data previously gathered by Nordic and reviewed by Commission staff as part of this CDP application are representative of actual conditions and that the proposed project would not adversely affect water quality or coastal fisheries, **Special Condition 1** requires Nordic to submit the findings of the monitoring programs, reports, and surveys conducted under **Special Conditions 2 through 4** to the Executive Director for review after five years. If the Executive Director determines that the discharge has caused any significant adverse environmental impacts or contributed to the occurrence of harmful algal blooms, **Special Condition 1** also requires Nordic to promptly submit an application for a CDP amendment that includes a plan to address all prior or future significant impacts, including but not limited to modifying the discharge to ensure consistency with the Coastal Act. The five-year timeframe for this re-assessment also coincides with the term of the National Pollutant Discharge Elimination System (NPDES) permit issued in October of 2023 by the North Coast Regional Water Quality Control Board for Nordic's discharge. **Special Condition 2** memorializes the terms of that NPDES permit and requires Nordic to provide to the Commission's Executive Director the results of monitoring carried out in compliance with it. **Special Condition 3** additionally requires Nordic to conduct a comparative evaluation of indigenous biota in the vicinity of the outfall at least two times during the months of February, March and April and at least two times during the months of July, August, and September to confirm that the discharge does not cause adverse impacts to natural ecological productivity. **Special Condition 4** memorializes Nordic's

commitment to complete monitoring of coastal oceanography, water quality, and benthic habitats to complement the monitoring required in **Special Condition 3** and requires Nordic to submit a monitoring plan for Executive Director review and approval to ensure effective coordination on the program as it is implemented. Finally, **Special Condition 5** requires an updated shear stress mortality analysis to plankton (from the force and velocity of the discharge). If that analysis reveals that the discharge is causing significant entrainment impacts to plankton, Nordic must submit a CDP amendment with a plan to modify the discharge and/or to mitigate impacts.

Commission staff therefore recommends **APPROVAL** of the CDP application 9-20-0488, as conditioned. The motion is on page 5 of this document. The standard of review for the proposed project is Chapter 3 of the Coastal Act.

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## APPENDICES

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## EXHIBITS

[Exhibit 1: NPDES Permit Attachment E – Monitoring and Reporting Program](#)

## I. MOTION AND RESOLUTION

### Motion:

I move that the Commission approve Coastal Development Permit No. 9-20-0488 pursuant to the staff recommendation.

### Staff Recommendation:

Staff recommends a YES vote on the forgoing motion. Passage of this motion will result in approval of the permit as conditioned and adoption of the following resolution and findings. The motion passes only by affirmative vote of a majority of the Commissioners present.

### Resolution:

The Commission hereby approves a coastal development permit for the proposed development and adopts the findings set forth below on grounds that the development as conditioned will be in conformity with the policies of Chapter 3 of the Coastal Act and will not prejudice the ability of the local government having jurisdiction over the area to prepare a Local Coastal Program conforming to the provisions of Chapter 3. Approval of the permit complies with the California Environmental Quality Act because either 1) feasible mitigation measures and/or alternatives have been incorporated to substantially lessen any significant adverse effects of the development on the environment, or 2) there are no further feasible mitigation measures or alternatives that would substantially lessen any significant adverse impacts of the development on the environment.

## II. STANDARD CONDITIONS:

- 1. Notice of Receipt and Acknowledgement.** The permit is not valid and development shall not commence until a copy of the permit, signed by Nordic or its authorized agent, acknowledging receipt of the permit and acceptance of the terms and conditions, is returned to the Commission office.
- 2. Expiration.** If development has not commenced, the permit will expire two years from the date on which the Commission voted on the application. Development shall be pursued in a diligent manner and completed in a reasonable period of time. Application for extension of the permit must be made prior to the expiration date.
- 3. Interpretation.** Any questions of intent or interpretation of any condition will be resolved by the Executive Director or the Commission.
- 4. Assignment.** The permit may be assigned to any qualified person, provided assignee files with the Commission an affidavit accepting all terms and conditions of the permit.

5. **Terms and Conditions Run with the Land.** These terms and conditions shall be perpetual, and it is the intention of the Commission and Nordic to bind all future owners and possessors of the subject property to the terms and conditions.

### III. SPECIAL CONDITIONS

#### 1. Permit Reporting

Nordic shall report to the Executive Director by December 31, 2028, with the findings of the monitoring programs, reports, and surveys, described in **Special Conditions 2, 3, and 4**. If the Executive Director determines that the discharge has caused eutrophication, hypoxia, or harmful algal blooms, or caused any other significant adverse environmental impacts, Nordic or its successors shall promptly submit to the Commission a complete application for an amendment to this coastal development permit that includes a plan to address all prior or future significant impacts, including but not limited to modifying the discharge to ensure consistency with the Coastal Act. The required amendment application shall conform to the Commission's permit filing regulations at the time and shall reflect the findings of the monitoring programs, reports, and surveys identified in **Special Conditions 2, 3, and 4**. If the Executive Director does not determine that the discharge has caused eutrophication, hypoxia, or harmful algal blooms, or caused any other significant adverse environmental impacts, Nordic may request an amendment to this permit to reduce the frequency of monitoring carried out under **Special Conditions 3 and 4**.

#### 2. National Pollutant Discharge Elimination System (NPDES) Permit Reporting Requirements.

Nordic shall comply with all permit requirements of the North Coast Regional Water Quality Control Board's NPDES Order No. R1-2023-0019. Copies of the reports provided to the North Coast Regional Water Quality Control Board shall also be provided to the Commission's Executive Director.

#### 3. NPDES Biological Survey

No later than July 1, 2024, Nordic shall submit to the Executive Director, for review and approval, a Biological Survey Work Plan. The Executive Director may extend this deadline if significant progress has been made on developing the Biological Survey Work Plan but additional time is needed for it to be considered by the North Coast Regional Water Quality Control Board. The Biological Survey Work Plan may be combined with the Coastal Oceanography, Water Quality and Benthic Habitat Monitoring Plan described in **Special Condition 4**. Nordic shall conduct monitoring and a comparative evaluation of the indigenous biota in the vicinity of the outfall according to the requirements described in [Exhibit 1](#) (NPDES Order, Attachment E), section 8.2, with the following additional elements incorporated:

- Monitoring shall commence no less than two years prior to the initiation of the discharge and continue annually.
- Monitoring shall be conducted at least two times in early spring during the months of February, March and April, and at least two times in mid to late summer during the months of July, August, and September.
- Monitoring events shall take place no less than four weeks apart to help ensure the identification of disruptions to natural ecological productivity.

Nordic shall submit the findings of this Biological Survey to the Executive Director each year by December 1 and at the end of five years, as consistent with **Special Condition 1**.

#### **4. Coastal Oceanography, Water Quality and Benthic Habitat Monitoring**

PRIOR TO ISSUANCE OF THIS PERMIT, Nordic shall submit to the Executive Director for review and approval a Coastal Oceanography, Water Quality, and Benthic Habitat Monitoring Plan. This plan may be combined with the Biological Survey Work Plan described in **Special Condition 3**. The Coastal Oceanography, Water Quality, and Benthic Habitat Monitoring Plan shall include the elements described in [Appendix B](#) along with the following:

- Monitoring shall commence no less than two years prior to initiation of the discharge and continue annually.
- Monitoring events shall be conducted at least two times in early spring during the months of February, March and April, and at least two times in mid to late summer during the months of July, August, and September.
- Monitoring events shall take place no less than four weeks apart and shall align with the monitoring described in **Special Condition 3**.
- Acoustic doppler current profiler (ADCP) deployments shall span each seasonal survey period (i.e. February through April and July through September monitoring events).
- Benthic sampling shall occur at a resolution sufficient to ensure statistical power to detect an ecologically relevant effect size for each monitored resource with a confidence interval of 0.10, unless otherwise justified and approved by the Executive Director.

The monitoring plan shall additionally include:

- Description of how monitoring will build upon and contribute to existing datasets (e.g., CenCOOS or other regional or local resources).
- Description of metrics and tools selected, as informed by clear technical rationales. Passive sampling techniques capable of providing integrated measures of discharge pollutant exposure shall be considered.
- Description and rationale of the sampling resolution to characterize spatial patterns of temperature and salinity.
- Description and rationale of the benthic sampling.

- Description of monitoring approach to detect harmful algal blooms and their toxins in the vicinity of the outfall.

Fixed criteria and comparisons of baseline conditions with those associated with discharge operation shall be used to assess whether and what impacts may be due to the project. Any fixed criteria shall have a strong technical basis. Statistical tests to be used to assess differences that may be significant between baseline and discharge operation shall be specified and supported by a clear rationale.

Nordic shall submit the findings of this Coastal Oceanography, Water Quality, and Benthic Habitat Monitoring to the Executive Director each year by December 1 and at the end of five years, as consistent with **Special Condition 1**.

#### **5. Shear Stress Mortality Analysis**

PRIOR TO ISSUANCE OF THIS PERMIT, Nordic shall provide for Executive Director review and approval an updated modeling and biological assessment of the project discharge's expected shear-related plankton mortality impacts, as described in Section D of these Findings. Nordic shall first provide for Executive Director review and approval proposed methods to conduct this modeling and assessment, which shall include:

- Final design criteria for the project outfall, discharge ports, and discharge velocities.
- Site characterization, including ambient current speed(s) at the outfall location (including average annual, peak seasonal, and low seasonal, if available).
- Biological information, including a list, description, and seasonal concentrations of predominant planktonic taxa in the area that would be exposed to project discharge velocities. The description shall identify the velocities and exposure times that each of the predominant taxa are known or expected to experience mortality.
- Modeling that will be conducted based on the above characteristics that identifies the daily average volume of seawater in which these taxa would be subject to shear-related mortality and the number of predominant taxa that will be subject to mortality.

Upon the Executive Director's approval of the proposed methods, Nordic shall implement the modeling and assessment as approved and provide for the Executive Director's review and approval results that identify the expected shear-related impacts of the project's discharge on biological resources. If the Executive Director determines that the discharge is likely to cause significant entrainment impacts to plankton, Nordic shall submit a CDP amendment application with a plan to modify the discharge and/or to mitigate the impacts.

#### **6. Liability for Costs and Attorneys' Fees. BY ACCEPTANCE OF THIS COASTAL**



DEVELOPMENT PERMIT, Nordic agrees to reimburse the California Coastal Commission (Coastal Commission) in full for all Coastal Commission costs and attorneys' fees including (1) those charged by the Office of the Attorney General, and (2) any court costs and attorneys' fees that the Coastal Commission may be required by a court to pay, which the Coastal Commission may incur in connection with the defense of any action brought by a party other than Nordic against the Coastal Commission, its officers, employees, agents, successors and assigns challenging the approval, issuance, and implementation of this CDP. The Coastal Commission retains complete authority to conduct and direct the defense of any such action against the Coastal Commission.

- 7. Assumption of Risk, Waiver of Liability, and Indemnity.** By acceptance of this permit, Nordic acknowledges and agrees (i) that the project may be subject to hazards from tsunami, storm waves, surges, and erosion; (ii) to assume the risks to Nordic and the property that is the subject of this permit of injury and damage from such hazards in connection with this permitted development; (iii) to unconditionally waive any claim of damage or liability against the California Coastal Commission, its officers, agents, and employees for injury or damage from such hazards; and (iv) to indemnify and hold harmless the California Coastal Commission, its officers, agents, and employees with respect to the California Coastal Commission's approval of the project against any and all liability, claims, demands, damages, costs (including costs and fees incurred in defense of such claims), expenses, and amounts paid in settlement arising from any injury or damage due to such hazards.

## **IV. FINDINGS AND DECLARATIONS**

### **A. BACKGROUND AND CONTEXT**

The permit application under consideration in this report is for an element of an aquaculture project proposed by Nordic Aquafarms (Nordic) to construct and operate an onshore yellowtail kingfish (*Seriola lalandi* or yellowtail) cultivation facility in Samoa. That project would include the proposed discharge through an existing ocean outfall structure, an onshore fish cultivation facility, and a seawater intake located on the shores of Humboldt Bay that would be operated by the Humboldt Harbor, Recreation and Conservation District (Harbor District) and from which Nordic would purchase water for its facility.<sup>1</sup> Nordic originally proposed to cultivate non-native Atlantic salmon (*Salmo salar*) in its land-based recirculating aquaculture facility and targeted a much larger production volume. However, after receiving a coastal development permit from

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<sup>1</sup> The Harbor District has submitted a CDP application (No. 1-21-0653) to the Commission for that intake system and it is currently under review. The Harbor District proposes to withdraw approximately 12 million gallons of water per day from Humboldt Bay and sell it to Nordic and/or other similar users. Commission staff anticipates bringing this CDP application to the Commission for consideration in late 2023 or early 2024.

Humboldt County for that onshore facility in September of 2022<sup>2</sup>, Nordic modified it in April of 2023 to cultivate the California native species, yellowtail, instead of non-native Atlantic salmon. Those modifications were approved by Humboldt County on October 19, 2023, as noted in the Notice of Final Action Taken provided to Commission staff by Humboldt County Planning and Building Department staff. As part of the changes, Nordic also proposed to reduce production from approximately 25,000-27,000 metric tons of head on, gutted fish annually to approximately 3,000 metric tons of head on, gutted fish annually at the end of phase one and 15,000 metric tons at full buildout. This proposed reduction in project scope and size would reduce a number of components related to the project as a whole including:

- reducing the size of the onshore project by a minimum of 75,000 square feet of building footprint;
- reducing anticipated truck traffic due to reduced material goods during operation and reduced construction intensity;
- reducing the energy needs of the project at full build out by 36%;
- reducing the use of fish feed by 20,250 metric tons per year, or 36%;
- reducing the use of freshwater, as it will no longer be needed for fish production; 300,000 gallons would be used annually for processing only, a reduction of 88%; and
- reducing direct and indirect greenhouse gas emissions associated with the proposed project;

Additionally, the changes to the proposed project also modified the discharge from what Nordic had initially proposed. These changes are shown below in Table 1. These changes reduce the volume of the discharge and bring the characteristics of the discharge closer to those of background coastal waters near the outfall (as compared with the originally proposed discharge).

**Table 1: Changes to proposed discharge parameters**

<b>Discharge Parameter</b>	<b>Updated Values</b>	<b>Original Values</b>	<b>% Reduction</b>
Volume	10.3 million gallons per day (MGD)	12.5 MGD	18%
Total Nitrogen	1,224 lbs/day	1,607 lbs/day	24%
Temperature	68°F	71.4°F	5%
Salinity	31 PSU	26.8 PSU	-16% (increase) <sup>3</sup>

<sup>2</sup> The CDP approved by Humboldt County for the land-based facility (No. PLN-2020-16698) was appealed by five separate parties. These appeals (Appeal No. A-1-HUM-22-0063) are currently under review by Commission staff and are anticipated to be brought to the Commission for consideration in late 2023 or early 2024.

<sup>3</sup> This increase in salinity brings the discharge closer to the salinity of the receiving waters near the outfall.

A detailed description of the changes to the proposed project from the originally proposed project is contained in Humboldt County's Substantial Conformance Review and Minor Deviation Authorization for the project, both of which are available in [Appendix A](#). The proposed project description below in Section B reflects yellowtail as the proposed species for cultivation along with the reduced project size.

## **B. PROJECT DESCRIPTION**

Nordic proposes to discharge up to 10.3 MGD of wastewater from its proposed onshore recirculating yellowtail cultivation facility in Samoa through the existing outfall pipe at Redwood Marine Terminal II. Nordic would source and purchase up to 10 MGD of its water from the seawater intake system proposed to be constructed and operated by the Harbor District (currently under review by Commission staff in CDP Application No. 1-21-0653) and up to 0.3 MGD of freshwater from Humboldt Bay Municipal Water District, using existing infrastructure on the Samoa peninsula. As mentioned above, at the end of phase one, the proposed facility would be expected to produce up to 3,000 metric tons of fish annually. At its maximum output, the yellowtail kingfish facility would be expected to produce up to 15,000 metric tons of fish annually. In this review, the Commission is evaluating the discharges at the full scale of the project (i.e. production of 15,000 metric tons of fish annually) through an existing ocean outfall.

The existing outfall pipe extends 1.55 miles offshore to a diffuser array. This outfall was formerly installed and used by a pulp mill that previously operated on the Samoa peninsula but has subsequently closed and been out of operation for over a decade. The diffuser array at the end of the outfall line is approximately 82 feet below the water's surface and has 144 ports, each of which are 2.4 inches in diameter. The diffuser ports are paired on either side of the pipe at a spacing of 12 ft between the ports; the ports discharge wastewater at a 45-degree vertical angle relative to the seabed. The outfall pipe is currently used by two other dischargers: DG Fairhaven Power Company, which releases intermittent batch discharges of 200-400 gallons per minute (up to 0.35 MGD) and the Samoa Wastewater Treatment Plant, which is authorized to release up to 0.765 MGD of effluent from its plant. Currently, 16 ports are maintained open to allow for these discharges, and the discharge velocity from these combined discharges is 3.41 feet per second.

Nordic proposes to open an additional 56-60 ports on the existing ocean outfall pipe to maximize diffusion of its anticipated discharge. Divers would open the ports using hand tools, and Nordic estimates that the total amount of time for in water activities to open the ports would take about three days. Opening the ports would include other maintenance activities such as installing anodes, jetting sand away from closed ports, inspecting joints and removing the toggle bold blinds to open closed ports. Additional ports would be opened in conjunction with changes in the discharge volume to maintain optimum port discharge velocity. At full buildout of Nordic's facility and peak discharge, the maximum port velocity would be approximately 10 feet per second.

The proposed discharge would be treated at an on-site tertiary wastewater treatment plant prior to comingling with the existing discharges described above and releasing to the ocean. This wastewater treatment plant would be part of the land-based aquaculture facility approved by Humboldt County and include a nitrogen reduction system, phosphorous removal, 0.04-micron ultrafiltration membrane bioreactor systems, and a 300 millijoule end of lamp life ultraviolet dose before water is discharged. As proposed by Nordic, the wastewater treatment plant would result in a 99 percent reduction in total suspended solids, biochemical oxygen demand, and phosphorous, and at least a 90 percent reduction in nitrogen discharge. The maximum discharge through the outfall at full buildout would be expected to have the following constituents:

**Table 1: Discharge Constituents from Nordic Aquafarms**

<b>Discharge Constituent</b>	<b>Maximum Daily Amount</b>	<b>Concentration</b>
Discharge Volume	10.3 million gallons per day	n/a
Total Suspended Solids (TSS)	337 lbs per day	3.5 mg/L Monthly Average 4.5 mg/L Weekly Average 5 mg/L Daily Maximum
Settleable Solids	n/a	1.0 mL/L Monthly Average 1.5 mL/L Weekly Average
Biochemical Oxygen Demand (BOD)	295 lbs per day	3.5 mg/L Monthly Average 4.0 mg/L Weekly Average 5.0 mg/L Daily Average
Total Nitrogen (TN)	1,224 lbs per day	15 mg/L Monthly Average 16 mg/L Weekly Average 18 mg/L Daily Maximum
Nitrogen Oxide (NO <sub>x</sub> )	Included in Total Nitrogen above	13 mg/L Monthly Average 14 mg/L Weekly Average 16 mg/L Daily Maximum
Ammonium Nitrogen (NH <sub>4</sub> )	0.15 lbs per day*	0.004 mg/L Daily
Total Phosphorous (TP)	12.79 lbs per day*	0.15 mg/L Monthly Average 0.17 mg/L Weekly Average 0.2 mg/L Daily Maximum
Temperature	68°F	n/a
Salinity	~31 PSU	n/a

\*Converted to imperial units from Nordic's submission

Dewatered filtrate and sludge from the wastewater treatment system, which would be rich in nutrients, would be recycled for other uses on land such as fertilizer or biogas, and would not enter the marine environment.

## **C. OTHER AGENCY APPROVALS**

### **North Coast Regional Water Quality Control Board**

The North Coast Regional Water Quality Control Board (Regional Board) has the authority to permit Nordic's proposed discharge under the National Pollutant Discharge Elimination System (NPDES) and to establish effluent and discharge criteria and limits. Commission staff has coordinated closely with the Regional Board staff as part of Commission's staff's evaluation of the project. The Regional Board approved Nordic's NPDES permit at its October 5, 2023, hearing.

The Regional Board required monitoring referred to as a "biological survey" as part of its NPDES permit. The Regional Board requires this biological survey once every five years. The biological survey includes monitoring of phytoplankton or algae, and water quality parameters such as floating particulates, grease and oil, and any evidence of degradation to indigenous biota attributable to increased concentrations of water pollutants. **Special Condition 3** would increase the frequency of this monitoring to four times annually and has specified time between the monitoring events to help ensure that they appropriately capture the natural variability present.

Additionally, Nordic has voluntarily proposed additional monitoring, in consultation with local stakeholders. This monitoring proposal is memorialized in **Special Condition 4** and is intended to complement and add to the monitoring required in the NPDES permit. **Special Condition 4** and monitoring events for the two monitoring programs would be aligned.

### **California Department of Fish and Wildlife**

The California Department of Fish and Wildlife (CDFW) oversees several permitting or authorization programs related to aquaculture. Most relevant to the proposed project is the aquaculture registration, which authorizes cultivation of specific species at an aquaculture site. CDFW considered and approved Nordic's proposed registration for cultivating yellowtail at the project site in July 2023.

### **Humboldt County**

Humboldt County (County) has approved the onshore development associated with the Nordic Aquafarms Project and approved a CDP under its Commission-certified Local Coastal Program. As mentioned above, this local CDP considered a larger facility for the purpose of producing Atlantic salmon. The County's decision on this local CDP has been appealed to the Commission and will be considered under Appeal No. A-1-HUM-22-0063. After the County approved the CDP, and after the appellant submitted their notices of appeal of the CDP, Nordic modified the project to propose a smaller facility producing yellowtail kingfish instead of Atlantic salmon. On July 27, 2023, Humboldt

County conducted a substantial conformance review for the changed project, and the County determined that the proposed changes were consistent with the County's approved CDP for the onshore facility. In addition, on October 19, 2023, the County also approved a Minor Deviation to an Approved Coastal Development Permit and Special Permit (Minor Deviation) in order to formally modify the scope of its CDP to align with Nordic's modified project. The substantial conformance review letter is available in [Appendix A](#) along with the Notice of Final Action Taken for the Minor Deviation.

### **Tribal Outreach**

Consistent with the Commission's Tribal Consultation Policy, Commission staff has reached out to the following tribes regarding the Nordic Aquafarms Project: The Bear River Band of the Rohnerville Rancheria, the Blue Lake Rancheria, and the Wiyot Tribe. Outreach and invitations to consult on this application were combined with outreach and invitations to consult on CDP Application No. 1-21-0653, for the seawater intakes proposed by the Harbor District. The Commission received one request for consultation from the Wiyot Tribe. This consultation occurred with the Wiyot Tribe on September 18, 2023. Commission staff has also considered the comments Tribes submitted on the Environmental Impact Report for this project in these findings.

### **D. WATER QUALITY**

Section 30231 states:

The biological productivity and the quality of coastal waters, streams, wetlands, estuaries, and lakes appropriate to maintain optimum populations of marine organisms and for the protection of human health shall be maintained and, where feasible, restored through, among other means, minimizing adverse effects of waste water discharges and entrainment...

Section 30412(b) states:

The State Water Resources Control Board and the California regional water quality control boards are the state agencies with primary responsibility for the coordination and control of water quality...The commission shall not... modify, adopt conditions, or take any action in conflict with any determination by the State Water Resources Control Board or any California regional water quality control board in matters relating to water quality or the administration of water rights.

The Coastal Act requires that the Commission minimize adverse effects of wastewater discharges on the biological productivity and quality of coastal waters. Additionally, any conditions imposed by the Commission must not conflict with water quality related determinations by the Regional Board. To help ensure that, Commission staff has coordinated extensively with staff of the Regional Board throughout its review.

As discussed in further detail below, the proposed discharge has the potential to affect the biological productivity and quality of coastal waters through:

- near-field toxicity to marine organisms;
- nutrient enrichment and resulting eutrophication, hypoxia and harmful algal blooms;
- release of fish viruses and pathogens; and
- shear stress causing entrainment and plankton mortality.

### **Near-field Toxicity to Marine Organisms**

Many marine organisms require specific temperature and salinity environments to survive. The proposed discharge has the potential to create toxic conditions to marine organisms in the immediate vicinity. The most likely potential risks result from salinity and temperature differences between the comingled discharge and the receiving ocean waters and from the presence of ammonia in the discharge. The types of organisms most likely to be affected by discharge toxicity are sessile organisms or plankton that would be unable to move away from the discharge plume.

To assess the impacts of the proposed comingled discharge to the marine environment, Nordic commissioned a dilution study. This dilution study, and its subsequent updates to account for the modified project, are available in [Appendix A](#). The dilution study used a modeling approach to evaluate the toxicity mixing zone as the area in which water quality objectives for chronic or acute toxicity to marine organisms are likely to be exceeded in marine waters.

The dilution study used a water quality data set that was collected at the entrance bay of Humboldt Bay, 3.5 miles south-southeast of the outfall diffuser location. This was the only time series data set available to estimate appropriate water quality objectives. Other offshore data sets did not collect nutrient data, which is an important component of this proposed discharge. The dilution study noted that Humboldt Bay has a high flushing rate, which supports the assumption in this study that entrance bay water quality is representative of adjacent coastal waters, including the diffuser site.

As described above, the portion of the diffuser array to be used by the proposed discharge would include 28 pairs of ports spaced 12 feet apart, for a total of 336 linear feet. The Regional Board has employed numerical modeling to determine that, with a seawater-to-discharge dilution ratio of 173.9:1, the concentrations of the effluent will become equivalent to those in the coastal water within a proximity of five feet from the diffuser. The toxicity mixing zone, the area in which the discharge would mix with coastal waters to achieve water quality objectives and protect marine life, is estimated to cover approximately 240 million cubic feet or 0.0016 cubic miles surrounding the diffuser. As further discussed below, most of the constituents in the discharge are anticipated to reach comparable concentrations to those found in coastal waters with significantly fewer dilutions. It is important to note that no baseline water quality monitoring has been conducted at the outfall site thus far, and some effluent concentrations may show variability, which can affect the reliability of the numerical

model. Due to these uncertainties, Nordic has proposed, and the Water Board's NPDES permit requires, that additional water quality and ecological monitoring be implemented. This will enable the early detection of any imbalances related to biological productivity and water quality, both within and outside of the mixing zone.

#### *Ammonia*

Nordic proposes to meet a concentration limit for ammonia of 0.004 mg/L in its discharge effluent prior to discharge. This proposed ammonia concentration would be two orders of magnitude below the 0.6 mg/L water quality limit established by the State Water Resources Control Board's Ocean Plan, therefore the discharge would more than meet the 0.6 mg/L standard at the diffuser site. As described above, Nordic proposes to comingle its discharge with the DG Fairhaven Power Company and the Samoa Wastewater Treatment Plant. In comingling the proposed discharge with the current discharges, the Final Environmental Impact Report for the project found that:

The permitted concentration of ammonia from the Samoa Waste Water Treatment Plant is [5 mg/L or] 1,250 times higher than [Nordic's proposed] discharged ammonia concentration... The permitted concentration of ammonia from the DG Fairhaven Power Plant is 0.4 mg/L, or one hundred times the ammonia concentration from the [Nordic] Project. The net effect of the comingled effluent would be to reduce the Samoa Waste Water Treatment Plant and DG Fairhaven Power Plant ammonia concentrations, which are much higher than ammonia concentrations resulting from the [Nordic] Project, and therefore reduce the potential for toxicity impacts due to greater dilution in the outfall pipe. The dilutionary effect will serve to reduce any potential toxicity impacts over current conditions. Therefore, the Project will have a lower level of potential toxicity than what is currently being discharged from the fully permitted and compliant users of the ocean outfall. The comingled ammonia concentration would reduce to 0.03 mg/L, most of which is attributable to the Samoa Waste Water Treatment Plant. It is therefore unlikely that any of the marine resources of concern [special-status species], which are for the most part all highly mobile, would be exposed to potentially toxic levels of effluent as a result of the Project, even within five feet of the diffuser.

In short, the proposed discharge would release very little ammonia into coastal waters. The amount of ammonia released would not be expected to adversely affect water quality.

#### *Temperature*

For temperature, Nordic's dilution study found four to five dilutions would protect marine organisms from temperature changes. The discharge would be diluted by up to 20-40 dilutions within 6.6 feet of the outfall ports, limiting the mixing zone and areas of potential toxicity to the immediate vicinity of the diffuser. For comparison, the proposed



discharge is required to meet water quality objectives for temperature and salinity within 33.6 feet of the diffuser. The dilution modeling results above were performed for Nordic's original, larger project. The currently proposed project would result in effluent temperatures of 68 degrees Fahrenheit, which is closer to ambient conditions of 52 degrees Fahrenheit than the original proposed project. This is because Nordic would now be cultivating a different fish species with different temperature requirements and has therefore re-designed its infrastructure to ensure that heat is retained within the aquaculture facility. Nordic's temperature control strategy would include using a series of heat exchangers and heat pumps to warm the incoming water from the intake and cool the outgoing effluent, ensuring that heat is retained in the facility. The Regional Board analyzed a time series of temperature data from the North Spit tide gauge from April 2020-April 2021 and found that:

Of the 8,784 data points, 1.8 percent of the hourly values were 20 degrees less than the proposed 68 degrees in the effluent. The data had an average of 52 degrees Fahrenheit, a 20th percentile of 50 degrees Fahrenheit and a 10th percentile of 49.5 degrees Fahrenheit.

The temperature of the discharge is very similar to the temperature of coastal waters near the outfall and would not be expected to adversely affect coastal water quality.

### *Salinity*

Nordic's dilution study found that up to seven dilutions would be required to protect marine organisms from salinity stress. This means that the volume of discharge water would need to be diluted by nearby coastal waters seven times to reach protective salinity concentrations. As described above, the discharge would be diluted by up to 20-40 times within 6.6 feet of the outfall ports, limiting the mixing zone and areas of potential toxicity to the immediate vicinity of the diffuser and well exceeding mixing zone requirements. Further, the near-field dilution study was performed for Nordic's originally proposed larger project. The currently proposed project would result in salinity that is closer to ambient conditions due to yellowtail completing their lifecycle as a saltwater fish. The discharge is therefore now expected to have a salinity of approximately 31 practical salinity units (PSU)<sup>4</sup> in comparison to the original expected discharge salinity of approximately 27 PSU. Median salinity of ambient waters is approximately 33.5 PSU. The proposed discharge's salinity is very similar to the salinity of coastal waters near the outfall. Thus, the salinity would reach similar concentrations as coastal waters less than 6.6 feet from the diffuser and would not be expected to adversely affect coastal water quality or biological productivity.

### *Near-field toxicity and Appeals*

The pending appeals of the County's CDP for the onshore facility also discussed the proposed discharge (i.e. even though the discharge is outside the scope of that local

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<sup>4</sup> Practical Salinity Units are a standard unit for describing the salinity of ocean waters, and it is based on the properties of seawater conductivity.

CDP). One appellant raised the issue of green sturgeon foraging near the seafloor offshore and potentially experiencing near-field toxicity. Because the water quality objectives would be met within five feet of the diffuser, and because the discharge would be buoyant and would not spread along the seafloor, near-field toxicity impacts to fish foraging on the seafloor would not be expected.

However, to confirm that the proposed discharge will not create near-field toxicity impacts to water quality or marine life, **Special Condition 2** requires Nordic to comply with all permit requirements of its NPDES permit and to provide copies of the reports prepared under that permit to the Commission's Executive Director. **Special Condition 3** additionally requires Nordic to increase the frequency of its biological surveying under the NPDES permit to confirm the absence of any significant near-field toxicity effects. Commission staff will coordinate with Regional Board staff on review of the biological survey plan prepared under **Special Condition 3** to help ensure that it meets the objectives and requirements of both agencies. Additionally, Nordic has proposed an expanded monitoring program for Coastal Oceanography, Water Quality, and Benthic Habitat monitoring that goes beyond the work described in **Special Condition 3**. This monitoring program is memorialized in **Special Condition 4**. **Special Condition 4** also requires Nordic to submit for Executive Director review and approval a Coastal Oceanography, Water Quality, and Benthic Habitat Monitoring Plan that ensures at least two years of baseline monitoring and subsequent monitoring during discharges which would detect changes in water quality or marine life. The findings of the monitoring and surveys conducted under **Special Conditions 2, 3, and 4** must be reported to the Commission's Executive Director on an annual basis and, under **Special Condition 1**, combined into a comprehensive report at the end of five years. Based on this monitoring data, if the Executive Director determines that the proposed discharge has caused significant adverse environmental impacts, Nordic shall promptly submit an application for an amendment to this CDP that includes a plan to address all prior or future significant impacts. This includes, but is not limited to, modifying the discharge to ensure consistency with the Coastal Act.

### **Nutrient Enrichment**

The proposed discharge has the potential to contribute to nutrient enrichment of marine waters. Excess nutrients from runoff and treated wastewater discharges enhance phytoplankton and algae growth in marine environments and this additional primary production can lead to multiple types of adverse effects including eutrophication, hypoxia, and harmful algal blooms. Each of these effects is discussed further below.

#### *Eutrophication and Hypoxia*

Eutrophication and hypoxia are related processes that may affect the quality of coastal waters. Eutrophication occurs when nutrient enrichment promotes the growth of phytoplankton and algae faster than they can be consumed by zooplankton and other organisms. The breakdown of excess dead phytoplankton uses significant amounts of dissolved oxygen in the water, leading to low-oxygen conditions, or hypoxia. Fish,

shellfish and other marine species require dissolved oxygen for their survival and hypoxic conditions result in fish leaving the area or fish mortality.

The proposed discharge would be expected to release 1,224 lbs of total nitrogen per day and up to 12.79 lbs of total phosphorous per day. The maximum daily concentration of these pollutants to be released would be up to 18 milligrams per liter (mg/L) for total nitrogen and up to 0.2 mg/L for total phosphorous. The average weekly concentration of total nitrogen and total phosphorous would be 16 mg/L, and 0.15 mg/L, respectively. The Regional Board calculated that using the proposed discharge of 1,224 lbs per day and a maximum flow rate of 10.3 MGD, the concentration of nitrogen would be at 0.08 mg/L at the edge of the mixing zone.

In order to determine the extent to which nutrient discharges may drive phytoplankton growth, Nordic's dilution study also included hydrodynamic modeling of the area surrounding the outfall where elevated nutrient concentrations may be found. The area where these elevated nutrient concentrations were found above ambient levels is referred to as the "zone of water quality degradation." This modeling found that, under Nordic's originally proposed project, the zone of water quality degradation, where phytoplankton growth could be enhanced, would extend up to one kilometer (km) away from the diffuser at the surface of the water column on either side, for a total plume transect of two km. The area up to one km away from the diffuser would experience potential water quality degradation up to 1% of the time. This 1% contour was not found to enter Humboldt Bay under either summer or winter modeling scenarios and the nutrients from the outfall are not expected to affect Humboldt Bay. The area around 500 m from the diffuser is predicted to experience potential water quality degradation up to 5% of the time, the area around 300 m from the diffuser would experience potential water quality degradation up to 20% of the time, and the area in the immediate vicinity of the diffuser - similar to the near-field toxicity area described above - would experience potential water quality degradation 50% of the time.

The spatial extent of the zone of potential water quality degradation in the mid-depth waters is similar to surface waters, but smaller in spatial extent. The zone of potential water quality degradation in the lower portion of the water column (>16 m) for the 1% and 5% of the scenarios is predicted to extend up to 50 m and 25 m from the diffuser, respectively. Under the models in the dilution study, dilution of the proposed discharge in the lower water column was greater than the dilution target of 173.9 to 1 identified by the Regional Board for at least 90% of the time. Updated modeling for the modified, currently proposed project (which would result in a 22% reduction in nitrogen load and an 8% reduction in nitrogen concentrations from the originally proposed project), demonstrated a reduced aerial extent of potential water quality degradation. For example, the area within the 1% contour (i.e. the worst-case scenario) would extend approximately 0.75 km away from the diffuser on either side, for a total transect of approximately 1.5 km, instead of 2 km as in the originally proposed project. Maps showing the reduced areal extent of the area of water quality degradation are in [Appendix A](#). Nordic's original dilution study found that:

Because the currents are constantly transporting surface and mid-depth waters through this area, the duration that pelagic (in water) organisms experience elevated nutrients is limited (minutes). Hence, a ‘negligible’ material increase in pelagic ecosystem productivity under such conditions is predicted, and the risk of deleterious water quality impacts to the surface and mid-water column waters are ‘very low.’

At its hearing on October 5, 2023, the Regional Board similarly found that these concentrations would meet the relevant objectives of the California Ocean Plan and stated that “nutrient materials shall not cause objectionable aquatic growths or degrade indigenous biota.” Overall, the discharge is not expected to significantly contribute to phytoplankton blooms due to the anticipated rapid dilution and short amount of time phytoplankton would be exposed to elevated nutrients in the discharge.

### *Harmful Algal Blooms*

In addition to the eutrophication and hypoxia impacts discussed above, nutrient enrichment may also promote the growth of phytoplankton species that produce harmful toxins or substances. The nature of these harmful toxins varies based on the algae species and the toxins they produce. Some of these toxins accumulate in marine species and, at high concentrations, can make seafood unsafe for consumption, lead to marine species injury or mortality, or require fisheries closures or beach closures. Stakeholders have raised concerns about impacts to recreational use of the beaches in Samoa and Humboldt Waterkeeper noted in its comments to the Regional Board on the draft NPDES permit that the outfall pipe is in the vicinity of some of the most popular surfing areas in Humboldt County. There are several types of harmful algal species that produce toxins but the most prominent type of harmful algal species in coastal California waters is *Pseudo-nitzschia*, which produces domoic acid.<sup>5</sup> The most significant *Pseudo-nitzschia* blooms have occurred across large portions of the coast and have been driven by large scale ocean processes including warming water temperatures and upwelling.

The specific drivers of *Pseudo-nitzschia* bloom persistence in certain localities and the conditions that bring about *Pseudo-nitzschia* production of domoic acid is an active area of research. Pier monitoring stations in Humboldt Bay and in Trinidad note spikes of domoic acid in the months of February, March and April and during the months of July, August, and September.<sup>6</sup> There is consensus among marine scientists that nutrients are necessary for blooms of *Pseudo-nitzschia* but other portions of the California coastline that have experienced local or regional persistence of harmful algal blooms typically have retentive coastal features, such as large bays, that promote longer residence time of water and plankton. By contrast, the proposed project site does not have retentive

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<sup>5</sup> A brief overview of different harmful algal species, where they are found, and the toxins they produce is available on the California HABMAP website: <https://calhabmap.org/what-hab-species-are-found-in-california>

<sup>6</sup> A map of domoic acid monitoring locations, with graphs of the data when each location is selected, is available here: <https://data.caloos.org/#dashboards/layer/59cb173d-9fab-44d0-9a13-5e1c35a10f1b>

oceanographic features and would not be expected to retain water or phytoplankton in the area surrounding the outfall plume. As discussed above, the largest extent of the nutrient plume from the outfall is expected to reach up to 0.75 km away only 1% of the time and because phytoplankton would only be exposed to low concentrations of elevated nutrients for short periods of time, the discharge is not expected to be a significant contributor to any harmful algal blooms.

Similarly, in response to comments regarding concerns about harmful algal blooms and recreational use, including swimming, surfing, and clam digging near Samoa, the Regional Board referred to the dilution study and found that nutrient inputs would not significantly affect harmful algal blooms:

Nitrate concentrations will be reduced below 1 mg/L after the zone of initial dilution... The dilution in the open ocean is significant so as to result in a mass discharge of nutrients to a level that is less than significant.

Staff understands the concerns of surfers and beachgoers related to the former Pulp Mill discharge.<sup>7</sup> However, the Proposed Facility will be treating their effluent to a much higher level than the former Pulp Mill... In addition, the Facility will be discharging to an ocean outfall with a 64 port diffuser. Historically, the Pulp Mill did not have a diffuser and the terminal point of the original pipe, which created the conditions that prompted the Surfrider lawsuit, was about a mile shorter than the current outfall.

Essentially, based on the modeling data reviewed by Commission staff, the amount of naturally-occurring nutrients in the vicinity of the outfall are higher than Nordic's proposed discharge within five feet of the diffuser. Additionally, although there are concerns about prior discharges from this outfall, such as those from the former pulp mills, this proposed discharge differs significantly from earlier industrial discharges in the Humboldt area. Unlike the former pulp mill, Nordic would not be discharging as much material, would treat its discharge, would use an outfall line that has been extended further offshore, and would not be expected to significantly contribute to harmful algal blooms or adversely affect coastal recreation due to harmful algal blooms.

However, to confirm that the proposed discharge would not have significant adverse effects on coastal resources or cause harmful algal blooms, especially in light of changing ocean conditions and climate change, several special conditions would establish monitoring and re-assessment requirements. **Special Condition 4** requires Nordic to develop a plan for its voluntarily proposed Coastal Oceanography, Water Quality, and Benthic Habitat Monitoring Program and to submit it for Executive Director review and approval. This monitoring must occur for two years before discharges begin

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<sup>7</sup> The former pulp mill discharge used the same outfall pipe as proposed by Nordic and was the source of significant pollution, up to 40 million gallons per day of untreated wastewater. This ultimately prompted a lawsuit by the Surfrider Foundation in the early 1990s: [Clean Water Act Case Study: Surfrider Foundation's Early Victory against Humboldt Pulp Mills](#)

in order to establish baseline conditions and the monitoring must continue on an annual basis thereafter. **Special Condition 4** also adds specificity and criteria to Nordic's proposed monitoring program to help ensure that sufficient data are provided to inform a robust analysis and to help ensure that harmful algal bloom monitoring is comparable to other monitoring performed nearby. These additions include increasing monitoring frequency – including two monitoring events during the months of February, March and April to account for *pseudo nitzschia* blooms during early spring; requirements that the program build upon existing datasets so that its findings can be understood in a regional context; and requirements for adequate sampling frequency to effectively inform the Executive Director's review. The monitoring required under **Special Condition 4** must be reported to the Executive Director on an annual basis and, under **Special Condition 1**, compiled after five years to help inform a more comprehensive review. **Special Condition 4** would also be complementary to the requirements of **Special Condition 3** in that it would help provide a more robust data set to confirm that the proposed discharge would not have significant adverse effects.

### **Viruses and Pathogens**

The proposed discharge has the potential to release fish viruses and pathogens, in the event of a disease outbreak in the onshore aquaculture facilities. Concerns around viruses and pathogens from aquaculture facilities arose out of evidence that in-water aquaculture (e.g. salmon grown in net pens) transmits diseases to wild fish.<sup>8</sup> In the case of in -water net pens, however, there is no treatment of the water passing through the aquaculture facility for pathogens, so live pathogens enter the surrounding environment easily. By contrast, Nordic's proposed project would include land-based tanks for fish cultivation and tertiary wastewater treatment onshore, including biosecurity measures, to ensure that the effluent does not include live pathogens. The aspects of wastewater treatment that would protect against the spread of pathogens to the coastal environment would include ultrafiltration, which removes all particles larger than 0.04 microns, and ultraviolet (UV) disinfection. UV disinfection would occur immediately after ultrafiltration and would use a 300 millijoule (mJ) end of lamp life UV dose. The Regional Board found that a dose of at least 250 mJ is necessary to protect water quality.

Additionally, before the wastewater is treated at the proposed Nordic facility, it would go through a recirculating aquaculture system (RAS) unit. As part of treatment in these RAS units, ozone would be used both to break down large inorganic substances into smaller substances that are more readily biodegradable by bacteria in the RAS system, and to cause small organic particles to aggregate into larger particles, allowing them to be captured by the RAS biological filters. The combination of these factors would lead to higher standards of environmental control and a reduction in effluent volumes.

Finally, concerns around fish viruses and pathogens escaping aquaculture facilities and entering the coastal environment center around transmission of pathogens between

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<sup>8</sup> Mordecai, G.J., et al. Aquaculture mediates global transmission of a viral pathogen to wild salmon. *Sci. Adv.* 7,eabe2592(2021).DOI:10.1126/sciadv.abe2592.

similar species, for example, Atlantic salmon and Chinook salmon. As mentioned in the project description, Nordic proposes to cultivate yellowtail at its facility. While native to California’s marine waters, yellowtail are a warmer-water species that is typically found farther south. Water temperatures off the coast of Humboldt County are generally considered too cold to support the presence of yellowtail. Therefore, wild yellowtail would not be likely in coastal waters off of Humboldt County. With the wastewater treatment and disinfection provided and the lack of readily available wild species for a pathogen to infect, the proposed discharge is not expected to spread fish viruses or pathogens.

However, to confirm the effectiveness of Nordic’s approach to neutralizing fish viruses and pathogens, **Special Condition 2** requires that Nordic comply with all permit requirements of its NPDES permit. This includes requirements for continuous monitoring of the UV dose treating the effluent and to report on the findings of this monitoring monthly. **Special Condition 2** also requires that Nordic submit these monitoring reports to the Executive Director. As described above, **Special Condition 1** requires Nordic report to the Executive Director the findings of its monitoring programs, including those in **Special Condition 2**, for a period of five years. If the Executive Director finds that the discharge has caused significant adverse environmental impacts, Nordic shall promptly submit a CDP amendment application that includes a plan to address all prior and future significant impacts, including but not limited to modifying its discharge to ensure consistency with the Coastal Act.

**Shear Stress**

The proposed discharge also has the potential to cause mortality to marine life due to the planktonic community being exposed to “shear stress” from being entrained in the approximately 10.3 million gallons per day (“MGD”) of effluent to be discharged at a high velocity to the ocean. The project discharge would be through 56 to 60 diffuser ports located along an existing outfall that is currently used to discharge about 1.1 MGD of effluent from the DG Fairhaven Power Plant and the Samoa Wastewater Treatment Plant (see Figure 1 – schematic of multiport diffusers on outfall).

Figure 1: schematic of multiport diffusers on outfall (from Roberts, 2018)

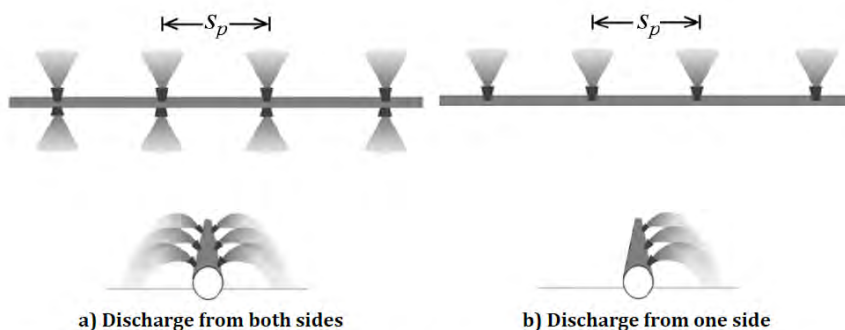


Figure 8. Schematic depiction of discharge from a multiport linear diffuser. After Abessi and Roberts (2014).



Nordic's project is designed to discharge its effluent at a velocity of about 10 feet per second, which is beneficial in that it allows for rapid mixing of the effluent in the receiving waters and helps prevent biofouling of the diffuser ports. However, velocities at these levels also create turbulence in the water column that is likely to result in damage and mortality to some of the larval and other planktonic organisms that are exposed to these discharge "jets." The mortality results from shear forces created when the discharge "jet" interacts with the ocean water column. The relatively high speed of the jet creates small eddies near the diffuser ports and some small organisms, particularly planktonic life stages of some species like bivalves and gastropods that are soft or thin-shelled and are at or smaller than the size of those eddies, can be killed by the resulting shear forces.<sup>9</sup> The Commission has found that other projects with high velocity discharges can create significant adverse impacts to the planktonic community, which functions as the base of the food web relied on by other marine life.<sup>10</sup> Available data shows that the project is likely to result in de minimis or less than significant impacts, as described below. Nonetheless, because the available data is not comprehensive on this issue, **Special Condition 5** is needed to confirm the results of this de minimis conclusion.

Several variables affect the scope of this shear-related mortality, including the discharge volume, the exit velocity at the discharge port, the extent of the mixing zone needed to dilute the discharge, the types and concentrations of organisms exposed to the higher velocities, the duration of their exposure, and others.

Commission staff's analysis used a modified volumetric approach to calculate a conservative estimate of the maximum potential adverse shear effects on marine life. Inputs and variables included:

- Discharge volume: 10.3 MGD.
- Exit velocity: 10 feet per second.
- Number of discharge ports: 60, each with a diameter of 2.5 inches.
- Mixing zone: up to five feet from each discharge port.
- Average ambient current speed: 0.2 feet per second.

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<sup>9</sup> Jessopp, M. J., 2007. The quick and the dead: larval mortality due to turbulent tidal transport. *J. Mar. Biol. Ass. U. K.* 87: 675-680.

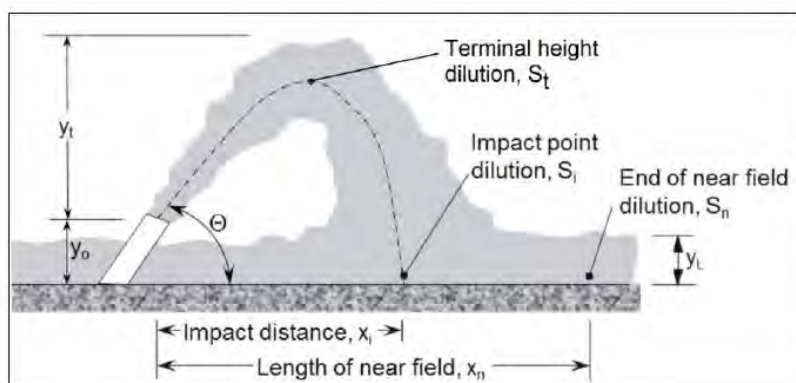
<sup>10</sup> See, for example, CDP Applications 9-21-0488 – Poseidon Resources and 9-20-0691 – South Coast Water District, for which the Commission found that shear-related mortality impacts would require up to several dozen acres of mitigation.



Note: several of these variables are based on conservative assumptions that were later modified through recent information submittals provided by Nordic, as described below.

As shown in Figure 2 below, each discharge port creates a “cone” of higher velocity water that extends outward and widens as it moves away from the port, with the velocity dropping as the effluent mixes with the receiving water. For this project, the static volume of water within each cone is fairly small, though the overall volume of receiving water exposed to the higher velocities within the cones over time is much higher.

Figure 2: schematic of discharge “cone” (from Roberts, 2018)



As a starting conservative assumption, Commission staff’s calculation applied the 10 feet per second velocity to the full five-foot distance of the mixing zone from each port. Staff also assumed the “cone” of higher velocities at five feet distance would be a foot in diameter; therefore, each cone would contain about 1.3 cubic feet, or 9.7 gallons, of a blend of effluent and ambient seawater. At the 10.3 MGD discharge rate, each of the 60 ports would discharge about two gallons per second, with the remaining 7.7 gallons in each cone being ambient seawater.

With average ambient current speeds of 0.2 feet per second, a particle (or planktonic organism) in the seawater would cross the base of the cone almost immediately and the top of the one-foot wide cone in about five seconds, resulting in an overall average time of exposure within the cone of 2.5 seconds. Using this as an “exchange” period – i.e., the time that the 7.7 gallons of seawater in a cone is replaced by the next 7.7 gallons – over the course of a day results in each cone exposing up to 266,112 gallons per day to the assumed area of higher velocities (i.e., 7.7 gallons X (86,400 seconds in a day / 2.5) = 266,112 gallons per day). With 60 ports, this would total almost 16 million gallons per day.

For several reasons, however, the discharge’s actual shear-related impact would be expected to be substantially less than this maximum potential impact. For example, the full 10 feet per second velocity would not be expected to extend the full five-foot distance from the exit ports. Modeling results provided by Nordic on October 18, 2023, indicate that the velocity decays at a relatively rapid rate with the most harmful velocities occurring within about a foot of each diffuser port. At that distance, velocities are

expected to decay to just under four feet per second. This lower velocity is just beyond the range of naturally-occurring velocities of 2.7 to 3.4 feet per second that occur during tidal exchange at the nearby entrance to Humboldt Bay. Additionally, because these velocities would occur close to each cone's narrow base, both the overall volume of water and the plankton within it would be much less than described in Commission staff's initial conservative calculation. Further, the period of exposure within the first foot of the base of the cones would be much less than the full five seconds at the top of the cone, so some plankton that might be killed by the longer exposure would be expected to survive the much shorter exposure. Applying the velocity decay rate so that harmful velocities occurred within just a one-foot distance from each port reduces the overall volume of seawater (and affected plankton) from 16 MGD to about 0.44 MGD (or 440,000 gallons).

The overall adverse effect would also depend on the concentrations and types of planktonic organisms within the receiving waters that would be exposed to harmful velocities. Some soft-bodied taxa may be affected by just short exposure to slightly elevated velocities while hardier hard-shelled taxa may be able to resist the shear forces at longer exposures to higher velocities.

Previous studies suggest using a starting mortality rate of about 23% for a planktonic community exposed to this type of shear stress, though this could be higher or lower depending on the actual taxa exposed at each project location.<sup>11</sup> On October 23, 2023, Nordic provided a summary describing four predominantly expected taxa found in these receiving waters, with at least one known to resist turbulence at the modeled levels.<sup>12</sup> Importantly, because much of the planktonic community offshore of Humboldt Bay is naturally exposed at the nearby Bay entrance to similar velocities (though not necessarily the turbulent flows of the ports), it is likely that most have evolved to withstand most of the velocities they would experience at this discharge. Applying this 23% mortality rate volumetrically to the above assumptions results in plankton mortality in about 0.1 MGD of seawater (or 100,000 gallons per day).

This volume and level of impact to plankton productivity is within a range the Commission has previously considered not to significantly affect the biological productivity of coastal waters during its review of nearby aquaculture projects (for the intake side of these projects and within estuary waters). For example, the Commission required compensatory mitigation for the 1.02 MGD intake volume at a Coast Seafoods shellfish nursery facility in Humboldt Bay (CDP 9-16-0033), and determined that compensatory mitigation was not needed at two other Humboldt Bay shellfish nursery aquaculture projects that withdrew somewhat smaller volumes of Bay water – Hog Island Oyster Company (CDP 9-13-0500) at about 100,000 gallons per day and Taylor Seafoods (CDP E-11-029) at about 27,000 gallons per day. Nordic's estimated 100,000 gallons per day is within the range for which the Commission previously determined the

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<sup>11</sup> See, for example, Foster et.al, Desalination Plant Entrainment Impacts and Mitigation – Final Report, submitted to the California State Water Quality Control Board, October 2013.

<sup>12</sup> The four taxa are xx. Of those, studies show that xx is able to resist turbulence xx . See xx [cite study].

impact to be de minimis on those two nearby projects. Further, Nordic's proposed discharge is likely to cause even less of an impact because it would affect the less concentrated plankton offshore as compared to the more highly productive estuarine waters of Humboldt Bay.

Nonetheless, changes in any of the assumptions used in the analysis above could result in a potentially greater impact. Therefore, as a protective measure, **Special Condition 5** is needed to confirm the relative de minimis projected impact or to provide updated analysis showing whether the impact is greater than projected. **Special Condition 5** requires Nordic to submit, for Executive Director review and approval, a proposed modeling and biological assessment that is based on more refined project details and characteristics, including the actual number of ports to be used, the design "decay rate" for the discharge velocities within the mixing zone, and others. It also requires Nordic to provide a biological assessment based on the predominant taxa expected to be present within the outfall area, along with any relevant information available about their response to the expected discharge velocities and exposure time. **Special Condition 5** further requires that once Nordic implements the Executive Director-approved assessment, the Executive Director may direct Nordic to submit an application to amend this CDP if the assessment results show the discharge is causing impacts materially greater than those projected to occur based on the analysis in this section.

### **Conclusion**

Although the proposed discharge would likely not cause significant adverse impacts to water quality and coastal resources, additional protections and robust monitoring would be appropriate to help ensure that the modeling studies and data provided by Nordic as part of its CDP application are representative of the actual conditions that would occur as a result of the proposed discharge. **Special Condition 1** requires Nordic to report to the Executive Director on the findings of its monitoring programs, reports, and surveys as described in **Special Conditions 2-4**. **Special Condition 1** also requires Nordic to submit a complete application to amend its CDP if the Executive Director determines, based on the results of those additional studies, that the project is causing significant adverse impacts.

**Special Conditions 2, 3, and 4** require effluent monitoring data, near-field biological survey results, and far-field coastal and oceanographic water quality monitoring data, respectively. Specifically, **Special Condition 2** requires that Nordic comply with monitoring and reporting requirements identified in its NPDES permit from the Regional Board and provide copies of its reports to the Commission's Executive Director. **Special Condition 2** focuses on monitoring of treated effluent prior to comingling with other discharges.

**Special Condition 3** requires that Nordic conduct a comparative evaluation of indigenous biota in the vicinity of the outfall through monitoring at least two times in the early spring during the months of February, March and April and at least two times in later summer and early fall during the months of July, August and September. This

monitoring would detect any disruptions to natural ecological productivity. These seasonal timeframes were identified to capture times of year when harmful algal blooms have been present historically and to capture times of year when the discharge will dilute less rapidly, due to less upwelling activity.

**Special Condition 4** complements the requirements of **Special Condition 3** and requires Nordic to submit a plan for its voluntarily proposed Coastal Oceanography, Water Quality, and Benthic Habitat Monitoring Program that would be implemented in the vicinity of the outfall concurrently with the biological surveys.

Finally, **Special Condition 5** requires Nordic to further refine the initial analysis performed by staff on potential shear stress impacts to plankton at full buildout. Prior to issuance of this permit, Nordic shall submit a shear stress analysis with expected plankton mortality to the Commission's Executive Director. If this analysis finds that impacts are greater than de minimis, Nordic shall submit a CDP amendment with proposed mitigation to offset the impacts.

For the reasons set forth above, the Commission finds that the project, as conditioned, would protect and maintain water quality and the biological productivity of the marine environment consistent with Coastal Act Section 30231.

## **E. FISHERIES**

Section 30234.5 states:

The economic, commercial, and recreational importance of fishing activities shall be recognized and protected.

The Coastal Act requires that the Commission protect and recognize the importance of fishing activities. Numerous commercial fisheries take place offshore of Humboldt Bay including fisheries for Chinook salmon, coonstripe shrimp, Dungeness crab, groundfish, market squid, spot prawn, surf perch, and smelts. Hagfish, pink shrimp, halibut, and highly migratory species, like Albacore, are fished further offshore. Additionally, recreational clam digging takes place within Humboldt Bay. The proposed discharge has the potential to affect coastal fisheries through nutrient enrichment resulting in harmful algal blooms, as discussed above.

*Pseudo-nitzschia* blooms and high levels of domoic acid have caused fisheries closures or delays in fishery openings, particularly for the Dungeness crab fishery. In 2016, a federal fisheries disaster was declared when elevated levels of domoic acid delayed the fishery opening for nearly three months. Per communication with the California Department of Fish and Wildlife, since 2016, three additional delays to the Dungeness Crab fishery opening date have occurred north of Shelter Cove, and one of those was in the vicinity of the proposed discharge. Other shellfish species, including razor clams

and rock crabs, may also accumulate domoic acid and be affected by season delays or closures.<sup>13</sup>

As discussed above, in the worst-case scenario, elevated levels of nitrate in the discharge plume would extend up to 0.75 km at the surface of the water column. The amount of time it would take phytoplankton to traverse the outfall plume would typically be short, on the order of minutes, and in the worst-case scenario could be on the order of hours. Regardless, the discharge is not expected to drive harmful algal blooms due to the fast dispersal of nutrients and the lack of retentive oceanographic features that would keep phytoplankton near the discharge plume. Finally, under no scenarios would the discharge plume enter Humboldt Bay, where the recreational clam digging occurs.

To confirm that that proposed project would not adversely affect commercial and recreational fisheries, **Special Condition 1** requires reporting of the monitoring findings during the first five years of the project to the Commission's Executive Director. If the Executive Director finds significant adverse coastal effects, Nordic shall submit a complete application for an amendment to this CDP to modify its discharge and address any significant adverse effects. **Special Conditions 2 through 4** require the collection of biological survey data and water quality monitoring information to demonstrate a lack of adverse impacts.

For the reasons set forth above, the Commission finds that the project, as conditioned, would protect the economic, commercial, and recreational importance of fishing activities, consistent with Coastal Act section 30234.5.

## **F. CALIFORNIA ENVIRONMENTAL QUALITY ACT**

Section 13096 of the Commission's administrative regulations requires Commission approval of coastal development permit applications to be supported by a finding showing the application, as modified by any conditions of approval, to be consistent with any applicable requirements of CEQA. Section 21080.5(d)(2)(A) of CEQA prohibits approval of a proposed development if there are feasible alternatives or feasible mitigation measures available that would substantially lessen any significant impacts that the activity may have on the environment. The Commission's regulatory program for reviewing and granting CDPs has been certified by the Resources Secretary to be the functional equivalent of environmental review under CEQA. (14 CCR § 15251(c).) The Commission incorporates its findings on Coastal Act consistency as if set forth in full herein. As discussed in the findings, the project as conditioned herein incorporates measures necessary to avoid any significant environmental effects under the Coastal Act, and there are no less environmentally damaging feasible alternatives or mitigation measures. Therefore, the proposed project is consistent with CEQA.

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<sup>13</sup> Health advisories and closures for California finfish, shellfish, and crustaceans are available here: <https://wildlife.ca.gov/Fishing/Ocean/Health-Advisories>

9-20-0488 (Nordic Aquafarms)

## **SUBSTANTIVE FILE DOCUMENTS**

Coastal Development Permit Application No. 9-20-0488 and associated materials.

Coastal Development Permit Application No. 1-21-0653 and associated materials.

Coastal Development Permit Appeal No. A-1-HUM-22-0063 and associated materials.

Final Environmental Impact Report Samoa Peninsula Land-based Aquaculture Project, County of Humboldt, Planning and Building Department (SCH#: 2021040532), June 30, 2022.