1.0 Mixing Zone Analysis

In accordance with 18 AAC 70.240, the Department may authorize a mixing zone in a permit.

The Department (DEC) received OBI Seafoods, LLC (OBI)'s application for a mixing zone in a reissued AKG528493 authorization (under the AKG528000 Seafood Processors Operating Onshore Facilities in Kodiak, Alaska General Permit) on March 19, 2021. In the application, OBI requested authorization of a new mixing zone for temperature.

As a part of the mixing zone application and modeling review process, DEC also modeled the mixing zone using Cornell Mixing Zone Expert System (CORMIX) version 12.0 modeling software. CORMIX is a widely used and broadly accepted modeling tool for accurate and reliable point source mixing analysis. CORMIX predicts the distance at which a modeled parameter meets water quality criteria.

Inputs to CORMIX included the maximum expected effluent concentration, water quality criteria, receiving water characteristics (such as water depth and density) at the outfall, and outfall and diffuser specifications (such as port size, direction, and number).

DEC's modeling yielded a different result than that proposed by OBI in their application. OBI's consultants conducted modeling and then applied a safety factor in choosing to request a 50-meter radius mixing zone. However, DEC found that the mixing zone size required to meet water quality criteria at the boundary of the mixing zone was a 25-meter radius mixing zone. Water quality criteria for temperature may be exceeded within the authorized mixing zone.

There are several regulatory criteria that must be met for the Department to authorize a mixing zone. These criteria include the size of the mixing zone, treatment technology, existing uses of the waterbody, human consumption, spawning areas, human health, aquatic life, and endangered species.

The following summarizes this analysis:

1.0.1 Size

In accordance with 18 AAC 70.240, a mixing zone must be as small as practicable. 18 AAC 70.240(b)(2) requires the Department to consider the characteristics of the effluent after treatment of the wastewater. DEC reviewed OBI's expected effluent temperature prior to discharge to the receiving water and found that it had reasonable potential to exceed water quality criteria. Therefore, the Department modeled temperature in CORMIX version 12.0 to determine the smallest practicable mixing zone.

The new proposed mixing zone is a circular area with a 25-meter radius, centered over the outfall terminus, extending from the seafloor to the sea surface.

Table 1 summarizes basic CORMIX inputs that DEC used to model the mixing zone for temperature.

Table 1 - CORMIX Model Inputs

Parameter Modeled	Maximum Expected Concentration	Ambient Concentration	Water Quality Criterion
Temperature	24.44 ℃	11.67 ℃	The maximum rate of change may not exceed 0.5 ℃ per hour.
Outfall and Receiving Waterbody Characteristics			
Outfall Type	Submerged Single Port Discharge		
Outfall Length	131 meters		
Port Diameter	0.209 meters		
Height of Port Centerline above Seafloor	0.254 meters		
Water Depth at Discharge	14.6304 meters		
Ambient Velocity	0 meters per second (m/s) slack tide 1.543 m/s high tidal current		
Ambient Water Density	1023.62 kilograms per cubic meter		
Effluent Characteristics			
Flow Rate	1,500 gallons per minute		

1.0.2 Technology

In accordance with 18 AAC 70.240(c)(1), the most effective technological and economical methods should be used to disperse, treat, remove, and reduce pollutants. The OBI Kodiak Seafood Processing Plant proposes to cool cannery retort cooling water (beginning at 76.7 °C) with seafood processing wastewater prior to discharge. The maximum expected temperature of the combined effluent stream at discharge would be 24.4 °C. OBI investigated several other treatment options, including providing initial cooling of the retort water with an array of dry fan coolers, using a mechanical refrigeration unit, mixing seawater with the retort water, and combinations of those options. OBI concluded that, considering technical and economic constraints, the proposed treatment method was the most effective treatment option.

1.0.3 Existing Use

In accordance with 18 AAC 70.240(c)(2) and (3) and 18 AAC 70.240(c)(4)(B) and (C), the mixing zone has been appropriately sized to fully protect the existing uses of Saint Paul Harbor. Saint Paul Harbor's existing uses and biological integrity have been maintained and protected under the terms of the previous permit and shall continue to be maintained and protected under the terms of the reissued permit. Water quality criteria are developed to specifically protect the uses of the waterbody as a whole. Because water quality criteria for pollutants that demonstrated reasonable potential to exceed water quality criteria will be met prior to or at the boundary of the mixing zone, designated and existing uses in Saint Paul Harbor that are beyond the boundary of the mixing zone will be maintained and protected.

1.0.4 Human Consumption

In accordance with the conditions of the permit, and in accordance with 18 AAC 70.240(d)(6), the pollutants discharged cannot produce an objectionable color, taste, or odor in aquatic resources harvested for human consumption. There is no indication that the pollutants discharged have produced objectionable color, taste, or odor in aquatic resources harvested for human consumption.

1.0.5 Spawning Areas

In accordance with 18 AAC 70.240(f), a mixing zone will not be authorized in flowing fresh waters that are spawning areas for certain species.

This authorization does not propose a mixing zone in any flowing fresh waters.

1.0.6 Human Health

In accordance with 18 AAC 70.240(d)(1), the mixing zone must not contain bioaccumulating, bioconcentrating, or persistent chemicals above natural or significantly adverse levels. 18 AAC

70.240(d)(2) states that the mixing zone must not present an unacceptable risk to human health from carcinogenic, mutagenic, teratogenic, or other effects as determined using risk assessment methods approved by DEC and consistent with 18 AAC 70.025. The effluent is not expected to contain toxic pollutants. The expected effluent temperature was used in conjunction with applicable water quality criteria, which serve the purpose of protecting human and aquatic life, to size the mixing zone to ensure all water quality criteria are met in the waterbody at the boundary of the mixing zone.

1.0.7 Aquatic Life and Wildlife

In accordance with 18 AAC 70.240, the mixing zone authorized in the permit shall be protective of aquatic life and wildlife. The mixing zone does not form a barrier to migratory fish species or fish passage nor will it result in a reduction of fish population levels. A toxic effect will not occur in the water column, sediments, or biota outside the boundaries of the mixing zone. CORMIX modeling conducted for this discharge to Saint Paul Harbor incorporated the most stringent water quality criteria for protection of the growth and propagation of fish, shellfish, other aquatic life, and wildlife. All water quality criteria will be met at the boundary of the authorized mixing zone.

1.0.8 Endangered Species

In accordance with 18 AAC 70.240(c)(4)(F), the mixing zone will not cause an adverse effect on threatened or endangered species. Review of applicable endangered species mapping and databases, and information received from the National Marine Fisheries Service (NMFS) and the United States Fish and Wildlife Service (USFWS) in communications with DEC, identified that the threatened Steller's eider (*Polysticta stelleri*), critical habitat for the threatened northern sea otter (*Enhydra lutris kenyoni*), and nesting colonies of Black-legged Kittiwake (*Rissa tridactyla*) are present at the discharge area in Saint Paul Harbor. The General Permit includes specific monitoring applicable to seafood processing facilities located near critical habitat areas, requiring permittees to collect data regarding threatened and endangered species during sea surface and shoreline monitoring activities. DEC determined that considering the nature of the discharge, mixing zone size, and ambient conditions, these species would not be affected by discharge from the OBI Kodiak Seafood Processing Plant.

DEC will provide a copy of the authorization to NMFS and USFWS when it is public noticed. Any comments received from the agencies regarding endangered species will be considered prior to issuance of the authorization under the AKG528000 General Permit.