OCEAN DISCHARGE CRITERIA EVALUATION
FOR THE PROPOSED PRIBILOF ISLANDS
NPDES PERMITS for SEAFOOD PROCESSING

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SECTION 1. INTRODUCTION

1.1 Purpose of Evaluation

In February 1999, the U.S. Environmental Protection Agency (EPA) Region 10 issued a general National Pollutant Discharge Elimination System (NPDES) Permit for seafood processors discharging within 3 nmi of the Pribilof Islands (NPDES General Permit No. AK-52-7000; 64 FR 1010). This permit expired in February 2004, but has been administratively extended by the Regional Administrator in accordance with 40 CFR § 122.6.

EPA intends to reissue individual NPDES permits for each shore-based or floating seafood processing facility which has effluent discharges associated with seafood process wastes, process disinfectants, sanitary wastes and other wastewaters to the ocean waters within 3 nmi (5.6 km) of the Pribilof Islands in the Bering Sea of Alaska (Figure 1). Section 403(c) of the Clean Water Act (CWA) requires that NPDES permits for such ocean discharges be issued in compliance with EPA's Ocean Discharge Criteria (40 CFR 125, Subpart M) for preventing unreasonable degradation of ocean waters. The purpose of this Ocean Discharge Criteria Evaluation (ODCE) report is to identify the salient information and concerns relative to the criteria and discharge of seafood processing wastes into these waters. This ODCE is based on the *Ocean Discharge Criteria Evaluation for the Proposed Pribilof Islands Seafood Processing General NPDES Permit* prepared by the U.S. Environmental Protection Agency in August 1998 and has been updated with additional information received since the issuance of the 1999 *Pribilof Islands Seafood Processing General NPDES Permit*.

EPA's Ocean Discharge Criteria set forth specific determinations of unreasonable degradation that must be made prior to permit issuance. "Unreasonable degradation of the marine environment" is defined (40 CFR 125.121[e]) as follows:

(1) significant adverse changes in ecosystem diversity, productivity, and stability of the biological community within the area of discharge and surrounding biological communities,

(2) threat to human health through direct exposure to pollutants or through consumption of exposed aquatic organisms, or

(3) loss of aesthetic, recreational, scientific, or economic values, which are unreasonable in relation to the benefit derived from the discharge.

This determination is to be made based on consideration of the following 10 criteria (40 CFR 125.122):

(1) the quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged;

(2) the potential transport of such pollutants by biological, physical, or chemical processes;

(3) the composition and vu1nerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain;

(4) the importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism;

(5) the existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs;

(6) the potential impacts on human health through direct and indirect pathways;

(7) existing or potential recreational and commercial fishing, including finfishing and shellfishing;

(8) any applicable requirements of an approved Coastal Zone Management Plan;

(9) such other factors relating to the effects of the discharge as may be appropriate;

(10) marine water quality criteria developed pursuant to Section 304(a)(1).

If the Regional Administrator determines that the discharge will not cause unreasonable degradation to the marine environment, an NPDES permit may be issued. If the Regional Administrator determines that the discharge will cause unreasonable degradation to the marine environment, an NPDES permit may not be issued.

If the Regional Administrator has insufficient information to determine, prior to permit issuance, that there will be no unreasonable degradation to the marine environment, an NPDES permit will not be issued unless the Regional Administrator, on the basis of the best available information, determines that: (1) such discharge will not cause irreparable harm to the marine environment during the period in which monitoring will take place, (2) there are no reasonable alternatives to the onsite disposal of these materials, and (3) the discharge will be in compliance with certain specified permit conditions (40 CFR 125.122). "Irreparable harm" is defined as "significant undesirable effects occurring after the date of permit issuance which will not be reversed after cessation or modification of the discharge" (40 CFR 125.121[a]). Once sufficient information is received and it is determined that the permit would not result in "irreparable harm", the Regional Administrator can propose to re-issue the general permit.

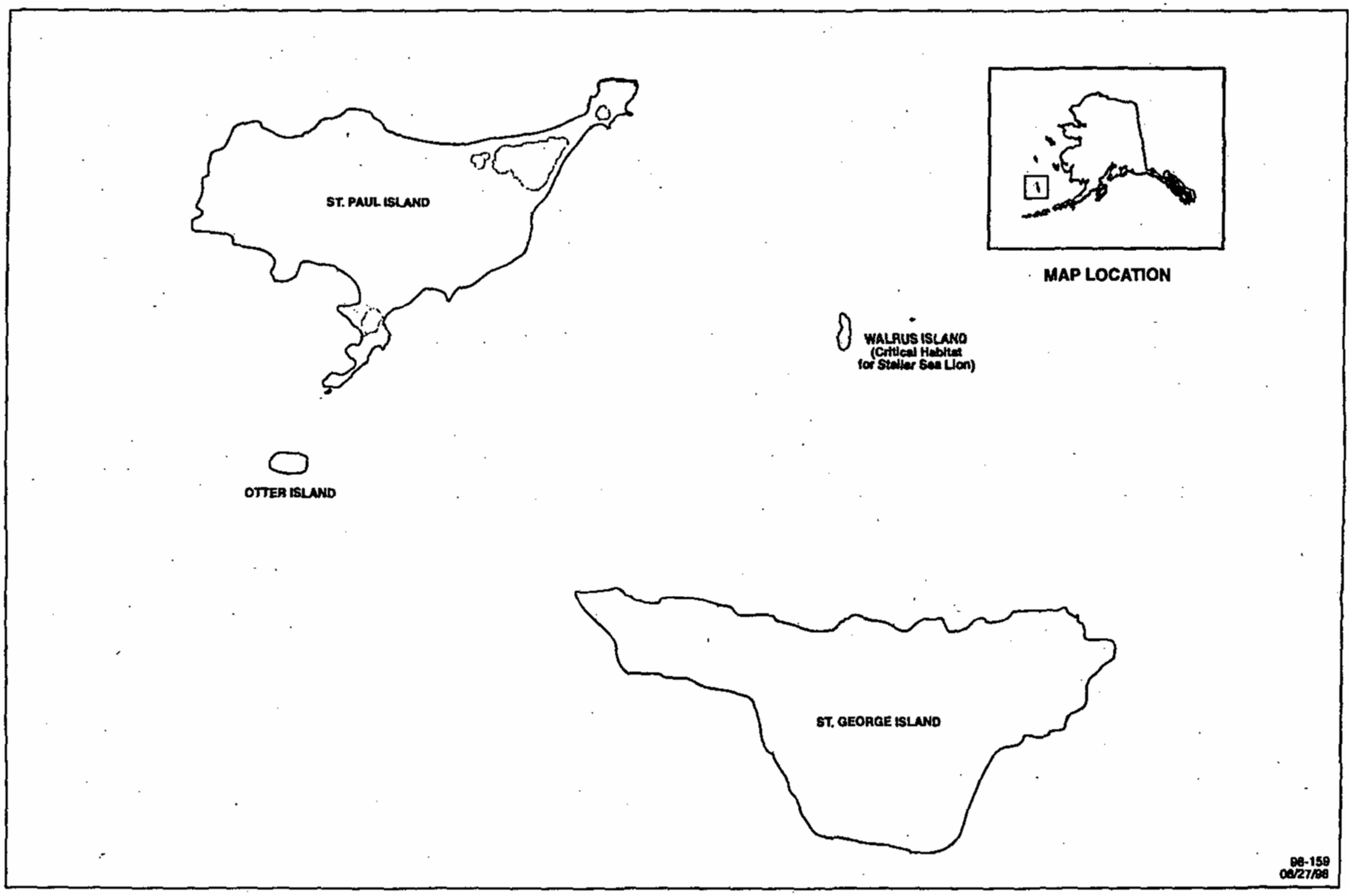

Figure 1. The Pribilof Islands including Critical Habitat for Steller Sea Lions on Walrus Island

1.2 Scope of Evaluation

The information presented in this document is a synthesis of data from seafood processing permit reports for facilities operating under the Pribilof Seafood Processors General NPDES Permit from 1996 through 2007, physical oceanographic and climatological data, discharge modeling results, seafloor and beach monitoring reports, relevant biological information, and information on commercial, recreational, and subsistence resource utilization in the area of the Pribilof Islands. Where appropriate, the reader will be referred to the available scientific literature for more detailed information concerning certain topics.

1.2.1 Area of Coverage of the Proposed Individual NPDES Permits

This document evaluates the impacts of waste discharges as provided for by the NPDES permits proposed for seafood processing within 3 nmi (5.6 km) of the Pribilof Islands pursuant to Section 403(c) of the Clean Water Act.

The proposed NPDES permits authorize wastewater discharges to the waters of the State of Alaska and waters of the United States adjacent to State waters within 3 nmi of the Pribilof Islands (i.e., St. Paul, St. George, Walrus, and Otter Islands and Sea Lion Rock) in accordance with the effluent limitations, monitoring requirements, and excluded areas (if applicable) specified in each permit.

1.2.2 Discharges in Areas of Concern

The following areas are defined as critical habitat for species in the Pribilof Islands:

- the area within 3 nmi of Walrus Island, a designated rookery and critical habitat of the Steller sea lion;
- the area within 0.5 nmi of land owned and/or managed by U.S. Fish and Wildlife Service (USFWS) for the protection of birds and bird nesting areas during the period May 1 through September 30;
- the area within 0.5 nmi of land owned and managed by the National Marine Fisheries Service (NMFS) for the protection of the northern fur seal rookeries and haulout areas during the period May 1 through December 1;
- the area within 0.5 nmi of designated Steller sea lion haulout areas (Sea Lion Rock and Northeast Point on St. Paul and Dalnoi Point and South Rookery on St. George); and
- the area within 0.5 nmi of the Alaska Maritime National Wildlife Refuge, Bering Sea Unit.

Floating Seafood processors (i.e., Stellar Sea, Westward Wind) are not authorized to discharge in the above areas. Seafood processors that discharge from stationary outfalls (i.e., Trident Seafood, Arctic star) are located within land owned and managed by the National Marine Fisheries Service (NMFS) for the protection of the northern fur seal rookeries and haulout areas. This area is designated as critical habitat area for Northern Fur Seals which has been listed as depleted under the Marine Mammal Protection Act. The National Oceanic and Atmospheric Administration, National Marine Fisheries Services allowed the discharges from the Trident and Arctic Star facilities to occur in critical habitat area on the premise that these were existing discharges, and all new discharges would be outside of the critical habitat area (see EPA’s 1999 Response to Comments Document for the *Pribilof Islands Seafood Prpocessing General NPDES Permit*).

1.3 Seafood Processing Facilities

EPA is proposing to authorize discharges from four seafood processing facilities in 2008. The proposed NPDES Permits authorize wastewater discharges to the waters of the State of Alaska and waters of the United States adjacent to State waters within 3 nmi of the Pribilof Islands (i.e., St. Paul, St. George, Walrus, and Otter Islands and Sea Lion Rock) in accordance with the effluent limitations, monitoring requirements, and excluded areas specified in the permits. The following provides a description of facilities and the limitations and conditions in each permit:

Stellar Sea

The Stellar Sea is a 281.4 foot floating seafood processor. This facility processes opilio and/or bairdi crab from January through May 5th in the Pribilof Islands. This vessel has been processing in this location since 1992.

Crab harvesting vessels offload their catch by brailer while moored alongside the vessel. During crab processing the body shell and guts are removed, then the two leg sections are washed, cooked, cooled, and frozen. The facility processes while at anchor. Weather and sea conditions can change frequently and as a result the vessel moves frequently. It is not unusual to move daily. When the crab season is finished the Stellar Sea leaves the Pribilof Islands to process in other areas of Alaska.

Some of the permit limitations and conditions in the permit are as follows:

- Discharge may occur from January to May 5th each year and is limited to processing and discharging crab and associated wastes
- Crab waste must be ground to ½ inch prior to discharge
- Volume of crab waste cannot exceed 78,000 lbs/day
- Permit contains effluent limits for ammonia, chlorine, and pH
- Increased effluent monitoring requirements for chlorine, ammonia, pH, oil and grease, BOD, TSS, arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver, and zinc
- Monitoring requirements for waste conveyor system, grinder system, outfall,
- Sea surface/shoreline and biological monitoring
- Surface water monitoring requirements for chlorine, ammonia, pH, oil and grease, BOD, TSS, salinity, arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver, and zinc
- The permit prohibits a discharge within 3 nautical miles (nm) of Walrus Island, within ½ nm of Sea Lion Rock and Northeast Point on St. Paul Island, within ½ nm of Dalnoi Point and South Rookery on St. George Island, and within ½ nm of the Alaska Maritime National Wildlife Refuge.
- Starting May 1st the permit prohibits discharge with ½ nm of land owned and/or managed by the National Marine fisheries Service for the protection of northern fur seal rookeries and haulout areas, and within ½ nm of land owned and/or managed by the U.S. Fish and Wildlife Service for the protection of seabird and seabird nesting areas
- Discharge of any equipment or miscellaneous items is prohibited
- Discharge of wastewater that contain floating solids, debris, sludge, deposits foam, scum, or other residues which cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; or cause a sludge solid or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shoreline, except for incidental foam and scum produced by the discharge of seafood catch transfer water is prohibited. The State is considering authorizing a small mixing zone for solids within the water column. While there is adequate tidal and wave action to disperse the seafood solids there will be solids within the water column as dispersion is occurring. The mixing zone is needed to allow adequate time for the wave and tidal action to fully disperse all of the solids. In essence the mixing zone is formally

recognizing that seafood residues will occur within the water column to some degree as dispersion is occurring.

- Discharge of oil and grease that causes a film, sheen, or discoloration on the water is prohibited.

Westward Wind

The Westward Wind is a 281.4 foot floating seafood processor. This facility processes opilio, bairdi, blue king, red king crab from January through April 30th in the Pribilof Islands. This vessel engages in catching, procuring, and processing crab. Processing includes all aspects of butchering, cleaning, freezing, packing, and transporting of crab product.

Some of the permit limitations and conditions in the permit are as follows:

- Discharge may occur from January to May 5th each year and is limited to processing and discharging crab and associated wastes
- Crab waste must be ground to ½ inch prior to discharge
- Volume of crab waste cannot exceed 28,500 lbs/day
- Permit contains effluent limits for ammonia, chlorine, and pH
- Effluent monitoring requirements for chlorine, ammonia, pH, oil and grease, BOD, TSS, arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver, and zinc
- Monitoring requirements for waste conveyor system, grinder system, outfall,
- Sea surface/shoreline and biological monitoring
- Surface water monitoring requirements for chlorine, ammonia, pH, oil and grease, BOD, TSS, salinity, arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver, and zinc
- The permit prohibits a discharge within 3 nautical mile (nm) of Walrus Island, within ½ nm of Sea Lion Rock and Northeast Point on St. Paul Island, Within ½ nm of Dalnoi Point and South Rookery on St. George Island, and within ½ nm of the Alaska Maritime National Wildlife Refuge.
- Starting May 1st the permit prohibits discharge with ½ nm of land owned and/or managed by the National Marine fisheries Service for the protection of northern fur seal rookeries and haulout areas, and within ½ nm of land owned and/or managed by the U.S. Fish and Wildlife Service for the protection of seabird and seabird nesting areas
- Discharge of any equipment or miscellaneous items is prohibited
- Discharge of wastewater that contain floating solids, debris, sludge, deposits foam, scum, or other residues which cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; or cause a sludge solid or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shoreline, except for incidental foam and scum produced by the discharge of seafood catch transfer water is prohibited. The State is considering authorizing a small mixing zone for solids within the water column. While there is adequate tidal and wave action to disperse the seafood solids there will be solids within the water column as dispersion is occurring. The mixing zone is needed to allow adequate time for the wave and tidal action to fully disperse all of the solids. In essence the mixing zone is formally recognizing that seafood residues will occur within the water column to some degree as dispersion is occurring.

- Discharge of oil and grease that causes a film, sheen, or discoloration on the water is prohibited.

Arctic Star

The Arctic Star is a floating seafood processor moored in St. Paul Island harbor. Crab harvesting vessels offload their catch by brailer while moored alongside the Arctic Star. The crab are butchered, washed, packed, cooked, frozen and boxed onboard the Arctic Star. Finished product is offloaded to 40 foot refrigerated containers on the beach and then stored in an offsite area maintained by the shipping company(s). When the crab season is finished the Arctic Star leaves the harbor and processes in other areas of Alaska.

The facility discharges though two outfalls. Seafood processing waste, from processing Opilio crab, is discharged through outfall 001 which is a stationary outfall located approximately 920 feet offshore in the Bering Sea, and condenser cooling water is discharged through Outfall 002 which is located in St. Paul Harbor.

Some of the permit limitations and conditions in the permit are as follows:

- Discharge may occur from January to April 30th each year and is limited to processing and discharging crab and associated wastes
- Crab waste must be ground to ½ inch prior to discharge
- Volume of crab waste cannot exceed 65,000 lbs/day
- Permit contains effluent limits for ammonia, chlorine, and pH
- Increased effluent monitoring requirements for chlorine, ammonia, pH, oil and grease, BOD, TSS, arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver, and zinc
- Monitoring requirements for waste conveyor system, grinder system, outfall
- Monitoring of seafloor
- Sea surface/shoreline and biological monitoring
- Surface water monitoring requirements for chlorine, ammonia, pH, oil and grease, BOD, TSS, salinity, arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver, and zinc
- Discharge from a failed or leaking outfall is prohibited
- Discharge of any equipment or miscellaneous items is prohibited
- Discharge of wastewater that contain floating solids, debris, sludge, deposits foam, scum, or other residues which cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; or cause a sludge solid or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shoreline, except for incidental foam and scum produced by the discharge of seafood catch transfer water is prohibited. The State is considering authorizing a small mixing zone for solids within the water column. While there is adequate tidal and wave action to disperse the seafood solids there will be solids within the water column as dispersion is occurring. The mixing zone is needed to allow adequate time for the wave and tidal action to fully disperse all of the solids. In essence the mixing zone is formally recognizing that seafood residues will occur within the water column to some degree as dispersion is occurring.
- Discharge of oil and grease that causes a film, sheen, or discoloration on the water is prohibited.

<u>Trident Seafood</u>

The Trident Seafood Corporation is a seafood processing facility located on St. Paul Island. The facility discharges seafood processing wastes though stationary outfall 001 located in the Bering Sea. The facility also discharges live tank water to St. Paul Harbor through outfall 002. From 1996 through 1999 the facility primarily discharged Opilio crab waste and some halibut wastes. In 2001 the facility also started discharging cod waste, and in 2003 the facility started discharging red king crab waste. Additionally, since 1999 the production of halibut has increased significantly.

Some of the permit limitations and conditions in the permit are as follows:

- Discharge of waste may occur from December to April 30th each year through outfall 001 and is limited to processing and discharging crab and associated wastes.
- Discharge of halibut waste in the summer must occur at an ocean dumping site 7 miles west of St. Paul Island. Discharge of associated waste*water* may occur through Outfall 001
- Crab and halibut waste must be ground to ½ inch prior to discharge

- Volume of crab waste cannot exceed 180,000 lbs/day
- Permit contains effluent limits for ammonia, chlorine, and pH
- Increased effluent monitoring requirements for chlorine, ammonia, pH, oil and grease, BOD, TSS, arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver, and zinc
- Monitoring requirements for waste conveyor system, grinder system, outfall
- Monitoring of seafloor is required
- Sea surface/shoreline and biological monitoring
- Surface water monitoring requirements for chlorine, ammonia, pH, oil and grease, BOD, TSS, salinity, arsenic, copper, cadmium, lead, mercury, nickel, selenium, silver, and zinc
- Discharge from a failed or leaking outfall is prohibited
- Discharge of any equipment or miscellaneous items is prohibited
- Discharge of wastewater that contain floating solids, debris, sludge, deposits foam, scum, or other residues which cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; or cause a sludge solid or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shoreline, except for incidental foam and scum produced by the discharge of seafood catch transfer water is prohibited. The State is considering authorizing a small mixing zone for solids within the water column. While there is adequate tidal and wave action to disperse the seafood solids there will be solids within the water column as dispersion is occurring. The mixing zone is needed to allow adequate time for the wave and tidal action to fully disperse all of the solids. In essence the mixing zone is formally recognizing that seafood residues will occur within the water column to some degree as dispersion is occurring.
- Discharge of oil and grease that causes a film, sheen, or discoloration on the water is prohibited

1.4 Overview of Report

This evaluation focuses on sources, fate, and potential effects of seafood processing discharges (and the existing domestic wastewater discharges from St. Paul Island) on various groups of aquatic life in the receiving water. The types and quantities of discharges are detailed in Section 2 of this document. Anticipated amounts or volumes of wastes and measured concentrations are also summarized. The fate, transport, and persistence of the wastes is examined in Section 3, which summarizes previous seafood waste solid deposition modeling (EPA 1995a) and discusses the results of seafloor and beach monitoring programs.

Before discussing potential biological and ecological effects, an overview of aquatic communities and important species is presented in Section 4. The means by which discharges could impact marine life, the concentrations at which effects have been documented, and the compliance of expected seafood discharges and discharges from the St. Paul wastewater treatment facilities with federal and state water quality criteria are presented in Section 5. Section 6 summarizes the biological evaluation of potential impacts to endangered and threatened species (EPA 2008) required by the Endangered Species Act. Particularly important uses and plans for the permit area, including commercial, recreational and subsistence harvests, special aquatic sites, and coastal zone management plans, are discussed in Sections 7 and 8. Section 9 summarizes the findings of this report and Section 10 presents recommendations for continued monitoring of seafood waste discharges in the proposed permit area.

SECTION 2. CHARACTER AND QUANTITY OF MATERIAL DISCHARGED

The determination of "unreasonable degradation" of the marine environment is to be based on the 10 criteria listed in Section 1. The following section provides information pertinent for the consideration of the Ocean Discharge Criterion listed below:

- Criterion #1: The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged.

<u>Seafood processing facilities:</u>

Discharges from seafood processing facilities may be classified into solid and dissolved (or particulate and soluble) wastes. Solid wastes consist primarily of unused portions of fish and shellfish that have been processed. The unused portions of processed raw fish and shellfish can include heads, skin, scales, viscera, fins, and shells discarded during cleaning and butchering operations. Dissolved wastes can include soluble organic matter and nutrients leached from fish and shellfish tissues during processing. The dissolved wastes may also include disinfectants used to maintain sanitary conditions in compliance with requirements for the production of food for human consumption. The solid and liquid wastes have the potential to adversely affect the marine environment.

<u>Domestic wastewater system:</u>

The St. Paul wastewater treatment facility discharges primary treated domestic wastewater from residential homes, businesses and shore-based processors in close proximity to the Trident Seafood and Arctic Star outfalls. EPA is not re-issuing a permit to this facility at this time, however because the outfalls are so close to each other, it is important to assess the effects of each of the discharges. The outfalls are located on the south eastern shore of St. Paul Island in a small bay between Kitovi point and a man-made structure known as East Landing. It is in a shallow water area, with a large cobble and rock bottom interspersed with sand. This area experiences heavy wave and swell action year round. The distance from the shore to the end of the outfall pipes is approximately 920 feet at MLLW. The depth of the outfall at MLLW is 31 feet. The three outfalls are within 30 – 40 feet of each other.

The character and quantity of wastewater discharged in the vicinity of the Pribilof Islands is assessed below.

2.1 Introduction

This section provides a summary of available data on the character and quantity of wastewater discharged by facilities operating in the area covered under the Pribilof Seafood Processors General NPDES Permit. Data evaluation focuses on production reports, and monitoring reports submitted by processors for the period of 1999 through 2007.

The following discusses characteristics of wastewater that allow for an assessment of the potential effects of the discharge on receiving water quality and biological communities (Section 5).

<u>Seafood processing facilities:</u>

Seafood processing in the Pribilof Islands is conducted in a variety of locations and under a variety of conditions. Processors in the Pribilof general permit area are categorized as shore-based or mobile facilities depending on the mode of discharge. Shore-based facilities are those facilities that discharge via existing submerged, stationary outfalls. These facilities include onshore processing facilities and floating vessels and barges that moor in the harbors and discharge through the existing outfalls. When the Pribilof general permit was issued in 1999 there were five seafood processors covered under the General Permit which were considered shore-based facilities. These included three processors discharging through three separate outfalls located off East Landing on St. Paul Island:

- Trident Seafoods - AKG527707
- the Barge Unisea (UniSea, Inc.) - AKG527701
- the P/B Arctic Star (Icicle Seafoods, Inc.) – AKG527703

There were also two processors sharing one outfall in Zapadni Bay on St. George Island:

- the M/V Blue Wave (Seven Seas Fishing Co.) –AKG527704
- the M/V Snopac (Snopac Products, Inc.) – AKG527705

Of these five facilities only Trident and Arctic Star continue to operate. The Barge Unisea was dismantled, and the harbor in Zapadni Bay was damaged by a storm in 2000, and large floating processors (i.e., Blue Wave, and Snopac) no longer have access to this area.

Under the 1999 general permit mobile processing facilities may operate in offshore waters within 3 nmi of St. Paul, St. George, and Otter Islands and Sea Lion Rock. Eight offshore processors filed Notices of Intent (NOIs) with EPA for coverage under the Pribilof Seafood Processors Genera1 NPDES Permit. These include:

- M/V Omnisea (UniSea, Inc.) – AKG527715
- M/V Stellar Sea (Stellar Seafoods, Inc.) – AKG527707
- M/V Sea Alaska (Trident Seafoods Corporation) – AK527708
- M/V Alaska Packer (Trident Seafoods Corporation) – AKG527709
- M/V Independence (Trident Seafoods Corporation, Inc.) – AKG527710
- P/V Aleutian Falcon (NorQuest Seafoods, Inc.) – AKG527711
- P/V Coastal Star (Icicle Seafoods, Inc) – AKG527713
- Blue Dutch (Blue Dutch LLC) – AK527722

In addition to the above, the vessel Westward Wind, operated by Yardarm Knots Fisheries, LLC operated in the Pribilof Islands in 2006 and 2007. In 1996 through 1998 there were 7 additional mobile processors operating in the area (M/V Tempest (Trident Seafoods Corporation, Inc.; M/V Bountiful (Trident Seafoods Corporation, Inc.), M/V Yardarm Knot (Yak Inc.), M/V Galaxy (Dutch Harbor Seafoods, Inc.), M/V Alaskan 1 (Dragnet Fisheries Co. Inc.), P/V Northland (Northland Fisheries, Inc.), F/V Mister B (South Atlantic Fisheries LLC)).

Domestic wastewater system:

The St. Paul domestic wastewater system is currently covered under the 1999 general permit.

The following sections describe: (l) the general season and the locations of significant processing activity, (2) a brief overview of the processing or treatment procedures at the facilities and the wastes they produce, and (3) available data on Pribilof Islands facilities covered under the general NPDES permit.

2.2 Seasonality and Locations of Activities

Seafood processing facilities:

The quantity and character of the seafood wastes generated within 3 nautical miles of the Pribilof Islands vary considerably over the course of a year due to the distribution of exploitable finfish and shellfish stocks, seasonal variation in their abundance, and the openings and closings of fishing seasons (see Tables 1.1 through 1.4). The primary fisheries that has support seafood processing operations in the Pribilof Is1ands include several species of crab (opilio Tanner crab [*Chionoecetes opilio*], bairdi Tanner crab [*Chionoecetes bairdi*], red and blue king crab [*Paralithoides* sp.], and Korean hair crab [*Erimacrus isenbeckii*]), sea snails (*Neptunea pribilofensis*), Pacific halibut (*Hippoglossus stenolepis*), and Pacific cod (*Gadus macrocephalus*). The following discussion describes harvest seasons of the primary species as they relate to processing activities in the Pribilof Islands permit area.

Shellfish Fisheries. According to the monthly discharge monitoring reports for 1999, crab processing accounted for approximately 99 percent of the annual processing activity (raw product weight) and 99 percent of the annual discharge (by weight) in the Pribilof Islands permit area in 1999. Since 1999 the crab fisheries are primarily for opilio Tanner crab, and some very small amounts of King, and Bairdi crab. Since 1999, crab processing has declined and finfish processing has increased. From 2000 – 2006 crab processing has accounted for 58 – 89 percent of the annual processing activity (raw product weight) and 54-96 percent of the annual seafood discharge (by weight).

The Crab fishing seasons vary depending on the species (see Figure 4). The season for opilio Tanner crab begins mid-January and can last through May. The season for red and blue king crab begins September 15 and can last through November. The season for bairdi Tanner crab normally begins on November 1 and may last through December. However, the bairdi Tanner crab fishing season was closed since 1997 and no bairdi Tanner crab processing occurred except for January through March 2006. The season for Korean hair crab generally begins in October and may last through December. However, no Korean hair crab was processed in the Pribilofs.

Snail harvesting is managed by a permit system administered by Alaska Department of Fish and Game. Harvesting is permitted throughout the year, but the fishery generally occurs during summer months (Figure 4). No sea snails processing was reported on the 1999-2007 discharge monitoring reports.

Finfish Fishery. The fishery for Pacific halibut is generally conducted in offshore waters. The halibut fishery in the Pribilof Islands is managed according to community development quotas (CDQs) designed to provide special economic benefits to resident fishers. The halibut fishing season begins on March 15 and extends until either the regulatory area catch limits are met or November 15, whichever date arrives first (Figure 4). Halibut fishery regulations require that the gills and entrails of the fish must be removed prior to offloading at a processing facility. Therefore, some processing of the fish generally occurs at sea. Since 2000, halibut has accounted for 8-13 percent of the annual processing activity (raw product weight) and 3-9 percent of the annual discharge (by weight).

The Pacific cod season begins on the first of January and continues through the year unless the fishery is closed because harvest or bycatch quotas have been reached. Recent discharge monitoring reports indicated that most processing occurs during January through March, with some processing occurring in September. Since 2000, cod has accounted for 7-26 percent of the annual processing activity (raw product weight) and 12-43 percent of the annual discharge (by weight).

Domestic wastewater system:

Both the quantity and quality of discharge may vary through the year depending on sources from seafood processing facilities. No process flow data are currently available from individual discharges and therefore the effects of seasonality on the quantity of discharge cannot be evaluated. Quality of discharge does not appear to have a seasonal trend as discussed in more detail in Section 5. Because the St. Paul facility is a land-based facility, the discharge location does not change as it does with mobile seafood processing facilities.

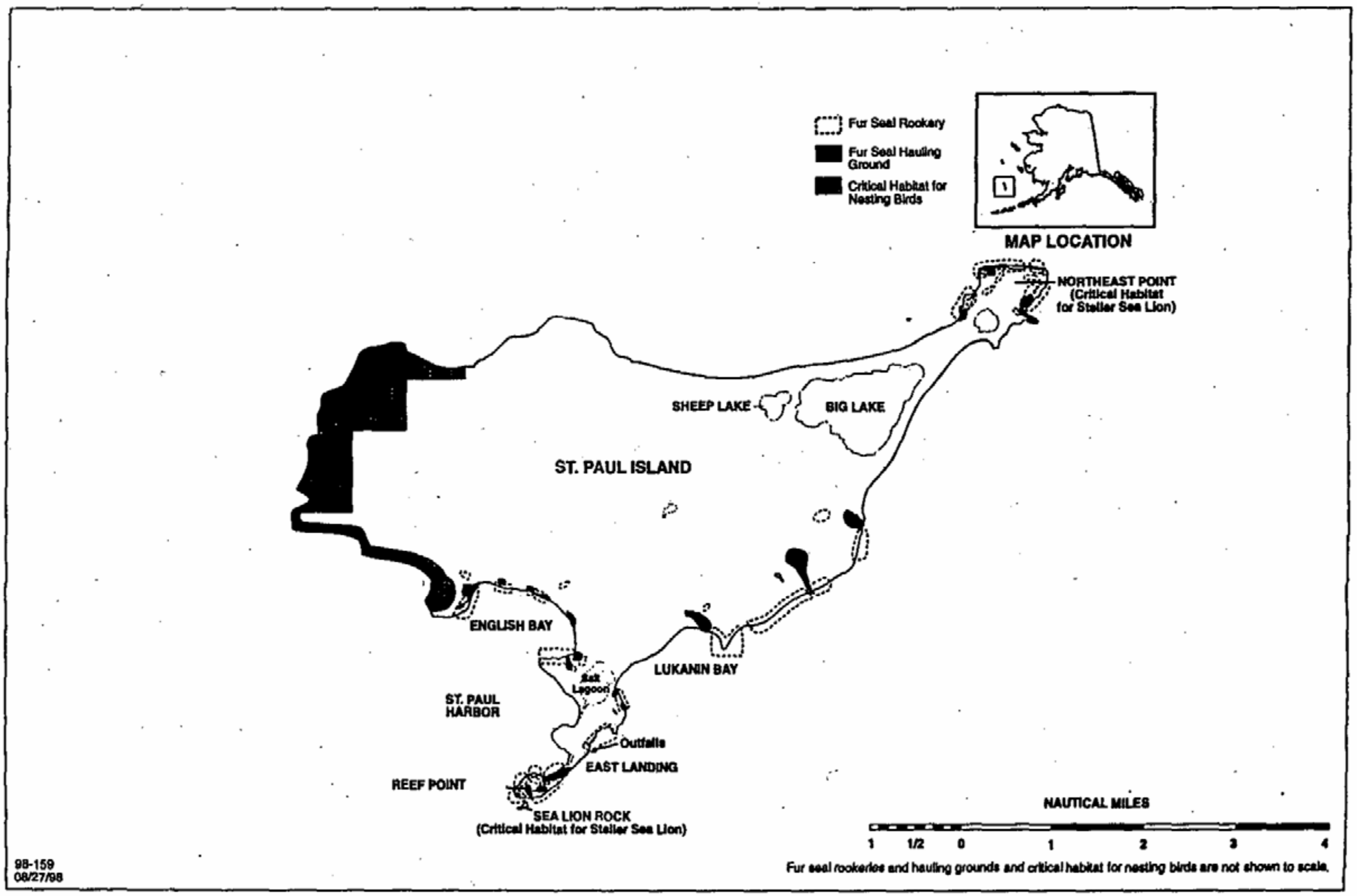

Figure 2. St. Paul Island including Protected Marine Mammal and Seabird Habitats

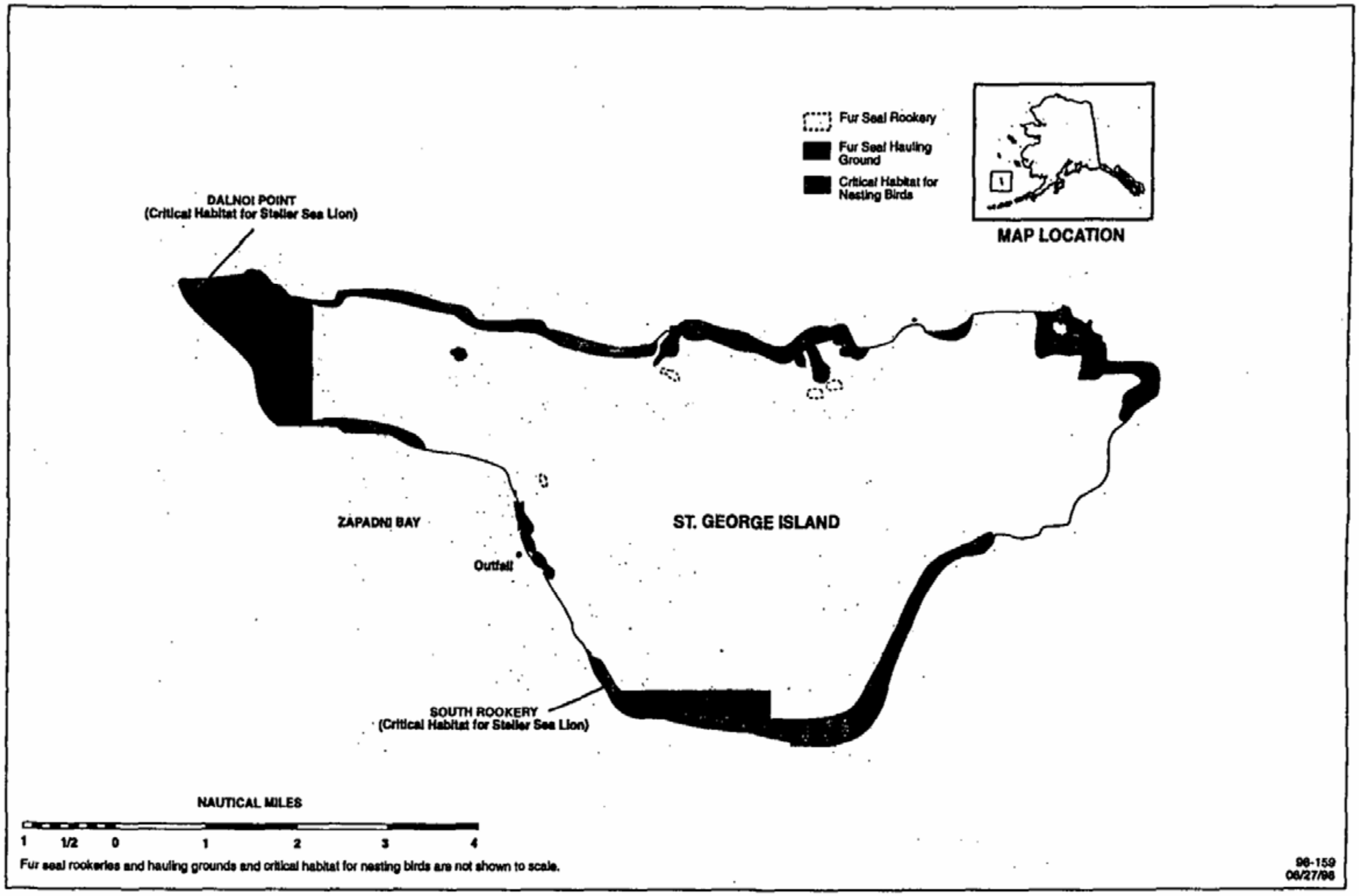

Figure 3. St. George Island including Protected Marine Mammal and Seabird Habitats

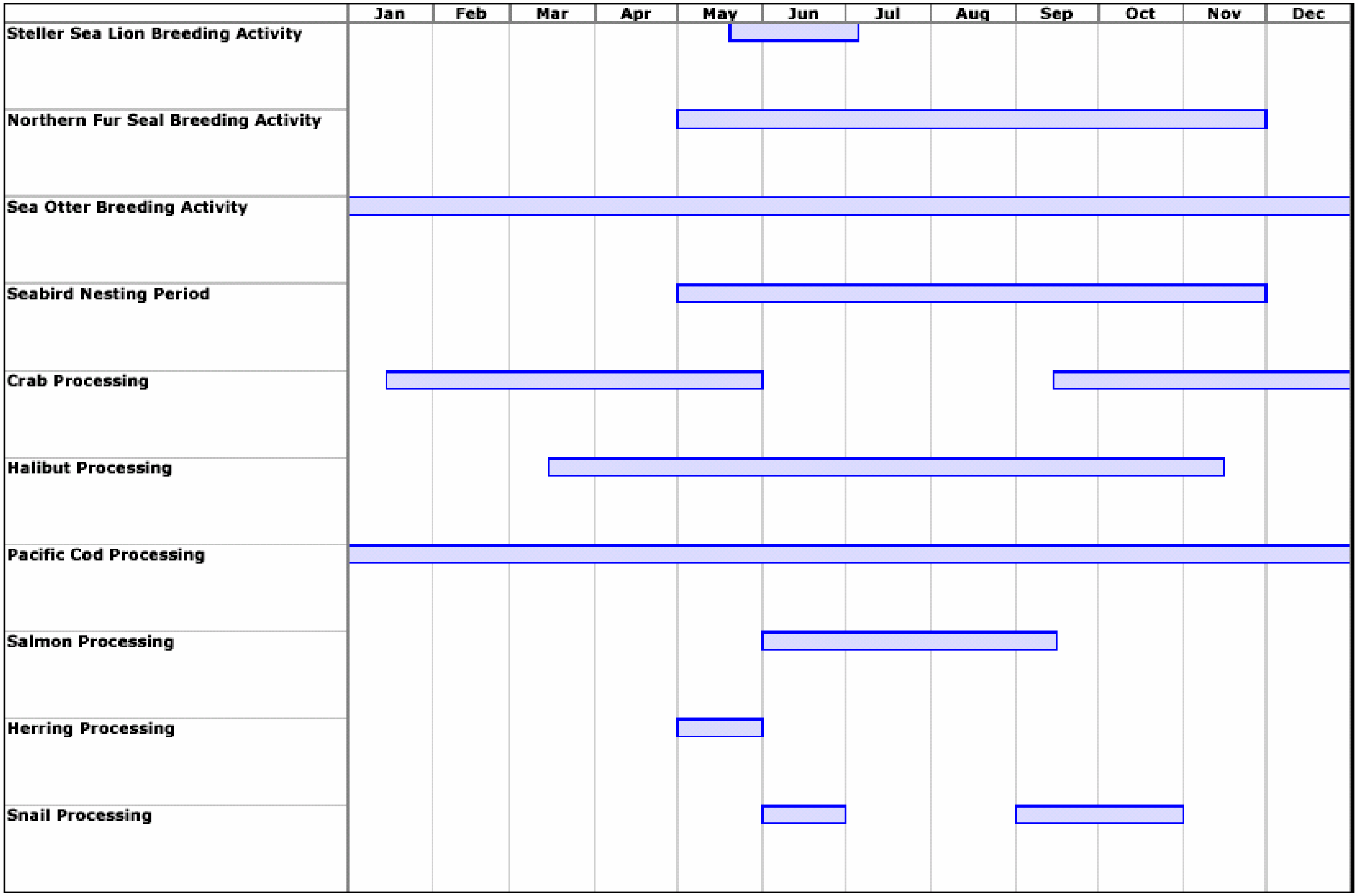

Figure 4. Critical Breeding and Nesting Periods and Seafood Processing Activities.

2.3 Quantity of Waste Discharges from Existing Facilities in the Pribilof Islands

Seafood processing facilities:

The amount of raw seafood product and waste product discharged are presented in Tables 1.1 through 1.22. Table 1.1 presents the amounts of seafood waste discharged by the facilities on St. Paul Island from 1996 through 2007, Table 1.2. presents the amount of seafood waste discharged by facilities on St. George Island from 1996 through 2007, and Table 1.3 presents the amount of seafood waste discharged by mobile processors from 1996 through 2007. Tables 1.4 through 1.22 present the amount of raw seafood product and waste discharged by each facility that operated in the area. The general permit also requires a mobile facility to keep records of the specific location and name of the receiving water that they discharge to for each new processing location.

Table 1.1 Summary of the Waste Discharges from Shore based Facilities on St. Paul Island

Year	Opolio waste discharge	Halibut waste discharge	Pacific Cod waste discharge
1996	4,447,934	40,000	0
1997	6,082,231	39,000	0
1998	14,027,004	See note 1	0
1999	16,475,265	91,233	0
2000	1,624,220	142,286	0
2001	2,302,013	151,711	2,343,236
2002	3,193,769	126,382	1,767,267
2003	1,866,810	288,140	1,116,845
2004	1,699,054	201,606	854,447
2005	2,055,838	339,191	1,229,218
2006	2,478,943	406,500	662,609
2007	0	406,500	0

Table 1.2 Summary of the Waste Discharges from Shore based Facilities on St. George Island

Year	Opolio waste discharge	Halibut waste discharge	Pacific Cod waste discharge
1996	1,835,085	0	0
1997	4,442,420	0	0
1998	8,307,396	0	0
1999	6,016,784	0	0
2000	733,711	0	0
2001	0	0	0
2002	0	0	0
2003	0	0	0
2004	0	0	0
2005	0	0	0
2006	0	0	0
2007	0	0	0

Table 1.3 Summary of the Waste Discharges from Mobile Processors

Year	Opolio waste discharge	Halibut waste discharge	Pacific Cod waste discharge
1996	5,796,185	0	0
1997	2,285,513	0	0
1998	2,999,572	0	0
1999	11,094,879	0	0
2000	1,273,795	0	0
2001	684,251	0	0
2002	806,353	0	0
2003	1,027,289	0	0
2004	930,609	0	0
2005	645,856	0	0
2006	2,046,490	0	0
2007	4,627,662	0	0

Table 1.4. Summary of Production and Discharges in the Pribilof Islands General Permit Area from 1996 through June 2007

Year	Opolio Crab		Halibut		Pacific Cod	
	Raw Product	Waste Product	Raw Product	Waste Product	Raw Product	Waste Product
1996[1]	34,172,080	12,079,213	---	40,000	0	0
1997[1]	37,051,967	12,810,164	---	39,000	0	0
1998[1]	68,757,874	25,333,972	---	---	---	---
1999	90,621,800	33,586,928	863,220	91,233	0	0
2000	11,190,599	3,631,726	1,273,285	142,286	0	0
2001	8,115,582	2,950,264	1,379,188	151,711	3,382,545	2,343,236
2002	10,329,598	4,353,690	1,137,097	126,382	2,692,722	1,767,267
2003	7,328,536	2,635,973	1,130,077	288,140	1,668,343	1,116,845
2004	6,896,784	2,618,837	964,777	281,5976	1,837,756	854,447
2005	7,416,016	2,701,694	1,856,580	339,191	2,107,255	1,229,218
2006	14,672,775	4,942,199	1,386,726	406,500	1,129,688	662,609
2007	11,748,839	4,174,860	1,144,958	406,500	0	0
1. Information is from the *Ocean Discharge Criteria Evaluation for the Proposed Pribilof Islands Seafood Processing General NPDES Permit*, August 1998.						

Shore-based processors. Seafood processors typically estimate and report discharge quantities based on known product recovery rates. Shellfish solid waste was discharged to Zapadni Bay, St. George Island in 1999 and 2000 only. After 2000, processing ships could not enter the harbor because of storm damage. In 1999, 6 million pounds of shellfish was discharged to Zapadni Bay, and in 2000, 0.7 million pounds of shellfish waste was discharged to Zapadni Bay.

The tota1 reported amount of seafood solid waste discharged from the St. Paul shore-based facilities from 1999 through 2007 ranged from 0.4 million pounds in 2007 to 16.2 million pounds in 1999. The reported amount of halibut and cod processing wastes from the St. Paul shore-based facilities ranged from 0.1 to 2.5 million pounds from 1999 through 2007. The maximum amount of fish discharge was reported in 2001, where 2.5 million pounds of fish waste, associated with cod and halibut processing was discharged. Approximately 2.3 million pounds was discharged over a one month period.

Mobile processors. The reported amount of crab processing wastes discharged during 1999-2007 ranged from 0.64 to 11.1 million pounds per year. The highest discharges occurred in 1999. No finfish processing was reported by the mobile processors for the period evaluated (1999-2007).

A summary of the amount of Opolio, halibut, and cod waste product discharged is summarized in Table 1.4, above. As can be seen from this table 1999 had the highest amounts of shellfish waste discharge (33,586,928 lbs). In 2001, Trident started processing and discharging cod waste. The highest amount of cod waste discharged was in 2001, however, as can be seen from the tables above, cod waste has become a significant amount of the waste discharge at St. Paul Island. This is a concern because this outfall discharges waste in very close proximity to the St. Paul wastewater discharge (primary treated effluent), the outfall is less than one half mile from the stellar sea lion haul out area which are protected areas, and the outfall is located in designated critical habitat area for the Northern fur seal.

Domestic wastewater system:

Effluent discharge rates (i.e. flow data) from the St. Paul system are not available and thus no mass loading data is available. However, the daily average and maximum flow indicated in the most recent NOI were 180,000 and 300,000 gallons/day.

2.4 Processing Techniques and Treatment Procedures

Seafood processing facilities:

Seafood processing facilities use a variety of techniques and equipment to produce marketable seafood products. Detailed descriptions of specific seafood processing facilities (e.g., crab and finfish processing) are provided in EPA (1975) and Swanson et al. (1980). In the Pribilof Islands, the material remaining after processing (e.g., crab shells, viscera, and other waste portions of shellfish and fish) is ground and discharged as a mixture of solid and liquid waste. The processes involved in the production of marketable seafood products range from packaging whole fresh or frozen seafood for shipment, which produces relatively little solid or liquid waste, to sectioning, and cooking processes that produce relatively large quantities of solid and liquid waste.

Some equipment used in the processing areas (i.e., rubber gloves, earplugs) can also be inadvertently washed into sumps during washdown and discharged along with processing wastes. Due to reports of gloves, earplugs, and rubber packing bands deposited on shorelines in the vicinity of seafood processing activity on St. Paul Island (NMFS 1994), the discharge of the above mentioned items, or any other equipment, via the seafood waste discharge system is prohibited in the proposed permit.

Because seafood processing facilities use a variety of processing techniques that have a direct bearing on the quality and quantity of liquid and solid waste produced, a brief overview of the types of seafood products produced is warranted. This overview includes a description of the products produced and the recovery ranges for these products which provide an indication of the amount of solid waste produced during processing. Product types and yields were obtained from monthly reports submitted to EPA. These data provide average or expected recovery ranges for fish and shellfish processed under ideal conditions. A brief overview of the seafood processes that affect the quantity and quality of liquid wastes generated during processing is also provided.

Shellfish processing. "Shellfish" is used here as a general category that includes several species of crabs and sea snails. Crab processing generally results in raw or cooked crab. The crabs may be cooked whole or in sections resulting in recoveries ranging from 58 to 69 percent, depending on the species processed. The meat may also be separated from the shell, producing additional waste. The production of cooked meat results in a recovery of 17-25 percent depending on the species processed (Crapo et al 1993).

The recovery of marketable products from snails is generally low (typically less than 30 percent) because the heavy shells from these animals are typically discarded (Crapo et al. 1993). However, shell wastes from these species are not typically ground and discharged through the waste handling system of the processing facility. Shell wastes generated at shore-based facilities in the Pribilofs are barged offshore and disposed of at sea. Few data are available on the recovery of products from the raw meat of these organisms excluding the shell. Estimates of the recovery of finished product from shucked snail meat reported in one quarterly production report from the 1996 permit for a Pribilof Islands processor indicated an 80 percent recovery.

Finfish Processing. Whole fish may first be scaled mechanically or by hand before further processing. Pacific halibut products include dressed fish with the head on or off. According to the 1999-2006 monthly report, yields for these products range from 71 to 88 percent. Cod, when processed, are typically gutted, or headed and gutted, with recoveries typically between 30-42%. The reported herring recovery rate was 100 percent.

Treatment of solid and liquid wastes. As mentioned in Section 1.2.1, the permit authorizes seafood processing facilities to discharge various types of wastewater to the specified areas. Wastewaters that come into contact with processing wastes such as washdown water, floor drain and scupper water, and scrubber water must be discharged through the permitted waste handling system. Washdown and scrubber waters carry soluble organic wastes such as blood and other soluble fats, proteins, and carbohydrates. The amount of soluble organic wastes dissolved in the washdown and scrubber waters depends on (1) the processing method, and (2) the contact time of the water with the tissue particles. Disinfectants and detergents may be added to these waters to facilitate the removal of wastes and to maintain sanitary standards during production. The disinfectants that may be used to sanitize seafood processing areas include hypochlorite solutions (chlorine-based solutions), iodophor solutions (iodine-based solutions), and quaternary ammonium chloride solutions (chlorine- and ammonium-based solutions). The discharge of residual amounts of process disinfectants used to sanitize seafood processing areas is permitted.

Wastewaters that have not contacted seafood processing wastes is not required by the permit to be discharged through the permitted waste handling system and outfall. Solid wastes must be ground to 0.5 inch or smaller in any dimension prior to discharge. Domestic wastewater discharges must be treated by certified and operable Type I and Type II Marine Sanitation Devices, or discharge to a permitted municipal wastewater treatment system.

<u>Domestic wastewater system:</u>

Sources of domestic wastewater to the City of St. Paul wastewater treatment plant include residential single and multi family homes, and businesses from the City of St. Paul, and domestic waste from shore processors. Wastewater is collected and treated by flowing through a series of septic tanks (Figure 5) where solids are settled out and the wastewater is discharged through one of the stationary outfall at East Landing. Sludge is annually pumped from these septic tanks and disposed of at the landfill. The city's outfall line is within 30 to 60 feet of the stationary outfall lines of Trident Seafood, and the Arctic Star. The city's wastewater potentially commingles with seafood processing wastes from the Trident and Arctic Star outfall lines during periods when the seafood processors are operating.

The results of sampling and testing of the city's discharge (before commingling) indicate that there is approximately a 20% removal of Biochemical Oxygen Demand (BOD) and Total Suspended Solids (TSS) (EPA 1998c).

Section 301(H) of the CWA provides for variances from secondary treatment standards for publicly owned treatment works that discharge into marine waters if the modified requirements do not interfere with the attainment or maintenance of water quality.

2.5 Summary

Generally speaking, the timing and location of mobile seafood processing activity determine the timing and location of seafood processing activity. The characteristics of seafood processing effluent are dependent on several factors, including the time of year, the species being processed, the type of product, and the production machinery utilized at the facility. Available monthly reports generally suggest that crab processing has diminished since 1999 and that there are no discharges in the St. George Island area.

The quantity and characteristics of St. Paul's wastewaters may be dependent on seafood processing activities as their discharge is commingled with seafood processing wastes and wastewater during periods when the seafood processors operate. Moreover, it is assumed that some of the domestic wastes originate from the seafood processing workers themselves. However since effluent flow data from the St. Paul system is not available, no mass loading data is available and seasonality can only be evaluated by comparing quality of effluent discharge instead of quantity.

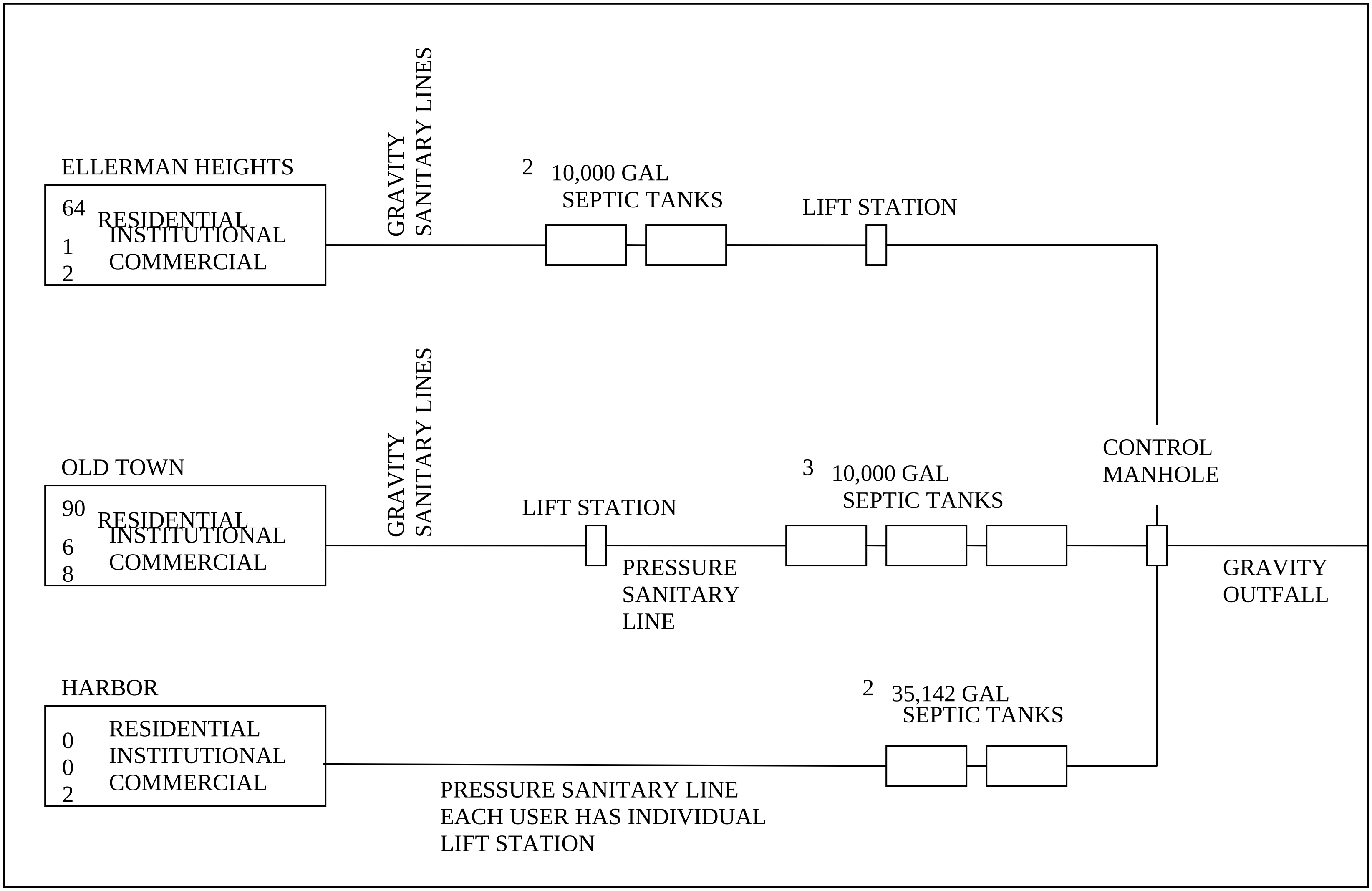

Figure 5. City of St. Paul Sewer Utility Process Flow Diagram

SECTION 3. TRANSPORT, FATE, AND PERSISTENCE OF MATERIALS DISCHARGED

3.1 Physical Oceanographic Characteristics of the Receiving Water

Significant physical oceanographic characteristics to consider include water temperature, density stratification, and water circulation in the vicinity of seafood processing discharges. The Pribilofs are a group of volcanic islands located in the northwest portion of the southeastern Bering Sea shelf near the 100 m (330 ft) isobath. The southeast Bering Sea is covered by a broad, shallow shelf, with the shelf break located in approximately 170 m (560 ft) of water. Significant seasonal variations in water temperature and density structure occur in the southeastern Bering Sea. These changes are influenced by the seasonal advance and retreat of ice cover in winter and spring. During winter, waters of the Bering Sea shelf are vertically uniform in temperature and salinity. The melting and retreat of sea ice and the input of freshwater from continental rivers during spring result in the development of three distinct hydrographic domains in the southeastern Bering Sea (Kinder and Schumacher 1981a). This hydrographic structure strongly influences the distribution of biological communities along the southeastern Bering Sea shelf (see Section 4). Much of the circulation energy over the shelf is derived from tidal currents, although the mean current, speed and direction over the middle shelf southeast of the Pribilof Islands are generally low (1-5 cm/sec [0.02-0.1 kn] and to the west (Kinder and Schumacher 1981b).

Although oceanographic studies have focused on many physical aspects of the Bering Sea, limited studies have been conducted on the nearshore coastal waters of the Pribilof Islands. However, studies suggest the presence of a hydrographic front around St. Paul and "trapped" circulation around St. Paul and St. George Islands (Stabeno and Schumacher 1997). Structure fronts result in unstratified nearshore waters and present a hydrographic barrier to exchange between nearshore and offshore waters. Salinity and temperature measurements made by personnel from the Auke Bay Laboratory indicate that nearshore waters off East Landing in St. Paul were unstratified in November 1993 and May 1994.

Water circulation results in the advection or transport of discharged wastewater, and when bottom currents (or wind-induced waves) are strong enough, solid wastes that have settled on the bottom may be resuspended and transported away from the discharge. Water circulation occurs through wind- and tidally-driven currents. The amount of wind-, wave-, and tidally-induced circulation will vary seasonally, and tidally-induced currents will vary over the course of the day. Wind-driven circulation most strongly influences circulation patterns during winter storms that frequent the Bering Sea, although storms also occur during summer months.

In the Pribilof Islands the tide range and tidal currents are generally lower than in other regions of Alaska. The mean diurnal tide range in St. Paul and St. George is 1.0 m (3.3 ft) (National Ocean Service 1994a). The predicted maximum tidal current speed between St. Paul and St. George Island is 0.31 m/sec (0.6 kn). However, maximum tidal currents as high as 1.5 m/sec (3 kn) have been reported in the vicinity of St. Paul Island (National Ocean Service 1994b).

In addition to tidal currents, wind-, and wave- induced bottom currents along the coast may also be significant, especially during heavy winter storms. Wind records collected at St Paul (October 1992-September 1993) indicate wind speeds of 10 to 20 mph (9-17 kn) occurring in all months from almost all quadrants. Wind speeds greater than 20 mph (17 kn) were recorded in October through January. For exposures to winds from the west and south (i.e., exposure of Zapadni Bay in St George and East Landing in St Paul to winds), the calmest months appear to be March through June.

Long-period waves generated by large offshore storms would induce the highest bottom currents that could resuspend and transport deposited seafood waste solids. A summary of long term (1963-1970) observations of waves offshore of the Pribilof Islands indicates wave heights greater than 7.9 m (26 ft) occur, albeit infrequently. However, waves 2.1 to 3.7 m (7-12 ft) high occur frequently. During extreme winter conditions, wave heights exceeding 2.3 m (7.5 ft) are predicted to occur over 50 percent of the time (U.S. ACOE 1988). Over the course of the year, wave heights are predicted to exceed 0.7 m (2.4 ft) 50 percent of the time with wave periods ranging from 5.5 to 14 seconds.

Seafood processing operations that occur at a fixed position (i.e., shore-based processors) generally operate in locations that are relatively protected so that fishing and supply vessels can easily dock and transfer catch or load finished products. Shore-based discharges would be the most likely to result in the accumulation of solid waste on the bottom in the vicinity of the discharge.

3.2 Summary of Conceptual Model of the Fate, Transport, and Persistence of Seafood Processing Wastes

A conceptual model of the fate, transport, and persistence of seafood processing waste was developed as part of the ODCE for the 1996 interim Pribilof Islands seafood processing permit (EPA 1995a). EPA (1995a) used a mathematical model to simulate the discharge and accumulation of solid waste from discharges near the bottom from shore-based facilities. Current speeds of 1, 5, 15 and 30 cm/sec were simulated. The model predicted that waste piles of at least 1.7 cm (0.7 inches) deep over a 324 m^2 (0.08 acre) area would result after 30 days of steady discharge at a rate of 25,000 pounds of seafood solid waste per month under conditions of the highest modeled current speed (30 cm/sec [0.6 kn]). Lower current speeds or higher discharge rates resulted in predictions of deeper waste accumulations and larger areal coverage of waste. At a discharge rate of 200,000 pounds per month and a net-drift current speed of 1 cm/sec (0.02 kn), the maximum model-predicted waste depth was 19 cm (7.5 inches) and the area1 coverage of the waste was 324 m^2 (0.08 acres) after 30 days of steady discharge. The same discharge rate with a net-drift current speed of 30 cm/sec resulted in the highest estimated areal coverage of waste during a 30-day discharge period (972 m^2 [0.24 acres]).

An analyses conducted of the available wind and wave data indicate that wave-induced current speeds sufficient to resuspend and transport the deposited waste should occur frequently in all months at the current shore-based discharge locations offshore of St. Paul and St. George Islands. Therefore, it is expected that the deposition of wastes may be a temporary phenomenon. Wave-induced, and possibly tidally-induced currents should result in frequent resuspension and transport of the deposited waste. This is consistent with diver observations (i.e., observations taken for the 1998 ODCE) of the discharge areas which have found no waste accumulations. However, waste transport may result in deposits of waste on shore, which is consistent with observations of occasional accumulations of crab waste onshore.

3.3 Observations of Bottom and Shoreline Accumulations of Solid Waste

Although not strictly a characteristic of the waste itself, the accumulation of waste solids on the bottom and along the shoreline in the vicinity of seafood waste discharges is of concern under the proposed Pribilof Islands permits. There is little available information regarding the presence or absence of these waste accumulations. However, what is available is summarized below.

The 1999 General Permit required shore-based processing operations in St. Paul and St. George to conduct an inspection of the condition and integrity of the outfall lines during 2000 and 2002. While making these inspections, the divers would note any seafood processing waste accumulations observed on the seafloor during the inspection. These inspections were to occur within 60 days after the close of the crabbing season. The facilities did not comply with these requirements. In 2000, both the Blue Wave and Snopac operated on St. George Island, but neither conducted the survey. However, in 2000 a storm severely damaged the harbor in St. George Island, and neither Blue Wave or Snopac have been able to use the St. George harbor for processing since the storm occurred.

On St. Paul Island, three facilities (i.e., Trident, Unisea, and Arctic Star) processed in 1999. At the end of the 1999 season Unisea discontinued operations. The Arctic Star had their outfall line inspected in November 2004 and again in September 2007. The reports did not note if there was or was not any seafood accumulated at the outfall terminus. Trident Seafood also had their outfall line inspected in November 2004. The report did not note if there was or was not any seafood accumulation at the outfall terminus. Trident had the outfall inspected again in September 2007. During this survey the divers observed seafood accumulated on the seafloor. The area measured 75 feet by 100 feet and was covered with 2 to 4 inches of seafood wastes. Following this dive, there was a week of adverse weather, and when the divers went to finish the outfall inspection the seafood accumulation was gone except for trace amounts (the report did not define “trace amounts”). Prior to the inspection, the facility had been processing halibut from June through September in 2007. It is not know how long the pile was on the seafloor. This is of particular concern because the seafood pile is located in designated critical habitat for Northern fur seals and occurred during the critical breeding season for the seals.

Reports of visual surveys conducted by seafood processors of the shoreline in the vicinity of the discharges in St. Paul have noted one incident of seafood processing wastes depositing along the beach during onshore wind conditions. On March 6th, 1999, approximately 500 to 1000 pounds of Opilio shell fragments ranging from 1” to 4” in size were observed on a 300-yard stretch of beach between East Landing and Kitovi Point on the St. Paul Island. The 1999 general permit requires visual surveys of the shoreline. There have been no reports of seafood processing wastes deposited on the shoreline since that time.

SECTION 4. COMPOSITION OF BIOLOGICAL COMMUNITIES

The determination of "unreasonable degradation" of the marine environment is to be based upon consideration of the 10 criteria listed in Section 1. The following section provides information pertinent to consideration of the two Ocean Discharge Criteria shown below:

- Criterion #3: The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain.

- Criterion #4: The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism.

This section provides an overview of the biological communities found within the area of the Pribilof Islands covered under the new NPDES general permit. This overview will identify key species that are important from an ecological and economical standpoint, or for subsistence harvesting. Significant interspecies relationships, essential environmental requirements, seasonal distribution and abundance, and prominent areas or habitats where these species occur will also be discussed. The biological communities to be discussed in this section include the following:

- Nearshore intertidal and subtidal communities
- Plankton (both phytoplankton and zooplankton)
- Benthic invertebrates
- Fishes
- Marine birds, shorebirds, and waterfowl
- Marine mammals

4.1 Nearshore Intertidal and Subtidal Communities

The development of nearshore habitats of the Pribilof Islands is controlled primarily by the frequency of scouring by ice during winter and spring (O’Clair 1981). However, the Pribilof Islands are at the southern limit of animal intrusion of sea ice into the Bering Sea (Niebauer 1981). Therefore, ice scour does not occur every year. Following 3 years of repeated ice scour, the species diversity of intertidal sites sampled on St. George Island was much less than that on islands of the Aleutian chain that had not been affected by ice (O'Clair 1981). The dominant species (in biomass) identified on St. George and Otter Islands was the attached alga *Halosaccion glandiforme*. Also present were species of canopy forming algae (i.e., *Fucus distichus*, *Alaria* sp., and *A. taeniata*) and *Porphyra* sp. Also present were herbivorous mollusks, including *Littorina sitkana*, *Haloconcha reflexa*, *Margarite helicinus*, and *Schizoplax brandtii*. Small sessile invertebrates were also noted, including mussels (*Mytilus edulis*) and barnacles (*Balanus glandula* and *B. cariosus*).

A study conducted by the Auke Bay Laboratory at East Landing on St. Paul identified patches of *Fucus distichus, Halosaccion glandiforme*, and *Cymathere triplicata* in the intertidal zone, along with species of

Littorina sp. in the lower intertidal zone (Freese and Stone 1993). More species of flora and fauna were observed during the subtidal survey, primarily attached to the boulders within 35 m (115 ft) of shore. The flora included coralline algae (*Lithothamnion* sp.) and macrophytic brown, red, and green algae. Species of sponges, anemones, sea urchins, sea stars, chitons, and limpets were also observed.

4.1.1 Important Trophic Relationships

Due to the lack of detailed information, it is not possible to identify important trophic relationships for the intertidal and subtidal communities of the nearshore habitats of the Pribilof Islands. However, general trophic relationships found in colder or subarctic marine environments are believed to exist in the Pribilof Islands as well.

4.1.2 Important Habitats or Areas

Due to the lack of detailed information, most important intertidal or subtidal habitats or areas have not been carefully described with the possible exception of Salt Lagoon. Salt Lagoon is a shallow saline waterbody connected to St. Paul Harbor by a narrow channel. The lagoon is a unique habitat type in the Bering Sea and provides important feeding habitat for resident and migrant shorebirds (St. Paul Coastal Management Plan 1998).

4.2 Plankton

Phytoplankton and zooplankton are vital components of the pelagic marine community. These two groups provide the food base for many other groups of marine organisms found in the vicinity of the Pribilof Islands. In addition, larval stages of many benthic invertebrates and fish species are temporary members of the zooplankton community (meroplankton) during early developmental stages. The distribution, abundance, and seasonal variation of these organisms are strongly influenced by the physical environment of the southeastern Bering Sea. The distribution of these organisms also influences the distribution and abundance of pelagic and benthic communities that depend on phytoplankton and zooplankton for food.

The development of the hydrographic front structure of the southeastern Bering-Sea over the continental shelf provides a physical control over the distribution, abundance and seasonal variation of phytoplankton and zooplankton communities in the southeastern Bering Sea (Goering and Iverson 1981), including the Pribilof Islands.

Three stages of phytoplankton have been observed that are applicable to the three distinct shelf domains described by the three oceanographic fronts. The spring bloom is dominated by small diatoms of the genera *Chaetoceros* and *Thalassiosira* and the colonial haptophyte *Phaeocystis poucheti*. This bloom begins in the mid-shelf and inner shelf fronts and spreads inward to the coast and outward across the outer shelf. The conditions that trigger bloom formation are related to the formation of a pycnocline at the retreating ice edge and enhanced light penetration. The second stage of phytoplankton in the mid-shelf domain consists of a successional community of medium-sized diatoms of the genera *Chaetoceros*, *Thalassiosira*, *Rhizosolenia*, and *Nitzschia*. This community is followed in summer by a third stage dominated by *Rhizosolenta alata*. Flagellates and dinoflagellates are the predominant phytoplankton of the outer shelf during the second and third successional stages.

The highest rates of primary production have been measured at the ice edge before breakup (Niebauer et al. 1981). Epontic algal production also contributes to the primary production of the southeastern Bering Sea (Alexander and Chapman 1981). The intensity and duration of the ice-edge bloom in spring appears to depend on the southerly extent of sea ice. In years when the sea ice extends over the shelf break, nutrient upwelling from , deep waters enhances primary production but also allows for grazing by zooplankton (Niebauer et al. 1981). In years when the sea ice extent is less, nutrient availability is lower but there are fewer large zooplankton in mid-shelf waters to effectively graze the phytoplankton production.

The abundance of phytoplankton in the mid-shelf and outer shelf domains appears to be controlled by a combination of the front structure which prevents the large zooplankton of the outer shelf region from grazing the abundant phytoplankton biomass of the mid-shelf domain (Cooney 1981). These zooplankton, consisting of large species of calanoid copepods and euphausids, winter in the outer shelf waters and effectively graze the spring phytoplankton bloom in offshore waters. The zooplankton species of mid-shelf waters are generally small species that are relatively ineffective grazers of large diatoms. Therefore, most of the primary production of the mid-shelf sinks to the bottom to provide energy for the benthic marine food web.

4.2.1 Important Trophic Relationships

In addition to forming the basic foundation for trophic interaction, a variety of herbivores are dependent upon phytoplankton, including zooplankton, benthic invertebrates, and waterfowl. Zooplankton serve as forage for fish (copepod nauplii are critical in the diet of most larval fish), shellfish, and marine birds and mammals. Euphausiids and copepods are essential organisms in the diets of many demersal and pelagic fish species. Copepods and euphausiids are important prey items for blue, bowhead, fin, humpback, minke, northern right, and sei whales.

4.2.2 Important Habitats or Areas

Due to the relatively broad distribution of phytoplankton over the Bering Sea shelf it would be difficult to identify specific areas or habitats of importance. Important habitat, as applied to zooplankton assemblages, is most appropriate for the temporary or meroplanktonic forms, such as the eggs and larvae of important fish and shellfish species. In the southeastern Bering Sea, zoea and megalops of crabs, of which Tanner crab is dominant, and larval walleye pollock have been observed. Crab larvae have been collected in all seasons, while pollock larvae are restricted to the early spring, in the mid-shelf region.

4.3 Benthic Invertebrates

Benthic organisms are generally sensitive to deposition of solids such as seafood waste, and can be considered to be sensitive indicators of pollution. Benthic invertebrates are important as prey for higher trophic levels and are important mediators for nutrient recycling. Several epibenthic species are harvested commercially: Tanner crab. king crab, Korean hair crab, and snails. Benthic species frequently harvested for subsistence purposes include sea urchins, clams, mussels, limpets, chitons, crab (hair and blue king crab), octopus, and sea cucumbers (Veltre and Veltre 1981).

In general, the distribution and abundance of benthic organisms in the vicinity of the Pribilof Islands are related to the hydrographic structure that controls phytoplankton production and losses to the sediments. Therefore, the highest benthic biomass is maintained along the mid-shelf domain (Haflinger 1981).

Polychaetes, bivalves, and small crustaceans, primarily amphipods, are the most abundant organisms, with deposit-feeding bivalve mollusks being the predominant species on the southeastern Bering Sea shelf (McDonald et al. 1981). Bivalve mollusks (i.e., clams and cockles) are a significant source of food for other benthic organisms such as crabs and flatfishes. Large marine gastropods (i.e., snails) also comprise a portion of the epifauna of the Bering Sea shelf, including commercially harvested species of *Neptunea* and *Buccinum*. Snails feed primarily on polychaetes, bivalves, barnacles, fishes, and crustaceans (MacIntosh and Somerton 1981). Benthic infauna are not-uniformly distributed, but many infauna have broadly overlapping ranges.

Approximately 140 infaunal species were collected in a survey of the southeastern Bering Sea shelf (Haflinger 1981).

4.3.1 Important Species and Trophic Relationships

The relatively high benthic production, coupled with the relatively warmer shelf bottom-water temperatures during summer compared to the northeastern Bering Sea shelf, results in some of the world's largest stocks of commercially valuable shellfish and finfish species (Feder and Jewett 1981). Tanner, king, and Korean hair crab and snails are the principal commercial epibenthic invertebrates harvested. In addition, benthic infauna provide food for a variety of demersal fish including commercially valuable species such as walleye pollock and Pacific cod. Crabs, clams, and cockles are also an important source of prey for many demersal fish and marine mammals, including Pacific walrus and bearded seals.

4.3.2 Important Habitats or Areas

The most important habitat for benthic invertebrates appears to be areas of high production located along the mid-shelf region of the southeastern Bering Sea shelf. These areas support an important commercial fishery and the production of many key prey species for fish and marine mammals.

4.4 Fishes

Fish assemblages may be pelagic or demersal in nature, with walleye pollock, yellowfin sole, and Pacific halibut being the most important commercial demersal species. Other important commercial species include Pacific cod and herring. Anadromous fish including chinook, coho, sockeye, chum, and pink salmon are important commercial fish that are transient residents of the Bering Sea shelf. Other species important as prey for higher trophic levels include sand lance and capelin.

A review of these species abundances and distributions can be found in U.S. DOI/MMS (1992). Detailed life history information and distribution of the species discussed below can be found in the "Atlas to the Catalog of Waters Important to Spawning, Rearing, and Migration of Anadromous Fish" and "Alaska Habitat Management Guides" published by the Alaska Department of Fish and Game.

4.4.1 Important Species and Trophic Relationships

The following discussion summarizes some species of commercially harvested fish, such as Pacific salmon and halibut, and other species which are not commercially harvested, but are important as prey for higher trophic levels, such as sand lance and capelin.

Anadromous Fish

Pacific salmon (*Oncorhynchus* spp.) is the major pelagic finfish group of the Alaska region; five species occur throughout the southeastern Bering Sea (chinook [*O. tshawytscha*], sockeye [*O. nerka*], pink [*O. gorbuscha*], coho [*O. kisutch*], and chum [*O. keta*] salmon). All Pacific salmon are anadromous, returning to freshwater from the ocean to spawn and then die. The life stages of salmon can be divided into (1) ocean life, (2) spawning migration, and (3) seaward migration. Several generations of adult salmon are distributed throughout the northern Pacific Ocean and Bering Sea. Pacific salmon may migrate over long distances in the ocean during the course of their maturation before returning to their natal spawning areas. Adult salmon in the open ocean feed on a variety of organisms (U.S. DOI/MMS 1984). Copepods, amphipods, tunicates, and euphausiids are the dominant prey of pink salmon. Sockeye salmon prey consists of copepods, amphipods, tunicates, and euphausiids. Adult chum salmon feed on zooplankton, small fish, and squid. Adult coho feed on squid, euphausiids, and small fish. Chinook adults feed on herring, sand lance, squid, and crustaceans.

Demersal Fish Species

Important demersal fish species include walleye pollock, Pacific halibut, Pacific cod, Pacific sand lance, and yellowfin sole. Relevant characteristics of these species and important trophic relationships are outlined below.

Walleye Pollock

Walleye pollock (*Theragra chalcogramma*) is the predominant demersal species of the eastern Bering Sea and is a primary target species in the commercial harvest of groundfish. This species is found in large schools. Annual spawning begins in early spring on the shadow shelf and may continue into early summer. The larvae form dense aggregations that appear to be strongly dependent on ocean dynamics for transport (Schumacher and Kendall 1989). Pollock migrate seasonally, moving from deeper waters in the winter to more shadow water in the spring to spawn. The fish also undergo diurnal, vertical migrations from deeper to shallow waters in the evenings (U.S. DOI/MMS 1984).

Pollock feed on numerous species including mysids, euphausiids, and small fish. In addition to being of great commercial value, all life stages of pollock serve as food for other marine fishes, birds, and marine mammals. Pollock larval stages serve as prey for marine birds such as the common murre and black- and red-legged kittiwake. Juvenile pollock also provide a food source for marine birds and for predaceous bottom fish such as the Pacific halibut and Pacific cod. Adult pollock also provide food for fish and for marine mammals such as the northern fur seal and Steller sea lion.

Pacific Halibut

Pacific halibut (*Hippoglossus stenolepis*) is the largest and most commercially valuable of the flounders. Halibut are slow growing and may live longer than 30 years. They spawn in deep waters along the shelf break during winter. The larvae gradually rise towards surface waters before entering the benthos. Adults feed on fishes, crabs, clams, squids, and other invertebrates during summer in relatively shadow water of the shelf. Larval halibut consume a wide variety of pelagic organisms including crustaceans, euphausiids, and amphipods. Halibut annually move to and from deeper waters but do not display obvious migratory patterns.

Pacific Cod

Pacific cod (*Gadus macrocephalus*) is a semi-demersal species that ranges throughout the North Pacific Ocean and eastern Bering Sea. Spawning occurs during winter and the eggs are demersal. Larval cod range from pelagic to benthic waters and they grow rapidly, reaching about 1 m (3.3 ft) in length within 2-3 years. Adult cod feed on a variety of worms, crabs, mollusks, shrimps, and herring.

Pacific Sand Lance

Pacific sand lance (*Ammodytes hexapterus*) are abundant in nearshore areas and bays and generally inhabit water less than 100 m (330 ft) deep. Sand lance lack a swim bladder and must actively swim, rest on the seafloor, or bury themselves in sand or fine gravel. They may form large pelagic schools during the day and return to the bottom at night. Sand lance spawn during winter in areas of strong current. The larvae are planktonic and feed on diatoms, copepods, shrimp, and barnacle nauplii (Blackburn 1979). Pacific sand lance are prey items for salmon, Pacific cod, halibut, other demersal fishes, marine birds and mammals.

Yellowfin Sole

Yellowfin sole (*Limanda aspera*) is a major component of the demersal fish biomass of the eastern Bering Sea continental shelf. Migration of this fish species is seasonal; from outer shelf and slope waters occupied in winter and early spring to inner shelf waters during summer to spawn. Young fish remain in shallow waters for 3 to 5 years before initiating seasonal migration. Large wintering populations form west of St. Paul Island and south or east of St. George Island (Bakkala 1981). Prey items include clams, polychaete worms, zooplankton (mysids and euphausids), and pelagic fish (capelin and smelt).

Pelagic Fish Species

In addition to anadromous fish species, important species of pelagic fish include the Pacific herring and capelin. Some salient characteristics of these species and important trophic relationships are outlined below.

Pacific Herring

Pacific herring (*Clupea harengus pallasi*) form an important part of the Bering Sea food web, and herring are also the basis of a major commercial fishery. Herring sac-roe is of high commercial value while adult herring are currently used mainly for bait in other fisheries. Bering Sea migrations are along the North Alaska Peninsula and out to the Aleutian Islands, then to an area northwest of the Pribilof Islands where herring overwinter in deeper waters (Wespestad and Barton 1981). Pacific herring undergo annual spring migrations in late April and mid-May from pelagic waters to the coastal areas of Bristol Bay and between the Yukon and Kuskokwim Rivers. The eggs are deposited on kelp, other seaweeds, rock substrate, and detritus in the shallower coastal zone. After spawning and hatching, both adult and larval herring remain in nearshore water until October when the schools move to deeper and warmer waters to overwinter. Adults and larvae feed primarily on zooplankton (U.S. DOI/MMS 1992). Larvae and juveniles feed and grow in estuaries and embayments, thus making them vulnerab1e to changes in inshore habitats. Herring are important food fishes for other pelagic fishes, and marine birds and mammals.

Capelin

Cape1in generally form large schools near the bottom. Large concentrations may occur within the Pribilof Islands. Spawning usually occurs from the end of May to about mid-July. Eggs are deposited on sandy beaches at night or on cloudy days following a high tide and are buried in the sand by wave action. Capelin consume copepods, amphipods, euphausiids, and shrimp and are important prey items for other fishes, marine birds and mammals (EPA 1983).

4.4.2 Important Habitats or Areas

Due to the wide distribution and extensive migration patterns it is difficult to identify specific habitats or areas that are important for Bering Sea fish species. The benthic habitat is important for many of these fish because of their demersa1 habits and the production of demersal eggs. However, because walleye pollock produce large surface concentrations of larval fish, the upper surface water layer should also be considered an important habitat.

4.5 Marine Birds, Shorebirds, and Waterfowl

Marine birds, shorebirds, and waterfowl are significant components of the marine ecosystem of the eastern Bering Sea shelf and are highly vulnerable to human impacts. One of the largest seabird colonies in the world is found in the Pribilof Islands, consisting of approximately 2.5 million seabirds belonging to 12 different species (U.S. Fish and Wildlife Service 1988). The refuge provides protection for approximately 90 percent of the world's red-legged kittiwake population and Alaska's largest murre colony.

The short-tailed albatross was listed as an endangered species under the Endangered Species Act (ESA) in 2004 (USFWS 2004). Steller's eider, a marine diving duck, was listed as a threatened species in May 1997 (62 FR 31748). Spectacled eider, a large sea duck, was federally listed as threatened throughout its entire range and critical habitat in 2001 (FR 66 9146). These species are discussed in greater detail in Section 6.

4.5.1 Important Species and Trophic Relationships

The following discussion will be divided into (1) marine birds, which spend at least a portion of their lives in the open ocean, (2) shorebirds, and (3) waterfowl, which are not typically found far from land.

Marine Birds

The most prominent and numerous avian group found in the eastern Bering Sea are the pelagic (open ocean) seabirds. This group consists of birds such as shearwater, petrels, murrelets, aukIets, and gulls. These seabirds exhibit a wide array of body forms, life history patterns, and strategies for obtaining food, reproducing, and avoiding predation. These birds developed in an environment relatively free from predation but with a less predictable food source. These factors have led to the development of long life spans, late attainment of sexual maturity, and small clutch sizes (U.S. DOI/MMS 1992).

Pelagic distribution of seabirds in the Bering Sea, as elsewhere in Alaskan marine waters, exhibits a patchy pattern of high and low densities (Piatt et al. 1988). Typically, greatest densities (e.g., 40-600 birds/km^2) occur in spring, summer, and fall over the outer continental shelf and shelf break (100 to 200 m depth). Densities over the inner shelf, though generally lower, may reach high levels where shearwaters concentrate in huge flocks (tens of thousands to well over a million individuals) (U.S. DOI/MMS 1992). During the winter and early spring, most seabirds are widely dispersed over the southern Bering Sea, Aleutian Islands, and North Pacific Ocean south of the consolidated pack ice. Overwintering seabirds and spring migrants also tend to gather along the ice edge where prey may be concentrated. Bird densities of 500 to 1,000/km^2 commonly occur in the ice front, while densities of up to 10,000/km^2 have been observed (Divoky 1983).

Many of these marine birds nest in the Pribilof Islands wherever there are suitable sites, usually cliffs. Common and thick-billed murres, black-legged kittiwakes, auklets, puffins and fulmars are abundant on the Pribilofs Islands; 88 percent of red-legged kittiwakes nest on the Pribilofs.

Most seabirds return to breeding colonies in April and lay eggs in May, June, and July. While seabirds are rearing young, foraging is limited to nearshore waters. Most seabirds leave their breeding colonies by October.

Seabirds feed primarily on marine invertebrates and fishes, although their diet varies according to body and bill size, age, season, prey size and availability. The major food sources during spring and summer months include capelin, sand lance, euphausiids, squid, and pollock. Various benthic invertebrates and demersal fish are the main winter food sources (U.S. DOI/MMS 1984). Studies that have measured the food fed to seabird chicks have indicated that capelin and sand lance comprise 48-84 percent of their diets (Baird and Gould 1983). Most foraging of breeding birds occurs within 48 km (30 mi) of their colony and usually within 4.8 km (3 mi) of land.

Shorebirds

The term "shorebird" is used to represent those birds generally restricted to shoreline margins (bays, beaches, lagoons, and mudflats). Shorebirds encompass members of the plover, sandpiper, and avocet families.

An important characteristic of almost all shorebird species is their migratory behavior, which is strongly developed. The vast majority of shorebirds that occur along the Pacific coast of North America breed in Alaska where important nesting concentrations are found on moist tundra and marshlands of the Arctic North Slope, the west coast (e.g., Yukon-Kuskokwim River Delta); and Bering Sea islands, including the Pribilof Islands. From May through September each year, millions of shorebirds may be found in these areas.

Shorebirds use the coastal areas of the Pribilof Islands for feeding, resting, and breeding grounds. These birds use gravel beaches, rocky shores, and intertidal mudflats as forage areas for clams and small invertebrates. The most common shorebirds found in the coastal habitats include: American golden plovers, godwits, ruddy turnstones, sanderlings, red and northern phalaropes, and rock sandpipers.

Waterfowl

Waterfowl in the Pribilof Islands include ducks and geese. During the fall migration, the numbers of ducks increase dramatically as local populations are supplemented by ducks from the north and west. Eighteen species of diving ducks breed in Alaska, including oldsquaw, common eider, king eider, spectacled eider, Steller's eider (recently listed as threatened; see Section 6), black scoter, surf scoter, white-winged scoter, greater scaup, harlequin duck, Barrow's goldeneye, common goldeneye, and red-breasted merganser. Goose species include white-fronted goose, emperor goose, cackling Canada goose, Pacific black brant, tule goose, Taverner's Canada goose, Vancouver Canada goose, dusky Canada goose, lesser Canada goose, and lesser snow goose. Areas of major importance to waterfowl populations in the Pribilof Islands include the ice front and coastal embayments including Salt Lagoon on St. Paul Island. .

Dabbling ducks include American widgeon, mallard, northern pintail, and green-winged teal. The initial nesting period for dabbling ducks usually begins in mid-April and extends through June. The molt and brood-rearing period occurring from late June to early August is a stressful period and demands considerable energy. By November, most dabbling ducks have departed for wintering grounds. Dabbling ducks feed primarily on invertebrates and plant matter.

Most diving ducks arrive on their breeding grounds by late May, with the nesting period generally extending through June. Brood rearing and molting occurs throughout July and August. The majority of the diving ducks are residents of Alaskan coastal areas in winter.

4.5.2 Important Habitats or Areas

Important habitats for marine birds, shorebirds, and waterfowl include nearshore waters, lagoons (i.e., Salt Lagoon), beaches, and rocky cliffs that serve as feeding and breeding areas. Critical habitat for nesting birds has been purchased by the U.S. Fish and Wildlife Service along the western shore of St. Paul Island, along much of the shoreline of St. George Island, and Otter and Wa1rus Islands. These areas have been incorporated into the Alaska Maritime National Wildlife Refuge.

4.6 Marine Mammals

Several species of marine mammals occur in the eastern Bering Sea waters. These species include cetaceans, pinnipeds, and sea otters. All marine mamma1s are protected under the Marine Mammal Protection Act (MMPA) of 1972. The MMPA also incorporates regulations and restrictions regarding the harvests of marine mammals. Additional protection is provided for blue, bowhead, fin, humpback, right, and sperm whales, and the Steller sea lion (also known as the northern sea lion) under the Endangered Species Act of 1973. Additional regulations associated with the northern fur seal are provided by a 1957 treaty, the Interim Convention on Conservation of Northern Fur Seals. The cetacean species that have been listed as endangered are discussed in Section 6.

4.6.1 Important Species and Trophic Relationships

Most of the marine mammals occurring in Bering Sea waters can be grouped into two categories: (1) pinnipeds (seals, sea lions, and walrus) and (2) cetaceans (whales). Sea otters are also discussed below.

Pinnipeds

Pinnipeds include the northern fur seal, Steller sea lion, ice seals (spotted, ribbon, bearded, and ringed), harbor seal, and Pacific walrus.

Northern Fur Seal

The northern fur seal has a range extending from the Bering Sea south to San Diego, California (NMFS 1993a). These sea1s are migratory and widely dispersed throughout this range during the non-breeding season (November to May) in pelagic waters. During other times of the year, the majority of the entire population is concentrated in the Pribilof Islands. Seals begin to arrive at rookeries in the Pribilofs in late April and most leave by December. It is estimated that fur seals consume more than 10 percent of their body weight each day in fish and squid in the Bering Sea/Aleutian Islands area to maintain a high metabolic rate (body heat). Although generally considered opportunistic feeders, most of their diet is accounted for by gonatid squid, capelin, and walleye pollock. The Northern fur seal has been designated as depleted under the Marine Mammal Protection Act.

Predators on northern fur seals include humans, killer whales, and large sharks. Both Steller sea lions and Arctic foxes are known to prey on pups.

Steller Sea Lion

Steller sea lions are not migratory and breeding populations range from as far south as the Channel Islands off of Santa Barbara, California, and north to Prince William Sound in Alaska. During periods other than the breeding season (late May to early July), male sea lions disperse widely. The highest concentrations of these animals are in the Gulf of Alaska and Aleutian Islands.

The Steller sea lion was listed as a threatened species throughout its range in 1990 (55 FR 12645). Critical habitat for the species was designated in 1993 (58 FR 45269) and includes all rookeries and haulout areas including the rookery on Walrus Island. In May 1997, the NMFS changed the listing status of Steller sea lion populations west of 144 deg. W. longitude from threatened to endangered, thus Steller sea lion populations in the Pribilof Islands are now classified as endangered. Steller sea lions are discussed in more detail in Section 6.

Ice Seals

Four seal species in Alaska (spotted, ringed, bearded; ribbon) are ice-associated for much or all of the year. Although the general range of all four species extends from the Beaufort Sea to the southeastern Bering Sea, spotted and ribbon sea1s are concentrated in the Bering Sea, while the majority of bearded and ringed seals occupy areas farther north. Estimated populations of these seals in the Bering-Chukchi-Beaufort area are spotted 250,000, ribbon - 110,000, bearded - 300,000, and ringed - 1.5 million (Burns et al. 1985; Lentfer 1988). Winter/spring spotted seal densities are greatest east of the Pribilof Islands, while ribbon seals are most numerous west of the Pribilof and St. Matthew Islands. All four species breed and give birth in the spring and are associated with the ice pack in some way.

Spotted seals and ribbon seals all feed to a large extent on pelagic and semi-demersal fishes, crustaceans and octopus. Demersal fishes appear to be more important in the diet of ribbon seals than for the other seals. Ringed sea1s eat pelagic fishes, semidemersa1 fishes, and crustaceans. Bearded sea1s feed primarily on benthic organisms.

Harbor Seal

The harbor seal has an extensive range extending from the Bering Sea southward to Baja California. Harbor seals tend to frequent nearshore waters and haul out on offshore rocks, sandbars, and beaches of the Pribilof Islands. These seals often move considerable distances between various haulout sites, although they tend to have a limited number of preferred sites which they return to repeatedly. The breeding and pupping season occurs from late May through July (KPB 1990). The diet of harbor seals is highly varied with prey primarily consisting of herring, eulachon, walleye pollock, octopus, salmon, shrimp, and flounder.

Pacific Walrus

In Alaska, the Pacific walrus ranges from the Beaufort Sea to the southeastern Bering Sea. A large portion of the estimated 234,000 to 250,000 walruses migrate north and south with the seasonal pack ice (U.S. DOI/MMS 1992). During the winter months (January-March), most walruses occur in the drifting pack ice west and southwest of St Lawrence Is1and and in the Bristol Bay area. Beginning in April, nearly all the pregnant females and those with young (approximately 150,000) move north with the receding pack ice. By late June, the migrants have passed through the Bering Strait to occupy the area west to Wrangle Island and north to the northeastern Bering Sea and western Beaufort Sea, Adult and subadult males that remain in the Bering Sea in summer most consistently haul out at several sites in northern Bristol Bay (Walrus Islands State Game Sanctuary) and St Matthew Island (Alaska Maritime National Wildlife Refuge). Pacific walrus feed almost exclusively on clams.

Sea Otters

The southwest Alaska distinct population segment of the northern sea otter was listed as threatened by the U.S. FWS effective September 8, 2005 (FR 70 46366). This portion of the otter population has declined seriously since mid-1980s. Overall, the southwest Alaska stock has declined at least 55 to 67 percent, with some specific locations experiencing reductions of 90 percent or more (FR 70 46366). Sea otters are discussed in more details in Section 6.

Cetaceans

There are several non-listed cetaceans within the Alaskan region. They include gray, minke, beluga, and killer whales, and Dall and harbor porpoises. Cetaceans listed under the ESA are discussed in Section 6.

Dall Porpoise

The Dall porpoise is present year-round in ice-free waters. This species usua1ly travels in groups of 2 to 20 animals, although large concentrations of over 1,000 porpoises infrequently occur. The majority of breeding and calving takes place from June to August. Dall porpoises feed on walleye pollock, sablefish, capelin, Pacific herring, sand lance, eulachon, and squid (Crawford 1981).

Harbor Porpoise

Harbor porpoises are assumed to be year-round residents where they occur; sightings are much less frequent in fall and winter. They are generally observed in harbors, bays, and river mouths. Breeding occurs from June or July to October with peak calving in May and June (U.S. DOI/MMS 1984).

Killer Whale

Killer Whales prefer shallow areas of the continental shelf and are considered surface feeders, preying mostly upon large fishes when available and marine mammal. Among the fishes eaten are herring, cod, skates, smelt, capelin, halibut, sharks, and salmon. Although sea lions and fur seals are abundant in the Pribilof Islands, killer whales do not generally congregate in this area (Frost and Lowry 1981).

Beluga Whale

There are believed to be two separate stocks of beluga whales in Alaska: the western Arctic stock and the Cook Inlet stock. The western Arctic stock numbers about 18,000 individuals and is distributed from Yakutat in the Gulf of Alaska to the eastern Beaufort Sea. Major concentrations of belugas occur in Bristol Bay and Yukon River-Norton Sound. These areas are used during migration and throughout the summer. The beluga feeds on salmon, smelt, flounder, sole, sculpin, cephalopods, and shrimp. Calving takes place during the summer from July to August (Calkins 1987, U.S. DOI/MMS 1992). The Cook Inlet population of beluga is a candidate for listing under the ESA. Beluga whales in the Pribilofs are not considered candidates.

Gray Whale

The gray Whale now occurs only in the North Pacific and adjacent waters of the Arctic Ocean. The eastern Pacific gray Whale stock migrates through the Gulf of Alaska area during April, May, and June and again during the fall migration in November and December. They generally migrate along the eastern side of Kodiak Island from the Kenai Peninsula to Unimak Pass on their way to the Bering Sea. Summer feeding grounds are located in the northern Bering Sea and Southern Chukchi Sea off St. Lawrence Island. This species usually migrates close to shore, within 1 km (0.6 mi), and little food is consumed during migration and winter months. The gray whale is a bottom feeder, moving along the seafloor while sifting the sediments through baleen to capture prey. The principal prey is amphipods, however, their diet also includes other benthic invertebrates, small fish, and herring 'eggs (Breiwick and Braham 1984).

Minke Whale

The minke whale is the smallest of the baleen whales. It is a coastal species, usually occurring within the 200 m (660 ft) depth contour. In spring, most minke whales are located over the continental shelf, especially in shallow nearshore waters. During summer, the season of greatest abundance, they are distributed all along the Alaska coast and into the Bering and Chukchi Seas. They are concentrated near Kodiak Island, and in the northeast Gulf of Alaska during the summer. Most whales probably leave the region by October as they are seldom observed in the fall or winter. It is likely that they migrate northward in early spring and southward in the fall (U.S. DOI/MMS 1984). Breeding occurs throughout the year with peaks in January and June. Their prey consists mainly of euphausiids and copepods (U.S. DOI/MMS 1992).

4.6.2 Important Habitats or Areas

Important habitats in the Pribilof Islands can be identified for Steller sea lions and northern fur seals. Walrus Island, a Steller sea lion rookery, has been designated as critical habitat for the Steller sea lion (NMFS 1993b). Important rookery and haulout areas for northern fur seals and critical haulout areas for Steller sea lions have also been identified on St. Paul and St. George Island (See Figures 1, 2, and 3).

4.7 Summary

Phytoplankton communities are dominated by diatoms, with dinoflagellates, microflagellates, and other classes and families of phytoplankton also being present. Several herbivores, including zooplankton, herbivorous fishes, benthic invertebrates, and some waterfowl, are dependent upon phytoplankton.

Copepods and euphausiids are the dominant zooplankton species. Fish and invertebrate eggs and larvae quantities vary throughout the year. Zooplankton are prey for fish, shellfish, marine birds and mammals. Due to ineffective grazing by zooplankton of the primary production of the mid-shelf front, high phytoplankton production in this region provides the food energy that supports an abundant benthic infaunal, epifaunal, and demersal fish community. This benthic production supports significant commercial fisheries for crab, snails, and bottom fish, as well as the support for marine bird and mammal communities.

Several epibenthic species present in the area are harvested commercially: Tanner crab, king crab, Korean hair crab, and snails. Species frequently harvested for subsistence purposes include sea urchins, clams, mussels, limpets, chitons, crab, octopus, and sea cucumbers. Benthic infaunal species include bivalve mollusks, po1ychaetes, and small crustaceans, primarily amphipods. Bivalve mollusks are a significant source of food for benthic organisms such as crabs and flatfishes, as well as marine mammals such as Pacific walrus and bearded seals.

The fish assemblages are dominated by demersa1 species, with walleye pollock, yellowfin sole, and halibut being biologically and commercially important species. Semi-demersal and pelagic species such as Pacific cod and herring are also found in the area. Transient residents in the vicinity of the Pribilof Islands also include all five species of Pacific salmon. Species important as prey for higher trophic levels include sand lance and cape1in, as well as previously mentioned species, especially walleye pollock.

Pelagic seabirds are the most prominent and numerous avian group found in the region. The most abundant species are fork-tailed storm petrel, tufted puffin, Leach's storm petrel, common murre, black-legged kittiwake, and homed puffin. Other common seabirds in the area include shearwaters, fu1mars, cormorants, gulls, terns, guillemots, murrelets, and auklets. Seabirds feed primarily on marine invertebrates and fishes, although their diet can vary. Many of these birds nest in the Pribilof Islands, especially along protected cliffs. Common and thick-billed murres and black-legged kittiwakes and fu1mars are abundant on the Pribilof Islands, and over 90 percent of the world's red-legged kittiwakes nest there. Shorebirds are primarily migratory and may be present from May through September. In the Pribilof Islands, common shorebirds include American golden plovers, godwits, ruddy turnstones, sanderlings, red and northern phalaropes, and rock sandpipers.

Waterfowl in the area include ducks and geese. Eighteen species of diving ducks breed in Alaska, including species of eider (spectacled and Steller's eider), harlequin duck, scoters, oldsquaw, scaups, and goldeneyes. Dabbling ducks include American widgeon, mallard, northern pintail, and green-winged teal. Waterfowl feed primarily on crustaceans, mollusks, aquatic insects, and fish.

Several species of marine mammals occur in Alaskan coastal waters including cetaceans (beluga, minke, gray, killer whales; Dall and harbor porpoises), pinnipeds (northern fur seals, Steller sea lion, ice seals, harbor seals, walrus), and sea otters. Many of these animals are found year-round in the coastal areas, or use these areas as potential migratory routes. Frequent prey for marine mammals include copepods, euphausiids, herring, cod, walleye pollock, cape1in, salmon, bivalves, squid, and crustaceans. Important rookeries and haulouts for northern fur seals and Steller sea lions are found in the Pribilof Islands.

SECTION 5. POTENTIAL IMPACTS OF SEAFOOD WASTE DISCHARGES ON MARINE ORGANISMS

The determination of "unreasonable degradation" of the marine environment is based upon consideration of the 10 criteria listed in Section 1. The following section provides an assessment pertinent to consideration of the Ocean Discharge Criteria shown below:

- Criterion # 1: The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged.
- Criterion #2: The potential transport of such pollutants by biological, physical, or chemical processes.
- Criterion #3: The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain.
- Criterion #4: The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism.
- Criterion #6: The potential impacts on human health through direct or indirect pathways.
- Criterion #10: Marine water quality criteria developed pursuant to Section 304 (a)(1).

Solid and liquid wastes from seafood processing facilities and the City of St. Paul domestic wastewater system described in Section 2 may potentially affect water quality, and subsequently wildlife and human health. This section summarizes the results from the discharge monitoring program, discusses compliance with water quality criteria, and evaluates potential adverse impacts to wildlife and human health. The 1999 General Permit required permittees discharging through stationary outfalls to do sediment chemistry monitoring in 2001. The permittees did not comply with this requirement of the general permit. As a result, evaluation of potential adverse impacts must rely on water quality data. In addition, the permit requires monitoring of discharge flow information. However, with the exception of a few facilities, this data was not collected, and as a result the evaluation could only be conducted exclusively using discharge concentrations instead of constituent loading.

The 199 general permit requires all discharges to comply with Alaska Water Quality Standards (Alaska Administrative Code, 18 AAC Chapter 70). The Alaska marine water quality standards protects various designated beneficial uses including: (1) water supply for aquaculture, seafood processing, and industrial uses, (2) water recreation including primary or contact recreation (e.g., swimming) and secondary recreation (e.g., boating), (3) growth and propagation of fish, shellfish, other aquatic life, and wildlife, and (4) harvesting for consumption of raw mollusks or other raw aquatic life. EPA has also promulgated water quality criteria for toxic and other potentially harmful organic and inorganic substances (EPA 2003). For constituents with no current state criteria, federal criteria and other numerical guidelines would be of use in evaluating potential impacts.

No mixing zone or zones of deposit were granted under the 1999 general permit and this requirement has been retained in the proposed individual permits, therefore any potential impacts would be evaluated based on end-of-pipe concentrations without dilution.

5.1 Impacts Associated with Seafood Processing Activities

Seafood processing waste includes both solid and liquid wastes as described in Section 3. While the current general permit required each facility to collect at least two effluent samples each year, the facilities did not comply with this requirement, therefore, there are only a few additional sample events since 1997. Tables 2 , 2(a), 2(b) and 2(c) summarize available effluent discharge monitoring data from various mobile and land-based seafood processing facilities. The sections following the tables include discussion of discharge compliance with the 1999 general permit and the associated potential adverse effects of seafood processing discharges to water quality, biology, and human health. The following subsections are organized by constituents.

Table 2. Summary of Seafood Processing Effluent Discharge Concentrations in the Pribilof Islands General Permit Area .

Facility	**Date**	**Type of Wastewater (mg/L)**	**Estimated flow (mgd), see note 1**	**Total Phosphorus (mg/L)**	**BOD (mg/L)**	**pH (s.u.)**	**Ammonia (mg/L)**	**Oil & Grease (mg/L)**	**TSS (mg/L)**	**Chlorine (mg/L)**
Unisea, St. Paul Island	Feb 1997	Process water			130	7.7	0.4	51	57	
	Feb 1997	Clean up water			10	7.4	0.2	6	13.6	
	Jan 1999	Process water	0.6		253	6.4	5.9	160	324	
	Feb 1999	Process water	0.1		330	7.3	6.6	244	168	
	Mar 1999	Clean up water	2.4		16	7.7	0.6	3	37	
Trident, St. Paul Island	Feb 1997	Processing water	3.5 2.2	16.7	3300	6.7	7.4	1200	1460	---
	Feb 1997	Clean up water	3.5 0.4	1.1	120	7.5	0.6	0.88	63.5	---
	Mar 1999	Sump water	3.5	1.82	174	---	5	13	99	
	Aug 2007	processing	3.5	3.8	418	7.5	1.6	170	239	0.91

Facility	**Date**	**Type of Wastewater (mg/L)**	**Estimated flow (mgd)**	**Total Phosphorus (mg/L)**	**BOD (mg/L)**	**pH (s.u.)**	**Ammonia (mg/L)**	**Oil & Grease (mg/L)**	**TSS (mg/L)**	**Chlorine (mg/L)**
Arctic Star, St. Paul Island	Mar 1997		0.1	1.92	320	6.9	1.62	57.7	234	
	Mar 1999		0.1	605	81,000	5.9	1280	35,800	51,900	1.4
	Feb 2003		0.1	80.2	13,300	7.4	63.9	293	17,300	2.0
	Jan 2008		0.1	20.8	1870	6.27	8.86	28	1460	
	Feb 2008		0.1	150	26,500	5.8	30.8	18,300	14,700	<1.0
	Mar 2008		0.1	101	15,600	5.9	80.7	439	4,200	
Snopac, St. George	Mar 1997			9.3	1500	6.2	2	654	932	
	Feb 1999	Processing Water			1450	6.8	18.1	39.7	545	1.0
	Mar 1999	Processing water		11.9	1390	6.6	15.5	262	811	
	Mar 1999	clean up	9.0	0.32	24	7.7	0.721	2.26	110	1.0
	Mar 1999	Processing water			660	7.7	5.4	175	540	
Blue Wave, St. George	Mar 1997	Clean up water			24	7.7	0.7	2.3	110	0.1
	Mar 1997	Processing Water	2.7		660	7.7	5.41	175	540	

0.3

2.7

Facility	Date	Type of Wastewater (mg/L)	Estimated flow (mgd)	Total Phosphorus (mg/L)	BOD (mg/L)	pH (s.u.)	Ammonia (mg/L)	Oil & Grease (mg/L)	TSS (mg/L)	Chlorine (mg/L)
Coastal Star, Mobile	Feb 1997			0.5	2000	6.6	6.0	474	733	
	Mar 1999			14.8	2230	6.3	24.4	308	1540	0.2
	May 1999			33.4	5550	5.9	68	540	2150	0.2
Aleutian Falcon, Mobile	Mar 1999	Processing water			2850	5.9	38.7	1100	1910	---
	Mar 1999	Receiving water			2	7.86	0.2	0.4	9.67	---
Independence, Mobile	Mar 1999		32.9	1.92	308	---	2	77.7	103	---
	Apr 2007			1.9	600	7	2.9	18	76	1.1
	Apr 2007	clean up	0.43	0.9	85.7	6.1	1.4	21	67	0.6
Stellar Sea, Mobile	Feb 1997		1.08	15.1	2200	6.3	6.5	799	840	---
	Mar 1999		1.08	15.2	3250	5.9	28.2	479	3200	0.1
	Jan 2006		1.08	116	---	---	20.9	500	3150	<0.5
	Mar 2006		1.08	118	21400	---	101	2120	19000	---
	Feb 2007		1.08	28	5100	---	45.6	191	3630	---
	Mar 2007		1.08	18.6	---	7.8	17.9	---	---	---
	Apr 2007	clean up		0.43	ND	---	ND	ND	6.4	2.0

Facility	Date	Type of Wastewater (mg/L)	Estimated flow (mgd)	Total Phosphorus (mg/L)	BOD (mg/L)	pH (s.u.)	Ammonia (mg/L)	Oil & Grease (mg/L)	TSS (mg/L)	Chlorine (mg/L)
Stellar Sea, mobile (cont.)	Apr 2007		1.08	88.0	5200	7.0	350	29.3	153	<0.5
Yardarm Knot, Mobile	Mar 1997	Processing water		82.9	7300	6.1	0.9	5840	8700	
	Mar 1997	Clean up water			2	7.7	0.3	36.1	6.3	0.5
Northland, Mobile	Feb 1997			4.83	1300	6.4	1.4	314	469	
Westward Wind, Mobile	Mar 2006		0.312	59	61		1.6	36	812	1.3
Sea Alaska, Mobile	Feb 1997			8.5	2100	6.3	3.3	653	741	
Omnisea, Mobile	Feb 1997			10.3	2100	6.3	5.8	547	760	

1. Flow for these facilities was based on the flow provided in their NPDES permit applications. No other flow data was available

Table 2(a) Metals Monitoring for the Arctic Star

	Acute criterion	chronic criterion	human health criterion	3/15/08	3/16/08	3/17/08	4/8/08	4/9/08
Arsenic	69	36	---	64.8	77.1	246	87.4	122
Cadmium	40	8.8	---	ND	6.79	34.3	8.87	12.9
Copper	4.8	3.1	---	75.5	99.3	600	317	272
Lead	210	8.1	---	2.21	ND	2.25	5.79	2.06
Mercury	1.8	0.94	0.051	ND	ND	ND	ND	ND
Nickel	210	8.1	---	ND	ND	31.5	ND	20.7
Selenium	290	71	---	202	172	174	212	207
Zinc	90	81	---	169	123	473	1190	426

1. All values are micrograms per liter
2. All analytical methods used had method detection limits less than the aquatic life criteria. The analytical method detection for mercury was 0.2, therefore it is not possible to determine if the monitoring results exceed the human health criteria. ND means the pollutant was not detected

Table 2(b) Metals monitoring for Trident Seafood

	Acute criterion	chronic criterion	human health criterion	4/9/08	4/10/08	4/19/08	4/20/08	4/21/08
Arsenic	69	36	---	168	139	92.7	103	94.4
Cadmium	40	8.8	---	8.16	5.6	5.5	5.9	6.1
Copper	4.8	3.1	---	140	95.7	65.6	70.8	64.8
Lead	210	8.1	---	ND	ND	ND	ND	ND
Mercury	1.8	0.94	0.051	ND	ND	ND	ND	ND
Nickel	210	8.1	---	22.2	22.2	14.8	17.9	15.8
Selenium	290	71	---	22.8	12.7	104	132	104
Silver	1.9	---	---	3.5	2.5	2.5	2.6	2.9
Zinc	90	81	---	83.1	56.6	36.4	33	40.9

1. All values are micrograms per liter
2. All analytical methods used have method detection limits less than the aquatic life criteria. The analytical method detection for mercury was 0.2, therefore it is not possible to determine if the monitoring results exceed the human health criteria. ND means the pollutant was not detected

Table 2(c) Metals Monitoring for the Stellar Sea

	Acute criterion	**chronic criterion**	**human health criterion**	**January 2006**
Arsenic	69	36	---	977
Cadmium	40	8.8	---	145
Copper	4.8	3.1	---	1560
Lead	210	8.1	---	---
Mercury	1.8	0.94	0.051	----
Nickel	210	8.1	---	---
Selenium	290	71	---	499
Zinc	90	81	---	1050

1. All values are micrograms per liter
2. All analytical methods used have method detection limits less than the aquatic life criteria. The analytical method detection for mercury was 0.2, therefore it is not possible to determine if the monitoring results exceed the human health criteria.

5.1.1 Solid Wastes

Solid wastes can generally be grouped into two categories: residues and sediment. The proposed permits require that seafood processing dischargers monitor their effluent for total suspended solids. The permits also prohibit the discharge of wastewater containing floating solids and/or foam, and prohibits discharge of seafood wastes that are deposited on the shoreline or accumulate on the seafloor within the permit area.

Residues. Residues are defined by the ADEC as floating solids, debris, sludge, deposits, scum, or other residues. ADEC currently has no numerical standard for residues. The narrative standards for residues are as follows:

WATER USE	**CRITERIA**
Water supply (aquaculture)	May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use. May not cause detrimental effects on established water supply treatment levels.
Water supply (seafood processing)	May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use; cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.

WATER USE	**CRITERIA**
Water supply (industrial)	May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use.
Water recreation (contact and secondary recreation)	Same as criterion for water supply (seafood processing).
Growth and propagation of fish, shellfish, other aquatic life, and wildlife	May not, alone or in combination with other substances or wastes, make the water unfit or unsafe for the use, or cause acute or chronic problem levels as determined by bioassay or other appropriate methods. May not, alone or in combination with other substances, cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.
Harvesting for consumption of raw mollusks or other raw aquatic life	May not make the water unfit or unsafe for the use; cause a film, sheen, or discoloration on the surface of the water or adjoining shorelines; cause leaching of toxic or deleterious substances; or cause a sludge, solid, or emulsion to be deposited beneath or upon the surface of the water, within the water column, on the bottom, or upon adjoining shorelines.

Whether the floating material or shoreline deposit standard will or will not be violated by a particular discharge depends on the depth of the discharge, the presence or absence of water column density stratification, and prevailing wind-, wave-, and tidally-driven currents, as well as the physical and chemical characteristics of the effluent. Seafood waste discharges near the surface or at depth in relatively shallow, unstratified waters will generally tend to result in the surfacing of the discharge plume. Relatively small waste particles with densities at or below that of seawater (e.g., small bits of fat) will tend to float and may result in accumulations of waste particles near the surface. Depending on the prevailing currents, surface accumulations of waste may be driven onto nearby shorelines.

A milky colored plumes at the surface of the water near the terminus of the stationary outfalls, surface plumes, and foam (from transfer water) were reported by some seafood processors during the period evaluated. Additionally, an EPA compliance inspection in the area noted an oily sheen on the water. Furthermore, incidents have been noted during EPA compliance inspections of several shore-based seafood processing facilities at other locations in Alaska which had shorter outfalls (50 to 200 ft versus 800 to 900 ft at Pribilof Islands facilities) (EPA 1991).

Violation of the standard for shoreline deposit is likely to occur during onshore wind conditions. Seafood waste residues have been observed along the shoreline near East Landing on St Paul Island in 1999 as described in Section 3.3. In addition, historical incidents of shoreline deposits were also observed (EPA

1998c). The duration of any violation is not known, this information is not available partly due to ice conditions which prevented close inspection of the deposits. Duration of these accumulations is dependent on wind direction and tidal action which could potentially remove them from the shoreline. Since the Spring of 1999 no shoreline deposits have been reported by the facilities.

As indicated in Section 3.2, fate and transport modeling has predicted that violation of the standard for seafood waste deposits on the bottom of the water column may occasionally occur. Duration of violation is expected to be relatively short due to current speeds that would enable re-suspension; in addition organic matter decay are expected to rapidly reduce and transport residual wastes (EPA 1998c). However, it must be noted that *any* deposition is a violation of the water quality standard. Deposition was not observed in the historical seafloor surveys conducted in the vicinity of shore-based processing facility outfalls following the peak winter seafood processing period (EPA 1998c). The proposed permit requires seafloor monitoring two weeks after crab processing ceases (every other year) to ensure that deposition is not occurring from stationary outfalls.

While inspecting the Trident outfall in September 2007 the divers observed seafood accumulated on the seafloor. The area measured 75 feet by 100 feet and was covered with 2 to 4 inches of seafood wastes. Following this dive, there was a week of adverse weather, and when the divers went to finish the outfall inspection the seafood accumulation was gone except for trace amounts. Prior to the inspection, the facility had been processing halibut and discharging halibut wastes from June through September in 2007. This is a concern because the discharge from outfall 001 occurs within a designated critical habitat area (rookery) and haulout areas for the Northern Fur Sea, and the accumulation occurred during the critical breeding season for the Northern fur seal. Northern fur seals have been designated as depleted under the Marine Mammal Protection Act, and 72 percent of the world's population of Northern fur seal is in the Pribilof Islands stock. Additionally, Stellar sea lions are listed as an endangered species, and designated critical habitat area for this species is located within 2 nautical miles of the Trident outfall. Trident was authorized to discharge in the Pribilof Islands under the 1999 general permit. The 1999 general permit prohibited the discharge of ground seafood waste within ½ mile of Northern Fur Seal Rookeries and haulout areas from May 1st through December 1st each year. The Trident outfall was provided an exception to this prohibition, however, the fact sheet for the 1999 general permit stated:

> "*Discharges for the currently existing stationary outfalls...will be allowed to continue provided there is no waste on the sea surface or shoreline or accumulated on the seafloor, the facilities comply with the shoreline and sea surface and seafloor monitoring program, and results from effluent testing do not indicate a significant change in the characterization of the discharge or any other indication that the discharge is adversely affecting the marine environment*."

Trident has generally not complied with the terms and conditions of the permit, and seafood wastes have accumulated on the seafloor. Additionally, the Trident facility has greatly expanded its production season. When the 1999 general permit was issued, Trident processed Opilio crab from January through April, and a small amount of halibut (less than 80,000 pounds) during the summer months. Today, Trident is processing Opilio crab from January through April, one - two million pounds of halibut from June through October, and Red King Crab from October through November. Processing for Halibut can occur from March through October, and processing for Red King crab occurs from November through December. This is a concern because the increased processing from Trident occurs during the critical breeding season for both the Northern Fur Seals, and the endangered Steller Sea Lion (i.e., May 1st through November 30th). The Biological Assessment for the 1999 general permit assumed that discharge during the critical breeding period would not occur. Furthermore, the seafood waste being discharged is creating a waste pile at the outfall 001 terminus. There is some evidence that sea lions are attracted to seafood processing waste discharges (*Biological Assessment of Seafood Processing Discharges on Threatened, Endangered and Special Status Species of the Pribilof Islands,* August 1998), therefore, contact with the waste during foraging periods and during travel to and from Steller Sea Lion rookeries and haulout areas (which are within two miles of the Trident outfall) is possible. This is a concern because untreated wastewater from the St. Paul wastewater treatment plant is within 30 feet of the Trident outfall. Additionally, seafood processing wastes may contain earplugs, rubber packing bands, and other materials used during processing. The potential exists that these materials, if discharged with seafood waste, may be ingested by foraging sea lions and fur seals. Due to these factors the proposed permit requires the facility to discharge it solid halibut waste at-sea.

It is not known whether discharge of seafood processing wastes from mobile facilities in the Pribilof area is expected to result in bottom accumulations of seafood waste. Several processing ships were processing offshore of the beach where the 1999 shoreline deposits were observed. These processing activities lasted five to seven days beginning approximately two weeks prior to the shoreline deposit observation. With the SE winds at the time of the deposit observation and heavy surf conditions, it is possible that the shoreline deposits were related to these mobile processing activities. However due to the limited information, a direct correlation cannot be determined. Studies conducted in Chiniak Bay indicated that waste deposits can occur temporarily but the deposited waste from mobile surface discharges generally disappeared within 30 days (Stevens and Haaga 1994).

Disposition or accumulation of seafood waste solids could potentially impact less mobile benthic organisms such as polychaetes and bivalves, and demersal fish eggs that cannot move away from areas of waste accumulation.

Many benthic invertebrates are relatively sedentary and sensitive to environmental disturbance and pollutants. Short-term effects of seafood waste on benthic invertebrates may include smothering of biota, especially by ground particulates in the area near the discharge. The greatest impact would be expected directly downcurrent of the discharge. However, the magnitude of impact cannot be estimated due to limited information.

A number of important species, including most sculpins, walleye pollock, Pacific cod, rock sole, and sand lance, release demersal eggs. Smothering could have a localized adverse impact on eggs of these demersal species. The proposed permit limits the time frame when stationary and mobile facilities can discharge. Seafood processing discharges in the Pribilof Islands may overlap with the spawning periods of these fishes. It is not known whether spawning areas overlap with seafood waste disposal area, however this may be possible. In such incident, seafood waste deposits may adversely affect demersal eggs.

Sediment. ADEC currently has no numerical marine water quality standard for sediment. The narrative standards for sediment are as follows:

WATER USE	**CRITERIA**
Water supply (aquaculture)	No imposed loads that will interfere with established water supply treatment levels.
Water supply (seafood processing)	Below normally detectable amounts.
Water supply (industrial)	Same as criterion for water supply (aquaculture).
Water recreation (contact recreation)	No measurable increase in concentration of settleable solids above natural conditions, as measured by the volumetric Imhoff cone method.

WATER USE	CRITERIA
Water recreation (secondary recreation)	May not pose hazards to incidental human contact or cause interference with the use.
Growth and propagation of fish, shellfish, other aquatic life, and wildlife	Same as criterion for water recreation (contact recreation).
Harvesting for consumption of raw mollusks or other raw aquatic life	Not applicable.

Total suspended solids (TSS) concentration from seafood processing by mobile facilities ranged from 76 mg/L to 19,000 mg/L. Total suspended solids (TSS) concentration from seafood processing by land-based facilities ranged from 57 mg/L to 51900 mg/L (see Table 2). There are currently no quantitative federal or state marine standard for TSS and therefore potential impacts are evaluated based on literature values. At elevated concentrations, TSS could affect zooplankton and fish larvae near the discharge. Zooplankton and fish larvae may experience altered respiratory or feeding ability due to stress, or clogging of gills and feeding apparatus. For example, 1000 mg/L of TSS could damage the epidermis of Pacific Herring larvae and 4000 mg/L of TSS could result in punctured epidermis in these larvae (Wilber and Clarke 2001). Chronic effects have also been observed in American Oyster larvae and Bay scallop at 750 mg/L and 500 mg/L, respectively (Priest 1981; Wilber and Clarke 2001). Elevated TSS concentrations may also decrease light availability, therefore reducing phytoplankton productivity.

The highest measured concentrations for mobile and land-based seafood processors were approximately 19 and 51.9 times, respectively, the concentration at which Pacific Herring larvae were reported to experience damaged epidermis. These TSS concentrations are expected to adversely impact marine organisms. The greatest adverse impacts would be expected in the immediate vicinity of the discharge. In addition, less mobile organisms are generally expected to be most affected by the discharge plume. Mobile invertebrates, fish, birds, and marine mammals presumably would avoid the discharge plume if conditions become stressfu1. However, it is not possible to predict the magnitude of impacts due to lack of discharge flow and organism behavior information. For example, organisms may be attracted to the area due to potential food sources.

Sediment, when deposited on the bottom of the water column, may change the local sediment characteristics. This is expected to locally impact the benthic community structure but likely more subtly than smothering.

Sediment chemistry monitoring was required by the general permit but this information was not collected by permittees. However, historical studies were conducted at several nearshore sites on St. Paul, St. George, and Otter Islands (Enviro-Tech Diving, Inc. 1997). Sediments were collected in areas near discharges and at reference sites which were not subject to discharges. Sediments were analyzed for a number of constituents to determine if sediment character had been affected by discharges (biological and chemical oxygen demand, nitrogen, sulfide, total organic carbon, tota1 solids, tota1 volatile solids, petroleum hydrocarbons, grain size, semi-volatile organics, polynuclear aromatic hydrocarbons, and microbial contamination). The results of the survey indicate that sediments tested were not affected by discharges and there was no significant difference between stations near discharges and the reference locations. No organic contaminants, oil or grease, or microbial contaminants were found in samples. BOD and COD levels were low. Organic carbon, nitrogen, and sulfides were either not detected or present in low concentrations.

Infaunal samples collected near discharges were not statistically different from reference sites. Species composition, abundance and diversity were similar at the discharge and reference sites. Based on chemical and biological information, no effects of discharges on sediment quality and infaunal organisms are discernible.

5.1.2 pH

The current ADEC marine water quality standards for pH are as follows:

WATER USE	CRITERIA
Water supply (aquaculture)	May not be less than 6.5 or greater than 8.5, and may not vary more than 0.2 pH unit outside of the naturally occurring range.
Water supply (seafood processing)	May not be less than 6.0 or greater than 8.5.
Water supply (industrial)	May not be less than 5.0 or greater than 9.0.
Water recreation (contact recreation)	May not be less than 6.0 or greater than 8.5. If the natural pH condition is outside this range, substances may not be added that cause any increase in buffering capacity of the water.
Water recreation (secondary recreation)	Same as criterion for water supply (industrial).
Growth and propagation of fish, shellfish, other aquatic life, and wildlife	Same as criterion for water supply (aquaculture).
Harvesting for consumption of raw mollusks or other raw aquatic life	Same as criterion for water supply (seafood processing).

Of the measured discharge monitoring pH values for seafood processing facilities, 16 of them violated the ADEC water quality standards for “Growth and propagation of fish, shellfish, other aquatic life and wildlife; and aquaculture; six (6) of the samples measured violated the ADEC water quality standards for seafood processing, contact recreation, and harvesting for consumption of raw mulllusks or other raw aquatic life (see Table 2). Receiving water samples collected from historical monitoring program have indicated a pH range of 7.76 to 7.89 (EPA 1998c). The effluent discharge is expected to slightly increase the acidity of the receiving water and potentially affect marine organisms in the immediate vicinity of the effluent plume.

5.1.3 Nutrients

The 1999 general permit required seafood processors to monitor total phosphorus (TP) and ammonia concentrations in their discharges. The following is a brief evaluation of potential impacts of these nutrient discharges from seafood processing facilities.

Total Phosphorus (TP). ADEC currently has no numerical marine water quality standard for phosphorus. Total phosphorus concentrations from seafood processing by mobile facilities ranged from 0.5 mg/L to 118 mg/L. Total phosphorus concentrations from seafood processing by land-based facilities ranged from 0.6 mg/L to 605 mg/L (see Table 2). These high concentrations may result in an increase in phytoplankton biomass, productivity, and changes in phytoplankton community species composition (United Nations 1990). Secondary or indirect impacts may occur if certain phytoplankton species become toxic or if toxic phytoplankton community could have significant effects on the marine ecosystem as a whole (Legendre 1990). Although enhanced phytoplankton growth would not necessarily be an adverse effect since phytoplankton form the base of the marine food chain, a large increase in phytoplankton standing crop or changes in species composition, particularly of nuisance or toxic species, could have adverse effects on dissolved oxygen concentrations, other marine organisms, aesthetic water quality, and impacts to humans.

There are several factors which control the rate of phytoplankton productivity and the accumulation of algal biomass. These include temperature, light intensity, mixing depth, and the supply of other nutrients such as nitrogen, phosphorus, silica, and a number of other essential elements (e.g., iron, manganese, zinc, copper, and cobalt). Other factors influencing phytoplankton productivity and biomass that are still poorly understood include inhibitory and stimulatory substances (e.g., vitamin B-12, chelating agents) (Aubert 1990; United Nations 1990).

The potential for adverse impacts from nutrient discharges by seafood processing facilities would depend on whether nitrogen or phosphorus limit phytoplankton growth in the vicinity of the discharge. Other relevant factors to consider include water exchange, mixing depth, zooplankton grazing activity, and the depth of light penetration in the water column.

It is difficult to predict the potential impact of nutrient-rich waste discharges from seafood processors on the Pribilof Islands marine phytoplankton communities. There appear to have been no studies on impacts of seafood waste discharges on marine phytoplankton in Alaska. Therefore, it is difficult to make a general assessment of the potential for enhancement of phytoplankton productivity and biomass in the vicinity of seafood processing discharges. Nonetheless, these impacts are most likely to occur in relatively shallow areas of restricted water: circulation when phosphorus limitation of phytoplankton growth occurs. Therefore, discharges to relatively well-flushed coastal areas have a lower potential to cause enhanced phytoplankton growth and biomass.

Alteration in phytoplankton species composition is another potential impact of nutrient-rich discharges. Concerns are primarily related to indirect effects due to the production of phytoplankton species that have adverse effects on marine organisms and humans. These effects include physical damage to marine organisms (e.g., diatom species of Chaetoceros which have caused mortality of penned salmon), toxic effects to marine organisms (e.g. raphidophyte flagellate species of Heterosigrna), and toxic effects to humans due to the concentration of algal toxins in marine fish and shellfish (e.g., Paralytic Shellfish Poisoning [PSP], Diarrheic Shellfish Poisoning [DSP], Neurotoxic Shellfish Poisoning [NSP], Amnesic Shellfish Poisoning [ASP], and ciguatera) (Taylor 1990; Haigh and Taylor 1990). Concerns regarding toxic phytoplankton have been heightened in recent years due to suspicions that the frequency of toxic phytoplankton blooms has increased due to human activities, especially due to agricultural runoff and the discharge of municipal and industrial wastewater to marine coastal areas (Smayda 1990; Smayda and White 1990; United Nations 1990; Anderson 1989).

Although there have been various reports linking mortalities of relatively large numbers of marine mammals (e.g., Berta and Sumich 1999; O'Shea et al. 1991; Anderson and White 1989; Geraci 1989; Geraci et al. 1989; Gilmartin et al. 1980; Lefebvre *et al*. 1999; Scholin et al. 2000; Lefebvre et al. 2001), fish and shellfish (e.g., Cosper et al. 1990; Harper and Guillen 1989; Smayda and Fofonoff 1989), and aquatic plants (e.g., Cosper et al. 1990) to the occurrence of toxic phytoplankton in other parts of the U.S., no such episodes have been reported for the coastal waters of Alaska or the Pribilof Islands. Limited studies have been conducted in Alaska to evaluate the potential impacts of toxic phytoplankton to marine species. Kvitek and Bretz's (2004) recent observation of sea otters in southeast Alaska indicated that sea otters altered their prey preference in response to elevated concentration of PSP toxin concentration in prey tissue. This may potentially reduce food source available to these predators, thereby resulting in an alteration of the structure of benthic prey assemblage.

Occurrence of human intoxication due to PSP has also been recorded at locations in southeast Alaska (Sundstrom et al. 1990). PSP is caused by the consumption of shellfish that have concentrated toxins from dinoflagellate algae of the species Protogonyaulax (Shimizu 1989). However, direct links between the occurrence of PSP and eutrophication have not been established (Anderson 1989). Although no algae bloom sightings have been reported in the Pribilof area, elevated levels of PSP in bairdi Tanner crab were detected in the Pribilof area. These incidents occurred in late October and early November but it is not known if these incidents are related to seafood processing activities in the area (Mike Ostasz, ADEC, Pers. Comm., 2005).

Although there is a potential for the discharge of seafood processing waste to cause at least loca1ized changes in phytoplankton species composition, there is currently no documented evidence that discharge of seafood processing waste has resulted in toxic or harmful phytoplankton blooms that have caused significant impact to marine organisms. Therefore it is not known if the regulated discharge of seafood processing waste will result in significant changes in phytoplankton species composition that would lead to adverse effects on marine organisms and humans.

Ammonia. Sources of ammonia attributable to seafood processing discharges include ammonia dissolved in the seafood processing wastewater, and ammonia released from the decaying waste organic matter in the water column or from seafood waste that has accumulated on the bottom. Un-ionized ammonia is the chemical form that is most toxic to marine organisms. The concentration of un-ionized ammonia depends on the total ammonia concentration and the salinity, temperature, and pH of the water. ADEC has defined two sets of acute and chronic criteria for total ammonia that are salinity, temperature, and pH-dependent. These criteria are established for the protection of saltwater aquatic life. On July 23, 1997 samples of pH, salinity and temperature were taken from 8 different sampling stations[1] in the Pribilofs. Data was taken at one meter intervals from one meter below the surface to 1 meter above the sea bottom. The highest temperature recorded was 6.77°C, the highest pH was 7.1 s.u., and the lowest salinity was 31.7 g/kg. Given these values, a relatively conservative estimate of the acute and chronic criteria can be developed using a salinity of 30 g/kg, pH of 7.6 standard units, and a water temperature of 10° C. This results in an acute criterion of 37 mg/L total ammonia as N, and a chronic criterion of 5.6 mg/L total ammonia as N (See Tables VIII and IX of *Alaska Water Quality Criteria Manual for Toxic And Other Deleterious Organic and Inorganic Substances*, State of Alaska Department of Environmental Conservation, May 2003).

Total ammonia concentration in the effluent discharges generally exceeded one or both of the acute and chronic criteria (See Table 2). One of the onshore seafood processors exceeded the chronic criteria by more than 200 fold. These elevated concentrations are expected to increase ammonia concentration in the receiving water as observed in past monitoring activities. Past monitoring data indicated that seafood processing discharges increased the ammonia concentration in the receiving water (Dames & Moore 1997a, 1997b). Based on the available discharge monitoring data, it is expected that untreated ammonia from seafood processing discharges would result in both acute and chronic impacts to marine organisms. The greatest adverse impacts would be expected to occur in the immediate vicinity of the discharge. However, these impacts will be mitigated because the proposed permits contains effluent limits for the discharges which are based on the ammonia criteria. With these limitations it is expected that the discharge of ammonia will have little, if any, effect.

5.1.4 Oxygen Demand/Dissolved Oxygen

The general permit requires monitoring of chemical oxygen demand (COD) and biochemical oxygen demand (BOD) only and dissolved oxygen (DO) monitoring is currently not required. Bacterial oxidation of the

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[1] Four of the stations were located immediately around the St. Paul Island stationary outfalls, one was located off of Tonki Point, northeast of the stationary outfalls, one was northeast of the outfalls near Lukania Point, one was southwest of the outfalls, near Sea Lion Rock, and the last was just north of the previous listed station.

soluble organic matter discharged to receiving waters from seafood processors results in the consumption of water column dissolved oxygen. Relatively low dissolved oxygen concentrations or the complete absence of dissolved oxygen is lethal to a number of marine organisms, with the exception of obligate and facultative anaerobic bacteria. COD and BOD marine water quality standards are currently not available from the state and federal. Average and maximum TMDL load values of 9,000 and 144,000 lb/day for BOD have been established by ADEC for the purposes of regulating Alaska seafood processing. This value was established based on compliance with a DO concentration of 5 mg/L (K. Mckerney, ADEC, Pers. Comm., 2005).

The highest measured BOD concentration from the mobile and shore-based seafood processing facilities were 21,400 and 81,000 mg/L, respectively. The highest measured COD concentration from the mobile and shore-based seafood processing facilities were 3,200 and 216,000 mg/L, respectively. Results for total organic carbon collaborated closely with BOD and COD concentrations, verifying that large quantities of organic materials are present in the discharge. Potential impacts of COD cannot be estimated due to lack of water quality guidelines and limited information for estimating DO concentration. Daily BOD loading from seafood processors could be estimated using by using the following equation:

Daily BOD load (lb/day) = BOD concentration (mg/L) * Discharge Flow Rate (gal/day) *
Unit Conversion Factor (lb-L-gal^{-1}-mg^{-1})

Discharge flow rate information was taken from the most recent permit applications (Trident flow is 3.5 mgd, Arctic Star flow is 0.1 mgd). The estimated daily BOD loadings for Trident Seafoods and P/B Arctic Star were 96,327 lbs/day and 67,554 lbs/day, respectively. Both of these loading estimates were below the maximum TMDL guideline value of 144,000 lb/day, however both exceeded the average of 9,000 lbs/day. It is not known if BOD from land-based processors would result in potential impacts due to limited information. Acute adverse effects is not likely due to compliance with maximum daily load, however it is not known whether chronic effects would result due to exceedance of the average daily TMDL guideline value.

5.1.5 Petroleum Hydrocarbons, Oil and Grease

The current ADEC marine water quality standards for petroleum hydrocarbons (PAHs) and oil and grease are as follows:

WATER USE	**CRITERIA**
Water supply (aquaculture)	Total aqueous hydrocarbons (TAqH) in the water column may not exceed 15 µg/L. Total aromatic hydrocarbons (TAH) in the water column may not exceed 10 µg/L. There may be no concentrations of petroleum hydrocarbons, animal fats, or vegetable oils in shoreline or bottom sediments that cause deleterious effects to aquatic life. Surface waters and adjoining shorelines must be virtually free from floating oil, film, sheen, or discoloration.

WATER USE	CRITERIA
Water supply (seafood processing)	May not cause a film, sheen, or discoloration on the surface or floor of the waterbody or adjoining shorelines. Surface waters must be virtually free from floating oils. May not exceed concentrations that individually or in combination impact odor or taste as determined by organoleptic tests.
Water supply (industrial)	May not make the water unfit or unsafe for the use.
Water recreation (contact and secondary recreation)	May not cause a film, sheen, or discoloration on the surface or floor of the waterbody or adjoining shorelines. Surface waters must be virtually free from floating oils.
Growth and propagation of fish, shellfish, other aquatic life, and wildlife	Same as criterion for water supply (aquaculture).
Harvesting for consumption of raw mollusks or other raw aquatic life	May not exceed concentrations that individually or in combination impart undesirable odor or taste to organisms as determined by bioassay or organoleptic tests.

The general permit only requires monitoring of oil and grease and PAHs monitoring is currently not required. Relatively small amounts of PAHs derived from machinery lubricating oils may be discharged along with the seafood processing waste; however impacts relating to PAHs cannot be evaluated due to lack of data. Currently, there are no quantitative oil and grease standards from either the state or federal regulatory agencies. The measured oil and grease concentration from the seafood processors' discharge ranged from 13 to 35,800 mg/L. It is not known if this elevated concentration of oil and grease would have an adverse impact on marine species since oil and grease includes thousands of organic compounds with varying physical, chemical, and toxicological properties. Oil and grease also includes PAHs, which at a relatively small fraction of the measured oil and grease concentration, could have an adverse impact on marine organisms. However, as mentioned previously, PAH information is currently not available and therefore the potential for associated impacts cannot be determined. Animal oils are generally chemically nontoxic to humans or aquatic life (EPA 1986), however, floating sheens or oils could potentially have an adverse impact to aquatic life and as a result is not permitted by the narrative standard. However, no observation of sheens have been reported in the available monitoring data and therefore it appears that this may not be of a concern.

5.1.6 Toxic and Other Deleterious Organic and Inorganic Substances

The general permit requires monitoring of residual chlorine, ammonia, metals and volatile organic carbons (VOCs) concentration in the seafood discharges. Metals data is available for 3 facilities and VOCs data was collected by Stellar Sea. Impacts due to VOCs could not be evaluated due to the scarcity of information. However, the Stellar Sea did collect one sample in 2006 and all pararmeters were non-detectable.

The current ADEC acute and chronic aquatic life criteria for marine waters for residual chlorine are 13 µg/L (one-hour average) and 7.5 µg/L (four-day average), respectively. Seafood processing effluent frequently exceeds these values, therefore, the proposed permit contains effluent limits for chlorine. It is expected that chlorine will have little, if any effect on aquatic life if the effluent limitations are met by the dischargers.

Metals data for arsenic, cadmium, copper, lead, mercury, nickel, selenium, and zinc was collected by Trident Seafoods, Arctic Star, and Stellar Sea. The acute and chronic aquatic life criterion for each of these parameters is shown in Tables 2(a), 2(b) and 2(c). As can be seen from these tables the facilities violate the aquatic life criteria for arsenic, cadmium, copper, nickel, selenium, silver and zinc. The levels being discharged can have an adverse impacts on aquatic life communities. The source of metals is unknown, particularly since metals are not a component of the processing system. It is possible that metals are being leached from pipes, or are in the intake water used in processing. In order to determine the source of the metals EPA is requiring additional metals monitoring along with a metals study in this permit.

A condition has been incorporated into the permit requiring the facilities to conduct metals monitoring of the influent and effluent for the Outfall, and for surface water. If monitoring indicates the concentrations of metals exceeds the criteria, and the source of contamination is not attributable to raw seafood or from the influent sea water then the source of metals contamination must be identified and eliminated from the discharge no later than 4 years from the effective date of the permit. The permittee must submit a report detailing the findings of their study and their method of eliminating pollutant sources.

5.1.7 Secondary Impacts Due to Seafood Processing Wastes

Potential secondary impacts of seafood waste discharges involve effects on marine mammals and birds due to their attraction to seafood waste discharges. Eutrophication of marine waters may also indirectly result in enhancement of phytoplankton species that are toxic to marine organisms and humans, as discussed in the previous sections. Pathogens and parasites associated with the decaying seafood waste may also adversely impact marine mammal and birds.

Attraction of organisms to the discharge. There is limited biological monitoring data, however this data does indicate that avian species' interaction with and feeding on seafood processing discharge is common. Some of these species include but are not limited to sea gulls, king eiders, oldsquaws, and black-legged kittiwakes. The Environmental Protection Agency and the Alaska Department of Environmental Conservation conducted an inspection of the Trident facility in September 2006 (when halibut is being processed). During this inspection Northern fur seals were documented all along East Landing, as well as in the water next to the facilities outfall pipe. The attraction of marine organisms to seafood waste discharges may make them easier prey for predators. There are currently no documented studies relating seafood processing waste discharges with marine mammal concentrations. However, there is anecdotal information from the National Marine Fisheries Service indicating a very strong attraction to both mobile offshore and shore-based processors by sea lions. As seafood processing moved onshore to Kodiak Island, sea lions were observed in the vicinity of shore-based discharges in Kodiak Harbor. Occasional observations of killer whales feeding on sea lions in Kodiak were also reported. NMFS personnel observed a possible linkage of sea lion observations with fishing activity-fish processing activity and sea lions in Kodiak (EPA 1995c).

Another potential secondary impact involves the development of dependence on an anthropogenic food supply that may result in the concentration and growth of marine mammal and bird populations that could be adversely affected if this food supply was reduced or eliminated. It is evident that a large number of birds are attracted to seafood processing waste discharges. They are most likely feeding on the discharged suspended matter and floating particulates. Artificial food sources, such as seafood process wastes, may increase the gull populations in the Pribilof Islands by providing food throughout winter months when natural food is less abundant and survival is the most difficult. Large gulls (herring, glaucous, and glaucous-winged) and parasitic birds Gaegers and skuas) interfere with the reproductive success in waterfowl and in seabirds by preying on ducklings and chicks, displacing other species from nests, and harassing adult birds (EP A 1995c). Several studies which have documented gulls and other parasitic birds preying on waterfowl and seabirds include Anderson (1974), Tyler (1975), Nettleship (1977), Munro and Bedard (1977), Martin and Barry (1978), Mendenhall and Milne (1985), Barry and Barry (1990), Lloyd ct al. (1991), and Mendenhall (1993). Seafood waste discharges may increase localized populations of gulls and parasitic birds which may adversely affect the breeding success of other bird species. The significance of this potential indirect impact is unknown.

Birds that are attracted to surface plumes of seafood waste (especially floating particulates and surface films) may potentially become oiled or their feathers fouled due to accumulation of waste oils (e.g. high concentrations of fish oils or process oils) on the water surface. There are no documented studies that could provide an indication of the potential significance of this problem. Other studies on effects of oil spills on birds have shown adverse impacts. Although fish oils are different in composition from petroleum products, the effects of oiling are similar.

Pathogens and parasites from waste accumulations. Pathogens and parasites associated with the seafood waste may potentially adversely impact marine mammals and birds. The potential for impact is hypothesized to be from animals consuming or contacting seafood waste (through ingestion or open wounds) that is contaminated with pathogens or parasites. Contact with waste would include suspended wastes in the water column or wastes washed on shore. Necropsies of juvenile northern fur seals conducted regularly at St. Paul since the 1980s have indicated a relatively low incidence of disease (NMFS 1993a). However, some juveniles collected in 1990 were affected by "white muscle syndrome" of unknown etiology, but possibly due to chemical oxidants (NMFS 1994). Identified parasites and pathogens of the northern fur seal include nematode worms and *Leptospira* (a bacterium that causes Leptospirosis) (NMFS 1993a). A number of parasites and pathogens of Steller sea lions have been observed, including parasitic nematodes, bacteria (*Leptospira* and Chlamydia), and viruses (calicivirus and seal herpesvirus) (NMFS 1992). The importance of these agents in sea lion mortality is not currently known but death and reproductive failure have been associated with nematode and *Leptospira* infections in species of sea lions.

Given the densities of Pribilof Islands bird and marine mammal breeding populations during summer, concern for this potential impact is warranted. However, these concerns can be mitigated if the proposed permits for Arctic Star, Stellar Sea, and Westward Wind do not allow discharges from after May 5th when sea lions and Northern fur seals and birds are breeding. Additionally, the proposed permit for Trident should require the facility to discharge its ground seafood waste at an at-sea disposal site from April 30th to November 30th (during the critical breeding season). Additionally, the proposed permits prohibit the accumulation of seafood waste on shore as a result of the discharge.

5.2 Impacts Associated with St. Paul's Wastewater System

The discharge from the City of St. Paul's domestic wastewater system has the characteristics expected of wastewater which is allowed to settle out the solids and floating materials. Most parameters monitored were either not detectable in the effluent or below the aquatic life and/or human health criteria. Table 3 summarizes effluent discharge monitoring data from the wastewater system from 2001 through 2006; only toxic data that exceeded criteria and conventional pollutants are summarized in the table. Following Table 3 are discussions of discharge compliance with the general permit and the associated potential adverse effects of the city's effluent discharge to water quality, biology, and human health, the subsections are organized by constituent.

Table 3. Summary of City of St. Paul Effluent Discharge Concentrations.

Parameter	Concentration
BOD	46.5 – 160 mg/L
Total suspended solids	22 – 71 mg/L
Oil and grease	4.9 – 49.3 mg/L
Chemical oxygen demand	130 – 312 mg/L
Total organic carbon	32.9 – 92.6 mg/L
Fecal coliform bacteria	170,000 – 28,000,000 colonies/100 ml
pH	6.8 – 7.7 standard units
Total phosphorus	2.1 – 5.2 mg/L
Ammonia	Non detect – 44.8 mg/L
Toluene	4.9 – 188 µg/L
1,4 Dichlorobenzene	0.7 – 11.5 µg/L
Dibromochloromethane	0.55 – 2.7 µg/L
Bromoform	1.887 – 7.4 µg/L
Chloroform	Non detect -5.13 µg/L
Aluminum	568 – 1090 µg/L
Barium	1.87 – 7.4 µg/L
Copper	68.4 - 73.2 µg/L
Iron	378 – 735 µg/L
Lead	Non detect – 1.83 µg/L
Manganese	7.7 – 20.3 µg/L
Selenium	Non detect – 3.02 µg/L
Silicon	7850 – 13,200 µg/L
Zinc	Non detect – 72 µg/L
Silver	5.6 – 26.6 µg/L

5.2.1 Solid Wastes

Septic tanks are expected to settle out the residues and therefore no significant impact is expected to be associated with residues. The 1999 general permit requires the city to monitor their effluent for total suspended solids. As mention in section 5.1.1 above, ADEC currently has no numerical marine water quality standard for sediment. TSS concentration in the city's effluent ranged from 22 mg/L to 71 mg/L (Table 3). These concentrations are generally below the concentrations at which toxicity was observed and therefore TSS from the city is not likely to have an adverse impact on aquatic species.

5.2.2 pH

The city's effluent pH was in compliance with the ADEC marine water quality standards for pH as described in section 5.1.2.

5.2.3 Nutrients

Similar to the seafood processors, the city is required by the 1999 general permit to monitor TP and ammonia concentrations in their effluent discharges. The following is a brief evaluation of potential impacts of these nutrient discharges from the city.

TP. ADEC currently has no numerical marine water quality standard for phosphorus. Total phosphorus concentrations ranged from 2.1 mg/L to 5.2 mg/L. These concentrations will contribute to affects discussed in section 5.1.3 of this document.

Ammonia. Sources of ammonia attributable to seafood processing discharges include ammonia dissolved in the seafood processing wastewater, and ammonia released from the decaying waste organic matter in the water column or from seafood waste that has accumulated on the bottom. Un-ionized ammonia is the chemical form that is most toxic to marine organisms. The concentration of un-ionized ammonia depends on the total ammonia concentration and the salinity, temperature, and pH of the water. ADEC has defined two sets of acute and chronic criteria for total ammonia that are salinity, temperature, and pH-dependent. These criteria are established for the protection of saltwater aquatic life. On July 23, 1997 samples of pH, salinity and temperature were taken from 8 different sampling stations[2] in the Pribilofs. Data was taken at one meter intervals from one meter below the surface to 1 meter above the sea bottom. The highest temperature recorded was 6.77°C, the highest pH was 7.1 s.u., and the lowest salinity was 31.7 g/kg. Given these values, a relatively conservative estimate of the acute and chronic criteria can be developed using a salinity of 30 g/kg, pH of 7.6 standard units, and a water temperature of 10° C. This results in an acute criterion of 37 mg/L total ammonia as N, and a chronic criterion of 5.6 mg/L total ammonia as N (See Tables VIII and IX of *Alaska Water Quality Criteria Manual for Toxic And Other Deleterious Organic and Inorganic Substances*, State of Alaska Department of Environmental Conservation, May 2003).

With the exception of one sample event the total ammonia concentration in the effluent discharge exceeded one or both of the acute and chronic criteria (See Table 3). Based on the available discharge monitoring data, it is expected that untreated ammonia from this discharge would result in both acute and chronic impacts to marine organisms. The greatest adverse impacts would be expected to occur in the immediate vicinity of the discharge.

5.2.4 Oxygen Demand/Dissolved Oxygen

Similar to the seafood processors, the city is currently required to monitor COD and BOD only and DO monitoring is currently not required. As mentioned above, COD and BOD marine water quality standards are currently not available from the state and federal. BOD and COD concentrations from the city ranged from 46.5 to 160 mg/L and 130 to 312 mg/L, respectively. The flow from this facility is estimated to be 300,000 gallons per day, which would result in a BOD loading of 116 lbs/day – 400 lbs/day. These values are much less than the loading from the seafood processing facilities, and would not likely have an impact on the receiving water (see section 5.1.4).

5.2.5 Petroleum Hydrocarbons, Oil and Grease

The general permit requires monitoring of various VOCs including some aromatic hydrocarbons such as benzene, ethylbenzene, toluene, and xylenes. Of these hydrocarbons, toluene concentration in 89% of the

[2] Four of the stations were located immediately around the St. Paul Island stationary outfalls, one was located off of Tonki Point, northeast of the stationary outfalls, one was northeast of the outfalls near Lukania Point, one was southwest of the outfalls, near Sea Lion Rock, and the last was just north of the previous listed station.

samples exceeded the Alaska water quality criteria for TAH (10 µg/L). Toluene concentration from the city's effluent ranged from 4.9 to 188 µg/L.

The general permit also required monitoring of oil and grease, which currently has no state or federal standard. The measured oil and grease concentration from the discharge ranged from 4.9 to 49.3 mg/L. It is not known if these relatively low concentrations of oil and grease would have an adverse impact on marine species due to great variation of physical, chemical, and toxicological properties of compounds included in oil and grease.

5.2.6 Toxic and Other Deleterious Organic and Inorganic Substances

The general permit requires monitoring of metals (including mercury) and VOCs concentration in the city's effluent discharges.

Metals. With the exception of copper and silver, metal concentrations were below aquatic life and human health criteria. Copper and silver concentrations both exceeded the ADEC water quality standard. The acute aquatic life criterion for copper is 4.8 µg/L and the chronic aquatic life criterion is 3.1 µg/L; the acute aquatic life criterion for silver is 1.9 µg/L, and there is no chronic aquatic life criterion for silver. Copper concentrations in all samples exceeded both the acute and chronic criteria. 2 of the 5 samples analyzed for silver exceeded the silver criterion. Other metals were also evaluated and the concentrations were below the levels at which toxic effects were observed. Method detection limit for mercury exceeded the water quality standard and therefore compliance cannot be evaluated. The elevated concentrations for copper and silver are expected to have an adverse impact to marine organisms.

VOCs. Other then toluene, the other VOCs were generally in compliance with the water quality standards. The potential effects relating to toluene is discussed in section 5.2.5. Most VOCs were not detected. For those that were detected, their concentrations were either below the criteria or the levels at which toxic effects were observed, or no toxicological data were available and therefore potential adverse impacts could not be estimated.

5.2.7 Fecal Coliform

The general permit requires monitoring of fecal coliform (FC) in the city's effluent discharges. The current ADEC marine water quality standards for fecal coliform are as follows:

WATER USE	CRITERIA
Water supply (aquaculture)	For products normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml. For products not normally cooked, the geometric mean of samples taken in a 30-day period may not exceed 20 FC/100 ml, and not more than 10% of the samples may exceed 40 FC/100 ml.
Water supply (seafood processing)	In a 30-day period, the geometric mean of samples may not exceed 20 FC/100 ml, and not more than 10% of the samples may exceed 40

WATER USE	CRITERIA
	FC/100 ml.
Water supply (industrial)	Where worker contact is present, the geometric mean of samples taken in a 30-day period may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml.
Water recreation (contact recreation)	In a 30-day period, the geometric mean of samples may not exceed 100 FC/100 ml, and not more than one sample, or more than 10% of the samples if there are more than 10 samples, may exceed 200 FC/100 ml.
Water recreation (secondary recreation)	In a 30-day period, the geometric mean of samples may not exceed 200 FC/100 ml, and not more than 10% of the samples may exceed 400 FC/100 ml.
Growth and propagation of fish, shellfish, other aquatic life, and wildlife	Not applicable.
Harvesting for consumption of raw mollusks or other raw aquatic life	Based on a 5-tube decimal dilution test, the fecal coliform median most probable number (MPN) may not exceed 14 FC/100 ml, and not more than 10% of the samples may exceed a fecal coliform median MPN of 43 FC/100 ml.

Fecal coliform concentrations in all the city's effluent samples exceeded the water quality criteria for all but growth and propagation of fish, shellfish, other aquatic life, and wildlife uses. No criterion is currently available for this water use because fecal coliforms are expected to have the most impact to human health. The measured concentration ranged from 170,000 FC/100 ml to 28,800,000 FC/100 ml. These elevated fecal coliform concentrations are expected to have a significant adverse impact to human health.

5.3 Summary

Evaluation of various monitoring data from the Pribilof area indicated that both seafood processing activities and City of St. Paul wastewater discharge may result in a number of direct and indirect adverse impacts. Due to limited monitoring data and issues with method detection limits as described in the sections above, impacts associated with some constituents cannot be evaluated. Below is a summary of the potentially adverse impacts identified based on available information.

Seafood processing. Potential direct impacts of seafood processing discharges include: smothering of benthic invertebrates and demersal eggs due to physical deposition, alteration of benthic community structure, adverse impact to marine organisms due to elevated TSS concentrations, toxicity due to depressed DO levels associated with the oxygen demand exerted by the process discharge, slight impact to organisms due to slightly acidic pH level, and toxicity to aquatic species due to elevated ammonia, chlorine, and metals concentration. Potential indirect impact may include eutrophication as a result of elevated nutrient concentration, which may enhance phytoplankton growth, alter phytoplankton species composition, subsequently reduce prey density for marine mammals, alter structure of benthic prey assemblage, and potentially lead to human intoxication.

City of St. Paul. Both direct and indirect adverse impacts are associated with the domestic discharges from the city. Direct impacts include adverse effects due to toxicity to marine organisms due to elevated ammonia, toluene, copper, and silver concentrations, potential impacts associated with depleted DO concentrations, and significant adverse impacts resulting in greatly elevated fecal coliform concentrations. Indirect impacts are similar to those associated with seafood processing activities.

SECTION 6. ENDANGERED AND THREATENED SPECIES

The determination of "unreasonable degradation" of the marine environment is to be made based upon consideration of the 10 criteria listed in Section 1. This section provides information pertinent to consideration of the criterion shown below:

- Criterion #3: The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain.

This section identifies species which have been listed as threatened or endangered and are located in areas with the potential to be exposed to seafood processing waste discharges. Potential impacts of seafood waste discharges on these species are discussed.

6.1 Endangered Species Act Terminology

Section 7(a)(2) of the Endangered Species Act (ESA) of 1973 requires federal agencies, in consultation with the agencies responsible for administering the ESA-- the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS)--to ensure that any action they authorize is not likely to jeopardize the continued existence and recovery of any species listed as threatened or endangered, or result in the destruction or adverse modification of critical habitat. An "endangered species" is defined as a species which is in danger of extinction throughout all or a significant portion of its range, whereas a "threatened species" is defined as a species which is likely to become endangered within the near future throughout all or a significant portion of its range. A species is classified as a "candidate species" when the administering agency is considering the species for listing as threatened or endangered.

"Critical habitat" is defined as the specific areas within and outside the geographical area currently occupied by a species at the time it is listed in accordance with the ESA, on which are found those biological or physical features essential to the conservation of the species and which may require special management considerations or protection (50 CFR 424.02). Designation of critical habitat contributes to the conservation of a species primarily by identifying critically important areas and by describing the features within the area that are essential to the species.

Special status species include species which have been listed as threatened or endangered, marine mammals that have been designated as depleted by NMFS pursuant to the Marine Mammal Protection Act (MMPA), and mammals and waterfowl that have been identified as proposed or candidate species by NMFS or USFWS pursuant to the ESA.

6.2 Abundance and Distribution of Endangered, Threatened, and Special Status Species

Table 4 presents the federal and state status for species listed as endangered, threatened, or with special status including species of special concern, rare, or depleted. Several species of endangered whales may travel through the Pribilof region while migrating to and from summer feeding grounds. These include bowhead, North Pacific right, sperm, blue, finback, and humpback whales (D. DeMasters, NMFS, pers. comm. 1995; Zimmerman 1998). The western distinct population segment (DPS) of the Steller sea lion and the southwest

Alaska DPS of the northern sea otter are the only marine mammals listed as threatened or endangered species that may be present in the Pribilof Islands throughout the year (NMFS 2005b; Burn, NMFS, pers. comm. 2005). The northern fur seal breeds on the Pribilofs and is considered a “depleted” species by the NMFS. Avian species with special status include the federally listed endangered short-tailed albatross, and Steller’s eider and spectacled eider, each of which are federally listed as threatened. One terrestrial species of special concern, the Pribilof Island shrew, is present in the project area. The following sections provide listing status, abundance, distribution, life history information, and descriptions of potential effects for these species within the Pribilof Islands.

Table 4. Threatened, endangered, proposed, and sensitive species potentially occurring in the permit area.

Common Name	Scientific Name	Status
Marine Mammals		
Bowhead whale	*Balaena mysticetus*	FE, SSC
North Pacific right whale	*Eubalaena japonica*	FE, SE
Sperm whale	*Physeter macrocephalus*	FE
Blue whale	*Balaenoptera musculus*	FE, SE
Finback whale	*Balaenoptera physalus*	FE
Humpback whale	*Megaptera novaeangliae*	FE, SE
Steller sea lion	*Eumetopias jubatus*	FE, SSC
Sea otter	*Enhydra lutris kenyoni*	FT, SSC
Northern fur seal	*Callorhinus ursinus*	D
Seabirds		
Short-tailed albatross	*Phoebastria albatrus*	FE, SE
Waterfowl		
Steller’s eider	*Polysticta stelleri*	FT, SSC
Spectacled eider	*Somateria fischeri*	FT, SSC
Terrestrial Mammal		
Pribilof Islands shrew	*Sorex hydrodromus*	R

FE = federally listed endangered; FT = federally listed threatened; FP = federally proposed for listing; SE = state-listed endangered; ST = state-listed threatened; SSC = state species of concern; R = rare; D = depleted stock (Marine Mammal Protection Act designation)

6.2.1 Cetaceans

This section presents a general description of the endangered whale species with potential to occur in the vicinity of the Pribilof Islands and discusses the potential effects of seafood processing and City of St. Paul’s discharges on these whale species.

Bowhead Whale

The bowhead whale is one of the rarest of all whales and is federally listed as endangered. Although the NMFS considered a petition to designate critical habitat for the Bering Sea stock of bowhead whales, no critical habitat has been designated to date (FR 66 28141).

The bowhead spends the majority of its life in and around Arctic waters (Braham 1984). These animals live much of their lives in and near the pack ice, migrating to the high Arctic in summer, and retreating southward in winter with the advancing ice edge (Duke University 2005). Bowheads occur in the Bering, Chukchi, and Beaufort Seas (Moore and Reeves 1993) with Bering Sea stocks estimated at approximately 7,500 animals (International Whaling Commission 1992). Therefore, some individuals may occur in the area of the Pribilof Islands during the fall and winter seafood processing season. However, most bowhead whales are thought to spend winter months (December through March) in the western Bering Sea, migrating north and west during spring and early summer (Braham et al. 1980; Brueggemann 1982).

Preferred prey items include euphausiids (*Thysanoessa raschii*) and copepods (*Calanus* spp.) which are taken at surface and midwater depths (NMFS 1994). Subsistence harvesting of bowhead whales by native Alaskans results in takes of 25 to 40 animals per year (NMFS 1994).

North Pacific Right Whale

North Pacific right whales formerly were known as the northern right whale, *Balaena glacialis*, and were once considered to be the same species as the North Atlantic right whale. They are now recognized as a distinct species, *Eubalaena japonica*. North Pacific right whales are among the rarest of all whale species and are federally listed as endangered. Critical habitat for the North Pacific right whale has not been designated, but a draft recovery plan is in preparation for this species (FR 68 17560).

Illegal whaling virtually eliminated the population of right whales in the eastern north Pacific off Alaska. Then, in the summer of 1996, a group of four animals was reported in the southeastern Bering Sea. Subsequent annual surveys yielded sightings of between 3 and 13 whales per year in a 60-nm by 100-nm core area about 200 nm north of Unimak Pass in the eastern Aleutian Islands. Extensive aerial, shipboard, and acoustic surveys in 2002 made six sightings and documented numerous right whale vocalizations, but none occurred outside the core area (Marine Mammal Commission 2002).

North Pacific right whale historical range in the eastern Pacific includes waters from California to the Bering Sea and Hawaii (NMFS 1994). The whales migrated northward in spring months with important concentrations historically occurring in the Gulf of Alaska, eastern Aleutian Islands, and south-central Bering Sea (Breiwick and Braham 1984). They typically feed on copepods and euphausiids collected from below the surface, including waters at or near the bottom (NMFS 1994). The north Pacific right whale could occur in the Pribilof Islands area during the summer halibut processing season, however, their presence during the winter seafood processing season would be unlikely.

Sperm Whale

Sperm whales are considered a relatively abundant large whale species; although they are federally listed as endangered, the North Pacific stock is not in danger of extinction (NMFS 2003a). No critical habitat has been designated for the sperm whale.

Sperm whales range from California to the Bering Sea, characteristically inhabiting deep oceanic waters over and beyond the continental slope. However, they do come close to shore where submarine canyons or other physical features bring deep water near the coast (Duke University, 2005).

World abundance has been estimated at nearly one million individuals (Rice 1988), although population estimates based on extrapolations from only a few areas range from 200,000 to 1,500,000 (NMFS 2005a).

Deep-water squid (*Architeuthis* and *Moroteuthis* spp.) are preferred prey items although demersal and mesopelagic fishes (e.g., sharks and skates) are also taken in large quantities (NMFS 2003a).

Blue Whale

Blue whales are federally listed as endangered and are found throughout all oceans (Breiwick and Braham 1984). No critical habitat has been designated for the blue whale.

Within the Pacific Ocean, it was long believed that all blue whale populations undertook extensive annual migrations from low-latitude wintering grounds, such as those off California and Hawaii, to summer feeding grounds in the Arctic or Antarctic (Breiwick and Braham 1984). However, recent monitoring for blue whales using the U.S. Navy's Sound Surveillance System (SOSUS) hydrophones has demonstrated the year-round occurrence of at least some blue whales in the north Pacific (Moore *et al*. 2002). A seasonal progression of call-location concentrations was centered over the Emperor Seamounts in winter, the Kamchatka Peninsula and seamounts in spring, the Kamchatka Peninsula and waters between the seamounts and Aleutian Islands in summer, and the seamounts again in fall. Although the high-concentration areas were mapped south of the Aleutian Islands, these findings suggest the potential for blue whales to occur in waters off the Pribilof Islands during the winter seafood processing period.

Although blue whales typically are found over deeper, offshore waters, they are sometimes observed near the coast following the retreating ice-edge as summer temperatures increase (NMFS 1994). Current population estimates for the Northern Hemisphere are unknown, although 179 individuals were observed off central California during surveys conducted from 1986 to 1988 (Calambokidis *et al*. 1990). Blue whales graze within the upper water column on euphausiid swarms.

Finback Whale

Finback whales are federally listed as endangered and are known to occur within Pacific waters from California to Alaska and Hawaii. Although no critical habitat has been designated, a draft recovery plan has been prepared for this species (FR 63 41802).

Finback whales are migratory, moving toward the poles in summer to exploit the food-rich, cold waters, and traveling in winter to warmer waters, where they reproduce (Duke University, 2005). Finback whales frequent both inshore and offshore waters (San Diego Natural History Museum, 2005), they may be present in areas around the Pribilof Islands during the summer halibut processing season.

Population abundances for the North Pacific are unknown; however, recent offshore surveys estimated over 900 individuals occurring in California coastal waters (Barlow 1993). Similar to blue whales, finback whales feed at or near the surface on euphausiids, but may also supplement their diet with small schooling fishes such as capelin, anchovies, and herring (Breiwick and Braham 1984).

Humpback Whale

Humpback whales are federally listed as endangered, although no critical habitat has been designated for the species. The species has a wide distribution within the North Pacific, ranging from California to the Chukchi Sea, Hawaii, and the Mariana Islands (NMFS 1994). In contrast to whales with more oceanic habitats, humpbacks are commonly found in shallower continental shelf waters and are known to frequent Alaskan waters seasonally during migratory periods (NMFS 1994). Prey items within southeastern Alaska include capelin, herring, walleye pollock, and krill (Bryant *et al*. 1981).

Like other baleen whales, humpbacks migrate long distances. In the summer, they move toward the poles to exploit the high productivity of the cold waters. In winter, humpbacks travel to warm tropical waters, where they concentrate on mating and calving (Duke University 2005).

The humpback whale is better studied than other baleen whale species, and migratory patterns are known for some stocks. In the north Pacific, four stocks are believed to exist:

Stock 1 winters off the coast of Mexico and summers off the coasts of California, Oregon, and Washington.

Stock 2 winters in offshore Mexican waters, near the Revillagigedo Islands; the summer grounds unknown.

Stock 3 winters in the central north Pacific and Hawaiian Islands and summers in Alaska (Prince William Sound) and British Columbia.

Stock 4 winters in the western north Pacific, near Japan and Taiwan, and summers in the Bering Sea and the coast of the Aleutian Islands, west of the Kodiak Archipelago.

Members of the last group could use the Pribilof Islands area during the summer halibut processing season, but their presence during the winter seafood processing season would be unlikely.

Direct Effects

The National Marine Fisheries Service indicated that although endangered whales may occur near the Pribilof Islands, it is unlikely that they would occur in the relatively shallow areas potentially affected by seafood processing discharges, with the exception of the humpback whale, which may occasionally frequent nearshore areas (NMFS 2005b). In the event that whales would swim in the vicinity of discharges, their presence would likely be transient and exposure to discharged effluent would be minimal. Toxic effect studies of seafood processing waste have not been conducted on marine mammals. However, it is unlikely that humpback whales or other large cetaceans would feed in proximity to seafood processing discharge outlets.

What is known of the water quality for both the seafood process discharge and the municipal waste discharges has been summarized in Section 5. This information is not adequate to evaluate whether these concentrations could constitute incidental take to the cetacean species of concern.

The city sewage treatment plant on St. Paul Island discharges wastewater through the outfall located offshore of East Landing. The presence of coliform or enterococci bacteria from inadequately treated sewage in waters close to the discharge point could indicate a possible risk of bacterial and viral disease transmission to endangered whales (or other cetaceans) that entered the contaminated waters. However, based on the small volumes of human sewage and the high potential for dilution with uncontaminated seawater in the areas where most of these species would be present, the ocean area that contains potentially infectious levels of pathogens might be small. Animals that did not enter areas with enterococci levels greater than 35 per 100 mL (or 100 MPN/100mL for fecal coliform) probably would have a low risk of developing pathology from inadequately treated discharges of human sewage from St. Paul Island.

Indirect Effects

Due to the number of excursions in effluent discharges as discussed in Section 5, some indirect effects to whales related to reduced prey availability or foraging success may be possible. Some temporary disturbance of whale activities may also occur due to increases in vessel traffic. However, these effects would be local and temporary, and would not likely result in adverse effects.

Summary

Because they would not be expected to forage with regularity in the vicinity of the Pribilof Islands, the six whale species discussed above may be affected, but are not likely to be adversely affected, by discharges of seafood processing wastes or inadequately treated human sewage, from the Pribilof Islands. The proposed discharge would not result in the destruction or adverse modification of critical habitat, and would not threaten the continued existence, of any of the cetacean species described above.

6.2.2 Steller Sea Lion

The Steller sea lion was originally listed as a threatened species under the ESA in November 1990 (55 FR 49204). Based on biological information obtained since the species was listed as threatened, NMFS reclassified the Steller sea lion into two distinct population segments. Effective on June 4, 1997, Steller sea lions occurring west of 144° longitude (a line near Cape Suckling, Alaska) were reclassified as endangered. The remainder of the Steller sea lion population, east of 144° longitude, maintained the threatened listing (FR 62 24345; FR 62 30772). Therefore, Steller sea lions occurring in the vicinity of the Pribilof Islands are listed as endangered. Model predictions indicated that the western population would be reduced to very low levels should declining population trends persist (FR 62 24345).

Factors that may have contributed to the population decline include past commercial harvesting, incidental take during commercial fishing operations, competition for food with commercial fisheries, entanglement in debris, and human disturbance (FR 62 24345).

Steller sea lions rely on both marine and terrestrial habitat. Terrestrial habitats include rookeries, or breeding areas, and haulouts, or resting areas. The locations of sea lion rookeries and haulouts tend to remain the same from year to year (NMFS 1992). Characteristics that may influence the location of rookeries and haulouts include substrate, exposure, human activities, potential food sources, and thermoregulatory factors. Rookery sites are often used as haulouts at times other than the breeding season (NMFS 1992).

To help protect the species, NMFS designated critical habitat for Steller sea lions effective September 27, 1993. This designation included one major rookery and four major haulout sites within the Pribilof Islands. The major rookery is located on Walrus Island, east of St. Paul Island (Figure 1). The boundary for the critical habitats includes a 20 nm offshore zone (Zimmerman 1998, FR 62 24352). Two major haulout sites are present on St. Paul Island (Northeast Point and Sea Lion Rock; Figure 2) and two occur on St. George Island (South Rookery and Dalnoi Point; Figure 3) (58 FR 45269).

Rookeries are usually occupied by sea lions during the breeding season, which typically runs from late May to early July, and the highest pup counts have occurred in early July (FR 63 30477). When not on land at rookeries or haulouts, Steller sea lions range from areas close to shore out to the edge of the continental shelf (NMFS 1992). Studies on adult females indicate that during the breeding season sea lions tend to stay close to rookeries, often foraging within 30 km of rookeries (Minerals Management Service 1992). During this period they make shallow dives with average and maximum depths of less than 30 m and 120 m, respectively (NMFS 1992). During winter, sea lions venture farther offshore and dive to greater depths. Offshore dive depths average up to 84 m, with maximum depths of approximately 273 m (NMFS 1992). The Steller sea lions may be present in the nearshore waters of the Pribilof Islands, including the seafood processing outfalls, throughout the year (Zimmerman 1998).

Steller sea lions are opportunistic predators, foraging and feeding primarily at night on a wide variety of fishes (e.g., capelin, cod, herring, mackerel, pollock, rockfish, salmon, sand lance, etc.), bivalves, cephalopods (e.g., squid and octopus) and gastropods. Their diet may vary seasonally depending on the abundance and distribution of prey. They may disperse and range far distances to find prey, but are not known to migrate.

According to studies conducted in Alaska since 1975, walleye pollock (*Theragra chalcogramma*) is an important food source of Steller sea lions (NMFS 1992). Estimates indicate that 33% of the sea lion's diet while in the eastern Bering Sea and Aleutian Islands region is composed of walleye pollock (Perez 1990). Many of the preferred prey species are harvested by commercial fisheries, and food availability may be affected by fishing. As a result, restrictions have been placed on the fisheries in attempts to minimize impacts to the sea lions (FR 62 24352).

The great majority (approximately 99%) of the statewide Steller sea lion subsistence take has been from the western U.S. stock and the majority (79%) of this take was by Aleut hunters in the Aleutian and Pribilof Islands. Real-time monitoring of Steller sea lion harvest involves monitoring of harvest information directly after the harvest, and occurs on St. Paul Island. Results are summarized and reported annually and are used as the source of the Steller sea lion subsistence harvest estimates in the annual Alaska Department of Fish and Game (ADF&G) report (e.g., Wolfe et al. 2004). The mean annual subsistence take from this stock over the 4-year period from 2000-03, excluding the harvest on St. Paul Island, was 162.5 sea lions; the mean annual subsistence take from St. Paul Island during this period was 25.3 sea lions per year (Zavadil et al. 2004), for a total annual mean subsistence harvest of 187.8 Steller sea lions. The subsistence harvesting may have some localized impact on survival; however its impact upon the survival of the overall population of Steller sea lions is not considered significant (FR 62 24352).

Direct Effects

Because Steller sea lions have an extensive foraging range and haulout (i.e., areas used for restperiods, molting, and rookeries for mating and pupping during the breeding season) at sites within 2 nm of St. Paul outfalls (Figure 2), they may frequently come into contact with seafood processing waste discharges. There is some evidence that sea lions are attracted to process discharges, particularly unground fish wastes and livers (Zimmerman 1998), although seafood particles within the discharges would be ground and screened to one-half inch diameter. This may affect both the behavior of individual animals in proximity of the discharge outfalls as well as the overall Steller sea lion population.

The proposed permits do not authorize discharges from mobile processors or shore-based operations within a 3.0 nm radius of designated Steller sea lion rookeries (i.e., Walrus Island), and the proposed permits do not allow discharges from mobile or shore based processors within 0.5 nm of major Steller sea lion haulouts during the sea lion breeding season. The proposed permit does allow discharges during the non-breeding season thus, some contact with waste discharges may occur during foraging periods and during travel to and from rookeries or haulouts.

What is known of the water and sediment quality for both the seafood process discharge and the municipal waste discharges has been summarized in Section 5. This information, combined with an incomplete understanding of Steller sea lion biology at the Pribilof Islands, is not adequate to evaluate whether these concentrations could constitute incidental take to the species of concern.

In addition to contaminants in the process discharges, seafood discharges may contain earplugs, rubber packing bands, and other materials used during processing. Such wastes were observed both in February and September of 1994 on the beach at the Kitovi northern fur seal rookery on St. Paul Island (NMFS 1994). The potential exists that these materials, if discharged with seafood waste, may be ingested by foraging sea lions. However, such discharges would be in violation of regulations and best management practices and while the potential for such discharges exists, they are expected to be minimal.

As described for whales, the presence of coliform or enterococci bacteria from inadequately treated human sewage in waters close to the discharge point could indicate a substantial risk of bacterial or viral disease transmission to sea lions that entered the contaminated waters. The risk would be higher for the resident sea lions than for whales, which are highly transitory and would spend little time in the vicinity of the human sewage pollution. There is evidence that sea lions are attracted to seafood discharges and it is common to see sea lions in the immediate area of such discharges. Since the current discharge at the City of St. Paul is within 30 -60 feet of the shore-based seafood processing discharges, it is possible that sea lions are exposed to potentially infectious levels of pathogens. Sea lions that only rarely entered areas with enterococci levels between 35 and 500 per 100 mL (or 100 MPN/100mL for fecal coliform) probably would have a low risk of developing pathology from inadequately treated discharges of human sewage from St. Paul Island.

Because organic wastes accumulation on the sea bottom is likely a temporary phenomenon (see Section 5), direct effects to Steller sea lions from contact with accumulated waste piles are expected to be minimal. Further, available data suggest that anthropogenic contamination of Steller sea lion food resources has not significantly contributed to the decline in species abundances (FR 58 45271). Most seafood processing in the Pribilof region occurs from January to March and from June through to December. Sea lion breeding activities occur primarily at rookeries but may also take place at haulouts (NMFS 1992) during the period extending from late May to early July. To minimize impacts during the breeding season the proposed permits do not allow discharges within ½ mile of haulout areas. Additionally, the Trident permit requires halibut waste to be discharged at-sea, still, potential contact with waste discharges during critical breeding periods is possible.

Indirect Effects

Potential indirect effects of the proposed permit on Steller sea lions include incidental fishery-related takings, entanglement in debris, increased probability of vessel collisions, and disturbance from vessel activities. The discharge of process wastes near sea lion foraging grounds could reduce visibility and individual foraging success.

The location of seafood processors on and near the Pribilof Islands could lead to increased vessel traffic and commercial fishing activity in the area. Should commercial fishing levels increase near the Pribilofs, incidental take of Steller sea lions in trawl nets or abandoned fishing line or net debris may occur. Further, increased vessel traffic increases the likelihood of collisions with marine mammals, shipwrecks, accidental spills or discharge of other materials (e.g., fuel, oil).

Effects on the Steller sea lion from waste discharges also were considered cumulatively with other factors affecting area populations. Most importantly, the sea lions will continue to experience competition for food sources with commercial fisheries. Effects on the sea lion population from waste discharges will be small compared to population pressures from competition for fish stocks. Subsistence harvesting also may have some localized impact on Steller sea lion populations, but its impact on the survival of the overall Steller sea lion population is not considered significant (FR 62 24352).

Summary

There are several conditions stated in the proposed permit that are designed to limit the potential for direct contact with species of concern. These include establishment of a 3-nm exclusion zone for Steller sea lion rookeries, barging and offshore disposal of excess wastes during critical breeding periods, and requirements for existing stationary processors to conduct sea surface and shoreline monitoring. Compliance with these conditions and appropriate waste management practices will minimize and offset potential effects to Steller sea lion populations.

Indirect effects to Steller sea lions may result from increased vessel traffic, heightened vessel activity, increased probability of incidental take (e.g. fishing by-catch), and greater likelihood of spills (e.g., fuel and oil). Vessel traffic in close proximity to Steller sea lion critical habitat (e.g., Sea Lion Rock) may lead to disturbance or modification of haulouts or rookeries. Although pinniped response to vessel traffic is not well documented (Richardson et al. 1991), reports indicate that disturbance from fishing activities near the Farallon Islands, California resulted in the shift of a breeding group to an undisturbed site (NMFS 1992).

In conclusion, individual Steller sea lions that use the area in the immediate vicinity of the discharge outlet disproportionately, either temporally or spatially, compared to other areas could potentially be adversely affected. Adverse effects would not be expected to occur for the general population of this species or to individuals with normal range and behavior. The potential adverse effects are theoretical in nature and are based on exposures to the maximum concentrations of effluent constituents.

6.2.3 Sea Otter

The southwest Alaska DPS of the northern sea otter was listed as threatened by the U.S. Fish and Wildlife Service effective September 8, 2005 (FR 70 46366). This portion of the otter population has declined substantially since the mid-1980s. Overall, the southwest Alaska stock has declined at least 55 to 67 percent, with some specific locations experiencing reductions of 90 percent or more (FR 70 46366). No critical habitat has been designated for the northern sea otter.

The sea otter is native to the Pribilof Islands (Nowak 1991), although human exploitation for their fur extirpated the otter from the Pribilofs by the early 1900s. A population was translocated to the Pribilof Islands in the 1970s and a remnant population is present on St. George, although the St. Paul population has likely been extirpated (Sowls, pers. comm. 2005). The number of sea otters currently using habitats near St. George is unknown, although it is probably in the range of 10 to 20 individuals (Sowls, pers. comm. 2005).

Sea otters typically use rocky substrate areas between the shoreline and the outer limit of the kelp colony; they also inhabit areas with soft sediment substrates. Sea otter diets vary between community types, although in general, they prey on sea urchins, octopus, and mussels in rocky substrates, and clams dominate their diet in soft substrates (FR 70 46366). Otters typically occur in shallow water near the shoreline and the majority of all foraging takes place in water less than 30 m (100 ft) deep.

Breeding can occur throughout the year, but births in the Alaska populations tend to peak in May and June and young are dependent on their mothers for six to eight months (Estes 1980).

Direct Effects

The U.S. Fish and Wildlife Service does not believe that commercial fishing activities have played a significant role in the population-level sea otter decline in southwest Alaska and these activities do not pose an immediate threat to the listed DPS (FR 70 46366). Because no otters are present in the waters around St. Paul Island and seafood processing has been, at least for the present, discontinued on St. George Island, there would be no direct effects to the sea otter.

Indirect Effects

Commercial fishing activities, including incidental fishery-related takings, entanglement in debris, disturbance from vessel activities, and reduction or change in fish or invertebrate community structure could affect individual sea otters around St. George Island, although population level effects are unlikely.

At least one of the land-based seafood processing facilities at the St. George Island has submitted an NOI and therefore it is possible that seafood processing operations could resume on St. George in the future. If that occurs, the discharge of seafood processing waste could affect sea otters around St. George. If water quality standards for waste discharges are met, then there would not likely be adverse effect to sea otters. However, if waste discharges have effluent characteristics similar to those that have been observed at St. Paul in the past, there could be adverse effects to the sea otter. Sea otters may change their foraging behavior in the presence of accumulated PSP toxins in their prey (Kvitek and Bretz 2004) and the increased energetic response required to meet their nutrition and metabolic needs would represent an adverse effect. It is recommended that if seafood processing operations resume on St. George, that regular monitoring of waste discharges be performed and that discharges be further treated or discontinued if water quality standards are exceeded.

Summary

The translocated population of sea otters that once used the waters around St. Paul Island has been extirpated and seafood processing operations, at least for the present, no longer take place on St. George Island. Therefore, seafood processing discharges in the Pribilof Islands would not likely to adversely affect the sea otters.

6.2.4 Short-tailed Albatross

The short-tailed albatross is listed as endangered throughout its range (USFWS 2004), but no critical habitat has been designated. Estimates indicate that the world population is about 1,700 and is increasing. About 80 to 90 percent of the population can be found in breeding colonies on Toroshima Island, Japan; the remainder breed on Minamikojima Island, Japan. The albatross reproduces slowly and does not reach sexual maturity until it is 7 or 8 years old. The albatross is generally pelagic during the non-breeding season (summer and fall), and is generally found in the Gulf of Alaska, along the Aleutian chain, and north into the Bering Sea during this period. However, they have also been observed within several miles of shore during the non-breeding period. The short-tailed albatross feeds on small fish and squid (USFWS 2004).

Approximately 5 million short-tailed albatrosses were harvested commercially between 1885 and the early 1900's (USFWS 2004). Although the birds are no longer harvested, other threats to their population include loss of breeding habitat due to volcanic eruption, erosion and mudslides caused by monsoon rains, and competition with other seabirds for nest sites. Seaborne plastic pollution, oil pollution, oil spills, and changes in food availability or distribution also threaten the continued existence of the short-tailed albatross (USFWS 2004). In addition, the albatross is known to follow longline fishing vessels while the vessels are setting their lines, and they occasionally ingest baited hooks and are drowned (USFWS 2004, FR 62 10017). In order to minimize the incidental mortality of the albatross and other seabird species during fishing, there are requirements in effect for the use of seabird bycatch avoidance devices (USFWS 2004, FR 62 23176, FR 62 65635).

Direct Effects

Although the short-tailed albatross can be found within several miles of shore during the non-breeding season, the albatross is primarily pelagic in distribution during this period. The albatross is not known to breed in the Pribilof Islands, therefore, it is unlikely that the bird would be exposed to the processing waste discharges or human sewage from the stationary outfalls. The seafood processing wastes do not contain significant quantities of toxic pollutants that are prone to bioaccumulate in aquatic organisms. As a result, adverse effects would not be expected should the short-tailed albatrosses ingest discharged seafood waste products or other wastes (EPA 1998b).

Indirect Effects

Should the short-tail albatross venture close to shore near the seafood processing facilities, they would be in close proximity to vessel traffic. Therefore, the albatross could be disturbed by increased vessel traffic and heightened activities related to the seafood processing industry. In addition, increased shipping activity increases the chance of accidental spills or discharges of materials (e.g., fuel oil) that may indirectly affect the short-tailed albatross. These potential adverse effects are probably discountable in light of the ability of the albatross to avoid such disturbances.

Summary

Potential impacts of seafood processing and related activities to the short-tailed albatross are minimal because the species does not breed in the Pribilof region and is generally pelagic in its occurrence in Alaskan waters. In addition, there are several conditions stated in the proposed permit that are designed to limit the potential for direct contact with species of concern. These include timing restrictions for discharges, requirements for existing stationary processors to conduct sea surface and shoreline monitoring, effluent monitoring, subsurface discharge, the one-half inch grind/screening requirement. Compliance with these provisions and appropriate waste management practices would result in a condition of "may affect, not likely to adversely affect" on the short-tailed albatross population. The proposed discharge will not result in the destruction or adverse modification of critical habitat.

6.2.5 Steller's Eider

Steller's eider is a marine diving duck, whose Alaskan breeding population was listed in 1997 as a threatened species under the ESA (62 FR 31748). Critical habitat for the species was designated by the USFWS in 2001. The designated critical habitats, in five discrete units, are located on the Yukon-Kuskokwim Delta and along the north shore of the east end of the Alaska Peninsula. The eider's breeding range in the U.S. is currently limited to the arctic coastal plain of northern Alaska, from Wainwright to Prudhoe Bay (USFWS 2004; Quakenbush and Cochrane 1993; FR 62 31748). The eiders generally are present on breeding grounds from mid-May through mid-September (USFWS 2005).

The majority of the world's population of Steller's eiders, including the Russian Pacific population and the Alaska breeding population, overwinter on the Yukon-Kuskokwim Delta, along the Alaskan Peninsula from the eastern Aleutian Islands to the southern portion of Cook Inlet, and within the Pribilof Islands. Estimates during the 1960s indicate that there were approximately 400,000 Steller's eiders world-wide (Quakenbush and Cochrane 1993). More recent population estimates were between 150,000 and 200,000 individuals, indicating a 50% decline in the worldwide population (Quakenbush and Cochrane 1993). Current estimates of the Alaskan breeding population range from hundreds to the low thousands (USFWS 2004). Preliminary USFWS surveys suggested that up to 1,000 Steller's eiders winter in the vicinity of the Pribilof Islands (USFWS 2005).

Steller's eiders prefer shallow, nearshore marine waters. This species primarily preys on mollusks, crustaceans, and polychaete worms found in shallow water habitats. Prey of wintering eiders includes blue mussels and sand-hoppers found in sheltered bay and lagoon foraging areas. During breeding season, they move inland in coastal areas and generally feed on aquatic insects (e.g., chironomid larvae), plants, crustaceans, and mollusks in freshwater ponds (Quakenbush and Cochrane 1993; FR 62 31748).

Direct Effects

Because they prefer shallow, nearshore marine waters, eiders may be exposed to processing waste discharges from the stationary outfalls, including possible sanitary wastes and cleaning solutions. Processing discharges are not, however, expected to contain these pollutants at toxic levels or to result in adverse effects. Potential contact with waste discharges would be minimal during the critical breeding period (see Figure 4). No direct adverse effects to Steller's eider are expected, or its designated critical habitats, as a result of seafood processing discharges in the Pribilof Islands.

Indirect Effects

Potential indirect effects on Steller's eider from the discharge of seafood process wastes include possible increases in exposure to predatory or scavenger species. Seafood wastes may attract scavengers, such as gulls, which prey on Steller's eiders. In addition, the presence of such wastes during the winter may allow larger populations of scavenger species to winter in the Pribilofs. However, because gulls primarily prey on Steller's eiders' eggs and young rather than adults, and because Steller's eiders do not breed in the Pribilof Islands, the potential effects on eider populations of increased predation by gulls would be negligible.

As mentioned above, Steller's eiders prefer shallow, nearshore marine waters. Such areas are in close proximity to vessel traffic. Thus, Steller's eiders may be disturbed by increased vessel traffic related to the seafood processing industry. In addition, increased shipping activity heightens the probability of accidental spills or discharges of materials (e.g., fuel and oil) that may indirectly effect these birds. Once again, because Steller's eiders do not breed in the Pribilof Islands, the potential for adverse effects from vessel traffic is minimal.

Summary

Any potential impacts of seafood processing and related activities to Steller's eiders are minimal because the species does not breed in the Pribilof Islands. In addition, there are several conditions stated in the proposed permit that are designed to limit the potential for direct contact with species of concern (i.e., timing restrictions for discharges, requirements for existing stationary processors to conduct sea surface and shoreline monitoring, effluent monitoring, subsurface discharge). Compliance with these provisions and appropriate waste management practices would result in a condition of “may affect, not likely to adversely affect” on Steller’s eider populations. The proposed discharge will not result in the destruction or adverse modification of critical habitat.

6.2.6 Spectacled Eider

The spectacled eider, a large sea duck, is federally listed as threatened throughout its range and critical habitat was designated in 2001 (FR 66 9146). The Alaska Department of Fish and Game considers the spectacled eider a species of special concern. The worldwide population, based on winter surveys in the Bering Sea, includes approximately 360,000 birds. The breeding population on the Yukon-Kuskokwim Delta declined over 96 percent in the 1970s to the early 1990s. Currently, the spectacled eider nests along the central coast of the Yukon-Kuskokwim Delta and the Alaskan and Russian arctic coastal plains. A few pairs are known to nest on St. Lawrence Island. Recent satellite telemetry research shows that the spectacled eider winters at sea (USFWS 2004). Critical habitat for the spectacled eider is designated on the Yukon-Kuskokwim Delta, in eastern Norton Sound along the central west coast of Alaska, in northwest Alaska in Ledyard Bay, and in winter habitat at sea, south and southwest of St. Lawrence Island. Spectacled eider presence in the Pribilof Islands is likely to occur on a casual and transient basis.

Direct Effects

Although the spectacled eider prefers shallow, nearshore marine waters, and could be exposed to processing waste discharges, their presence on St. Paul Island is not regularly expected. Potential contact with waste discharges would be minimal during the eider’s critical breeding period (see Appendix B, Figure 4). As a result, there would not likely be any adverse effect to the spectacled eider, nor its designated critical habitat, as a result of seafood or municipal waste processing discharges.

Indirect Effects

The spectacled eider uses habitats that are used by the commercial fishing industry. Thus, the eider may be disturbed by increased vessel traffic related to commercial fishing and the seafood processing industry. In addition, increased shipping activity heightens the probability of accidental spills or discharges of materials (e.g., fuel or oil) that could indirectly effect the eider. However, because the spectacled eider does not breed in the Pribilof Islands, and their wintering grounds are to the north in the central Bering Sea, the potential for indirect adverse effects related to seafood processing or the commercial fishing industry on the Pribilofs is minimal.

Summary

Because the spectacled eider does not breed on, or regularly use habitats in the Pribilof Islands, seafood processing discharges would result in a condition of “may affect, not likely to adversely affect” for the spectacled eider. The proposed discharge will not result in the destruction or adverse modification of critical habitat.

6.2.7 Northern Fur Seal

The northern fur seal breeds and has large colonies in the Pribilof Islands. The Pribilof Island stock, including those seals breeding at Bogoslof Island (about 174 nm [200 statute miles] south-southeast of the Pribilof Islands), was declared depleted under the Marine Mammal Protection Act (MMPA) in June 1988. Although this status does not confer protection to the species under the ESA, it may potentially be listed during the period of the proposed permit. Should the northern fur seal be officially listed during the legal period of the proposed permit, additional in-depth analysis of potential effects from seafood processing discharges should be undertaken.

Two northern fur seal stocks are found within the United States; the Pribilof Island and San Miguel Island stocks (NMFS 1993a). Designation of stocks is based primarily on geographic location during the breeding season.

The northern fur seal is endemic to the North Pacific Ocean. In the U.S., these seals range from the Channel Islands of southern California to the Pribilof Islands in the Bering Sea (NMFS 1993a). It is estimated that 72% of the world's population of fur seals are in the Pribilof Island stock. Further, the Pribilof stock represents approximately 99% of this species located within U.S. waters (NMFS 1993a). Figures 2 and 3 present maps of the northern fur seal rookeries and haulout areas on St. Paul and St. George Islands, respectively.

Pribilof Island rookeries occur primarily on St. Paul and St. George Islands (NMFS 1993a). It is estimated that the abundance of this stock has declined more than 50% since the 1950s (NMFS 1993a). Potential reasons for the decline include commercial harvesting, entanglement in marine debris, and changes in the quantity and/or quality of available prey. A moratorium on commercial harvest of males at St. George Island went into effect in 1973. At the end of 1984 all harvesting, except regulated subsistence harvesting, was halted (NMFS 1993a).

NMFS monitoring in August 2004 indicated that 122,825 northern fur seal pups were born on St. Paul Island and 16,876 pups were born on St. George Island. Estimated pup production on the two islands, as a whole, has declined at 6.0% per year since 1998 (NMFS 2004). Counts of adult males on the Pribilofs indicated a total population of 9,978, which represents a 23.8 percent decline since 2003 (NMFS 2004).

The majority of adult northern fur seals are found on land between June and October. To minimize impacts to the stock, subsistence harvesting of fur seals on the Pribilof Islands is limited to the period from June 23 through August 8 (FR 70 41187). Only subadult males between 2 and 4 years of age, and greater than 124 cm (4 ft) in length, are allowed to be taken in the subsistence harvest (NMFS 2005d). The most recent five-year average (1999-2003) of the actual subsistence harvest of fur seals was 705 from St. Paul and 167 from St. George, although the limits for the subsistence harvest are 2,000 from St. Paul and 500 from St. George (NMFS 2005d).

Surveys of typical prey showed that the preferred diet items of the northern fur seal include walleye pollock, squid, sand lance, and salmon (NMFS 2005c). Estimates indicate that about 60 to 70 percent fur seal's diet in the Pribilofs is composed of walleye pollock (NMFS 2005c).

Direct Effects

Northern fur seals may come into contact with seafood process waste discharges and/or waste accumulations, especially as part of foraging activities. Due to proposed permit restrictions and the operating schedules for existing shore-based facilities, the potential for contact with discharges is reduced during the critical breeding period. Fur seal occupation of rookeries during the breeding season occurs from May to November. Breeding occurs primarily from June through August, and lactating females continue to nurse pups and forage in the waters surrounding the Pribilof Islands until December. The proposed permit does not authorize discharges from floating processors or new shore-based facilities within a minimum protective zone of 0.5 nm radius from land that is owned and managed by NMFS for the protection of fur seal rookeries during the period extending from May 1 through December 1. Crab processing at existing shore-based facilities in the Pribilof region occurs from January to March and to a lesser extent occurs during November and December. Halibut processing at the shore-based Trident facility occurs from June through October. These discharges occur during the fur seal breeding period, and some may also occur during the period in which the pups are learning to swim and developing their foraging skills. It is possible for the fur seals to come in direct contact with process waste discharges during the breeding period (see Figure 4). To mitigate contact with seafood waste the proposed permit requires Trident to barge its seafood waste to an at-sea discharge location from May through November. Discharge may not occur when marine mammals are in the area.

Oils and grease discharges could potentially affect the fur seal's ability to maintain thermoregulation should the oils adhere to their fur. This would be particularly detrimental to pups. Some of the available DMR data from both seafood and municipal waste discharges indicate the presence of oil and grease, although no State or federal water quality standards for oil and grease are available. For dissolved, floating or suspended residues, it is expected that continued monitoring will be conducted to ensure that discharge levels of oil and grease would not be detrimental to the fur seals.

What is known of the water quality for both the seafood process discharge and the municipal waste discharges has been summarized in Section 5. This information is not adequate to evaluate whether these concentrations could constitute incidental take to the species of concern.

Seafood processing waste may contain anthropogenic materials such as ear plugs, rubber packing bands, and other articles used during processing. Such wastes were observed both in February and September of 1994 on the beach at the Kitovi northern fur seal rookery on St. Paul Island (NMFS 1994). The potential exists for these materials, if discharged with seafood waste, to be ingested by foraging fur seals. However, such discharges would be in violation of regulations and best management practices, and while the potential for such discharges exists, they are expected to be minimal.

Effects of discharges of inadequately treated human sewage would be similar to those described for the Steller sea lion. These would include a substantial risk of bacterial or viral disease transmission to seals that entered the contaminated waters. Seals that only rarely entered areas with enterococci levels between 35 and 500 per 100 ml (or 100 MPN/100mL for fecal coliform) probably have a low risk of developing pathology from inadequately treated discharges of human sewage from St. Paul Island.

Indirect Effects

Potential indirect effects to northern fur seals include incidental fishery takings, entanglement in debris, or disturbance from vessel traffic. Also, discharges near seal foraging grounds may reduce visibility, thus decreasing foraging success.

Increased fishing activity could potentially lead to greater numbers of incidental fur seal takes during trawling or through entanglement in debris such as netting and lines. The potential for disturbance is also greater if vessel numbers increase. Although vessel disturbance events are- likely to be localized and temporary, other related accidents such as oil spills could have more widespread effects. Fishing activities may also potential negative impact the fur seals by reducing the availability of fur seal prey; this is based on the overlapping of the fur seal foraging ranges with the groundfish fisheries.

Summary

There are several conditions stated in the proposed permit that are designed to limit the potential for direct contact with species of concern (i.e., establishment of a 0.5 nm exclusion zone for northern fur seal rookeries and haulouts, timing restrictions on when discharges may occur, subsurface discharge, barging and offshore disposal of excess wastes during critical breeding periods, and requirements for existing stationary processors to conduct sea surface and shoreline monitoring). Compliance with these conditions and appropriate waste management practices should result in no adverse effects to northern fur seal populations. However, indirect effects to northern fur seals may result from increased vessel traffic. Indirect effects related to heightened vessel activity include disturbance, increased incidental takes, and greater likelihood of spills or discharges of materials (e.g., fuel and oil). Vessel traffic in close proximity to fur seal habitat (e.g., rookeries and haulouts) may lead to disturbance or modification of such areas. Although pinniped (e.g., seals and sea lions) response to vessel traffic is not well documented (Richardson et al. 1991), reports indicate that disturbance from fishing activities near the Farallon Islands, California, resulted in the shift of a breeding group to an undisturbed site (NMFS 1992).

In conclusion, individual Northern fur seals that use the area in the immediate vicinity of the discharge outlet disproportionately, either temporally or spatially, compared to other areas could potentially be adversely affected. Adverse effects would not be expected to occur for the general population of this species or to individuals with normal range and behavior. The potential adverse effects are theoretical in nature and are based on exposures to the maximum concentrations of effluent constituents.

6.2.8 Pribilof Islands Shrew

One species of special concern, the Pribilof Island shrew (*Sorex hydrodromus*), is found in the Pribilof Islands. The Pribilof Island shrew is endemic to the Pribilof Islands and presently occurs only on St. Paul Island (Byrd and Norvell 1993). Its preferred habitat includes tall-plant communities, which are widespread on the island. The shrew may be an opportunistic feeder, preying on beetles and spiders (Byrd and Norvell 1993).

Direct Effects

It is unlikely that there will be any direct effects from the discharge of seafood process waste on the Pribilof Island shrew. It prefers tall grass, upland habitats, and typical prey are terrestrial organisms, such as beetles and spiders. Therefore, the species is not expected to come into contact with discharges to the marine environment.

Indirect Effects

Conceivable indirect effects on the Pribilof Island shrew include the potential of accidental introduction of the Norway rat from vessels mooring at the dock or from vessel wrecks. Norway rats are potential predators of

Pribilof Island shrews (Byrd and Norvell 1993). Other potential predators, such as gulls, may be attracted by the presence of seafood wastes. In addition, increased activity at shore-based processing facilities and\or construction of new facilities may disturb resident populations or lead to some habitat loss. However, these indirect effects are only potential and their likelihood of affecting the shrew are minimal.

Summary

Based on the potential direct and indirect effects discussed above, seafood processing and related activities may affect, but is not likely to adversely affect the Pribilof Island shrew.

6.3 Overall Summary

Based on the foregoing discussion, it appears that both direct and indirect effects for many of the listed species would fall under the category of "may affect, but not likely to adversely effect". Water and sediment quality monitoring data are inconclusive with regard to whether effects these special status species could be significant, but even where concentrations may be high exposures are expected to be relatively low, thus causing little or no impact to protected populations of these animals. A possible exception is for the Steller sea lion and Northern fur seal, which may be adversely affected at the individual level by the process discharges. In the case of both species, this finding refers to the possibility that it is possible that critical breeding periods would occur during the period of discharge.

SECTION 7. COMMERCIAL, RECREATIONAL, AND SUBSISTENCE HARVEST

The determination of "unreasonable degradation" of the marine environment is to be made based upon consideration of the 10 criteria listed in Section 1. This section provides information pertinent to consideration of the two Ocean Discharge Criteria shown below:

- Criterion #7: Existing or potential recreational and commercial fishing, including finfishing and shellfishing.

- Criterion #8: Any applicable requirements of an approved Coastal Zone Management Plan.

This section describes the commercial, recreational, and subsistence fisheries in eastern Bering Sea waters, and discusses the potential impacts of seafood waste discharges.

The Coastal Zone Management Plan for St. Paul includes provisions for the continuance of subsistence resources and harvesting within their jurisdiction. Therefore, discussions on subsistence harvests in this chapter are applicable to considerations of criterion #8.

7.1 Commercial Harvests

Eastern Bering Sea waters sustain several commercially important fisheries. Major fisheries exist for groundfish and crab. Other important commercial fisheries important to the Pribilof Islands include Pacific halibut, salmon, snails, and squid.

A discussion concerning the commercial fisheries involved in seafood processing in the Pribilof Islands is presented in Section 2. This information is also presented below with additional data regarding Bering Sea fisheries.

7.1.1 Groundfish

The commercial groundfish fishery of the eastern Bering Sea consists chiefly of walleye pollock, Pacific cod, sablefish, Atka mackerel, flounder, Pacific Ocean perch and other rockfish, yellowfin sole, turbots, and other fish. Pacific halibut is also targeted, but is not specifically classified as a groundfish species for management. The groundfish fisheries in the Bering Sea, with the exception of Pacific halibut, are managed by the North Pacific Fisheries Management Council (NPFMC) in the Fisheries Conservation Zone, which extends from 4.8 to 321.9 km (3 to 200 mi) offshore and includes the area of the Pribilof Islands. In the eastern Bering Sea fishery, walleye pollock comprise the largest proportion of the total groundfish catch with lesser amounts of Pacific cod, yellow fin sole, and turbots. Commercial fishing is concentrated along the outer continental shelf and upper slope, although recent efforts have occurred in shallower waters closer to shore (Aleutians East Coastal Resource Service Area [CRSA] 1984).

The groundfish fishery is managed by imposing catch limits on target and bycatch species for specific management regions and by restricting fishing activities from specified areas (which may include important spawning and marine mammal habitats). The groundfish commercial fishery commences on the first of January and continues throughout the year until the fishery in a particular management region is closed due to catch or bycatch quotas having been reached. A regulatory closure of the Bering Sea fishery for the protection of marine mammals from April through September results in a fishery that is concentrated in the first and last 3 months of the year in the Bering Sea.

In 1985, the Fisheries Oceanography Coordinated Investigations (FOCI) program of applied research was implemented as a long-term cooperative effort between scientists at the Pacific Marine Environmental Laboratory and the Alaska Fisheries Science Center. The goal of FOCI is to gain an understanding of the biotic and abiotic factors influencing recruitment of various commercially important fish and shellfish stocks in Alaskan waters. The majority of the FOCI research to date has been concentrated on walleye pollock spawning in Shelikof Strait and the southeastern Bering Sea.

WaI1eye pollock is the most abundant groundfish species in the Bering Sea and Aleutian Islands and constitutes the majority of the total groundfish harvested. Over 1,000,000mt (1,100,000 tons) are harvested annually from the Bering Sea and Aleutian Islands.

Pacific cod are harvested by foreign and domestic fisheries in the Bering Sea. The 1989 catch of this species was 170,928 mt (188,450 tons). Extremely large year classes in 1977 and 1984 resulted in high harvests for the past several years, however, as these year classes are removed from the fishery, harvests are expected to decline (U.S. DOI/MMS 1990).

The Pacific halibut fishery in the Bering Sea began in 1928. Halibut were traditionally harvested by Canadian and U.S. fishermen, and Japanese and Soviet fishermen were allowed to fish in the Bering Sea from 1962 to 1976. In 1981, however, the fishery was restricted to domestic vessels only, although significant quantities continue to be taken by foreign fisheries as bycatch (Aleutians East CRSA 1984).

The Pacific halibut fishery is managed by the International Pacific Halibut Commission (IPHC). The fishery for Pacific halibut is generally conducted in offshore waters using hook-and-line gear. Under recently revised regulations, the fishery is managed according to individual fishing quotas (IFQs) and community development quotas (CDQs) designed to provide special economic benefits to resident fishers of the Pribilof and outer Aleutian Islands. The halibut fishing season begins on March 15 and extends until either the regulatory area catch limits are met or November 15, whichever date arrives first. The halibut catch limit in 1995 for Area 4C, the management area including the Pribilof Islands, is 349 mt (385 tons) (NMFS 1995). There also exists a significant subsistence fishery for halibut in the Pribilof Islands as discussed in the following subsections.

The fishery for squid is also managed as a groundfish fishery by the NPFMC. There are currently no catch limits for squid. The squid are taken primarily for use as a long line bait in the Pacific cod and halibut fishery.

7.1.2 Shellfish

Shellfish fisheries are composed chiefly of crab (opilio and bairdi Tanner, red and blue king, and Korean hair crab) and snails. These fisheries are managed by the Alaska Department of Fish & Game (ADF&G). The crab fishery is the largest shellfish fishery and the fishing season varies with location, species harvested, and allowable catch. Large crab fisheries are located in the Bering Sea. In most areas, the king crab fishing seasons have been shortened due to decreased stocks. In addition, the bairdi Tanner crab fishing season has been closed since 1997. Snail harvesting is managed by a permit system administered by Alaska Department of Fish and Game.

Fishing seasons vary depending on the species; a summary of season by species is included in Section 2.2 and Figure 4.

7.2 Recreational Harvests

Pribilof Islands residents, as well as non-residents, participate in recreational fisheries (St. Paul CMP 1988). However, due to the predominant reliance of island residents on aquatic resources for subsistence, it is difficult to separate recreational from subsistence harvesting. Therefore, the discussion of subsistence uses of natural resources in Section 7.3 provides the most complete overview of non-commercial resource use in the Pribilof Islands.

7.3 Subsistence Harvests

Subsistence, as defined by state and federal law, is the customary and traditional non-commercial use of wild resources for a variety of purposes such as food, clothing, fuel, arts, crafts, sharing, and customary trade. Subsistence resources are important to the economy and culture of many Alaskan communities, especially for the residents of rural areas with limited road access. Subsistence harvests in many of these communities constitute a major proportion of the daily diets for these residents.

The population of St George and St. Paul Islands (Otter and Wa1rus Islands and Sea Lion Rock are unpopulated) is approximately 800 residents, of which about 90 percent are Alaska Native (Schroeder et al. 1987). Prior to 1983, the Pribilof Islands were managed by NMFS as a government managed fur sealing operation. In 1983 the NMFS transferred Control of the island to island natives with the support of a monetary trust fund. These funds are intended to support the development of a post-sealing economy and employment opportunities lost by the withdrawal of NMFS. However, no studies have been conducted since those of Veltre and Veltre (1981) that might allow an examination of possible changes in subsistence uses of resources in the Pribilof Islands following this change in the Pribilof Islands economic structure.

The types of fish, game, and plant resources that have been used in the Pribilof Islands include sea lions, fur seals, harbor seals, halibut, cod, sea urchins, clams, mussels, limpets, crab, chiton, octopus, and sea cucumbers. Some of these subsistence resources are used year-round while others are harvested only during certain periods due to availability of the resource, time, or harvest regulations. Halibut, cod, and fur seal harvesting occurs primarily during the months of May through September while the taking of sea lions generally occurs during September through May. The typical harvest seasons for birds and eggs also varies depending on the species.

Limited data are available on the amount of resources harvested each year. The available data indicates that northern fur seal contributes the greatest amount by weight to household subsistence harvests of meat each year with lesser amounts of meat provided by halibut, sea lion, and reindeer. To minimize impacts to the stock, subsistence harvesting of fur seals on the Pribilof Islands is limited to the period from June 23 through August 8 (FR 70 41187). Only subadult males between 2 and 4 years of age, and greater than 124 cm (4 ft) in length, are allowed to be taken in the subsistence harvest (NMFS 2005d). The most recent five-year average (1999-2003) of the actual subsistence harvest of fur seals was 705 from St. Paul and 167 from St. George, although the limits for the subsistence harvest are 2,000 from St. Paul and 500 from St. George (NMFS 2005d).

Cod, sculpin, ducks, geese, birds, and marine invertebrates are also reported to make significant contributions to the diet of island residents (Veltre and Veltre 1981). Additional information on subsistence use areas is provided in the St. Paul CMP (1988). Coastal areas utilized for subsistence on St George Island include offshore areas to the west, north, and east and nearshore areas in Zapadni Bay. On St Paul Island, coastal subsistence use areas are concentrated along the southern coast, including English Bay, Reef Point, Whale Point, Lukanin Point, and Halfway Point and the area around the northeast tip of the island (e.g., Northeast Point).

7.4 Effects of Seafood Waste Discharges on Harvest Quantity

Commercial, recreational, and subsistence fisheries have the potential to be adversely impacted by seafood waste discharges, either directly by the discharged processing wastes, or indirectly through effects such as alteration of habitat and increased predation. Potential direct and indirect effects are discussed below.

7.4.1 Commercial Fisheries

Seafood waste discharges have the potential to adversely impact commercial groundfish and crab fisheries in areas proximal to the discharges by directly affecting the health of adult fish and crabs or by indirectly causing reduction in stocks through adverse effects on eggs, larvae, or juveniles. As discussed in Section 3.2, temporary accumulation of seafood wastes on the seafloor may occur. Due to the limited spatial and temporal characteristics of seafood waste discharges, juvenile and adult fishes and crabs should be able to successfully avoid unsuitable areas. It is not known whether spawning areas of these species overlap with seafood waste disposal area, however this may be possible. In such incident, seafood waste deposits may adversely affect demersal eggs. A number of important species, including most sculpins, walleye pollock, Pacific cod, rock sole, and sand lance, release demersal eggs. Smothering could have a localized adverse impact on eggs of these demersal species. Seafood processing discharges in the Pribilof Islands occurs throughout the year and is expected to overlap with the spawning periods of these fishes. Because the discharged waste is predicted to cause temporary waste accumulations and seafood processing discharges does coincide with periods of egg or larvae production, impact of seafood waste discharges on demersal eggs and larvae may be possible. In addition, if the nutrient concentrations in the effluent discharges remain elevated above the WQS, this could potentially result in elevated PSP concentrations in shellfish and subsequently affecting this resource. Other water quality excursions such as metal concentrations may affect the fishery. For example, Pacific halibut feed in shallower waters during summer and spawn in deeper offshore waters during winter. Because effluent discharges do coincide with the period when halibut are in Pribilof Islands waters, elevated chemical concentrations may affect these fisheries.

7.4.2 Recreational and Subsistence Fisheries

Recreational or subsistence fishing may occur in the vicinity of shore-based seafood processing discharges, and these fisheries may be impacted. Other than the impacts discussed in Section 7.4.1 above, the greatest potential for adverse effects is for nearshore shellfish harvesting and subsistence harvests of fur seals and sea lions. The extent to which impacts could occur is dependent upon the type of wastes (e.g., seafood waste verses municipal discharge waste), the amount of wastes generated, the quality of waste discharged, and the location of the discharge. The permitted discharges of seafood processing waste are expected to significantly affect fur seal and sea lion populations (see Section 6), therefore, subsistence use of this resource may be affected.

7.5 Summary

Eastern Bering Sea waters sustain several commercially important fisheries. Major fisheries exist for groundfish and crab. Other fisheries that are important in the Pribilof Islands include Pacific halibut, salmon, snails, and squid.

Subsistence, as defined by state and federal law, is the customary and traditional non-commercial use of wild resources for a variety of purposes such as food, clothing, fuel, arts, crafts, sharing, and customary trade. Subsistence resources are important to the economy and culture of the Pribilof Islands communities. Important marine resources include fur seals, sea lions, halibut, and a number of nearshore invertebrates.

Seafood processing discharges do coincide with the spawning season of fish harvested during commercial, recreational, or subsistence fisheries, adverse impact to groundfish and shellfish is possible if water quality remains similar to those observed in the past monitoring activities. Seafood waste discharge is not expected to adversely impact commercial or subsistence fisheries if permit limitations are met.

SECTION 8. COASTAL ZONE MANAGEMENT AND SPECIAL AQUATIC SITES

The determination of "unreasonable degradation" of the marine environment is to be made based upon consideration of the 10 criteria listed in Section 1. The following section provides information pertinent to consideration of the two criteria shown below:

- Criterion #8: Any applicable requirements of an approved Coastal Zone Management Plan.

- Criterion #5: The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs.

Information relevant to the two criteria presented in this chapter includes coastal zone management policies implemented by the State of Alaska and coastal districts within the state. All NPDES permitted discharges governed by Section 403(c) of the Clean Water Act must be consistent to the maximum extent practicable with these district enforceable policies and the Standards of the Alaska Coastal Management Program (ACMP). Seafood processing waste discharges that "may have a reasonably foreseeable direct or indirect effect on a coastal use or resource" or have the potential to affect locations identified as a national refuge or sanctuary, state refuge or sanctuary, national park or monument, and critical habitat, are subject to the consistency review process in 11 AAC 50.300 – 11 AAC 110.355. Additionally, areas designated by coastal districts as areas meriting special attention (AMSA) are included since these locations have been identified as either sensitive to alteration or would preclude subsequent use of the resources to a conflicting or incompatible use.

8.1 Coastal Zone Management

An overview of the federal, state, and local requirements under the Coastal Zone Management Act are described below. The overview includes a description of the Alaska Coastal Management Program, and its relevance to evaluation of a consistency determination with the Pribilof Islands NPDES Permits.

8.1.1 Requirements of the Coastal Zone Management Act

The Coastal Zone Management Act requires that states issue consistency determinations for any federally licensed or permitted activity affecting the coastal zone of a state with an approved Coastal Zone Management Program (CZMP) [16 USC Sec. 1456 (c)]. Under the Coastal Zone Management Act, applicants for federal licenses and permits must submit a certification to the Department of Natural Resources, Office of Project Management and Permitting (OPMP) that the proposed activity complies with the approved Alaska Coastal Zone Management Program (ACMP). The state then has the responsibility to either concur with or object to the consistency determination. For general NPDES permits, the USEPA is the applicant and must submit, for consistency review the general permit and a consistency determination that says the proposed activity complies with and will be conducted in a manner consistent with the coastal management program. For individual NPDES permits the permittee seeking an NPDES permit is the applicant.

8.1.2 Relevance of Requirements

A consistency determination is required when a federally licensed or permitted activity is "within or affecting land or water uses or natural resources of the coastal zone subject to the state standards and to applicable enforceable policies of a district coastal management plan." Seafood processing waste from seafood processors occur inside the 3 mile territorial sea limit. These discharges have the potential to affect Alaska's coastal resources or uses.

8.1.3 Status of Coastal Zone Management Planning

The Alaska Coastal Management Program (ACMP) was approved by the U.S. Department of Commerce in 1979. Completed district Coastal Management Programs (CMPs) must be approved first by the DNR-OPMP and then by the U.S. Department of Commerce, either as a routine program implementation or as an amendment to the ACMP. Once approved by the U.S. Department of Commerce, the district CMPs become the basis for federal consistency determinations. St. Paul Island does not currently have an approved CMP. Statewide standards at 11 AAC 112 and 114 apply to coastal areas of the state that do not have an adopted coastal district plan.

8.1.4 Relevant Policies

Enforceable policies of the ACMP that are potentially relevant to waste discharges from seafood processing activities are set forth in the ACMP standards (11 AAC 112). Article 2 (11 AAC 114.200 – 11 AAC 114.290) sets forth standards related to a number of uses in the Alaska coastal zone, including fish and seafood processing activities. The following policy is set forth for subsistence uses: A project within a subsistence use area designated by the department or under 11 AAC 114.250(g) must avoid or minimize impacts to subsistence uses of coastal resources.

Article 3 (11 AAC 114.300 -11 AAC 114.385) sets forth standards for resources and habitats relevant to discharges associated with seafood processing activities. The following habitats are identified as being potentially affected by seafood process wastes: off-shore pelagic and benthic areas, estuaries, wetlands and tide flats, rocky islands and sea cliffs, barrier islands and lagoons, and exposed high energy coasts. The ACMP defines off-shore areas as submerged lands and waters seaward of the coastline as measured from mean low tide (see 11 AAC 112.990). The fundamental management standards for these habitats states that they "must be managed to avoid, minimize, or mitigate significant adverse impacts.

In addition, the following standards at 11 AAC 112.300 apply to specific habitats:

11 AAC 112.300. Habitats.
(a) Habitats in the coastal area that are subject to the program are

(1) offshore areas;
(2) estuaries;
(3) wetlands;
(4) tideflats;
(5) rocky islands and sea cliffs;
(6) barrier islands and lagoons;
(7) exposed high-energy coasts;
(8) rivers, streams, and lakes and the active floodplains and riparian management areas of those rivers, streams, and lakes; and
(9) important habitat.

(b) The following standards apply to the management of the habitats identified in (a) of this section:

(1) offshore areas must be managed to avoid, minimize, or mitigate significant adverse impacts to competing uses such as commercial, recreational, or subsistence fishing, to the extent that those uses are determined to be in competition with the proposed use;
(2) estuaries must be managed to avoid, minimize, or mitigate significant adverse impacts to:

(A) adequate water flow and natural water circulation patterns; and

(B) competing uses such as commercial, recreational, or subsistence fishing, to the extent that those uses are determined to be in competition with the proposed use;

(3) wetlands must be managed to avoid, minimize, or mitigate significant adverse impacts to water flow and natural drainage patterns;

(4) tideflats must be managed to avoid, minimize, or mitigate significant adverse impacts to

(A) water flow and natural drainage patterns; and

(B) competing uses such as commercial, recreational, or subsistence uses, to the extent that those uses are determined to be in competition with the proposed use;

(5) rocky islands and sea cliffs must be managed to

(A) avoid, minimize, or mitigate significant adverse impacts to habitat used by coastal species; and

(B) avoid the introduction of competing or destructive species and predators;

(6) barrier islands and lagoons must be managed to avoid, minimize, or mitigate significant adverse impacts

(A) to flows of sediments and water;

(B) from the alteration or redirection of wave energy or marine currents that would lead to the filling in of lagoons or the erosion of barrier islands; and

(C) from activities that would decrease the use of barrier islands by coastal species, including polar bears and nesting birds;

(7) exposed high-energy coasts must be managed to avoid, minimize, or mitigate significant adverse impacts

(A) to the mix and transport of sediments; and

(B) from redirection of transport processes and wave energy;

(8) rivers, streams, and lakes must be managed to avoid, minimize, or mitigate significant adverse impacts to

(A) natural water flow;

(B) active floodplains; and

(C) natural vegetation within riparian management areas; and

(9) important habitat

(A) designated under 11 AAC 114.250(h) must be managed for the special productivity of the habitat in accordance with district enforceable policies adopted under 11 AAC 114.270(g); or

(B) identified under (c)(1)(B) or (C) of this section must be managed to avoid, minimize, or mitigate significant adverse impacts to the special productivity of the habitat.

8.2 Special Aquatic Sites

Special aquatic sites are 1ocations designated as national and state refuges, national and state sanctuaries, national parks or monuments, and national seashores as defined by 40 CFR 125.122 (a)(5). In addition, critical habitat and Areas Meriting Special Attention (AMSA) are also considered special aquatic sites. There are no state or national refuges, sanctuaries, parks, or monuments in the Pribilof Islands. However, the Pribilof Islands, including St. Paul, St. George, Walrus, and Otter Islands, are considered to be special aquatic sites as these islands are essential not only for northern fur seal mating, pupping, and pup rearing, but also contain important feeding grounds extending to a minimum of 200 to 300 km (124 to 186 mi) from these islands (NMFS 1993a). Approximately 72 percent of the entire fur seal population is found on the Pribilof Islands during the breeding season. The Pribilof Islands have been designated as a "special reservation" due to the important habitat contained on these islands. Landing on any of the Pribilof Islands, with the exception of unavoidable causes such as inclement weather, is prohibited unless authorized by the NMFS.

The Pribilof Islands are also part of the Alaska Maritime National Wildlife Refuge (NWR), established in 1980. The refuge contains approximately 20,000 km^2 (4.9 million acres) and includes over 2,500 islands, islets, rocks, and headlands distributed throughout the state (USFWS 1988). The refuge areas in St. Paul, St. George, Otter and Walrus Islands provide habitat for the world's largest breeding colony of red-legged kittiwakes and a large population of thick-billed murres, auklets, and other migratory seabirds, shorebirds, and waterfowl.

Critical habitat for a threatened or endangered species listed under the ESA is defined as the specific area(s) within and outside the geographica1 area current1y occupied by a species at the time it is listed on which are found those biological or physical features essential to the conservation of the species and which may require special management considerations or protection (50 CFR 424.02 (d)). On 27 August 1993, the National Marine Fisheries Service published the final rule designating critical habitat, including areas in the Pribilof Islands, for the Steller sea lion under the ESA (58 FR 45269). The critical habitat designations became effective on 27 September 1993. Designated critical habitat in the Pribilof Islands includes the Walrus Island, an important rookery, two hau1out locations on St. Paul Island (Northeast Point, and Sea Lion Rock), and two haulout locations on St. George Island (South Rookery and Da1noi Point). The critical habitat designation includes terrestrial, air, and aquatic zones around major rookeries and hau1outs. In the Alaskan areas west of 144 degrees west, including the area of the Pribilof Islands, the terrestrial zone extends 0.9km (3,000 ft) landward, the air zone 0.9 km (3,000 ft) above, and the aquatic zone 37 km (20 nmi) seaward of haulouts and rookeries designated as critical habitat. In areas west of 150 degrees west, including the Pribilof Islands, vessels are not permitted to travel within 5.6 km (3 nmi) and trawling is prohibited within 18.5 km (10 nmi) of critical rookeries (i.e., Walrus Island).

The critical habitat designation contributes to a species' conservation primarily by identifying critically important areas and by describing the features within the area that are essential to the species. There are no mandates or any specific management or recovery actions associated with the designation. Under Section 7 of the ESA, the designation of critical habitat requires federal agencies to ensure that any action they authorize, fund, or carry out is not likely to destroy or adversely modify the designated critical habitat.

8.3 Areas Meriting Special Attention

The ACMP authorizes a mechanism for focusing attention to areas of a borough deemed critical to borough needs and where conflicts or potential conflicts are likely to occur. This process is initiated by nomination of an Area Meriting Special Attention (AMSA). Section AS 46.40.210(1) of the Alaska statutes defines an AMSA as:

> "a delineated geographic area within the coastal area which is sensitive to change or alteration and which because of plans or commitments or because a claim on the resources within the area delineated would preclude subsequent use of the resources to a conflicting or incompatible use, warrants special management attention, or which because of its value to the general public, should be identified for current or future planning, protection, or acquisition; these areas, subject to definition of criteria, include:

- Areas of unique, scarce, fragile or vulnerable natural habitat, cultural value, historical significance, or scenic importance.
- Areas of high natural productivity or essential habitat for living resources.
- Areas of substantial recreational or opportunity.
- Areas where development of facilities is dependent upon the utilization of, or access to, coastal waters.

- Areas of unique geologic or topographic significance which are susceptible to industrial or commercial development.

- Areas of significant hazard due to storms, slides, floods, erosion or settlement.

- Areas needed to protect, maintain, or replenish coastal land or resources, including coastal flood plains, aquifer recharge areas, beaches, and offshore sand deposits.

Under 11 AAC 114.410 of the ACMP an area to be designated as an area which merits special attention includes those categories included in AS 46.40.210, and the following:

- Areas important for subsistence uses.

- Coastal resources important to subsistence uses.

- Areas with special scientific values or opportunities, including those areas where ongoing research projects could be jeopardized by development or conflicting uses and activities.

- Potential estuarine and marine sanctuaries.

Once an area meets any one of the qualifying criteria listed above, a management plan for the area is prepared by the district. The management plan must include a description of the uses and activities considered proper and improper and the rationale for the designation of proper and improper uses, a statement of the enforceable policies used to manage the area, and identification of the authority used to implement the management plan. An area is established as an AMSA after approval of the AMSA plan by the Coastal Policy Council.

Areas for potential consideration as areas meriting special attention could include:

- watershed areas,

- subsistence use areas,

- harbor development area, and

- Salt Lagoon.

8.4 Consistency of Waste Discharges with Relevant Coastal Management Programs and Policies

On the basis of the analysis presented in this ODCE, discharges associated with the seafood processing facilities covered under the proposed NPDES permits are consistent with the Statewide standards. This assessment is based on the following findings:

The waste discharges associated with seafood processing activities covered under the NPDES Permits are expected to comply with, and are expected to be conducted in a manner consistent with, relevant Alaska Coastal Management Program policies under the limitations and conditions set forth in the permits. This consistency assessment is based upon the following:

- Based upon the evaluation in Section 7, opportunities for subsistence usage of coastal resources may be affected by both the seafood waste and the City of St. Paul's discharges. However, subsistence uses are not likely to be threatened or adversely affected by the seafood discharges if conditions in the permit are met.

- Due to the exceedances discussed in Section 5, coastal habitats may not maintain the biological, physical, and chemical characteristics of the habitats which contribute to their capacity to support living resources. This finding is based upon the evaluations of discharge monitoring data indicating that coastal habitats may experience significant adverse impacts from seafood waste and the City of St. Paul's discharges. These potential impacts are not likely if the limitations and conditions set forth in the NPDES permits are met.

- Offshore areas may not be managed in a way that would maintain sport, commercial, and subsistence fisheries. This conclusion is based upon the evaluation in Section 7 indicating that sport, commercial, and subsistence harvests are may experience degradation from effluent discharges based on available discharge data. These fisheries are not expected to be affected if limitations and conditions of the NPDES permits are met.

- Estuaries, wetlands, and tideflats may not assure adequate water flow, nutrients, and oxygen levels, and may be adversely affected by the discharge of toxic wastes. This finding is based upon the evaluations in Section 5 indicating that toxic substances in effluent discharges are likely to be present and discharges may adversely affect nutrient or oxygen levels in the vicinity of these coastal habitats. These adverse impacts however are not expected if limitations and conditions set forth in the permits are met.

- Rocky islands and seacliffs may result in harassment of wildlife, destruction of important habitat, and the introduction of competing or destructive species and predators. This finding is based upon the evaluation in Section 5 indicating that effluent discharges contains toxic substances that may like adversely affect wildlife or habitat in these areas. These adverse effects are not expected if permits limits are met.

- Barrier islands and lagoons may not maintain adequate flow of sediments, detritus, and water, and may decrease use of barrier islands by coastal species, including polar bears and nesting birds. This finding is based upon the evaluation in Section 5 indicating that seafood process waste discharges may adversely impact habitat or wildlife in these areas. These adverse impacts are not expected if limitations and conditions set forth in the permit are met. Barrier islands and lagoons are expected to be managed in a way that would avoid the alteration of wave energy.

8.5 Summary

Current discharges from the seafood processing wastes and the City of St. Paul are not expected to be consistent with relevant ACMP, district policies, and objectives of subsistence uses of the coastal zone, management of all coastal habitats, and management of specific habitat types (e.g., offshore areas, wetlands and tideflats, rocky islands and seacliffs, islands and lagoons, and high energy coasts). These discharges, however, would be expected to be consistent with the objectives of these polices and uses if the permit limits are met. The consistency assessment is based upon ACMP policies.

SECTION 9. DETERMINATION OF UNREASONABLE DEGRADATION

Section 1 of this ODCE provides the regulatory definition of unreasonable degradation of the marine environment (40 CFR 125.121[e]) and indicates the 10 criteria which are to be considered when making this determination (40 CFR 125.122). The actual determination of whether the discharge will cause unreasonable degradation is made by the EPA Regional Administrator. The intent of this section is to briefly summarize information pertinent to the determination of unreasonable degradation with respect to the 10 criteria,

Criterion #1: The quantities, composition, and potential for bioaccumulation or persistence of the pollutants to be discharged.

Seafood processing facilities:

- Among the seafood facilities that submitted discharge monitoring data, not all data required by the permit were submitted by the permittee, i.e., the quantity of discharge from each facility may be underestimated. Based on the permit applications received, it was estimated that Westward Wind has the capacity to process 2.25 million pounds of crab per month, Arctic Star can process 5.7 million pounds of crab per month, Stellar Sea can process 6 million pounds of crab per month and Trident can process 5.4 million pounds of crab per month. Of the total amount of crab processed, approximately 36% is discharged as waste. Additionally, Trident can process up to 2.7 million pounds of halibut per month, and 25 % of this is discharged as waste . These facilities also discharge soluble wastes but no data were available for the permit required flow monitoring information.

- Monitoring data for some of the permit required parameters are summarized in Section 5. In brief, multiple parameters exceeded the Alaska water quality standards for both shore-based and mobile facilities and insufficient data (e.g. no metals and VOCs data) were available for evaluation of potential bioaccumulation.

- The quantity and character of seafood processing wastes vary seasonally depending on the species processed and the types of products that are produced. Specific information is included in Section 2.

City of St. Paul wastewater treatment facility:

- Based on discharge records from 1999 through February 2005, it is not possible to estimate the quantity of discharges from the treatment facility as no flow data are currently available. However, the NOI submitted for the proposed permit indicated that the daily average and maximum flows are 180,000 and 300,000 gallons/day, respectively.

- Monitoring data for some of the permit required parameters are summarized in Section 5. In brief, multiple parameters exceeded the Alaska water quality standards and some parameters such as copper and silver that are known to bioaccumulate were detected at concentrations that exceeded the water quality criteria.

- No seasonal pattern was observed in the quality of the effluent discharge.

Criterion #2: The potential transport of such pollutants by biological, physical, or chemical processes.

Seafood processing facilities:

- The extent of the initial accumulation of solid waste on the bottom depends on the height of the discharge above the seafloor, current speed, and the settling velocities of the waste particles. The extent of bottom waste accumulation over the long-term depends primarily on the decay rate of the waste organic matter and the degree of resuspension and transport of the deposited waste. The relatively high energy coastal environment of the Pribilof Islands is expected to result in frequent resuspension and transport of the discharge solid organic wastes. The combination of resuspension, transport, and biological decay of these wastes is expected to prevent the occurrence of persistent seafood waste piles in the vicinity of these discharges. Modeling results indicated that temporary deposition is possible. Seafloor monitoring data from September 2007 showed halibut wastes, from Trident's discharge, accumulated on the seafloor. This is a concern because the pile occurred in critical habitat area for Northern fur seals and during the breeding season for the Northern fur sea and the Stellar sea lions. The draft permit requires Trident to barge its halibut waste approximately 7 miles west of St. Paul Island. This condition should minimize negative impacts to marine mammals.

- The draft permit contains effluent limitations for ammonia, chlorine, and pH to ensure that the State water quality standards are met for these parameters. The permit also requires a metals study such that any metals discharges exceeding the State water quality standards are removed from the discharge. Other soluble wastes from these discharges are expected to be diluted or degraded by biological, physical, and chemical processes during winter season. This is based on historical receiving water monitoring data. It is not known if soluble wastes from these discharges during summer months would dilute or degrade as rapidly as those in the winter season since no monitoring have been conducted during the summer season.

City of St. Paul wastewater treatment facility:

- Dilution and degradation is expected but the rate cannot be determined due to limited information.

Criterion #3: The composition and vulnerability of the biological communities which may be exposed to such pollutants, including the presence of unique species or communities of species, the presence of species identified as endangered or threatened pursuant to the Endangered Species Act, or the presence of those species critical to the structure or function of the ecosystem, such as those important for the food chain.

Seafood processing facilities:

- Benthic communities in the immediate vicinity of shore-based discharges may be impacted due to subtle changes in community composition and structure. Historical surveys of benthic communities and sediments in the vicinity of the outfalls have not indicated that the discharges have affected these communities or the character of their habitat.

- Detailed discussion on the listed species is included in Section 6. In brief, several species of endangered whales may travel through the Pribilof region while migrating to and from summer feeding grounds. These include bowhead, North Pacific right, sperm, blue, finback, and humpback whales (D. DeMasters, NMFS, pers. comm. 1995; Zimmerman 1998). The western distinct population segment (DPS) of the Steller sea lion and the southwest Alaska DPS of the northern sea otter are the only marine mammals listed as threatened or endangered species that may be present in the Pribilof Islands throughout the year (NMFS 2005b; Burn, NMFS, pers. comm. 2005). The northern fur seal breeds on the Pribilofs and is considered a "depleted" species by the NMFS. Avian species with special status include the federally listed endangered short-tailed albatross, and Steller's eider and spectacled eider, each of which are federally listed as threatened. One terrestrial species of special concern, the Pribilof Island shrew, is present in the project area.

- Because the most sensitive life stages of these species do coincide with the period of waste discharges, seafood processing wastes may have a significant adverse effect on the following species: Steller sea lion, northern fur seal, and the northern sea otter. This is based on the excursions observed in the effluent discharge data. However, these impacts will be mitigated provided the pH, chlorine, ammonia effluent limitations are met, the Trident facility barges its waste to sea during the summer months as required by the permit, and each of the facilities removes the sources of metals contaminating its discharge as required by the permits.

City of St. Paul wastewater treatment facility:

- Benthic communities and sediment chemistry data from the vicinity of the outfalls is not available.

- Species listing is the same as those described under the seafood processing facility subsection above.

- Because the most sensitive life stages of the listed species do coincide with the period of waste discharges, effluent discharge may have a significant adverse effect on the Steller sea lion and northern fur seal. This is based on the excursions observed in the effluent discharge data.

Criterion #4: The importance of the receiving water area to the surrounding biological community, including the presence of spawning sites, nursery/forage areas, migratory pathways, or areas necessary for other functions or critical stages in the life cycle of an organism.

- There are numerous areas in the coastal waters of the Pribilof Islands that are important areas for a variety of species, ranging from phytoplankton to marine mammals. These areas are used by a variety marine birds and mammals for migration and feeding. The Pribilof Islands are also an important area for many species including commercial species of crab and finfish. The islands also provide important habitat for migratory shorebirds and waterfowl. The Pribilof Islands, in particular, are very important areas for marine mammals and seabirds. The Pribilof Islands support approximately 72 percent of the entire North Pacific breeding population of northern fur seals. Critical habitat for the Steller sea lion has also been identified by the National Marine Fisheries Service in the Pribilof Islands and includes Walrus Island and locations on St. Paul and St. George Island. In addition, the Pribilof Islands support one of the largest colonies of nesting seabirds in the Bering Sea. St. George Island supports possibly the largest thick-billed murre colony in the world and is also the primary nesting area for most of the world's population of red-legged kittiwakes. There are no indications from monitoring results that seafood discharges covered under the proposed general permit are significantly affecting these important biologic communities.

- Provided each permittee complies with the effluent limitations and other monitoring restrictions in the permits, it is anticipated that the seafood discharges will have a minimal impact on the significant biological communities in the area of the Pribilofs.

Criterion #5: The existence of special aquatic sites including, but not limited to, marine sanctuaries and refuges, parks, national and historic monuments, national seashores, wilderness areas, and coral reefs.

- Areas of the Pribilof Islands are part of the Alaska Maritime National Wildlife Refuge. In the Pribilof Islands this refuge provides federally managed habitat for seabirds, shorebirds, and waterfowl, as well as marine mammals such as the northern fur seal and Steller sea lion. Provided each of the seafood discharges complies with the effluent limitations and other conditions in the permits it is anticipated that the discharges will not significantly affect these areas of concern.

- The National Marine Fisheries Service has designated critical habitat for the Steller sea lion pursuant to the ESA. Specific sites include: the rookery on Walrus Island, haulouts at Northeast Point and Sea Lion Rock on St. Paul Island, and haulouts at South Rookery and Dalnoi Point on St. George Island. No vessel entry is permitted within 5.6 km (3 nmi) and a no-trawl zone exists within 18.5 km (10 nmi) of the rookery on Walrus Island. No seafood waste discharges within 5.6 km of Walrus Island are authorized in the Pribilof Islands General NPDES Permit. Designated critical aquatic habitat extends 37 km (20 nmi) seaward of these rookeries and haulout areas. Provided each of the seafood discharges complies with the effluent limitations and other conditions in the permits it is anticipated that the discharges will not significantly affect these areas of concern.

- The Alaska Coastal Management Program authorizes a mechanism for focusing attention to areas of a borough which are critical to the borough's needs and where potential conflicts are likely to occur. This process is initiated by nomination of an Area Meriting Special Attention (AMSA). St. George Island does not have a Coastal Management Plan (CMF). St. Paul has an approved CMF, however, no AMSA has been nominated by St. Paul. Nonetheless, St. Paul's CMF identified Salt Lagoon, a unique habitat in the Bering Sea, as an area for future consideration as an AMSA. The limitations and other conditions in the proposed permits will ensure that the seafood discharges covered under the proposed permitst are consistent with applicable coastal management plans.

Criterion #6: The potential impacts on human health through direct and indirect pathways.

<u>Seafood processing facilities:</u>

- Seafood processing waste discharges may result in significant impacts to human health. These discharges do contain significant quantities of nutrients that may result in elevated PSP concentration in shellfish. However, as mention in the previous sections, it is not known if bioaccumulative or other potential toxic or carcinogenic pollutants are present in the seafood processing discharge as that data is currently unavailable.

<u>City of St. Paul wastewater treatment facility:</u>

- Effluent discharge from the City of St. Paul may result in significant impacts to human health. As discussed in more detail in Section 5, effluent data have indicated significant quantities of fecal coliform and other bioaccumulative chemicals that may adversely affect human health.

Criterion #7: Existing or potential recreational and commercial fishing, including finfishing and shellfishing.

- A detailed description of commercial fisheries is included in Section 7. In brief, commercial fisheries in the eastern Bering Sea include various species such as groundfish (chiefly walleye pollock, yellow fin sole, Pacific cod, and Pacific halibut) and Tanner, king, and Korean hair crab. The commercial harvest of snail and squid is also important to the local economy. Subsistence harvest includes marine marnma1s, halibut, and marine invertebrates. Provided each of the seafood discharges complies with the effluent limitations and other conditions in the permits it is anticipated that the discharges will not significantly affect these areas of concern.

- Because the expected seafood processing discharges do coincide with the season of peak egg and larvae production, the permitted waste discharges may affect commercial and subsistence fisheries. The discharges also coincide with the critical breeding period of northern fur seals and Steller sea lions which as discussed above. This could potentially affect localized individuals utilizing resources in the immediate vicinity of the discharges. Restrictions established in the permit that prohibit discharges in the vicinity of designated critical habitat for marine mammals and birds during their critical breeding and nesting periods should reduce the potential for adverse effects on subsistence resources.

Criterion #8: Any applicable requirements of an approved Coastal Zone Management Plan.

- Discharges associated with seafood processing wastes covered under the proposed NPDES general permit are not expected to be consistent with relevant Alaska Coastal Management Program and district policies if the permit limits are not met. Detailed discussion is included in Section 8. The following resources are not expected to be affected if limitations and conditions set forth in the general permit are met:
  - Opportunities far subsistence usage of coastal resources
  - Coastal habitats
  - Offshore sport, commercial, or subsistence fisheries
  - Adequate water flow, nutrients, and oxygen levels in estuaries, wetlands, and tideflats
- Similarly, the following would be true if permit limitations are met:
  - Rocky islands and seacliffs will be managed to avoid harassment of wildlife, destruction of habitat, and introduction of competing or destructive species.
  - Barrier islands and lagoons will be managed to maintain adequate water flow and avoid alteration of wave energy or a decrease in the use of islands by coastal species.
  - Mixing and transport processes of high energy coasts will not be altered.

Criterion #9: Such other factors relating to the effects of the discharge as may be appropriate.

<u>Seafood processing facilities:</u>

- Concerns have been raised about potential indirect effects of the discharge of seafood processing waste on marine organisms. These indirect effects include the following:
  - Elevated nutrient levels in the waste discharge may result in enrichment of coastal waters. This may in subsequently result in enhanced biomass of phytoplankton and alteration of plankton species composition. Toxic phytoplankton species may occur more frequently and at higher levels under these conditions, resulting in adverse effects to aquatic organisms, and potentially to human health.
  - The attraction of marine mammals to waste discharges, which makes them easier prey for predators. The attraction of seabirds to waste discharges, which may result in a number of adverse effects that range from birds becoming oiled, enhancement of the numbers of species of gulls that may adversely affect threatened or endangered bird species, and adverse effects on marine birds and mammals that contact seafood waste contaminated with pathogens.

<u>City of St. Paul wastewater treatment facility:</u>

- Elevated nutrient levels in the effluent discharge would have similar effects as in seafood processing facilities.

Criterion #10: Marine water quality criteria developed pursuant to Section 304(a) of the Clean Water Act.

- The regulated discharges of both seafood processing waste and the City of St. Paul effluent are not expected to comply with relevant water quality criteria as discussed in more details in Section 5 unless the effluent limitations specified in the permit are met, and the sources of metals in the discharge are identified and removed. It is expected that the facilities will meet these requirements.

SECTION 10. MONITORING RECOMMENDATIONS

Continued effluent and receiving water monitoring is recommended for seafood processing discharges that will be covered under the new NPDES general permit for the Pribilof Islands. Increased vigilance in monitoring is recommended to ensure compliance with permit stipulations and limits, and to improve the existing database on the quantity and character of seafood processing waste discharges. This includes the transport, fate, and persistence of the discharged waste, potential adverse impacts to aquatic organisms, and compliance with applicable water quality standards (if available). Recommendations to additional effluent monitoring and permit limitations are outlined below.

10.1 Effluent Discharge Monitoring

Information should be provided by each permittee that will allow EPA to characterize the quality and quantity of solid and liquid wastes discharged by facilities covered under the new permit. Seafloor monitoring immediately after crab season is recommended to allow evaluation of potential for accumulation. Metals monitoring of effluent, influent and ambient water, and a study should be included in the permit to determine the source of metals contamination ensure that the permittees have eliminated any metal contamination from their discharge that is contributed by the discharger.

10.2 Receiving Water Monitoring

Information should be provided by each seafood processing permittee that will allow determination of compliance with water quality criteria. Specifically, seafood processing facilities should provide the following information:

- Shore-based seafood processing facilities should provide a reasonably accurate assessment of the existence of a persistent wastepile and the areal extent of any seafood waste solids accumulation on the bottom in the vicinity of the discharge. The survey should at a minimum determine the maximum length of the wastepile and the maximum width perpendicular to the long axis of the wastepile. The depth of the deposited waste should be recorded at approximately 1 m (3.3 ft) intervals along each transect. Based on these data the permittee should estimate and report the total areal coverage and volume of the wastepile.

10.3 Water Quality Standards

- Permit limits should be included in the proposed permit for ammonia and chlorine to ensure that aquatic life is not impacted by these toxic chemicals.

SECTION 11. REFERENCES

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