NORTHWEST ARCTIC SUBAREA CONTINGENCY PLAN

BACKGROUND SECTION

BACKGROUND: PART ONE – SUPPORT INFORMATION

A. SUBAREA PLAN

This Subarea Contingency Plan (SCP) supplements the *Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases* (*Unified Plan*). The SCP in conjunction with the *Unified Plan* describes the strategy for a coordinated federal, state and local response to a discharge or substantial threat of discharge of oil or a release of a hazardous substance from a vessel, offshore or onshore facility, or vehicle operating within the boundaries of the Northwest Arctic Subarea. For its planning process, the federal government has designated the entire state of Alaska as a planning "region" and the western half of the state as a planning "area." The State of Alaska has divided the state into ten planning regions of which one is the Northwest Arctic Region. As part of the *Unified Plan*, this SCP addresses this Northwest Arctic Region; to avoid confusion with federal terms, the region is referred to as the Northwest Arctic Subarea.

This plan shall be used as a framework for response mechanisms and as a pre-incident guide to identify weaknesses and to evaluate shortfalls in the response structure before an incident. The plan also offers parameters for vessel and facility response plans under the Oil Pollution Act of 1990. Any review for consistency between government and industry plans should address the recognition of economically and environmentally sensitive areas and the related protection strategies, as well as a look at the response personnel and equipment (quantity and type) available within the area (including federal, state, and local government and industry) in comparison to probable need during a response.

B. SUBAREA DESCRIPTION

As defined by Alaska Statute AS 46.04.210 and regulations at 18 AAC 75.495 and 18 AAC 75.496, the Northwest Arctic Subarea encompasses the boundaries of the Northwest Arctic Borough and the Bering Straits Regional Corporation, including adjacent shorelines and state waters, and having as its seaward boundary a line drawn in such a manner that each point on it is 200 nautical miles from which the territorial sea is measured. Figures E-1 through E-4 depict this area. Figure E-2 through E-4 maps are available on Alaska Department of Natural Resources Prevention and Emergency Response Subarea Maps website at: http://www.asgdc.state.ak.us/maps/cplans/subareas.html.

The subarea encompasses a very diverse array of topographical features in the subarctic and arctic, including mountainous terrain, rivers, river deltas, tidal mudflats, wetlands, sand and gravel beaches, rocky shorelines, boreal-arctic transition zones, boreal forests, and various types of tundra.

Figure E-1
Northwest Arctic Area Map

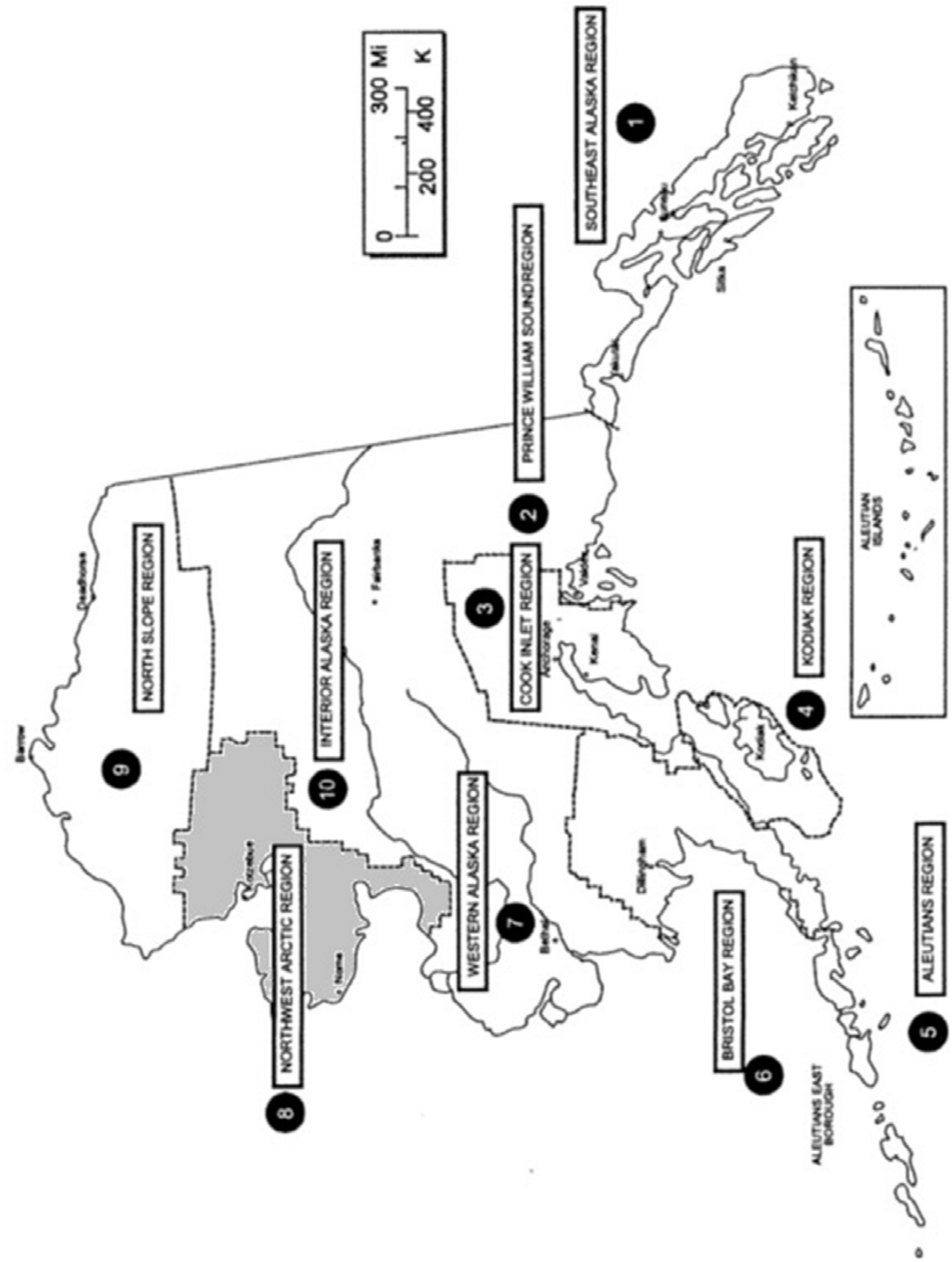


Figure E-2
Northwest Arctic Detailed Subarea Map

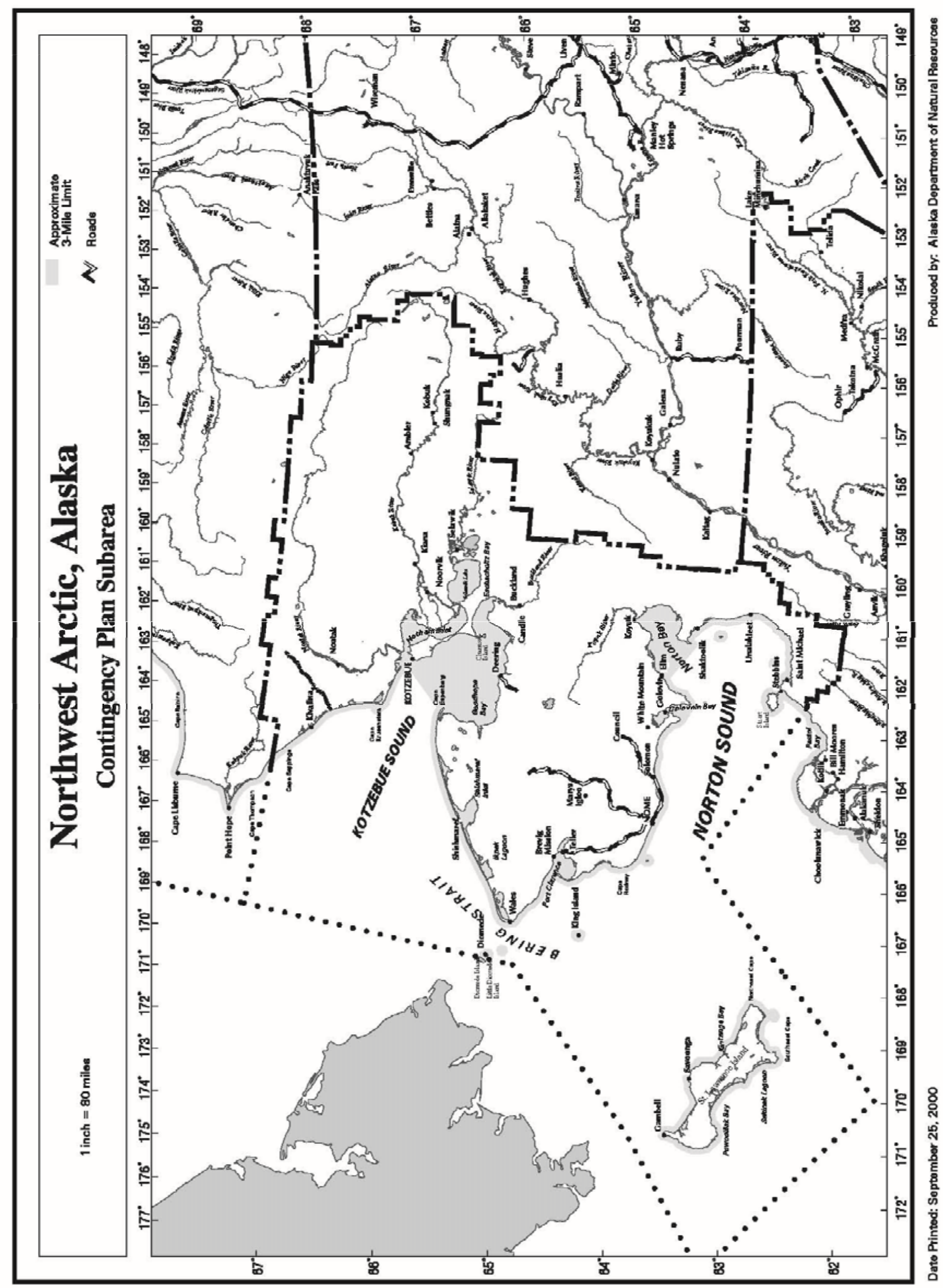


Figure E-3
Northwest Arctic USGS Topo Map Index

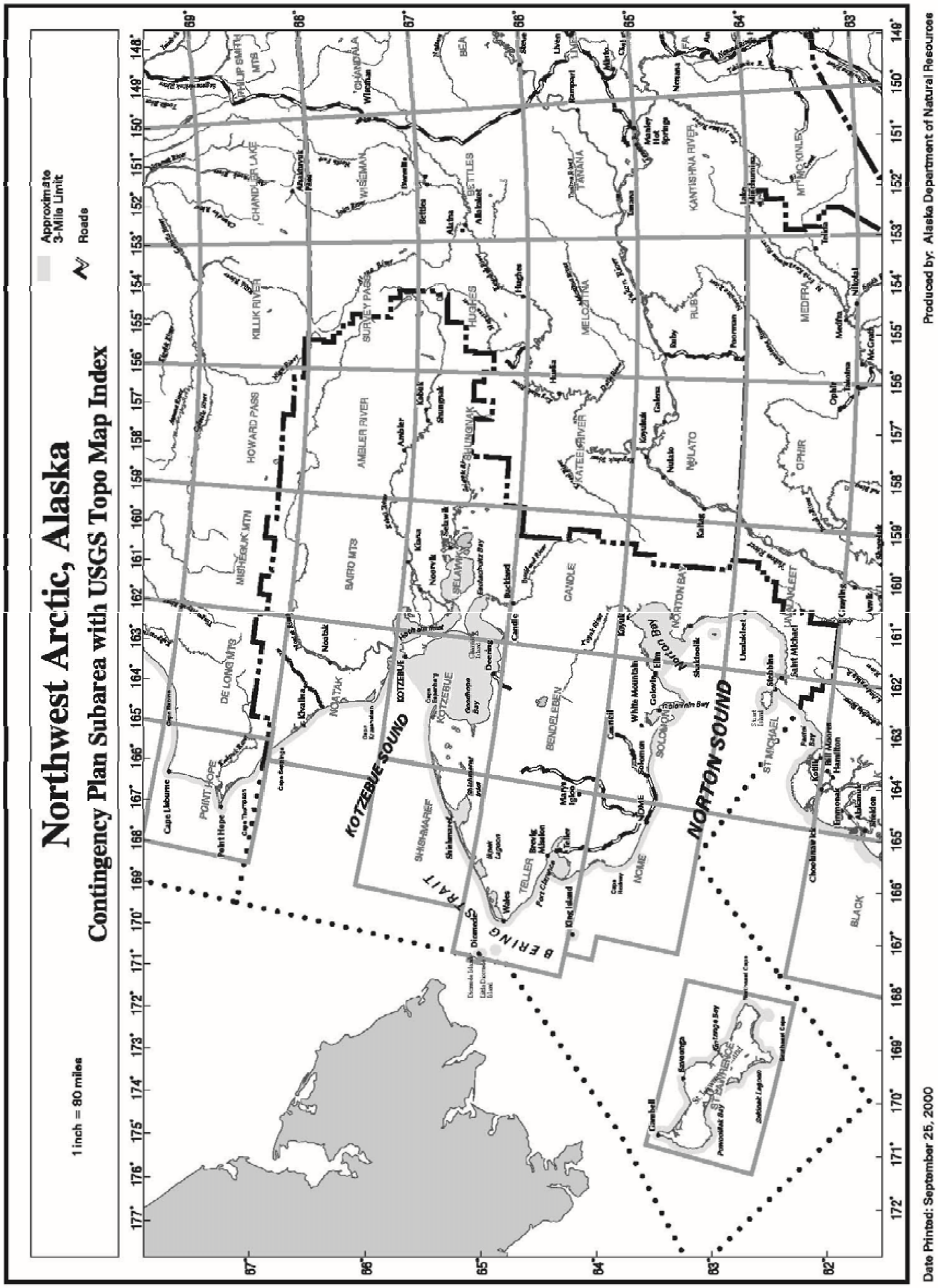
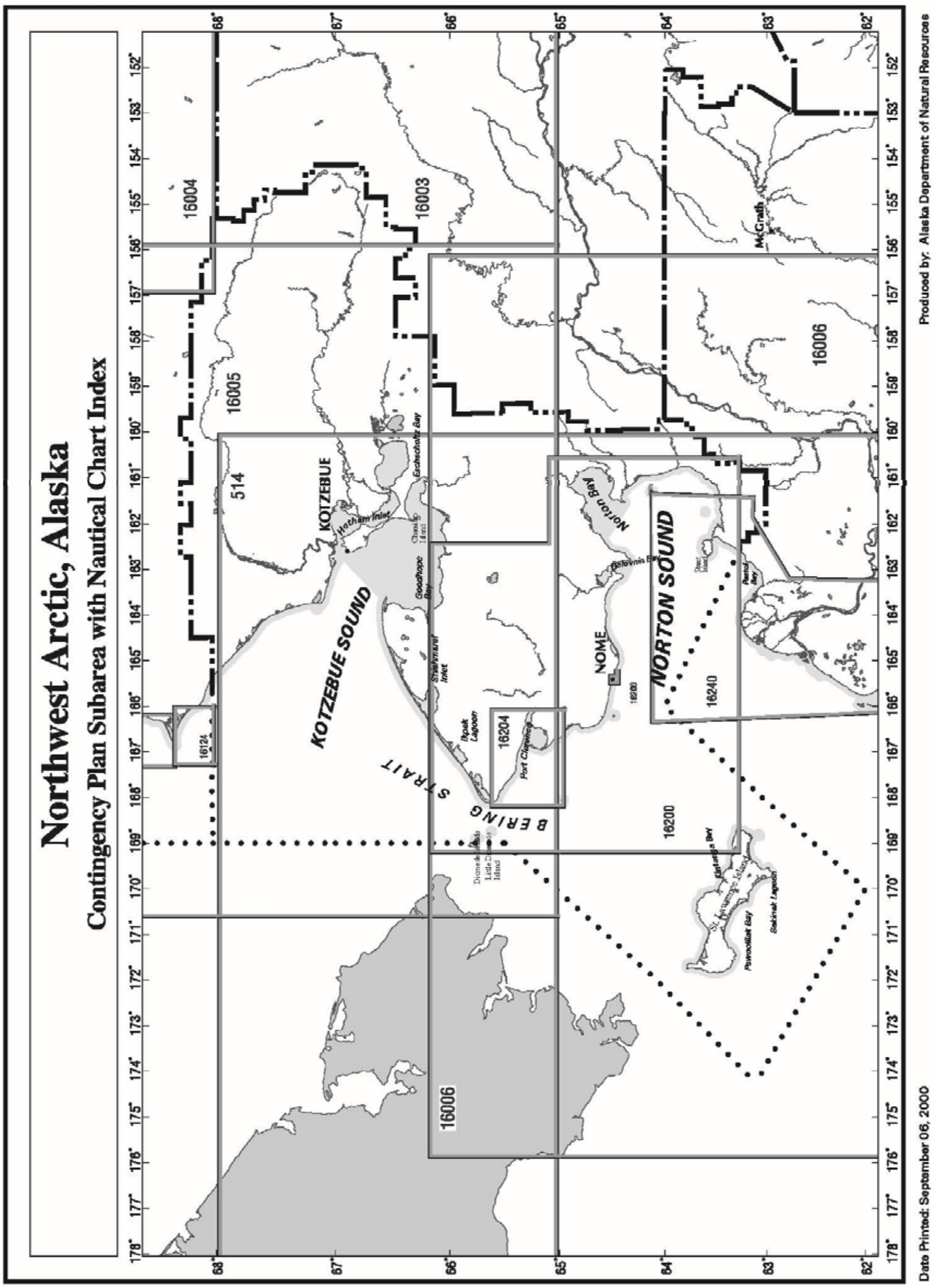


Figure E-4
Northwest Arctic Nautical Chart Map Index



C. AREA OF RESPONSIBILITY

This SCP covers the region outlined above. The U.S. Coast Guard (USCG) Captain of the Port (COTP) for Western Alaska is the pre-designated Federal On-Scene Coordinator (FOSC) for navigable waterways within the subarea, as agreed to and stipulated in a memorandum of understanding between the U.S. Environmental Protection Agency (EPA) and USCG. EPA is the pre-designated FOSC for the Inland Zone which encompasses all lands, rivers, streams, and drainages inland of the 1000-yard wide band which parallels the Alaskan coastline. These zones are clearly defined in the *Unified Plan*. It is possible that incidents may occur in locations that do not fall under federal jurisdiction and there will be no FOSC in these instances.

The State of Alaska places jurisdiction of spill response for the Northwest Arctic Subarea under the Northern Alaska Region of the Alaska Department of Environmental Conservation (ADEC). The State On-Scene Coordinator (SOSC) for the Northern Alaska Region is the pre-designated SOSC for the entire Northwest Arctic Subarea.

Memoranda of Understanding/Agreement (MOU/MOA) between the USCG/EPA and the EPA/State of Alaska further delineate the OSC responsibilities.

D. REGIONAL STAKEHOLDER COMMITTEE

Figure E-5
RSC ICS Organizational Position

** As long as there is an immediate threat to public safety, the Local On-Scene Coordinator (LOSC) will serve as the ultimate command authority if the FOSC or SOSC does not assume the lead role for response, or the LOSC requests a higher authority* to assume that responsibility.

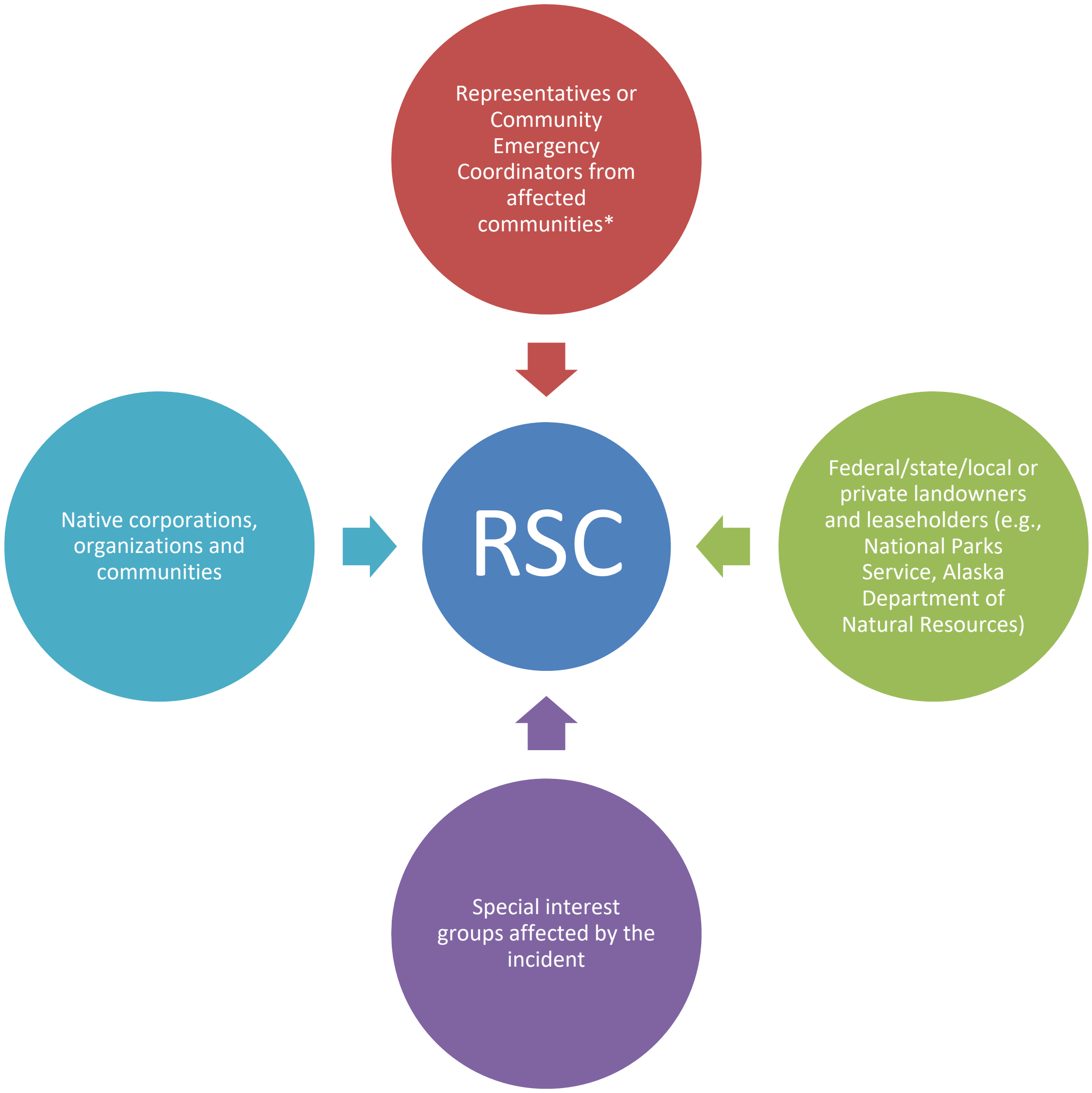
A Regional Stakeholder Committee (RSC) will normally be activated for significant incidents. The RSC was previously referred to as the Multi-Agency Coordination Committee (MAC). Unlike the MAC defined in the ICS of the National Incident Management System, the RSC for a spill response does not play a direct role in setting incident priorities or allocating resources. The RSC can advise the Unified Command (under the guidance of the Liaison Officer) and provide comments and recommendations on incident priorities, objectives and action plans.

Figures E-5 and E-6 provide the general location of the RSC in relation to the Unified Command organizational structure and suggested/potential membership of the RSC. Membership on the RSC is dependent upon the location of the incident and the interests or jurisdiction of the affected communities, landowners, and special interest groups. Government agencies will not normally use the RSC to provide input to the Unified Command. Federal agency personnel will participate within the ICS structure under the leadership of the FOSC; state personnel will do so under the guidance of the SOSC. During an incident in which no FOSC is taking part, federal agencies with jurisdictional responsibilities for resources at risk could participate as a member of the RSC, thus retaining a channel for input on containment, oversight, and cleanup. The preferred approach is to include these agencies as part of the overall ICS structure.

As indicated above, the RSC is not directly involved in tactical operations, though some of its members may be. The RSC's role is to convey to the Unified Command information relating to the authority, concerns and expertise of its members. RSC members recommend to the Unified Command overall objectives and priorities and review the Incident Action Plans developed by the Unified Command.

RSC activities will be coordinated by the Liaison Officer. RSC discussions will be documented, and recommendations or dissenting opinions expressed outside of the RSC meetings with the Unified Command will be communicated to the Unified Command through the Liaison Officer. The RSC will be chaired initially by the Liaison Officer. After convening, the RSC will then elect its own chair.

Figure E-6
RSC Suggested Membership



Note: *Communities may include the following

- Ambler
- Brevig Mission
- Buckland
- Candle
- Council
- Deering
- Diomede
- Elim
- Gambell
- Golovin
- Kiana
- Kivalina
- Kobuk
- Kotzebue
- Koyuk
- Mary's Igloo
- Noatak
- Nome
- Noorvik
- Saint Michael
- Savoonga
- Selawik
- Shaktoolik
- Shishmaref
- Shungnak
- Solomon
- Stebbins
- Teller
- Unalakleet
- Wales
- White Mountain

E. SUBAREA COMMITTEE

The primary role of the Subarea Committee is to act as a preparedness and planning body for the subarea. The pre-designated FOSC for the subarea and the pre-designated SOSC from ADEC compose the primary membership of the Subarea Committee. Each member is empowered by their own agency to make decisions on behalf of their organization and to commit the organization to carrying out roles and responsibilities as described in this plan and the *Unified Plan*.

The pre-designated FOSCs for the area (EPA & USCG), and the SOSC will serve as chairpersons of the committee. They will select work group members and provide general direction and guidance for the work groups and the Subarea Committee.

The Subarea Committee is encouraged to solicit advice, guidance or expertise from all appropriate sources and establish work groups as necessary to accomplish the prepared need and planning task. The FOSC should solicit the advice of the Alaska Regional Response Team to determine appropriate work group representatives from federal, state, and local agencies.

1. Subarea Committee Members

The Northwest Arctic Subarea Committee is comprised of representatives from the following federal, state and local agencies:

- U.S. Coast Guard, COTP Western Alaska
- U.S. Environmental Protection Agency
- Alaska Department of Environmental Conservation
- Borough, local, or tribal government, when applicable

The Northwest Arctic Subarea Committee also seeks advice and expertise concerning environmental and economic issues from federal, state and local agencies, and private industries, such as:

- Alaska Department of Fish and Game
- Alaska Department of Natural Resources
- Alaska Department of Military and Veteran Affairs
- Alaska Chadux Corporation
- Federally-recognized tribes
- Local borough, city and tribal governments
- Local Emergency Planning Committees
- Regional/local businesses
- National Marine Fisheries Service
- National Oceanic and Atmospheric Administration
- U.S. Department of the Interior-Office of Environmental Policy and Compliance
    - U.S. Fish and Wildlife Service
    - National Park Service
    - Bureau of Land Management

2. Subarea Work Groups

The Subarea Committee seeks to solicit advice, guidance or expertise from all appropriate sources and establish work groups as necessary to accomplish the preparedness and planning tasks. The Subarea Committee selects the work group members and provides general direction and guidance for the work groups. In addition to federal, state and local agency representatives, work group participants may include facility owners/operators, shipping company representatives, cleanup contractors, emergency response officials, marine pilot associations, academia, environmental groups, consultants, response organizations and representatives from any applicable regional citizens' advisory councils.

The Northwest Arctic Subarea Committee has formed the following work groups:

The Sensitive Areas Work Group is chaired by the Department of Interior-Office of Environmental Policy and Compliance representative. This work group coordinates the preparation of the necessary information for each separate subarea and ensures that the information is submitted in a common format. Participation by local community staff is vital to acquire local input and validate existing information. The Northwest Arctic Subarea-specific sensitive areas information has been prepared and incorporated into the *Sensitive Areas Section* of this plan.

The Logistics Work Group is co-chaired by representatives from USCG, EPA, and ADEC. This work group is responsible for preparing the *Resources Section* of this plan.

The Operations Work Group is co-chaired by representatives from USCG, ADEC, and EPA. This work group is responsible for scenario development and the refinement/expansion of the Emergency Notification Lists located in the *Response Section* of this plan.

BACKGROUND: PART TWO – RESPONSE POLICY & STRATEGIES

The strategy for responding to a specific spill or hazmat incident depends upon numerous factors. The strategy can change as the situation changes. As a general rule, the strategies listed below should be used as a guide in developing an effective response. Consider all factors that may affect the particular situation and revise/modify/expand these priorities as the situation dictates. The *Response Section* of this plan contains some specific information on response procedures and ramp-up timelines. Additional information can be found in the *Unified Plan*.

A. FEDERAL RESPONSE ACTION PRIORITIES/STRATEGIES

The following priorities are general guidelines for response to a pollution incident. They are based in the premise that the safety of life is of paramount importance in any pollution incident, with the protection of property and the environment, although important, being secondary. Nothing in this part is meant to indicate that higher priority items must be completed before performing a lower priority task. They may be carried out simultaneously or in the most logical sequence for each individual incident.

- Priority One: Safety of Life – For all incident which may occur, the safety of personnel, including response personnel, must be given absolute priority. No personnel are to be sent into an affected area without first determining the hazards involved and that adequate precautions have been taken to protect personnel.
- Priority Two: Safety of Vessel/Facility and Cargo – The facility and/or vessel and its cargo shall become the second priority.
- Priority Three: Protection of the Environment by elimination of the pollution source – Containment and recovery of oil in the open water must be effected expeditiously to preclude involvement of the beaches and shorelines. Due to remote location and restricted accessibility, it is extremely difficult to protect the majority of coastline by diversion and exclusion methods. Therefore, securing the source and open water containment and recovery are especially critical and should normally be the first line of defense to protect the environment. Likewise, spills which occur on land or in upland water courses will be dammed, boomed, diked, etc., as feasible to prevent the spread of the pollutant downstream. Note: In situ burning (*Unified Plan, Annex F* for checklist) of a vessel and its pollutants may be an alternative considered by the OSCs; this strategy places environmental protection priorities above saving the vessel and its cargo.
- Priority Four: Protection of the Environment by diversion/exclusion, dispersion, or in situ burning – In the event of that the location of a spill or the weather conditions do not permit open water recovery, protection of the shoreline becomes paramount, especially areas of greatest sensitivity. It is not possible to protect some areas entirely or even in part. It may be necessary to sacrifice some area in order to achieve the best overall protection of the environment, The OSC may consider in situ burning as a response option. *Refer to the Unified Plan, Annex F, Appendix II* for an in situ burning checklist. The use of dispersant must be considered early in the response phase while the oil is in the open water and conditions are agreeable. The *NCP, Subpart J* and the *Unified Plan, Annex F, Appendix I* address in detail the responsibilities of the FOSC in the use of chemicals.
- Priority Five: Protection of the Environment by beach cleanup and the use of sacrificial areas – It may not be possible to protect the entire shoreline from oil; in fact, spilled product may be allowed purposely to come ashore in some areas as an alternative to damaging other, more sensitive areas.

Selection of the proper shore line cleanup technique depends on many different factors, including the following:

- Depth of oil in the sediment
- Type of oil (tar balls, pooled oil, viscous coating, etc.)
- Trafficability of equipment on the shoreline
- Environmental or cultural sensitivity of the oil shoreline
- Prevailing oceanographic and meteorological conditions

The best way to minimize debate over the most appropriate response is to involve all interceded government and private agencies and other stakeholders. The shoreline assessment groups shall attempt to agree on the amount and character of the oil that is on the shorelines, anticipate interactions between the stranded oil and the environment, and assess the geological and ecological environment of the involved shorelines. Once a consensus is met on these parameters, an approach must be developed to determine the proper treatment required.

Shoreline cleanup options may include the use of physical and/or chemical processes. Physical shoreline cleaning methods include techniques such as natural recovery, manual sorbent application, manual removal of oiled materials, local pressure flushing, manual scraping, mechanical tilling, and mechanical removal using heavy equipment. Chemical shoreline cleanup products may increase the efficiency of water-washing during the cleanup of contaminated shorelines. However, the product must be listed on the NCP Product Schedule, and authorization must be obtained from the ARRT and the OSC of the spill. Bioremediation is also considered as a shoreline cleaning method. Bioremediation is the application of nutrients to the shoreline to accelerate the natural biodegradation of oil. The OSCs shall request site-specific guidelines for source protection measures required during shoreline cleanup operation.

B. STATE OF ALASKA RESPONSE PRIORITIES

- Safety: Ensure the safety of persons involved, responding, or exposed to the immediate effects of the incident.
- Public Health: Ensure protection of public health and welfare from the direct or indirect effects of contamination of drinking water, air, and food.
- Environment: Ensure protection of the environment, natural and cultural resources, historic properties, and biota from the direct or indirect effects of contamination.
- Cleanup: Ensure adequate containment, control, cleanup and disposal by the responsible party or supplement or take over when cleanup is inadequate.
- Restoration: Ensure assessment of contamination and damage and restoration of property, natural resources and the environment.
- Cost Recovery: Ensure recovery of costs and penalties to the Response Fund for response, containment, removal, remedial actions, or damage.

BACKGROUND: PART THREE - SUBAREA SPILL HISTORY, OIL FATE & RISK ASSESSMENT

A. NAVIGABLE WATERS SPILL HISTORY

The following spill history was obtained from ADEC and USCG. This partial listing includes only the more significant spills (over 1000 gallons) or hazardous material releases (over 100 pounds), plus several potentially severe incidents. This partial and abbreviated spill history is provided to give an overall view of the vast array of facility and transportation-related accidents that can occur.

The Northwest Arctic Subarea supports a variety of vessel traffic ranging including foreign vessels. Refined products, hazardous materials, and zinc and lead ore are routinely shipped through the region.

DATE	**INCIDENT**	LOCATION	**RELEASED (GALLONS)**	**PRODUCT RELEASED**
8/10/1994	F/B Umqua	Cape Nome	20,000	Diesel
9/10/2011	LCM Kaktovik II	Port of Nome	1,000	Diesel
11/5/2012	St. Lawrence Island – Oiled Wildlfe	Bering Sea	Unknown	Heavy product
5/26/2015	Shishmaref Mystery Sheen	Shishmaref	Unknown	Gasoline

B. INLAND SPILL HISTORY

DATE	INCIDENT	LOCATION	RELEASED (GALLONS)	PRODUCT RELEASED
7/29/1993	Red Dog 36,000 Gal Diesel	Red Dog Mine	36,000	Diesel
9/13/1995	Elim Native Store	Elim	7,000	Gasoline
11/15/1996	Navy Arctic Sub Lab	Wales	26,000	Diesel
1/23/1997	Savoonga Tank Farm	Savoonga	5,000	Diesel
5/3/1998	Shungnak AVEC Tank Farm	Shungnak	3,000	Diesel
11/2/1998	Bonanza Fuel Truck	Nome	1,118	Diesel
5/27/1999	Diomede Tank Farm	Diomede	2,000	Diesel
3/24/2000	West Coast Aviation Tank Farm Spill	Unalakleet	84,360	Gasoline
6/15/2000	Nome Drums of Tar	Nome	27,500	Tar/Asphalt
8/29/2000	Corroded Drums 15,000 Gal Diesel	Nome	1,500	Diesel
1/20/2001	Elim Water Plant	Elim	1,500	Diesel
6/11/2001	Kotzebue Airport Leaking Drums	Kotzebue	4,125	Petroleum Product Mixture
12/10/2001	Deering Diesel Spill	Deering	1,000	Diesel
2/1/2002	Teller School Day Tank Overfill	Teller	3,300	Diesel
2/15/2003	Gambell Native Store	Gambell	4,600	Diesel
7/7/2003	Stebbins Landfill Drum Release	Stebbins	1,100	Used Oil
8/11/2004	Nana-Lynden Red Dog Truck Rollover	Red Dog Mine	2,700	Diesel
10/2/2004	Red Dog Mine Port Site Tanker Diesel Spill	Red Dog Mine	4,075	Diesel
1/6/2008	Alaska Air Diesel Spill, Nome Airport	Nome	1,050	Diesel
1/23/2008	Selawik Tank Farm Release	Selawik	5,385	Diesel
4/5/2008	Buckland Kuskokwim Architect Tank Spill	Buckland	7,750	Diesel
4/8/2008	Shishmaref City Tank Line Spill	Shishmaref	2,000	Diesel
12/13/2010	Unalakleet Tank Farm Diesel #2 Spill	Unalakleet	10,000	Diesel
1/19/2012	Savoonga Tank Farm	Savoonga	12,045	Diesel
3/15/2014	Selawik AVEC Tank Farm 4,000 Gal Diesel	Selawik	4,000	Diesel
6/20/2014	Norton Sound Regional Hospital	Nome	1,000	Diesel
12/1/2015	Kiana Water Treatment Plan Diesel Release	Kiana	2,400	Diesel

C. HAZMAT RELEASE HISTORY

DATE	INCIDENT	LOCATION	RELEASED	PRODUCT RELEASED
7/23/1995	Dust System Mud-Dust Leak	Red Dog Mine	450 lbs	Zinc/Lead
6/3/1996	Mill Tailings Water	Red Dog Mine	10,000 gal	Tailings Water
6/7/1996	Ore Dump Roadway	Red Dog Mine	2,000 lbs	Zinc Concentrate
8/5/1996	Truck Rollover	Red Dog Mine	70,000 lbs	Zinc Concentrate
8/15/1996	Red Dog Ball Mill	Red Dog Mine	200 lbs	Zinc Slurry
12/10/1996	Cominco 34000 lb Zinc Spill	Red Dog Mine	34,000 lbs	Zinc Concentrate
1/2/1997	40,000lb Zinc Spill	Red Dog Mine Haul Road Mile 25	40,000 lbs	Zinc Concentrate
4/28/1997	Red Dog Water Treatment Plant	Red Dog Mine	1,000 gal	Process Water
8/19/1997	35 Ton Zinc Concentrate Truck Rollover	Red Dog Mine	70,000 lbs	Zinc Concentrate
8/21/1997	Zinc Concentrate Truck Rollover	Red Dog Mine	70,000 lbs	Zinc Concentrate
1/17/1998	Haul Road Truck Rollover	Red Dog Mine Haul Road Mile 35	37,760 lbs	Zin Concentrate
2/7/1998	Haul Road Truck Rollover	Red Dog Mine Haul Road	140,000 lbs	Zinc Concentrate
3/10/1998	Unsecured Load	Red Dog Mine Haul Road	200 lbs	Zinc Concentrate
3/22/1998	Cargo Not Secured	Red Dog Mine	2,000 lbs	Zinc Concentrate
4/13/1998	Slurry Line Release	Red Dog Mine	36,000 gal	Zinc Slurry
5/2/1998	Mill Site Leak	Red Dog Mine Mill Site	1,000 gal	Zinc Slurry
5/11/1998	Zinc Line Failure	Red Dog Mine	2,000 gal	Zinc Slurry
5/20/1998	Containment Failure	Red Dog Mine	1,200 lbs	–Zinc Concentrate
5/24/1998	Red Dog Leak	Red Dog Mine	1,200 lbs	Zinc Solution
5/31/1998	Red Dog Mine Mill Line Leak	Red Dog Mine	200,000 gal	Zinc Slurry
5/31/1998	Red Dog Mine Mill Container Failure	Red Dog Mine Mill	1,000 gal	Zinc Slurry
6/5/1998	Red Dog Mine Overfill	Red Dog Mine	500 lbs	Zinc Concentrate
6/7/1998	Red Dog Mine Container Leak	Red Dog Mine	2,000 gal	Zinc Slurry
6/9/1998	Red Dog Mine Mill Equipment Failure	Red Dog Mine	3,500 gal	Zinc Slurry
7/12/1998	Red Dog Mine Truck Rollover	Red Dog Mine Haul Road Mile 42	26,500 lbs	Zinc Concentrate
8/1/1998	Red Dog Mine Truck Rollover	Red Dog Mine Port Site	76,000 lbs	Zinc Concentrate
8/8/1998	Red Dog Mine Equipment Failure	Red Dog Mine	800 lbs	Zinc Concentrate

DATE	INCIDENT	LOCATION	RELEASED	PRODUCT RELEASED
11/10/1998	Red Dog Mine Conveyor Belt	Red Dog Mine Port Site	200 lbs	Zinc Concentrate
11/21/1998	Red Dog Mine Rollover	Red Dog Mine Porch Road	70,000 lbs	Zinc Concentrate
1/4/1999	Red Dog Mine Conveyor	Red Dog Mine	100 lbs	Zinc Concentrate
1/6/1999	Red Dog Mine Truck Rollover	Red Dog Mine Mile 45	50,000 lbs	Zinc Concentrate
1/21/1999	Red Dog Mine Truck Rollover	Red Dog Mine Pit 3	60,000	Zinc Concentrate
1/31/1999	Red Dog Mine Line Failure	Red Dog Mine	1,000 gal	Zinc Slurry
2/13/1999	Red Dog Mine Line Failure	Red Dog Mine	20,000 gal	Zinc Slurry
2/26/1999	Red Dog Mine Overflow	Red Dog Mine Mill	1,000 gal	Zinc Slurry
3/2/1999	Red Dog Mine Container/Line Failure	Red Dog Mine Module 2020, 2021	100,000 gal	Zinc Slurry
4/11/1999	Red Dog Mine Unknown	Red Dog Mine	150 lbs	Zinc Concentrate
7/19/1999	Red Dog Mine Truck Rollover	Red Dog Mine Port Site	160,000 lbs	Zinc Concentrate
3/25/2000	Red Dog Mine Leak	Red Dog Mine Module 2009	1,000 gal	Zinc Slurry
5/14/2000	Red Dog Mine Equipment Failure	Red Dog Mine Water Treatment Plant	5,000 gal	Tailings Water
7/26/2000	Red Dog Mine Water Treatment Plant Overfill	Red Dog Mine Water Treatment Plant	2,000 gal	Tailings Water
10/9/2000	Red Dog Mine Rollover	Red Dog Mine Haul Road Mile 31	60,000 lbs	Lead Concentrate
12/28/2000	Red Dog Mine Rollover	Red Dog Mine Haul Road Mile 45	80,000 lbs	Zinc Concentrate
2/16/2001	Red Dog Mine Truck Rollover	Red Dog Mine Haul Road Mile 42	12,000 lbs	Zinc Concentrate
5/31/2001	Red Dog Mine Containment Failure	Red Dog Mine	2,205 gal	Zinc Slurry
6/2/2001	Red Dog Mine Line Failure	Red Dog Mine	29,000 gal	Reclaimed Water
6/6/2001	Red Dog Mike Line Crack	Red Dog Mine	10,000 gal	Reclaimed Water
6/22/2001	Red Dog Mine Valve Failure	Red Dog Mine	1,500 gal	Zinc Slurry
7/20/2001	Red Dog Mine Truck Rollover	Red Dog Mine Haul Road MP 38.3	20,000 lbs	Zinc Concentrate
9/10/2001	Red Dog Mine Cargo Not Secured	Red Dog Mine Mill	775 lbs	Zinc Concentrate
9/23/2001	Red Dog Mine Leak	Red Dog Mine North of Mill	800 lbs	Zinc Concentrate
9/27/2001	Red Dog Mine Leak	Red Dog Mine Mill Site	800 lbs	Zinc Concentrate
12/22/2001	Red Dog Mine Silo Overfill	Red Dog Mine	200 lbs	Frag-Max/Mini-prills

DATE	INCIDENT	LOCATION	RELEASED	PRODUCT RELEASED
1/5/2002	Red Dog Mine Container Failure	Red Dog Mine Cold Storage	300 lbs	Zinc Concentrate
2/4/2002	Red Dog Mine Equipment Failure	Red Dog Mine Mine Site	200 lbs	Zinc Concentrate
2/5/2002	Red Dog Mine Line Failure	Red Dog Mine Site	1,500 gal	Propylene Glycol
8/8/2002	Red Dog Mine Tower Release	Red Dog Mine	500 lbs	Zinc and Lead Concentrate
9/20/2002	Red Dog Mine HVAC	Red Dog Mine	1,000 gal	Propylene Glycol
2/22/2003	Red Dog Mine Supersack Tear	Red Dog Mine	300 lbs	Zinc and Lead Concentrate
3/20/2003	Red Dog Mine Rollover	Red Dog Mine Haul Road	20,000 lbs	Zinc Concentrate
5/1/2003	Red Dog Mine Overfill	Red Dog Mine	200 lbs	Ammonium Nitrate
11/24/2003	Red Dog Mine Equipment Failure	Red Dog Mine Building 2030	158,398 gal	Zinc slurry
1/24/2004	Red Dog Mine	Red Dog Mine Utilidor	21,000 gal & 1,200 gal	Process Water & Propylene Glycol
12/25/2004	Red Dog Mine	Red Dog Mine	1,000 lbs	Lime
1/6/2005	Red Dog Mine	Red Dog Mine	250 lbs	Copper Sulfate
2/19/2005	Red Dog Mine	Red Dog Mine	100 lbs	Lime
6/22/2005	Red Dog Mine	Red Dog Mine	1,000 gal	Zinc Slurry
7/6/2005	Red Dog Mine	Red Dog Mine	600 lbs	Ammonium Nitrate
9/21/2005	Red Dog Mine Truck Rollover	Red Dog Mine Haul Road Mile 29	60,000 lbs	Zinc Concentrate
6/23/2006	Red Dog Mine Port Site	Red Dog Mine Port Site	250 lbs	Zinc and Lead Concentrate
10/18/2006	Red Dog Mine Truck Rollover	Red Dog Mine Haul Road	2,088 lbs	Zinc Concentrate
6/4/2007	Red Dog Mine	Red Dog Mine	100 lbs	Ammonium Nitrate
7/11/2007	Red Dog Mine	Red Dog Mine	500 lbs	Zinc Concentrate
10/21/2007	Red Dog Mine	Red Dog Mine	3,000 gal	Zinc Slurry
10/21/2007	Red Dog Mine	Red Dog Mine	8,854 lbs	Ammonium Nitrate
11/25/2007	Red Dog Mine	Red Dog Mine	1,000 gal	Zine and Lead Slurry
3/1/2008	Red Dog Mine	Red Dog Mine	100 lbs	Ammonium Nitrate
9/7/2008	Red Dog Mine	Red Dog Mine	300 lbs	Ammonium Nitrate
9/14/2008	Red Dog Mine	Red Dog Mine	260 lbs	Ammonium Nitrate
10/13/2008	Red Dog Mine	Red Dog Mine	480 lbs	Ammonium Nitrate
3/7/2009	Red Dog Mine	Red Dog Mine Haul Road Mile 38.3	200 lbs & 11,023 lbs	Lead & Zinc Concentrate
4/17/2009	Red Dog Mine	Red Dog Mine	4,200 gal	Lime
1/1/2010	Red Dog Mine	Red Dog Mine	1,500 gal	Zinc & Lead Slurry
10/11/2010	Red Dog Mine	Red Dog Mine	1,000 gal	Zinc & Lead Slurry

DATE	INCIDENT	LOCATION	RELEASED	PRODUCT RELEASED
11/9/2010	Red Dog Mine	Red Dog Mine	1,000 lbs	Ammonium Nitrate
6/22/2011	Red Dog Mine	Red Dog Mine	700 lbs	Urea
2/15/2012	Red Dog Mine	Red Dog Mine	2,000 gal	Zinc Slurry
8/12/2012	Red Dog Mine Truck Rollover	Red Dog Mine	250,000 lbs	Zinc Concentrate
10/14/2012	Red Dog Mine	Red Dog Mine Port	1,000 lbs	Ammonium Nitrate
12/16/2012	Red Dog Mine	Red Dog Mine	1,500 gal	Zinc & Lead Slurry
11/11/2013	Red Dog Mine	Red Dog Mine	100 lbs	Ammonium Nitrate
11/13/2013	Red Dog Mine	Red Dog Mine	100 lbs	Ammonium Nitrate
12/15/2013	Nome Hospital	Nome	1,000 gal	Propylene Glycol
1/20/2014	Red Dog Mine	Red Dog Mine Haul Road	3,000 lbs	Zinc Concentrate
3/29/2014	Red Dog Mine	Red Dog Mine Mill 2035	3,000 gal	Zin Concentrate
8/20/2014	Red Dog Mine	Red Dog Mine Haul Road	80,000 lbs	Zinc Concentrate
6/16/2015	Red Dog Mine	Red Dog Mine	1,300 gal	Propylene Glycol
7/18/2015	Red Dog Mine	Red Dog Mine	380 lbs	Urea
8/17/2015	Red Dog Mine	Red Dog Mine	200 lbs	Ammonium Nitrate
10/3/2015	Red Dog Mine	Red Dog Mine Haul Road	145,000 lbs	Zinc Concentrate
4/10/2016	Red Dog Mine	Red Dog Mine Module 2011	2,328 gal	Zinc Slurry
5/27/2016	Red Dog Mine	Red Dog Mine	300 lbs	Zinc Concentrate
10/8/2016	Red Dog Mine	Red Dog Mine	1,000 lbs	Ammonium Nitrate
12/31/2016	Red Dog Mine Truck Rollover	Red Dog Mine	143,260 lbs	Zinc Concentrate
1/22/2017	Red Dog Mine	Red Dog Mine	300 lbs	Zinc Concentrate
2/9/2017	Red Dog Mine	Red Dog Mine	22,000 gal	Processed Water

D. SPILL SUMMARY

Below is a spill data analysis report providing findings related to spills reported to ADEC for the nine year period extending from January 1, 2007 to December 31, 2016.

TOTAL SPILLS	TOTAL VOLUME Gallons	TOTAL VOLUME Pounds	AVERAGE SPILL SIZE Gallons	AVERAGE SPILL SIZE Pounds	AVERAGE SPILLS/YEAR	AVERAGE VOLUME/YEAR Gallons	AVERAGE VOLUME/YEAR Pounds
1,319	412,737	648,902	322	11,798	132	41,274	64,890

TOP 5 CAUSES BY NUMBER OF SPILLS			
Cause	***Spills***	***Gallons***	***Pounds***
Equipment Failure	333	14,153	2,080
Line Failure	241	212,106	0
Human Error	173	11,959	5,973

Leak	129	9,266	30
Seal Failure	71	84,079	0

TOP 5 CAUSES BY VOLUME SPILLED			
Cause	***Spills***	***Gallons***	***Pounds***
Rollover/Capsize	12	214	618,260
Line Failure	241	212,106	0
Seal Failure	71	84,079	0
Overfill	59	41,879	200
Human Error	173	11,959	5,973

TOP 5 PRODUCTS BY NUMBER OF SPILLS			
Product	***Spills***	***Gallons***	***Pounds***
Other	85	2,616	0
Process Water	90	229,280	0
Ethylene Glycol (Antifreeze)	130	712	0
Diesel	258	64,337	0
Hydraulic Oil	448	4,569	0

TOP 5 PRODUCTS BY VOLUME SPILLED			
Product	***Spills***	***Gallons***	***Pounds***
Zinc Concentrate	25	4,419	622,078
Process Water	90	229,280	0
Produced Water	7	78,468	0
Diesel	258	64,337	0
Other	85	2,616	13,850

TOP 5 FACILITY TYPES BY NUMBER OF SPILLS			
Facility Type	***Spills***	***Gallons***	***Pounds***
Mining Operation	1074	346,525	648,902
Other	57	17,840	0
Residence	32	3,062	0
Vessel	22	784	0
Air Transportation	21	2,309	0

TOP 5 FACILITY TYPES BY VOLUME SPILLED			
Facility Type	***Spills***	***Gallons***	***Pounds***
Mining Operation	1,074	346,525	648,902
Other	57	17,840	0
Bulk Fuel Terminal	16	16,956	0
Power Generation	13	15,526	0
Residence	32	3,062	0

Note: All volumes are calculated from quantity released and does not include potential spill volumes.

E. OIL FATE AND GENERAL RISK ASSESSMENT

1. Fate of Spilled Oil

Weathering is a combination of chemical and physical processes that change the persistence, toxicity, composition, and fate of spilled oil. These processes include evaporation, oxidation, biodegradation, emulsification, dispersion, dissolution, and sedimentation. Below are definitions of these processes and how they relate to oil spills.

- Evaporation occurs when substances are converted from liquid state to vapor. During an oil spill, lighter components can evaporate into the atmosphere, leaving behind heavier components. Evaporation rates depend on the composition of the oil and environmental factors like wind, waves, temperature, currents, etc. For example, lighter refined products, such as gasoline, tend to evaporate very quickly because they have a higher proportion of smaller/lighter compounds. Heavier oils, like bunker oil, contain relatively few light compounds, evaporate less readily, and leave viscous residues because they're composed of heavier compounds.
- Oxidation is a chemical reaction between two substances, which results in loss of electrons from one substance and gains by the other. This chemical reaction can take place between oil and oxygen (or other compounds) in the air or water. This reaction can produce water soluble compounds that can dissolve or form persistent compounds called tars. Oxidation of oil is typically a very slow process but can be enhanced by sunlight, elevated temperature, changes in pH, and the addition of supplemental electron receiving compounds (reducing agents).
- Biodegradation occurs when microorganisms, such as bacteria, fungi, and yeast, break down a substance by feeding on (metabolizing) it. Microorganisms capable of partially or completely degrade oil are nearly ubiquitous, though nutrient availability, petroleum type, soil moisture, soil type, water type, temperature, and oxygen availability can all affect biodegradation, which tends to be quicker in warmer environments. Molecules formed by incomplete biodegradation may become more or less less toxic than parent compounds.
- Emulsification is a process where small droplets of one liquid become suspended in another liquid. During a spill, emulsification takes place when strong currents or waves suspend water droplets in oil. Water-in-oil emulsions are frequently called "mousse" and are more persistent than the original oil.
- Dispersion is the break up and diffusion of substances from their original source. In an oil spill, turbulent seas can break oil into various sized droplets and mix them into the water column. Smaller droplets (i.e. <70 microns) typically stay suspended in the water column while larger droplets tend to resurface and create a secondary slick. The amount of oil dispersed depends on the oil's chemical and physical makeup, the dispersant-to-oil ratio, salinity, delivery system, sea state, and overall on-water mixing energy. For example, less viscous oils such as diesel, have higher, natural dispersion rates in rough seas. Chemical dispersants may be used to enhance dispersion.
- Dissolution is the process of dissolving one substance in another. Many oils contain light aromatic hydrocarbons, like benzene and toluene, which are more water soluble than larger, heavier petroleum molecules. These aromatic hydrocarbons are the first to be lost through evaporation, a process which is 10-100 times faster than dissolution.
- Sedimentation is a process where spilled oil chemically binds with, or adheres to, particulates (sediment, plants, plankton, and detritus), preventing oil from existing as a free liquid.

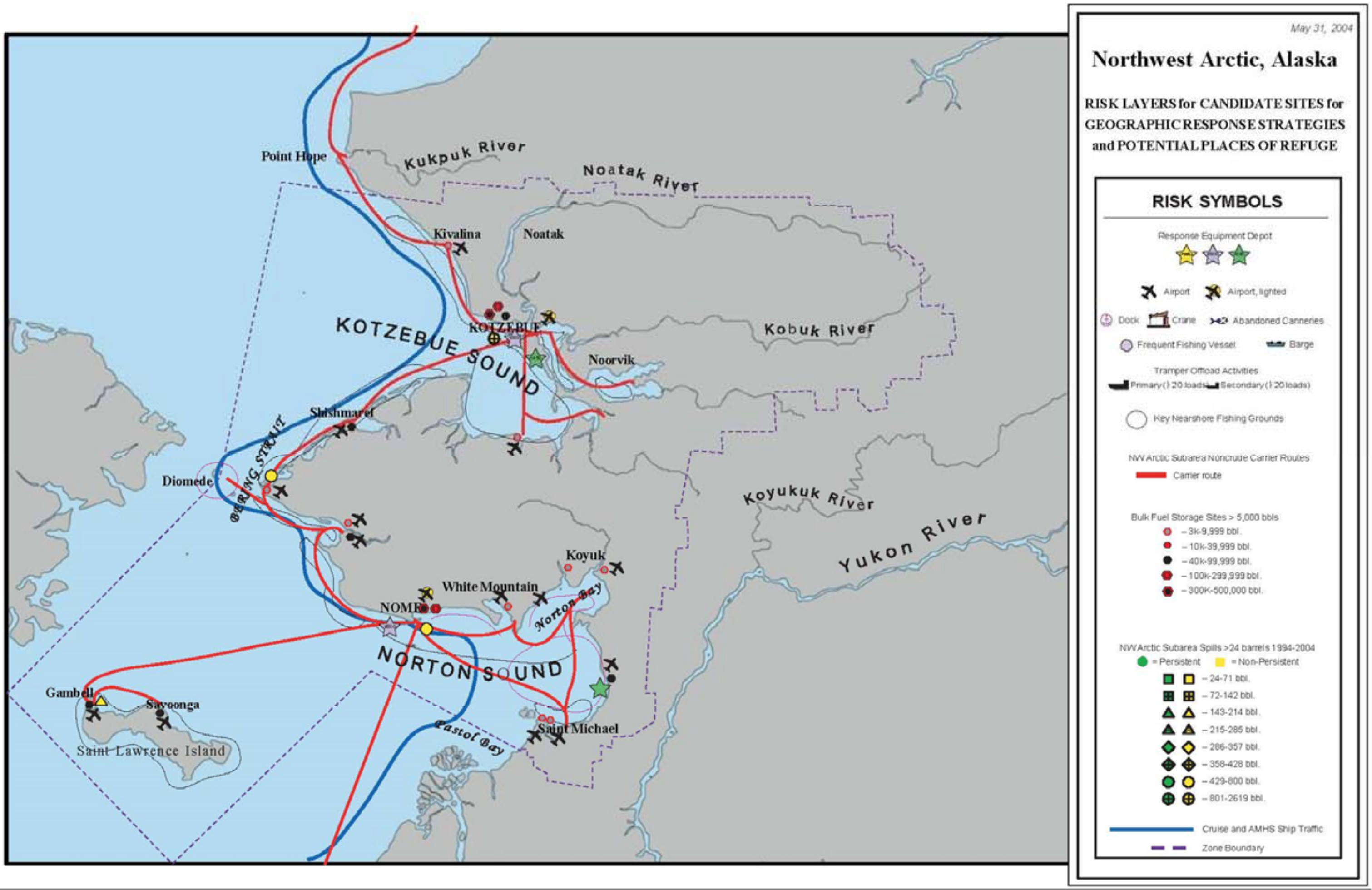
Sedimentation is much more common in shallow, nearshore, turbid areas because of the greater amount of suspended particulates, but the process can become common at any depth when microbes secrete mucus-like waste that adheres with oil particles. This process creates oil/particulate aggregates that are denser than the original oil. If the density of oil/particulate aggregates becomes greater than water, particles eventually settle out of the water column to rest on the substrate.

Weathering typically reduces the recoverability of oil with current technologies. Each petroleum product type weathers differently when released into the environment. Waterborne spills of refined product generally disperse quickly and undergo significant evaporation and spreading, complicating recovery. Crude oil and Intermediate Fuel Oils (bunker fuel) are affected by the same factors to a much lesser degree; these oil spills are considered “persistent” in nature and require aggressive action to successfully mitigate harm.

2. General Risk Assessment

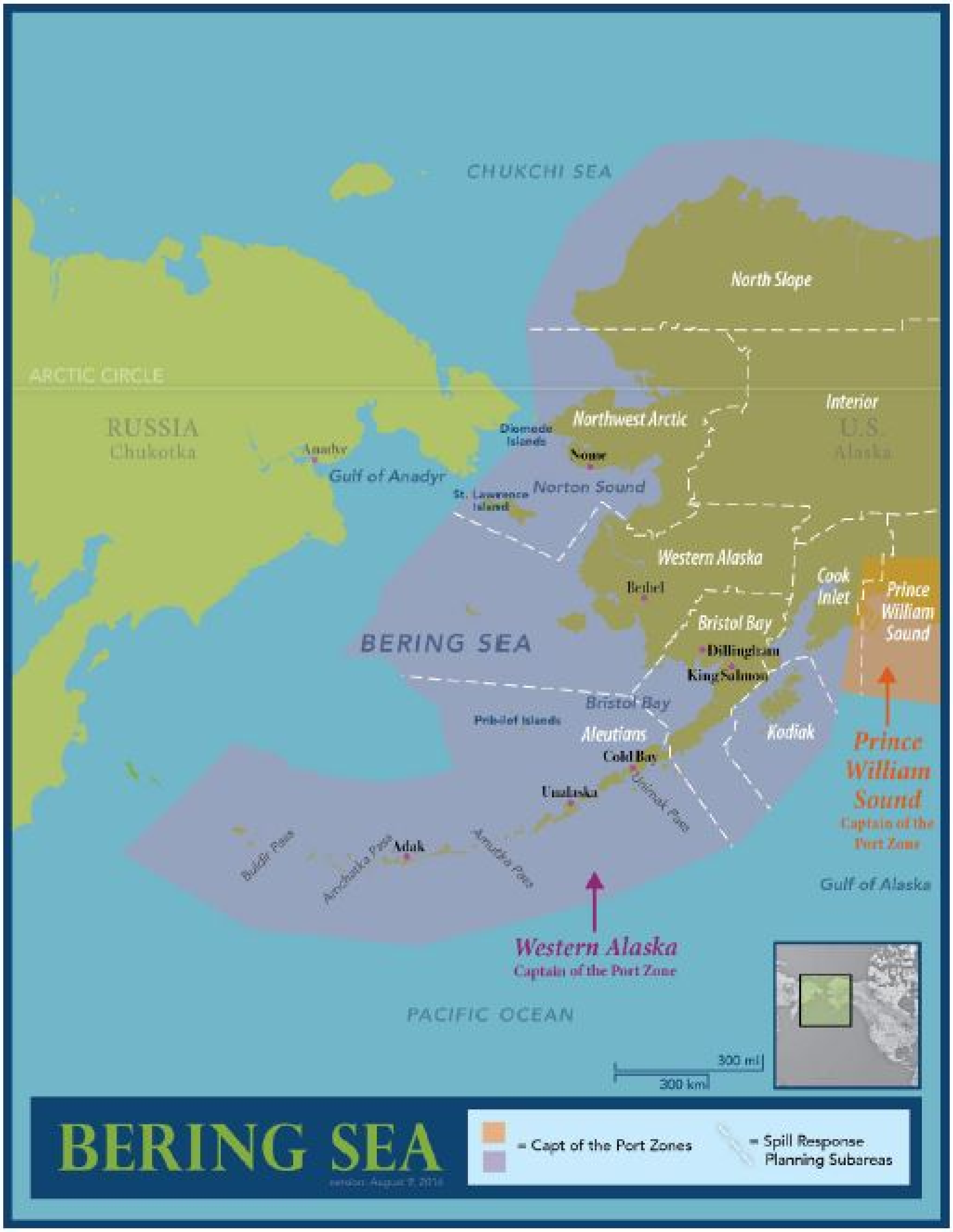
Considerable vessel traffic transits the waters of the Northwest Arctic Subarea, ranging from tankers, fishing vessels, recreational vessels, government vessels, cruise ships, cargo vessels, tugs, and barges. Refined oil products and cargo are shipped into Northwest Arctic Subarea and mineral resources and seafood are shipped out. Figure E-7 shows simplified bulk fuel carrier and cruise ship routes in relationship to major communities, nearshore fishing grounds, airports, and response equipment depots.

Figure E-7
Northwest Arctic, Alaska Risk Layers for Candidate Sites for Geographic Response Strategies and Potential Places of Refuge


May 31, 2004
Northwest Arctic, Alaska
RISK LAYERS for CANDIDATE SITES for GEOGRAPHIC RESPONSE STRATEGIES and POTENTIAL PLACES OF REFUGE
RISK SYMBOLS
Response Equipment Depot
Airport
Airport, lighted
Dock
Crane
Abandoned Canneries
Frequent Fishing Vessel
Barge
Tramper Offload Activities
Key Nearshore Fishing Grounds
NW Arctic Subarea Noncrude Carrier Routes
Carrier route
Bulk Fuel Storage Sites > 5,000 bbls
– 3k-9,999 bbl.
– 10k-39,999 bbl.
– 40k-99,999 bbl.
– 100k-299,999 bbl.
– 300K-500,000 bbl.
NW Arctic Subarea Spills >24 barrels 1994-2004
= Persistent
= Non-Persistent
– 24-71 bbl.
– 72-142 bbl.
– 143-214 bbl.
– 215-285 bbl.
– 286-357 bbl.
– 358-428 bbl.
– 429-800 bbl.
– 801-2619 bbl.
Cruise and AMHS Ship Traffic
Zone Boundary
Point Hope
Kukpuk River
Noatak River
Kivalina
Noatak
KOTZEBUE
KOTZEBUE SOUND
Kobuk River
Noorvik
Shishmaref
BERING STRAIT
Diomede
Koyukuk River
Yukon River
Koyuk
White Mountain
NOME
Norton Bay
NORTON SOUND
Gambell
Savoonga
Saint Lawrence Island
Pastol Bay
Saint Michael

.

Figure E-8
Bering Sea with Subarea Boundaries Map



(Nuka Research and Planning Group, LLC, Bering Sea Vessel Traffic Risk Analysis, December 2016)

The primary port for bulk cargo including refined petroleum products and mineral resources activity is at the Red Dog Mine Port Site.

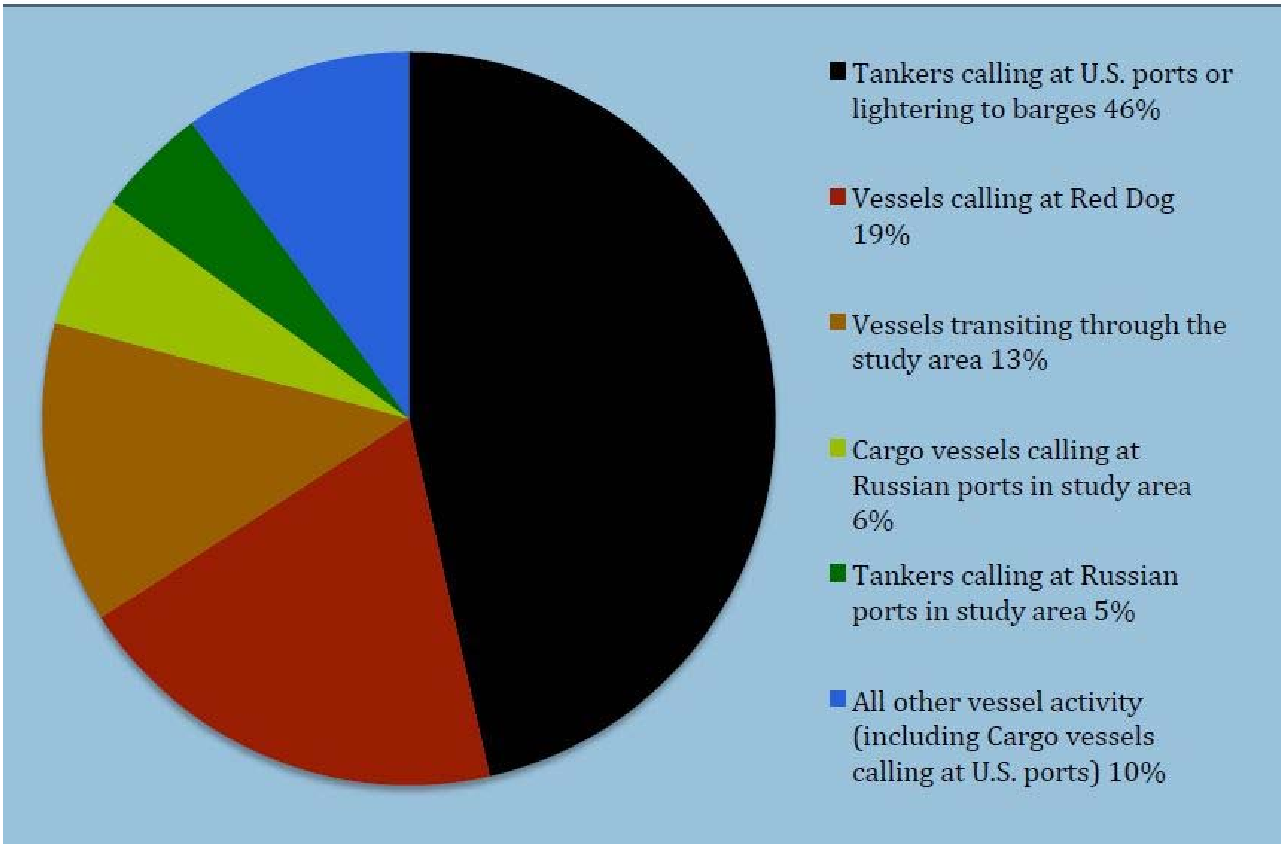
Figure E-9
Automatic Identification System (AIS) Tracks Recorded by Vessel Type in Bering Strait Region 2013-2015

(Nuka Research and Planning Group, LLC, Bering Sea Vessel Traffic Risk Analysis, December 2016)

According to the Bering Sea Vessel Traffic Risk Analysis, 13.4 million barrels of non-persistent oil and 10.7 million barrels of persistent oil (including oils of low, medium, and heavy persistence) were transported in Bering Sea waters between 2013 and 2015. (Nuka Research and Planning Group, LLC, Bering Sea Vessel Traffic Risk Analysis, December 2016). See Figure E-9.

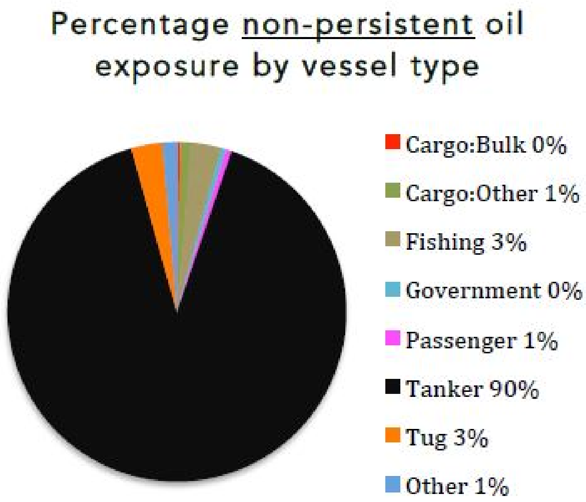
Any vessel traffic throughout the Bering Sea has the potential impact to Alaskan waters and shorelines. For example a vessel transiting through international waters can become disabled, and drift into U.S. and Alaskan waters, and become a potential for a release. This potential risk increases the importance of good vessel tracking, communications, preparedness, planning, and the development and maintenance of support and response systems in the region.

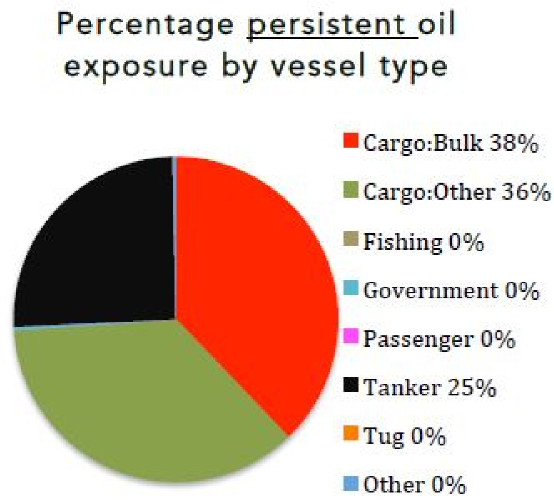
Figure E-10
Percentage of Overall Weighted Oil Exposure Attributed to Activities



Note that the 46% of tankers calling at U.S. ports (or lightering) does not include those serving Red Dog mine. This chart also includes oil exposure data from the Russian side of the Bering Sea and the Western Subarea. (Nuka Research and Planning Group, LLC, Bering Sea Vessel Traffic Risk Analysis, December 2016)

Figure 11
Non-persistent and Persistent Oil Moved via Vessels > 300 GT in Northwest Arctic in 2010





Note that oil exposure of barges was not calculated for these charts as AIS data describing operating days for barges was not adequate enough to develop a weighted oil exposure percentage.

There are no oil exploration or production activities in the Northwest Arctic. Refined oil products are stored in tank farms in all the communities within the Northwest Arctic.

With decreasing sea ice coverage, the Northwest Arctic region is expected to see an increase in shipping activity, including cruise ships. There are also plans to one day develop a deep sea arctic port in the Northwest Arctic.

In remote towns or villages, where refined products are stored in tank farms, the highest probability of spills occurs during fuel transfer of refined products to the tank farm from another source, such as the fuel barge, or from feeder lines from the tank farm onto users. Another threat for spills or chemical releases exists in the loading/unloading activities with vessels at port. This is not to say that these spills are common, but that precautions should be observed.

Spills in the subarctic and arctic-maritime climatic zone require careful preplanning to overcome the effects imposed by the moist, cold-weather environment. Machinery and people face significant challenges when operating in acute cold. The severe stresses imposed by winter conditions, with extreme temperatures and the extended darkness, can seriously reduce individual efficiency over a given period.

Cold weather conditions can prove beneficial, at times: ice and snow can act effectively as natural barriers, impeding the spread of oil, and can be used effectively to create berms for spill containment. Techniques for organizing and responding to spills in arctic environments have been developed and applicable supporting information should be consulted during an event.

The summer months expose many more species, both in diversity and numbers, to the negative effects of oil spills. Whereas in winter, most species have left the region and the snow and ice conditions may buffer the soil from the effect of released oil, during the warmer months the land, flora, and fauna are all quite vulnerable to an oil spill.

3. Wind, Ice, and Current Conditions

The following is an overview of wind, tide, ice, and current conditions from the Bering Sea to the Chukchi Sea, including the Bering Strait, Norton Sound, and Kotzebue Sound. Much of the available data is general in nature and should be supplemented by area-specific updates and any information available from local residents. Included herein are wind data, tidal ranges, data on a variety of ice conditions and maps of net surface currents. Using the current edition of the U.S. Department of Commerce National Oceanic and Atmospheric Administration tide current tables for the Pacific coast of North America, it is possible to predict the times of ebb and flood tides for points within this region.

Sea ice conditions are discussed below, and Table E-1 is included to show average marine and river breakup and freeze-up dates.

Table E-1
Average Arctic Marine and River Breakup and Freeze-up Dates

LOCATION	AVERAGE BREAKUP DATE	AVERAGE FREEZEUP DATE	AVERAGE YEARS RECORD
Kotzebue	May 31	Oct. 23	14
Nome	May 29	Nov. 12	50
Gambell, St.Lawrence Island	May 26	Nov. 21	10
Savoonga, St.Lawrence Island	May 26	Nov. 19	10
Golovin	May 23	Nov. 2	6
Kivalina	May 31	Oct. 23	14
Noorvik	May 29	Oct. 11	17
Kiana	May 18	Oct. 17	6
Deering	May 27	Oct. 16	3
Candle/Kiwalik River	May 18	Oct. 17	8
Selawik	May 28	Oct. 17	12
St. Michael	June 9	Nov. 10	53
Teller	June 7	Nov. 10	16

Source: AEIDC. 1983. AEIDC. 1975. ADF&G 1986a.

Sea Ice Conditions

Bering Sea: The sea ice generally begins as shore fast ice formation along the shores of the Seward and Chukotsk peninsulas in October. As the season progresses and waters in the open portions of the Bering Sea cool off, the pack ice generally begins its seasonal southward formation in November. An estimated 97% of the ice in the Bering Sea is formed within the Bering Sea; very little is transported south through the Bering Strait. During periods of increasing ice and prevailing northerly winds, the ice is generated along the south-facing coasts of the Bering Sea and moves southward with the wind at speed of 1 knot or less before melting at its southern limit. During periods of southerly winds, ice coverage generally decreases in the Bering Sea, causing a wide variation in ice cover from month to month and year to year. See Figure E-12 depicting the Bering Sea median sea ice extent calculated from 1979 to 2000.

A wind-induced polynya (a recurring area of open water in ice-covered regions) immediately south of St. Lawrence Island is a frequent but undependable feature. Northerly winds cause the polynya to form in the lee of the island, as sea ice is advected to the south. The polynya can extend more than 100 miles and is frequently covered with thin ice. However, the feature is temporal, and a wind shift to southerly flow can close this area rapidly. At such times, a corresponding polynya to the north of the island is sometimes observed, but it is generally much smaller and occurs less frequently. See Figure E-13, Recurring Polynyas.

Norton Sound: Most of the sea ice in the northern Bering Sea and Norton Sound is first year ice that forms in situ. Most of Norton Sound is covered by sea ice in November through May and into part of June. Relatively persistent, large polynyas form south of St. Lawrence Island, along the south coast of the Seward Peninsula between Cape Prince of Wales and Cape Nome, and in the northeastern part of Norton Sound.

Chukchi Sea: Sea ice within the Chukchi Sea is mostly first-year ice, with multi-year ice occurring most commonly in northward and westward areas. Ice forms between October and early December. Around mid-May the seasonal disintegration of the ice cover begins as shore-fast ice and thin ice decay and loosen along the northwest coast and in the interior of Kotzebue Sound. It is not until the beginning of July that there is a significant reduction in the probability of ice cover in the southern Chukchi Sea.

Figure E-12
Bering Sea Median Sea Ice Extent 1979-2000 (NSDIC 2016)

(Nuka Research and Planning Group, LLC, Bering Sea Vessel Traffic Risk Analysis, December 2016)

Figure E-13
Recurring Polynyas

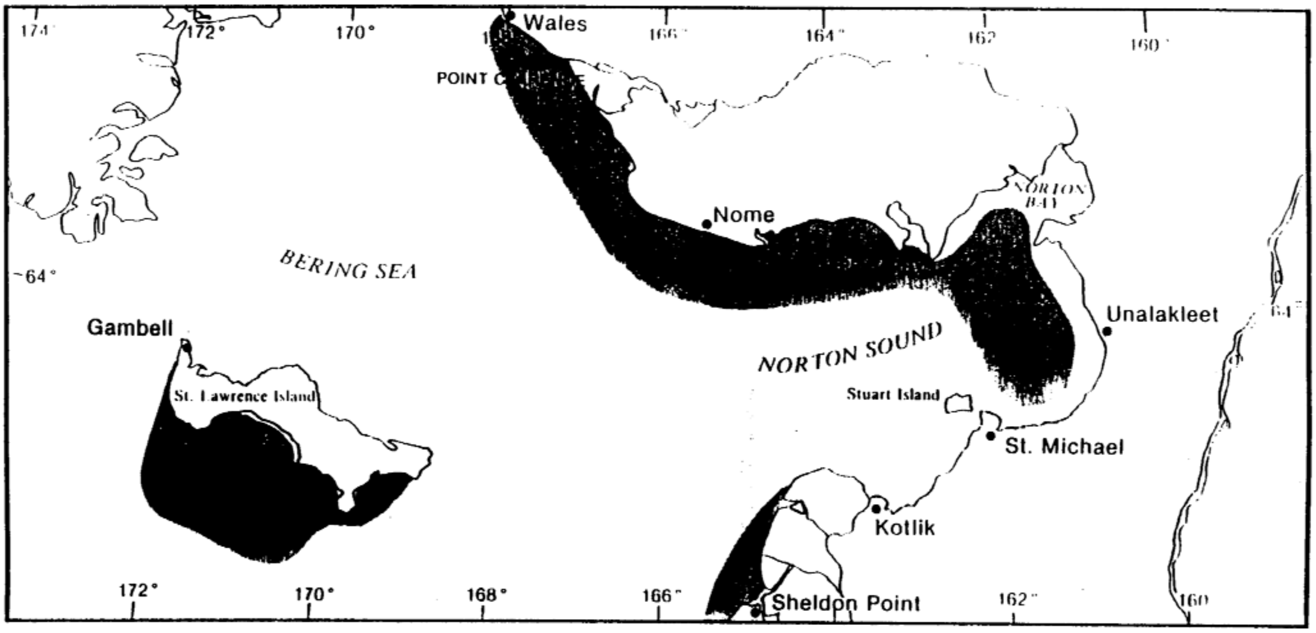


Figure 6. Recurring Polynyas

Synthesized from: McNutt 1981; Stringer, Barrett, and Schreurs 1980; Wohl 1982.

Current Data

Tides in the Bering Sea are considered to be the result of co-oscillation with large oceans. Once inside the Bering Sea, each tidal constituent propagates as a free wave subject to Coriolis Effect and bottom friction. The tide wave propagates rapidly across the deep western basin. Part of it then propagates onto the southeast Bering shelf where large amplitudes are found along the Alaska Peninsula and in Kvichak and Kuskokwim Bays. Another part propagates northeastward past St. Lawrence Island and into Norton Sound. Over most of the Eastern Bering Shelf region the tide is mainly semi-diurnal, but in Norton Sound diurnal tides predominate. Over the remainder of the Bering Sea tides tend to be mixed.

Norton Sound: As indicated in the following figures, the currents in Norton Sound are dominated by regional wind and surface pressure patterns. The highest observed flow was measured at about 50 centimeters/second (cm/s). Flow decreased with increasing depth. Oceanographic data from the mouth of Norton Sound indicate a net northward water transport, with strong seasonal differences in movement rates. Currents between the mouth of the sound and St. Lawrence Island to the west are characterized by pulsive north-south flow events having speeds of 50-100 cm/s. A typical feature is westerly flow of water mass, varying in extent and intensity over time, along the northern coastline. The tidal component in the sound is on the order of 50 cm/s and reverses either diurnally or semi-diurnally. Reversals are roughly north-southeast/southwest within Norton Sound. The upper- and lower-layer circulation is decoupled in the eastern sound, but less so in the western sound, where there is a monotonic decrease in speed along with a slight rotation of flow as depth increases. In summer, easterly flow enters the sound along its southern shore, curves cyclonically to the north, and is deflected west at the north coast, roughly following the bathymetry.

Bering Strait: Near St. Lawrence Island, the Bering Sea narrows into two straits, the Shpanberg and Anadyr. North of the island the two straits merge to form the Bering Strait. Circulation here is dominated by a northward mean flow ranging from 4 to 15 cm/s, with very small tidal influences. Flow in both the Anadyr and Shpanberg is to the north, approximately parallel to the bathymetry. The flow appears to come from around both ends of St. Lawrence Island. Frequent reversals are coincidental with meteorological events. The presence of ice appears to dampen the impact of wind stress. The major driving force for the northward flow through the Bering Strait is the sea surface sloping down to the north. The normal condition is, thus, one in which sea level in the southern Chukchi Sea (in summer) is about 0.5 meter lower than in the northern Bering Sea. South flow events are driven by strong north winds, strong atmospheric pressure cells, and a change in sea-level slope to the south. These conditions apparently require about one day to develop. Northward transport stands in contrast to the southerly transport events. Periods of northerly flow tend to be more persistent and not so great in magnitude.

Chukchi Sea/Kotzebue Sound: As indicated in the following figures, a warm current enters the Chukchi Sea via Bering Strait. In the Chukchi, this current concentrates near the surface and overlies dense, relict bottom water trapped by the shallow depths. It has a fairly uniform velocity which averages 45 cm/s in the summer and 10 cm/s in winter. This flow has many meanders and eddies and is slowed somewhat by dominant northeasterly winds. To the east, in deeper waters, the warm water mass descends to mid-depths. Maximum temperatures are observed in 30- to 50-meter depths. Water movement from the Bering Strait to Cape Lisburne takes 10-15 days in the summer. Tidal currents are rotary and very weak in the Chukchi. They vary from .3 to .9 cm/s depending on the location and tidal stage. Nearshore, the tidal currents appear to be small, on the order of 1 cm/s. Kotzebue Sound currents are mostly tide- and wind-induced. Velocities through and within the sound are very slow, averaging less than 0.1 cm/s.

Winds

In many cases, spill trajectory is determined primarily by winds, especially when currents are weak. Throughout the Bering the wind is fairly strong year-round but blows the hardest in winter.

Prevailing summer winds blow from the south or southwest at 7 to 10 knots. Winter winds generally come from the east or northeast at 10 to 15 knots, and can persist in one direction for weeks at a time causing a wide variety of water and ice movement. Winds are usually stronger at St. Lawrence Island (averaging 15.5 knots) than along the mainland. Maximum recorded sustained wind speed at Nome is 78 knots and 92 knots at Unalakleet. Even strong winds offshore may reach speeds of 100 knots and create large waves in Norton Sound.

Figure E-14
Bering Sea Currents - Winter

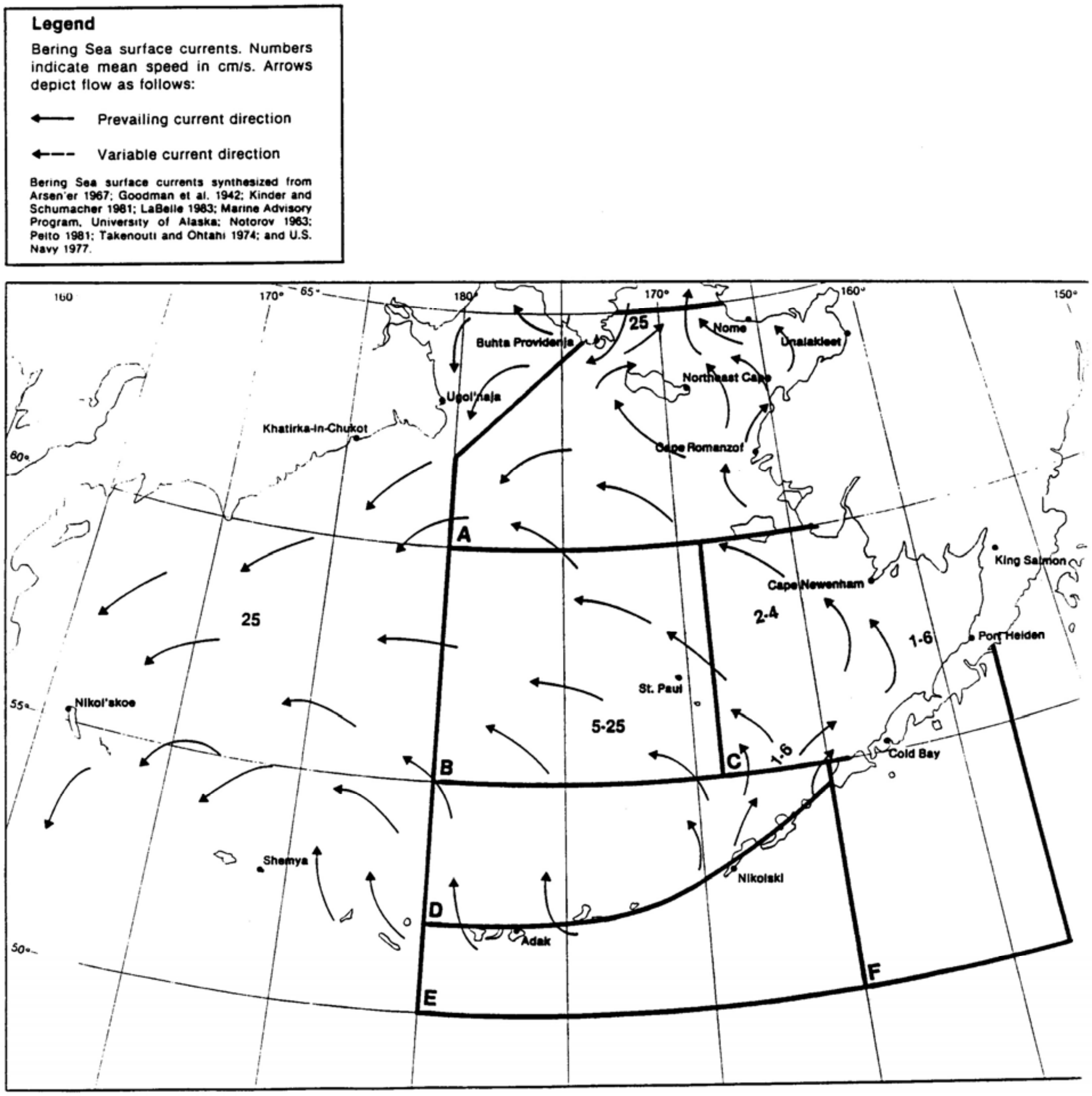


Figure E-15
Bering Sea Currents - Summer

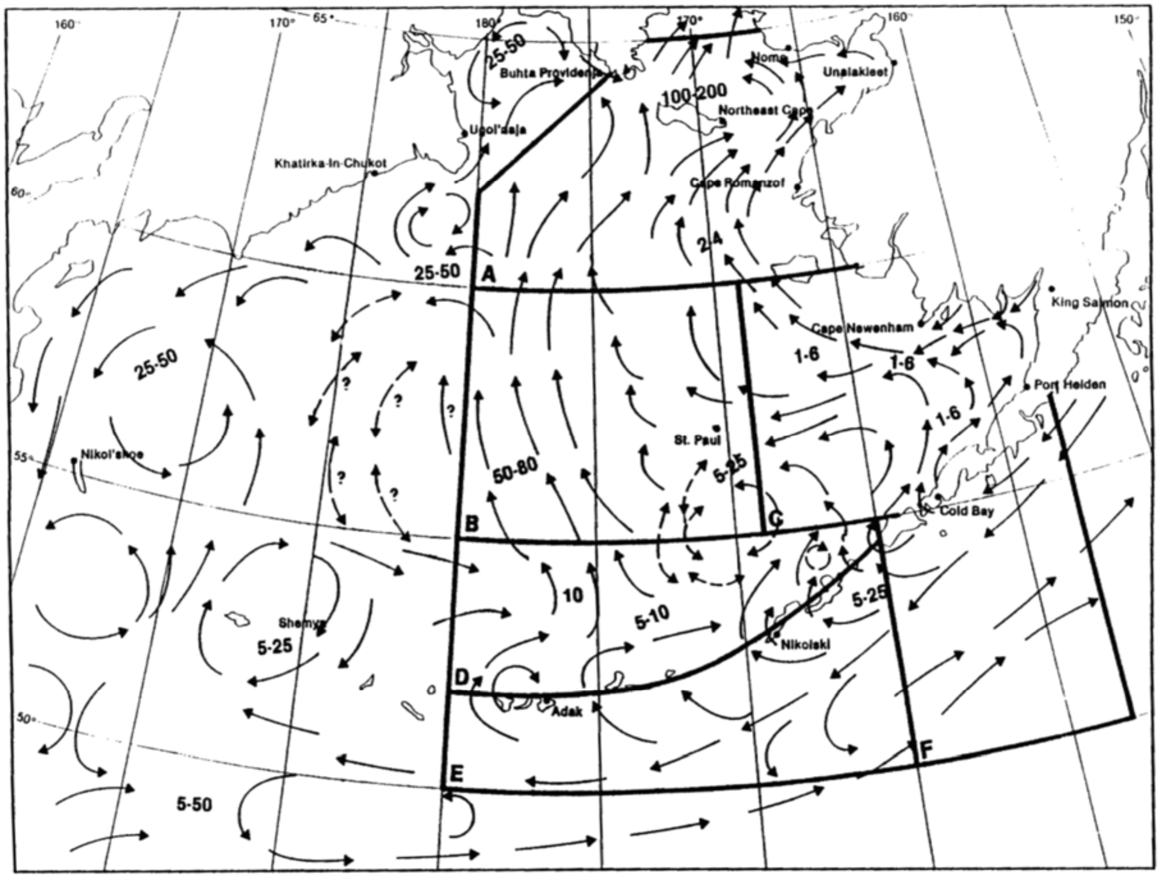
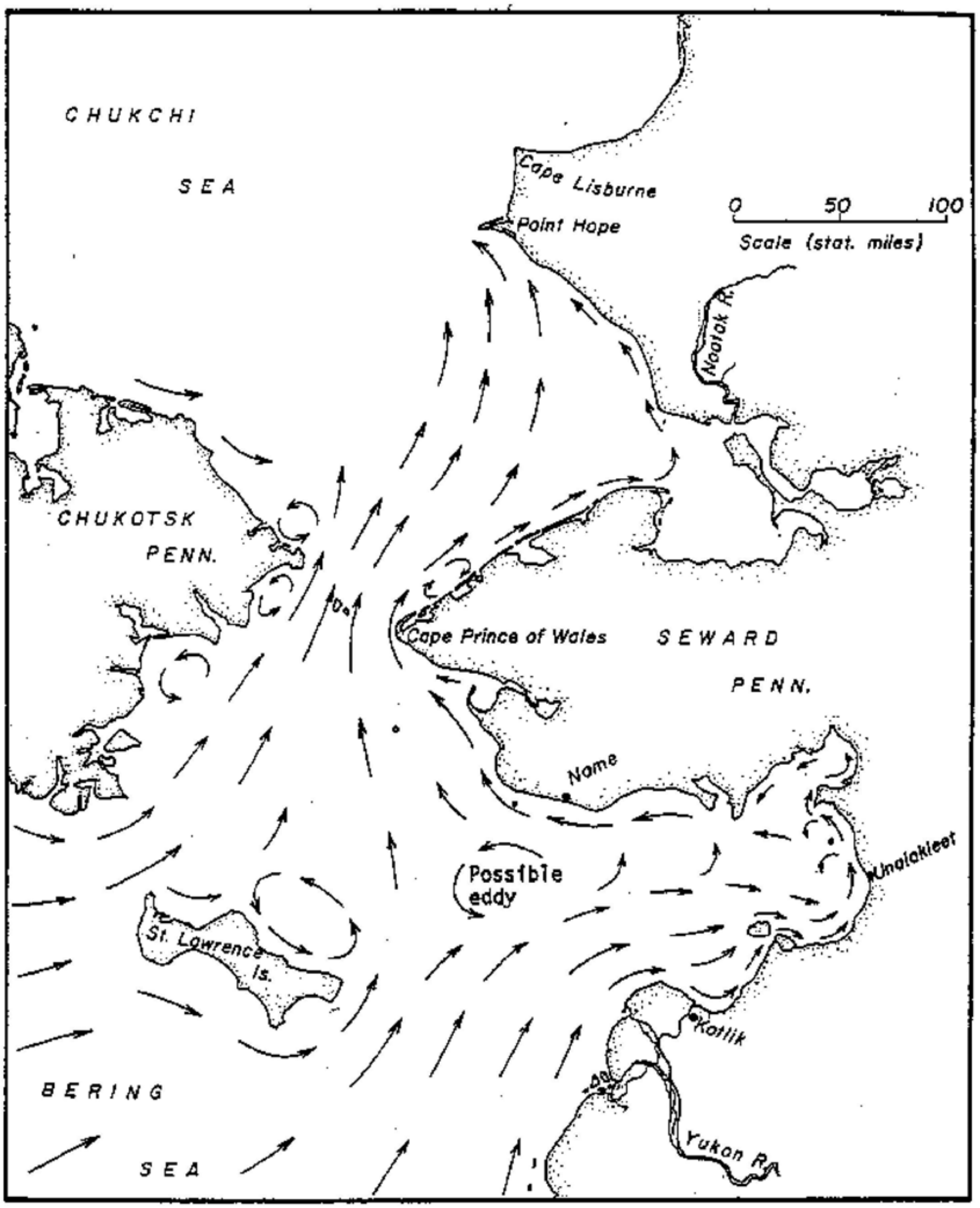


Figure 4. Bering Sea Currents—Summer

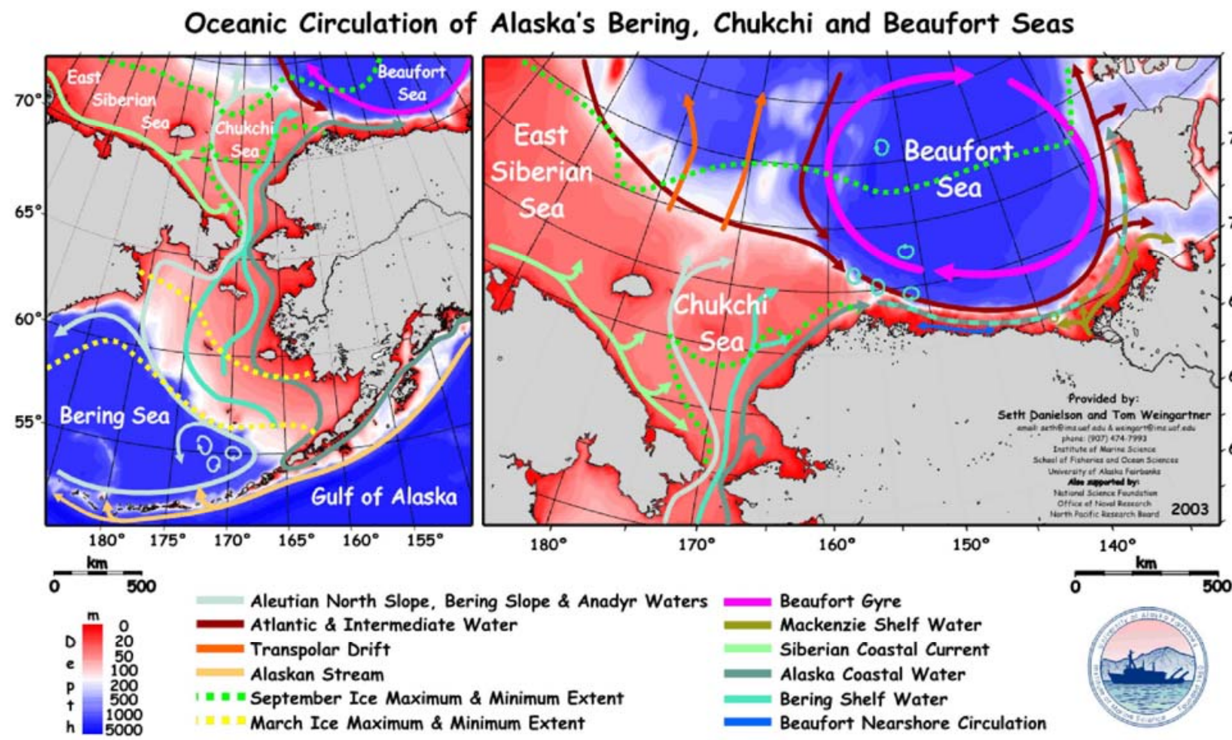
Figure E-16
Northwest Arctic – Surface Currents during the Summer and Fall (Open Water) Season



Surface circulation in the NE Bering Sea and SE Chukchi Sea during the summer and fall (open water) season.

Burbank, D.C., 1979, Drift Bottle Trajectories and Circulation in the NE Bering Sea and Se Chukchi Sea,Ó Habitat Section, ADFG, 52p.

Figure E-17


Oceanic Circulation of Alaska's Bering, Chukchi and Beaufort Seas
East Siberian Sea
Chukchi Sea
Beaufort Sea
Bering Sea
Gulf of Alaska
Provided by:
Seth Danielson and Tom Weingartner
email: seth@ims.uaf.edu & weingart@ims.uaf.edu
phone: (907) 474-7993
Institute of Marine Science
School of Fisheries and Ocean Sciences
University of Alaska Fairbanks
Also supported by:
National Science Foundation
Office of Naval Research
North Pacific Research Board
2003
km
0
500
Depth
m
0
20
50
100
200
500
1000
5000
Aleutian North Slope, Bering Slope & Anadyr Waters
Atlantic & Intermediate Water
Transpolar Drift
Alaskan Stream
September Ice Maximum & Minimum Extent
March Ice Maximum & Minimum Extent
Beaufort Gyre
Mackenzie Shelf Water
Siberian Coastal Current
Alaska Coastal Water
Bering Shelf Water
Beaufort Nearshore Circulation

Physical Features: The Northwest Arctic Subarea has an irregular shaped coast line, with many sounds, inlets, bays, lagoons, islands, rivers, peninsulas, spits, points, and capes. There are many rivers that flow out of the following mountain ranges: the southwest end of the Brooks Range, Delong Mountains, Baird Mountains, Schwatka Mountains, Waring Mountains, Selawik Hills, Purcell Mountains, York Mountains, Kigluaik Mountains, Bendelben Mountains, Darby Mountains, Kaiyuh Mountains, and Nulato Hills. The majority of these rivers empty into the salt waters of this subarea. The primary orientation of these mountain ranges are east to west.

Most of the communities of this subarea are located on the coast or can be found inland on river ways. The major river ways associated with the communities of this subarea are the Noatak River, Kobuk River, Selawik River, Buckland River, and Koyuk River.

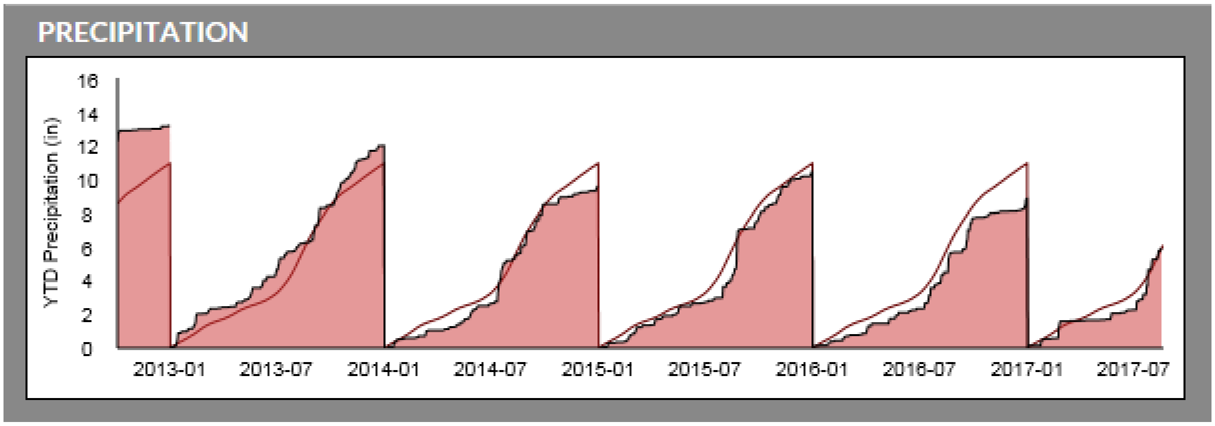
The subarea has many small lakes that are mainly found in the lowlands within watersheds and just inland of coastal regions. The three largest lakes within the Subarea are Selawik Lake, Inland Lake, and Imuruk Lake.

Climate: Most of the communities in the subarea are coastal and experience a maritime climate while the surrounding waters are ice-free around May through October. During these ice-free months cloudy skies are common, daily temperatures are fairly uniform, the predominate wind direction is from the west, humidity is higher, and fog is common due to the temperature difference of the water and the surrounding land mass. Most of the precipitation that falls occurs during these months. See Figure E-18.

When the water in coastal regions freezes the climate changes to be more like that of a continental climate, with large fluctuations in temperature. See Figure E-19. As more and more open water freezes the shift to a continental type environment becomes more pronounced. During these months cyclonic storms are more abundant and accompanied by high winds and blizzard conditions. Most of these months have light snow falls, but the fallen snow is often reactivated and windblown long distances away from where it originally fell.

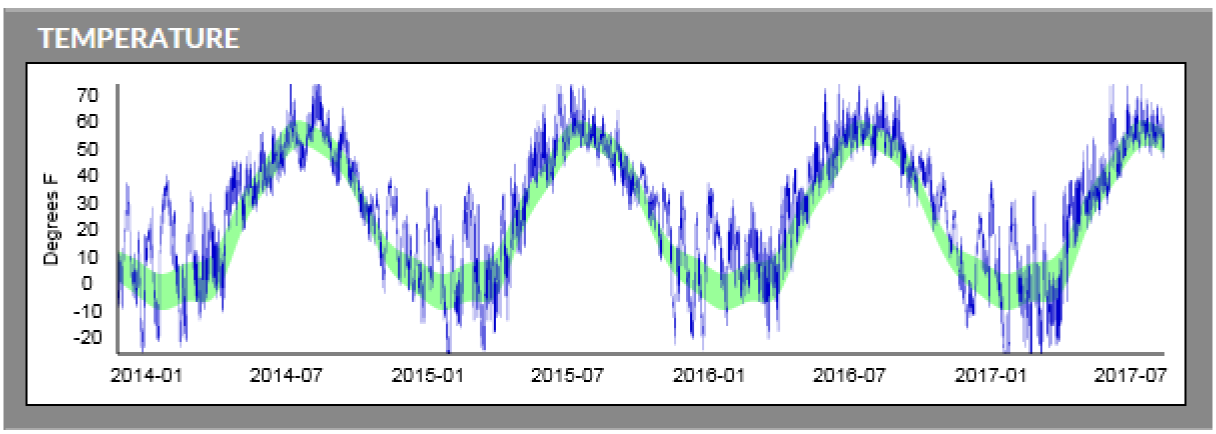
The mountain ranges in the subarea are for the most part oriented west to east and do little to block the year round westerly winds. The mountains in the area provide a barrier from the cyclonic storms coming from the south to the communities located proximally to their northern edges. The mountains also provide a barrier to arctic storms coming from the north for the communities that lie to their south.

Figure E-18
Precipitation Record from Kotzebue, AK (January 2013 through July 2017)



Note: The black line with red fill indicates daily precipitation observations recorded at the Ralph Wein Memorial Airport in Kotzebue. The red line represents a long-term averaged precipitation.

Figure E-19
Temperature Record from Kotzebue, AK (January 2014 through July 2017)



Note: The blue line indicates daily temperature observations recorded at the Ralph Wein Memorial Airport in Kotzebue. The thick green line represents a long-term averaged temperature.

Geology: Most of the communities in this area are located in lowlands near the coast and rivers. The lowlands in this area are covered in vegetation growing on unconsolidated sands, gravels, and muds, that are associated with fluvial, glaciofluvial, colluvial, and eolian deposits. These unconsolidated sediments were deposited in the Quaternary, Pleistocene, and uppermost Tertiary time periods. Some of these sediments such as those found around Nome are associated with placer gold deposits.

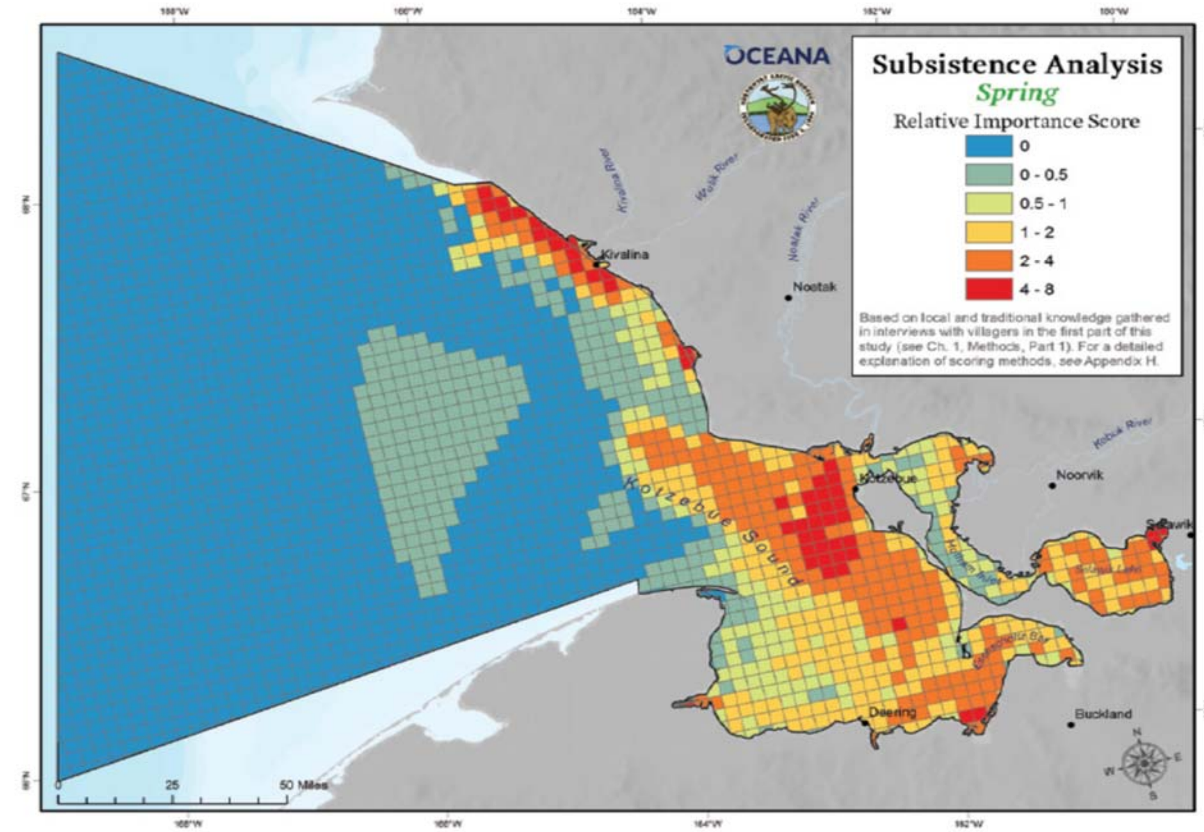
This area has many mineral resources associated with bedrock outcrops in the mountainous regions of this area. Communities have sprung up and disappeared with the mining of these resources. Due to the remoteness of this area, and lack of infrastructure like roads and deep water ports, it is economically difficult to extract these mineral resources. Currently Red Dog Mine, a zinc and lead mine located on the southern foothills of the Delong Mountains, is the largest operating commercial mine in this area. Red Dog Mine is located approximately 90 miles north of Kotzebue. Red Dog Mine also has a port site, to import supplies and fuel for the mine and export zinc and lead ore concentrate, that is located about 16 miles south east of Kivalina.

Oceanography: The primary water bodies associated with this area is the Chukchi Sea to the northwest and the Bering Sea to the west and south. The next largest water bodies are the Kotzebue Sound located to the North of the Seward Peninsula and the Norton Sound located to the south of the Seward Peninsula. The waters in the coastal regions of this area are too shallow to support a deep water port. Deep draft vessels that bring supplies and fuel to the communities of this area must anchor out in the deeper waters offshore and lighter their cargo to smaller more shallow drafted vessels and barges for transport to shore or up rivers. In the case of Kotzebue, one of the largest hub communities in the area, deep drafted vessels must anchor 15 miles off the coast due to the shallowness of coastal waters.

Coastal Resources: Many people in this area rely on subsistence foods. A large portion of the subsistence foods that are harvested in this area are from the sea. The primary marine species harvested in this area are bowhead whales, beluga whales, gray whales, bearded seals, spotted seals, ringed seals, polar bears, walrus, seabirds and their eggs, arctic cod, tomcod, herring, flounder, ellpouts, sculpin, salmon, trout, whitefish, and sheefish. Almost all of these species are migratory species and are often only available seasonally. It is also important to note that these species rely on the health of their ecosystem to provide enough food for them to flourish.

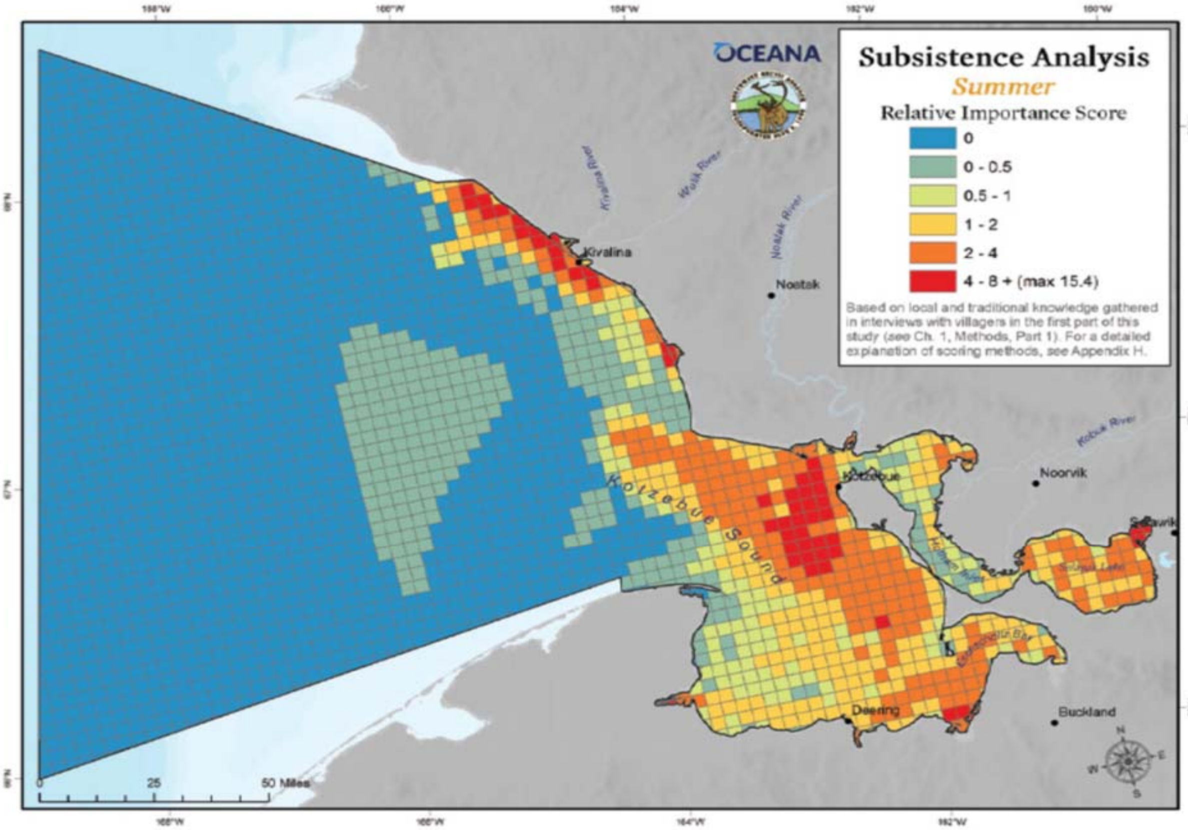
The following figures illustrate the areas of critical Northwest Arctic Borough (NAB) subsistence activity based on the season and include all of the species listed in the previous paragraph. Please note that the following figures are based off of traditional knowledge gathered by interviews with villagers, and that all communities' subsistence use were weighted the same regardless of community size. These figures only depict subsistence activities within the NAB boundaries and do not show the other coastal subsistence areas located in the Northwest Arctic Subarea that are south of the NAB boundary.

Figure E-20
Spring Subsistence Analysis



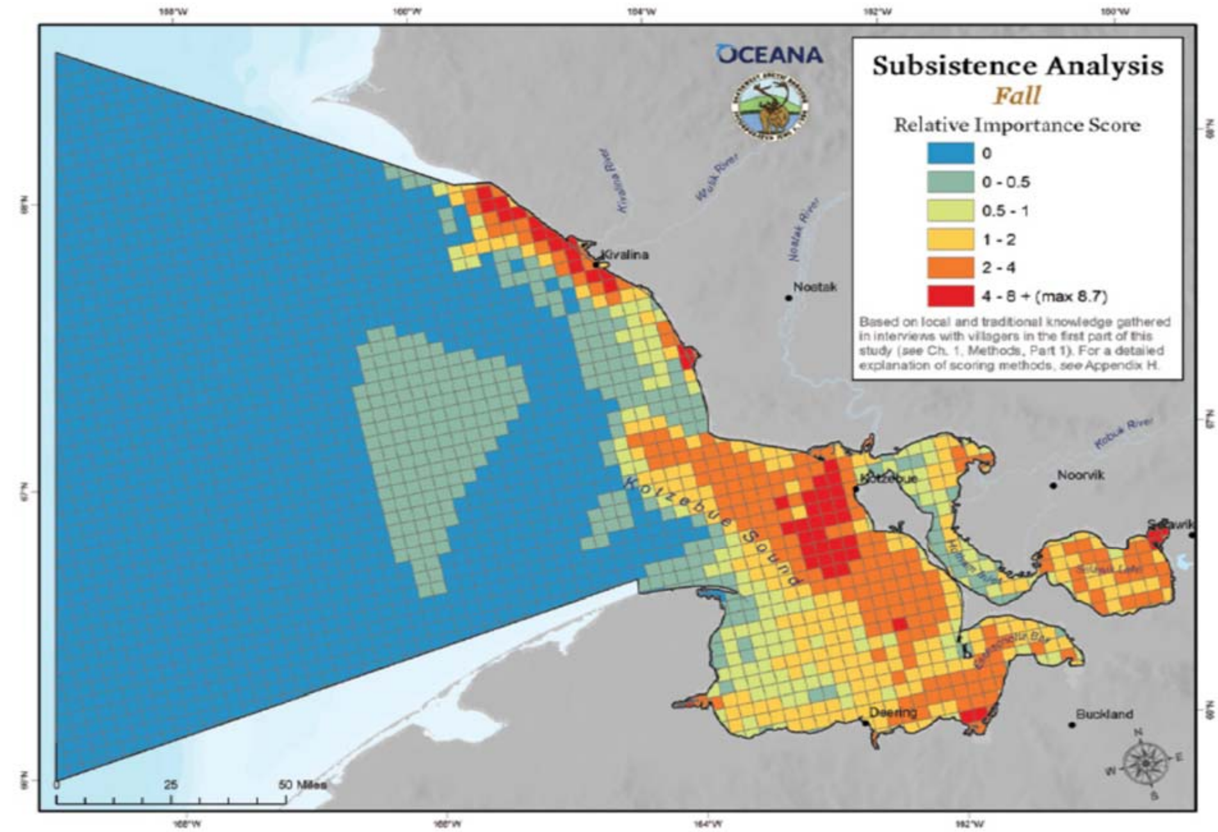
Source: IÑUUNIAŁIQPUT ILILUGU NUNA—UANUN Documenting Our Way of Life through Maps, Northwest Arctic Borough Subsistence Mapping Project, January 28, 2016.

Figure E-21
Summer Subsistence Analysis



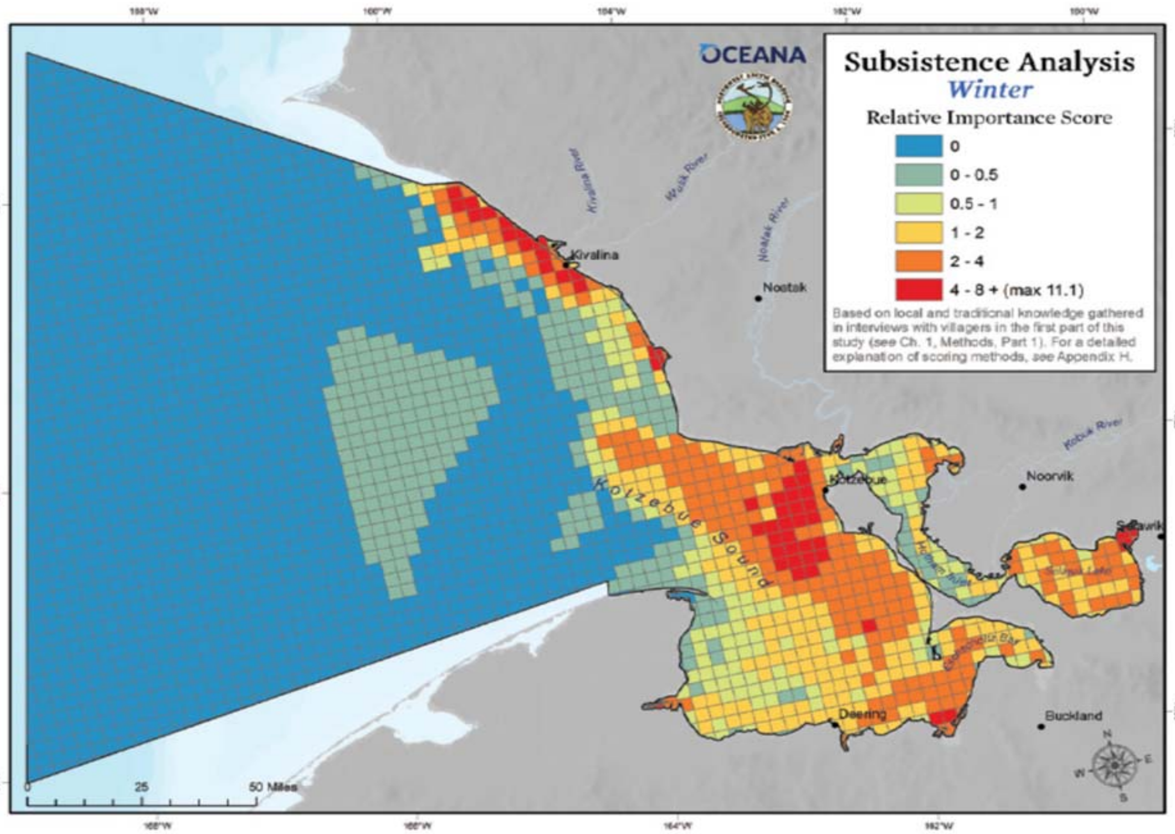
Source: IÑUUNIAŁIQPUT ILILUGU NUNA—UANUN Documenting Our Way of Life through Maps, Northwest Arctic Borough Subsistence Mapping Project, January 28, 2016.

Figure E-22
Fall Subsistence Analysis



Source: IÑUUNIAŁIQPUT ILILUGU NUNA—UANUN Documenting Our Way of Life through Maps, Northwest Arctic Borough Subsistence Mapping Project, January 28, 2016.

Figure E-23
Winter Subsistence Analysis



Source: IÑUUNIAŁIQPUT ILILUGU NUNA—UANUN Documenting Our Way of Life through Maps, Northwest Arctic Borough Subsistence Mapping Project, January 28, 2016.

According to the Northwest Arctic Borough, 134 residents hold commercial fishing permits. The 134 permit holder number does not include other potential commercial fishing permit holders that might reside in the Northwest Arctic Subarea but do not live within the Northwest Arctic Borough boundary.

Impacts to the coastal areas associated with a release could be very detrimental as the ecology in this region can take a very long time to rebound from a disruption.

a. <u>Data Sources</u>:

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- Historical Temperature and Precipitation Information from Ralph Wien Memorial Airport, Kotzebue, Alaska, https://toolkit.climate.gov/tools/climate-explorerDALTON HIGHWAY, YUKON RIVER TO PRUDHOE BAY, ALASKA Bedrock geology of the eastern Koyukuk basin, central Brooks Range, and east central Arctic Slope Edited by Charles G. Mull and Karen E. Adams Artwork and production coordinated by Ann-Lillian Schell Division of Geological & Geophysical Surveys Guidebook 7 Volume 1
- Generalized Geologic Map of the Brooks Range and Arctic Slope, Northern Alaska, C.G. Mull 1989, Alaska Division of Geological & Geophysical Surveys
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BACKGROUND: PART FOUR - ABBREVIATIONS & ACRONYMS

AAC	Alaska Administrative Code
ACA	Area Command Authority
ACFT	Aircraft
ACP	Area Contingency Plan
ACS	Alaska Clean Seas (North Slope industry cooperative)
ADCCED	Alaska Department of Commerce, Community and Economic Development
ADEC	Alaska Department of Environmental Conservation
ADF&G	Alaska Department of Fish and Game
ADMVA	Alaska Department of Military and Veterans Affairs
ADNR	Alaska Department of Natural Resources
ADOT&PF	Alaska Department of Transportation & Public Facilities, also as ADOTPF
AFB	Air Force Base
AIMS	Alaska Incident Management System Guide
AIR	Air Operations
AKNG	Alaska National Guard
ALCOM	Alaska Command
ALMR	Alaska Land Mobile Radio
AMHS	Alaska Marine Highway System (ADOT&PF)
ANCSA	Alaska Native Claims Settlement Act
ANS or ANSC	Alaska North Slope Crude oil
AOO	Alaska Operation Office (EPA)
AP	Associated Press
APSC	Alyeska Pipeline Service Company
ARRT	Alaska Regional Response Team
ATON	Aids to Navigation
AS	Alaska Statue, also Air Station (USAF)
ASAP	As soon as possible
AST	Alaska State Troopers
BBLS	Barrels
BIA	Bureau of Indian Affairs
BLM	Bureau of Land Management
BOA	Basic Ordering Agreement
BOEM	Bureau of Ocean Energy Management
BOPD	Barrels of Oil per Day
BSEE	Bureau of Safety and Environmental Enforcement
CAMEO	Computer-Aided Management of Emergency Operations
CAR	Central Alaska Region (ADEC)
CCGD 17	Commander, Coast Guard District 17
CEC	Community Emergency Coordinator
CEMP	Comprehensive Emergency Management Plan
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
CFR	Code of Federal Regulations
CHEMTREC	Chemical Transportation Emergency Center
CMT	Crisis Management Team

COM	Communications equipment/capabilities
COMDTINST	Commandant Instruction (USCG)
COTP	Captain of the Port (USCG)
CP	Command Post
C-Plan	Contingency Plan
CTAG	Cultural Technical Advisory Group
CUL	Cultural Resources
CWA	Clean Water Act
DAA	Documentation/Administrative Assistance
DHS	United States Department of Homeland Security
DHSEM	Division of Homeland Security and Emergency Management (division under ADMVA)
DOC	United States Department of Commerce
DOD	United States Department of Defense
DOE	United States Department of Energy
DOI	United States Department of the Interior
DRAT	District Response Advisory Team (USCG)
DRG	District Response Group (USCG)
DWT	Dead weight tonnage
ECRT	Emergency Communications Response Team (ADMVA)
EEZ	Exclusive Economic Zone
EMS	Emergency Medical Services
ENV	Environmental Unit
EOC	Emergency Operations Center
EOP	Emergency Operations Plan
EPA	Environmental Protection Agency
EPCRA	Emergency Planning and Community Right-to-Know Act of 1986
ESA	Environmentally Sensitive Area
ESI	Environmental Sensitivity Index
ETS	Emergency Towing System
F/V	Fishing Vessel
FAA	Federal Aviation Administration
FDA	Food and Drug Administration
FIN	Finance
FIR	Fire Protection/fire fighting
FLIP	Flight Information Publication
FOG	Field Operations Guide
FOSC	Federal On-Scene Coordinator
FPN	Federal Pollution Number
FRP	Facility Response Plan
FWPCA	Federal Water Pollution Control Act
GIS	Geographic Information System
GRS	Geographic Response Strategies
GSA	General Services Administration
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HQ	Headquarters
IAP	Incident Action Plan
IC	Incident Commander

ICP	Incident Command Post
ICS	Incident Command System
IDLH	Immediate Danger to Life and Health
IMH	Incident Management Handbook (USCG)
IMT	Incident Management Team
INMARSAT	International Maritime Satellite Organization
JPO	Joint Pipeline Office
LAT	Latitude
LEG	Legal
LEPC	Local Emergency Planning Committee
LEPD	Local Emergency Planning District
LERP	Local Emergency Response Plan
LNG	Liquefied Natural Gas
LO	Liaison Officer
LONG	Longitude
LOSC	Local On-Scene Coordinator
LRRS	Long Range Radar Station
M/V	Motor Vessel
MAC	Multiagency Coordination Committee
MAP	Mapping
MAR CH	Marine Channel
MED	Medical Support/Health Care
MESA	Most Environmentally Sensitive Area
MLC	Maintenance and Logistics Command (USCG Pacific Area)
MLT	Municipal Lands Trustee Program
MMPD	Maximum Most Probable Discharge
MOA	Memoranda of Agreement
MOU	Memoranda of Understanding
MSD	Marine Safety Detachment (USCG)
MSO	Marine Safety Office (USCG)
MSRC	Marine Spill Response Corp. (national industry cooperative)
NAB	Northwest Arctic Borough
NAR	Northern Alaska Region (ADEC)
NAVSUPSALV	U.S. Navy Superintendent of Salvage
NCP	National Oil and Hazardous Substance Pollution Contingency Plan
NIMS	National Incident Management System
NIIMS	National Interagency Incident Management System
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
NMFS	National Marine Fisheries Service
NOAA	National Oceanic and Atmospheric Administration
NOTAMS	Notice to All Mariners; also, Notice to Airmen
NPDES	National Pollution Discharge Elimination System
NPFC	National Pollution Fund Center
NPS	National Park Service
NRC	National Response Center
NRT	National Response Team

NRDA	(Federal/State) Natural Resource Damage Assessment
NSF	National Strike Force
NSFCC	National Strike Force Coordinating Center
NWR	NOAA Weather Radio; also National Wildlife Refuge (USFWS)
NWS	National Weather Service
OHMSETT	Oil and Hazardous Material Simulated Environment Test Tank
OOD	Duty Officer or Officer On Duty
OPA 90	Oil Pollution Act of 1990
OPCEN	Operations Center
OPS	General Response Operations
OSC	On-Scene Coordinator
OSHA	Occupational Health and Safety Administration
OSLTF	Oil Spill Liability Trust Fund
OSRO	Oil Spill Response Office
O/S	On-Scene
PERP	Prevention and Emergency Response Program (ADEC)
PIAT	Public Information Assist Team
PIO	Public Information Officer
PLN	General Planning Operations
POLREP	Pollution Report (USCG)
PPE	Personal Protective Equipment
PPOR	Potential Places of Refuge
PPP	Seafood Processor Protection Plans
RAC	Response Action Contractor
RCC	Rescue Coordination Center
RCAC	Regional Citizens Advisory Council
RCRA	Resource Conservation and Recovery Act of 1978
RMAC	Regional Multi-Agency Coordination Committee
RP	Responsible Party
RPOSC	Responsible Party On-Scene Coordinator
RPD	Recovery, Protection and Decontamination
RQ	Reportable Quantity
RRT	Regional Response Team
RSC	Regional Stakeholder Committee
RV	Recreation Vehicle
SAR	Search and Rescue
SART	Southeast Alaska Response Team (ADEC)
SCAT	Shoreline Cleanup Assessment Teams
SCBA	Self-Contained Breathing Apparatus
SCP	Subarea Contingency Plan
SDS	Safety Data Sheet
SEAPRO	Southeast Alaska Petroleum Resource Organization Inc.
SEC	Security
SHPO	State Historic Preservation Officer (ADNR)
SERVS	Ship Escort Response Vessel Service (Alyeska)
SITREP	Situation Report (ADEC)
SONS	Spill of National Significance
SOSC	State-On Scene Coordinator

SPAR	Spill Prevention and Response Division
SSC	Scientific Support Coordinator (NOAA)
STORMS	Standard Oil Spill Response Management System
T/V	Tank Vessel
TA	Trajectory Analysis
TAPS	Trans Alaska Pipeline System
TPO	Tribal Police Officer
UC	Unified Command
USAF	United States Air Force
USCG	United States Coast Guard
USDA	United States Department of Agriculture
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service
VIRS	Visual Information Response System
VOSS	Vessel of Opportunity Skimming System
VPO	Village Police Officer
VSPO	Village Public Safety Officer
VTS	Vessel Traffic Separation System/Scheme
WCD	Worst Case Discharge
WRR	Wildlife Protection/Care/Rehabilitation/Recovery
WX	Weather