Aleutian Islands RISK ASSESSMENT PROJECT

Phase A Summary Report

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PUBLICATION INFORMATION

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Executive Summary

The Aleutian Islands is a region of Alaska that supports rich and diverse marine resources, including some of the nation's most productive commercial fisheries. A major marine shipping route, known as the Great Circle route, which is used by international commercial shipping vessels, intersects the region. Domestic shipping occurs within the region to support the local communities and economic infrastructure. Past vessel accidents in the Aleutian Islands that have resulted in loss of cargo, oil spills and loss of life established the need to initiate a multi-phased study to assess the risks posed from maritime transportation in the Bering Sea and the Aleutian Archipelago. This report is a summary of Phase A of the Aleutian Islands Risk Assessment and includes the recommendations of the Advisory Panel assembled for the project.

This report documents the process, analysis, and outcomes of Phase A of the Aleutian Islands Risk Assessment. Phase A began in May 2009 with the establishment of an organizational structure made up of four groups: a Management Team, an Advisory Panel, a Risk Analysis Team, and a Technical Peer Review Panel. Over a two-year period, the Advisory Panel met in person or by web-conference fourteen times. The major work conducted and discussed under Phase A included:

- The development of a risk report analyzing the likelihood of spills based on vessel traffic through the Aleutians,
- The creation of a risk matrix to analyze the potential consequences of vessel-source spills, and
- A qualitative assessment and prioritization of risk reduction options.

The Risk Analysis Team developed the following six studies:

- Semi-quantitative vessel traffic study,
- Marine spill frequency and size study,
- Baseline spill study,
- Consequence analysis study,
- Accident scenario and causality study, and
- Evaluation and prioritization of risk reduction options study.

Accompanying reports were developed for each study and are summarized in this synthesis report. Each study and report built upon each other and was reviewed by the Project Team. All reports were developed with opportunities for public input and review.

Based on discussion and the analysis of Risk Reduction Options (RRO), the Advisory Panel developed recommendations that characterize all RRO's considered into three categories:

- RRO recommended for immediate implementation

- RRO recommended for Phase B Study, and
- RRO considered but set aside.

Two key principles were applied to the RRO analyses: (1) prevention measures take priority over response measures, and (2) all measures should be realistic and practical, and should support the basis for the Advisory Panele's recommendations.

The recommendations of risk reduction measures present a consensus of the Advisory Panel. The RRO's found to be sufficiently effective and practical for immediate implementation include:

- Develop an enhanced vessel monitoring and reporting program,
- Enhance towing capabilities on U.S. Coast Guard cutters and increase cutter presence in the Aleutians,
- Stage additional Emergency Towing Systems (ETS) in the Aleutians,
- Initiate the process to establish International Maritime Organization (IMO) Particularly Sensitive Sea Areas,
- Strengthen the Aleutians Subarea Contingency Plan, and
- Increase salvage and spill response capability in the Aleutians.

In some cases, the recommendations for immediate implementation have elements that require further study. The four Risk Reduction Options that require additional work or study as Phase B of the Aleutian Islands Risk Assessment prior to full implementation are:

- Increase rescue tug capability in the Aleutians,
- Increase salvage and spill response capability in the Aleutians,
- Determine the boundaries of the IMO Particularly Sensitive Sea Areas, and develop recommendations for associated protective measures, and
- Strengthen the Aleutians Subarea Contingency Plan.

All of the risk reduction option recommendations considered are described in this report, with additional background and detailed descriptions in Appendix A of this report.

The Advisory Panel's recommendations are presented in this report to the decision makers in the U.S. Coast Guard, State of Alaska, and local governments. The decision as to which measures will be adopted ultimately rests with the decision makers.

The Management Team has deemed Phase A of the Risk Assessment complete and will initiate Phase B in late 2011.

Project Background

1. Project Background

1.1 Need for the Study

The Aleutian Islands is a region that supports rich and diverse marine resources, including some of the nation's most productive commercial fisheries. While the Aleutian region is remote and sparsely populated, it is intersected by a major marine shipping route utilized by international commercial shipping vessels carrying various cargoes from the west coast of North America to Asia along the North Pacific Great Circle route (Figure 1).

Figure 1. North Pacific Great Circle route.

While a majority of the vessel traffic along the Great Circle Route passes through the region without making any port calls, accidents involving these vessels have the potential to significantly and adversely impact coastal and marine ecosystems, economies, and human activities in the Aleutian region. The frequency of storms, high winds, and severe sea conditions in this region increase the potential for accidents to occur. Limited infrastructure, coupled with these challenging operating conditions, often limit the potential to mitigate or respond to incidents in this remote region.

Vessel accidents have caused past oil spills in the Aleutian Islands, including the 2004 M/V Selendang Ayu incident (Figure 2). This incident, which involved loss of life of the ships' crew and resulted in a significant fuel oil spill, spurred a court settlement that established funding for a comprehensive risk assessment (United States of America v. IMC Shipping Co. PTE.).

Figure 2. M/V Selendang Ayu. Photo credit: Magone Marine

In response to the directive for an Aleutian Islands Risk Assessment, the National Fish & Wildlife Foundation (NFWF), US Coast Guard (USCG) and State of Alaska Department of Environmental Conservation (ADEC) initiated a multi-phase study assessing the risks from maritime transportation in the Bering Sea and the Aleutian Archipelago (Figure 3).

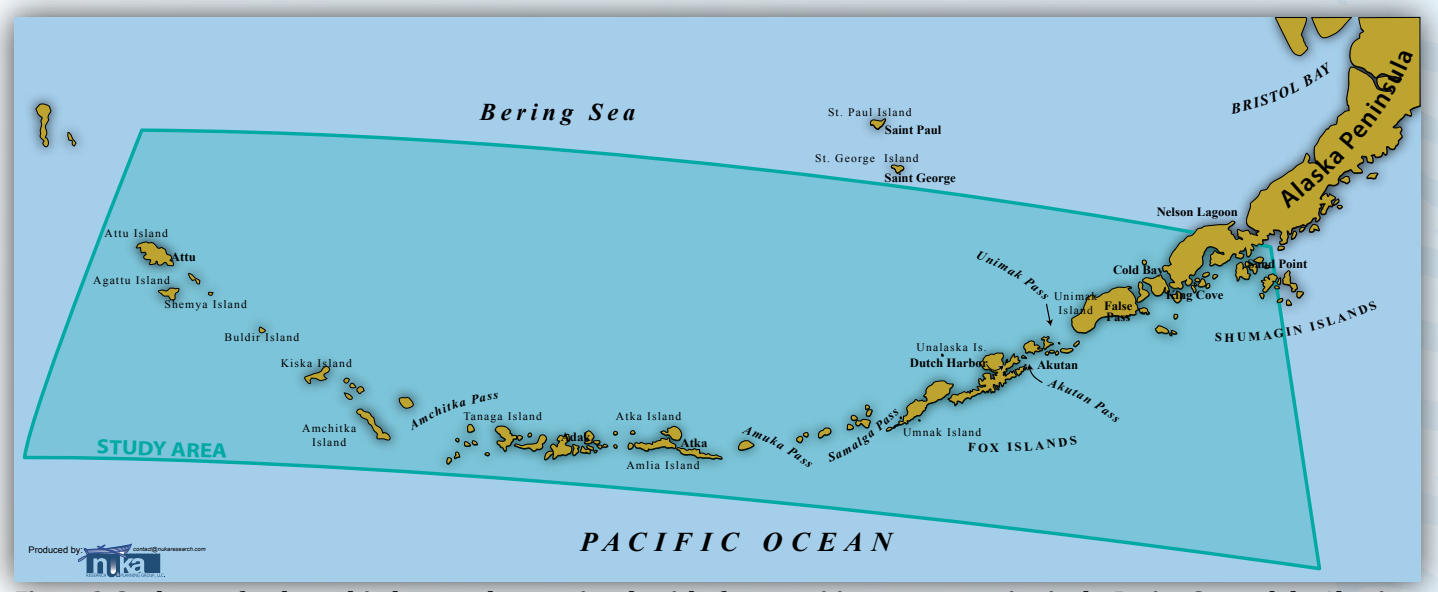


Figure 3. Study area for the multi-phase study assessing the risks from maritime transportation in the Bering Sea and the Aleutian Archipelago.

1.2 Previous Work and Related Studies

In support of a safety improvement activity, a formal Ports and Waterways Safety Assessment (PAWSA) for the Aleutian Islands was conducted in Anchorage, Alaska on July 24-25, 2006 and sponsored by the U.S. Coast Guard and the Alaska Department of Environmental Conservation. Twenty participants representing waterway users, regulatory authorities, and stakeholders attended the workshop. A Waterway Risk Model, incorporating 24 risk factors associated with both the causes and the effects of waterway casualties, was used throughout the workshop to guide discussions and numerical assessments. Based on extensive discussions during the workshop, concentrations of risks were noted by the participants in three locations: Unimak Pass, Dutch Harbor and North of Akun Island. The PAWSA participants judged that additional risk reduction actions were needed with respect to 14 or the 24 risk factors in the Waterway Risk Models. (PAWSA Workshop Report for Aleutian Islands, July 2006).

In 2007, the State of Alaska and the US Coast Guard determined that the Aleutian Islands Risk Assessment must follow a well-designed process to ensure a meaningful outcome. Consequently, they asked the Transportation Research Board (TRB), part of the National Academies, to examine the available data and develop a framework for the most appropriate and scientifically rigorous approach possible to complete the comprehensive risk assessment in a series of discrete phases.

To conduct this study, the TRB empanelled the Committee for Risk of Vessel Accidents and Spills in the Aleutian Islands: A Study to Design a Comprehensive Assessment. The committee included individuals with expertise in risk assessment methods and practices; risk assessment data and analyses; risk analyses, with emphasis on evaluation and prevention of ship accidents; commercial shipping, with emphasis on North Pacific operations; navigation safety and voyage planning; US Coast Guard missions and

operations related to waterway management and accident response; environmental protection; and regulatory approaches to ship safety and accident prevention.

The committee met three times. During a multiday meeting (October 29–November 2, 2007) in Alaska with a site visit to Dutch Harbor, the committee heard from stakeholders and reviewed available data pertinent to its charge. Stakeholders discussed specific hazards presented by Aleutian shipping operations and a range of possible mitigation measures they believed should be considered for implementation.

At its second meeting, held in Washington D.C. on January 7–8, 2008, the committee reviewed presentations on related maritime risk assessments conducted in Puget Sound, San Francisco, and Europe as well as spill response and environmental impact.

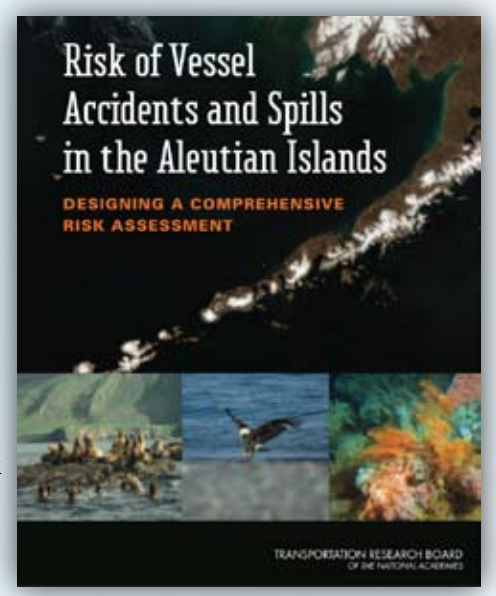


Figure 4. Risk of Vessel Accidents and Spills in the Aleutian Islands.

The efforts of this committee culminated with the completion of their report titled: Risk of Vessel Accidents and Spills in the Aleutian Islands (TRB, 2008). This report included recommendations for a methodology and approach for the Aleutian Islands Risk Assessment (Figure 4).

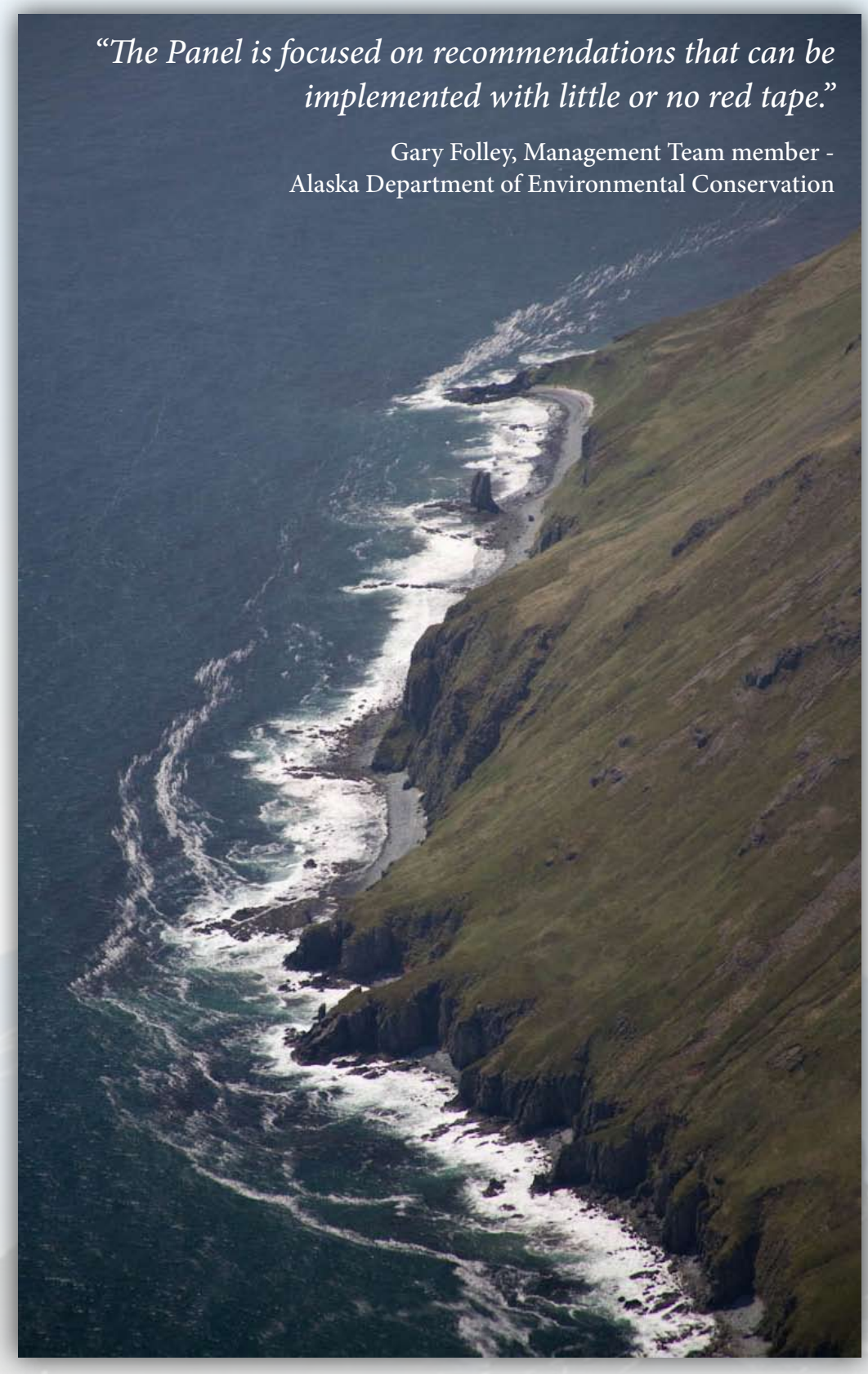
1.3 Phase A Methodology

The TRB recommended a two-phase approach to the Aleutian Islands Risk Assessment: a Preliminary Risk Assessment (Phase A) followed by a Focused Risk Assessment (Phase B). Phase A involved the establishment of a management structure, made up of four groups: a Management Team, an Advisory Panel, a Risk Analysis Team, and a Peer Review Panel. The major work under Phase A included the development of a risk report analyzing the likelihood of spills based on vessel traffic through the Aleutians, then creating a risk matrix to analyze the potential consequences of vessel-source spills, and finally conducting a qualitative assessment and prioritization of risk reduction options. Phase A was complete in 2011.

Phase B will further evaluate and also implement the risk reduction options recommended during Phase A and will report on the implementation process and findings.

The Preliminary Risk Assessment (Phase A) was conducted through a series of technical studies, which were refined as the project progressed (Section 3 of this report describes each Study). Six studies, each with accompanying reports, were conducted:

- Semi-quantitative vessel traffic study
- Marine spill frequency and size study
- Baseline spill study
- Consequence analysis
- Accident Scenario and Causality Study
- Evaluation and Prioritization of Risk Reduction Options


"The Panel is focused on recommendations that can be implemented with little or no red tape."
Gary Folley, Management Team member -
Alaska Department of Environmental Conservation

2. Aleutian Islands Risk Assessment Organizational Structure

The TRB methodology for Phase A recommended a management structure consisting of four groups: a Management Team, an Advisory Panel, a Risk Analysis Team, and a Peer Review Panel. A fifth group, the Facilitation Team was also formed to coordinate the activities of the other four groups.

2.1 Management Team

The Management Team was comprised of those agencies responsible for allocating the funds for the risk assessment, as well as for ensuring the work is carried out in an effective and useful way. The Management Team members were the US Coast Guard, the State of Alaska Department of Environmental Conservation, and the National Fish and Wildlife Foundation, which was responsible for allocation of the project funding. The Management Team's first priority was to establish an Advisory Panel consisting of stakeholders and recognized experts with knowledge and expertise on all issues pertinent to maritime transportation risks in the Aleutian Islands region.

2.2 Advisory Panel

The Advisory Panel provided a structured stakeholder/participatory approach intended to build trust, clarify project values and goals, and incorporate local knowledge into the risk assessment. The Advisory Panel operates as an independent entity from the Management Team and managed their affairs using a charter and followed an established set of protocols. (Charter and Protocols online at http://www.aleutiansriskassessment.com/documents.htm).

Figure 5. The Management Team and Advisory Panel in Dutch Harbor.

The Advisory Panel consisted of stakeholders and authorities with local knowledge and expertise on issues pertinent to the assessment, such as local infrastructure, relevant industries, waterways and their navigation, weather, and habitats. The Advisory Panel included members and alternates representing the

following interests: fisheries, local government, mariners, environmental organizations, local non-governmental organizations, resource managers, and subsistence users. Advisory Panel members were selected to represent stakeholder interests, rather than specific organizations. For example, the Advisory Panel representative for fisheries was intended to represent fisheries interests at a broad and inclusive level rather than a specific fishery. Advisory Panel members were encouraged to reach out to other organizations and individuals within their stakeholder interest group.

Table 1 lists the Advisory Panel membership.

Table 1. Advisory Panel make-up.

Panel Member	Organization	Area of Expertise
Tom Gemmell	Marine Conservation Alliance	Fishing
Brent Paine*	United Catcher Boats Association	Fishing
Shirley Marquardt	Mayor of Unalaska (current)	Local government
David Arzt	Alaska Marine Pilots	Mariner, Pilot
Peter Garay*	Alaska Marine Pilots	Mariner, Pilot
Bob Umbdenstock	Resolve Marine Group	Mariner, Salvor
Mike Ruiz*	American Marine Corporation	Mariner, Salvor
Eugene Makarin	American President Lines, Ltd.	Mariner, Containerships
Simon Lisiecki	BP Shipping (retired)	Mariner, Innocent Passage
Mayak Mishra*	Fleet Management Limited	Mariner, Innocent Passage
Louis Audette	K Sea Transportation	Mariner in Local Trade, Oil Barges/Tankers
Mike Baker*	Aleut Enterprise, LLC	Mariner in Local Trade, Oil Barges/Tankers
Marc Smith	Hudson Marine Management	Mariner, Trampers
Ed Page	Marine Exchange of Alaska	Mariner, General
Tom Rueter*	Alaska Maritime Agencies	Mariner, General
Whit Sheard	Oceana	NGO - Environmental
Layla Hughes*	WWF	NGO – Environmental
Karol Kolehmainen	Aleutians West Coastal Resource Service Area	NGO – Local
Frank Kelty*	Aleutians West Coastal Resource Service Area	NGO – Local
Jeff Williams	Alaska Maritime Natural Wildlife Refuge	Resource Manager
Catherine Berg*	US Fish and Wildlife Service	Resource Manager
Reid Brewer	University of Alaska	Subsistence User
David Gregory*	Ounalashka Corporation	Subsistence User

* Indicates alternate

2.3 Risk Analysis Team

The Risk Analysis Team for the Phase A Preliminary Risk Assessment performed the risk analysis technical studies under the direction of the Management Team. The Risk Analysis Team was comprised of experienced marine traffic experts, spill modeling and risk assessment scientists from Environmental Resources Management (ERM)

and Det Norske Veritas (DNV), selected through a competitive bid process. The Risk Analysis Team authored all of the Technical Studies summarized in Section 3 of this report.

2.4 Technical Peer Review Panel

The Management Team, in consultation with the National Academy of Science, TRB, established the Technical Peer Review Panel. Collectively, Technical Peer Review Panel members have expertise in all aspects of marine risk assessment. Its role was to perform peer review of the approaches, methodologies, models, and algorithms used by the Risk Analysis Team to ensure that assumptions were based on the best available data, that uncertainties had been properly described, that analyses had the appropriate level of rigor for the level of assessment, that the work was of consistently high quality, and that findings were properly justified.

The Aleutian Islands Risk Assessment (AIRA) Technical Peer Review Panel consists of the seven members listed in Table 2.

Table 2. Peer Review Panel make-up.

Panel Member	Affiliation
Dr. CJ Beegle-Krause	President, Environmental Research for Decision, Inc.
Dr. Paul S. Fischbeck	Director, Center for the Study & Improvement of Regulation, Department of Social & Decision Sciences – Carnegie Mellon University
Dr. John D. Lee	Professor, Department of Industrial and Systems Engineering, College of Engineering, University of Wisconsin
Dr. Thomas M. Leschine	Director, University of Washington School of Marine Affairs
R. Keith Michel	Chairman of the Board, Herbert Engineering Corporation
Dr. Ali Mosleh	Professor of Mechanical Engineering, University of Maryland
Dr. Beverly Huey (TRB Staff)	Senior Program Officer, Transportation Research Board of the National Academies

2.5 Facilitation Team

The Facilitation Team supported the Management Team and had the key role of assembling, facilitating, and documenting Advisory Panel activities and project process. The Facilitation Team developed and maintained a website throughout the life of the project, summarizing the process and timeline and serving as a central repository for project reports and related documents (www.aleutiansriskassessment.com). The website was used along with e-mail lists and public notices to communicate the project status, meeting announcements, and opportunities for public comments or input. The Facilitation Team also created private, password-protected websites for use by the Management Team and Advisory Panel in sharing and reviewing draft documents and interim work products.

The Facilitation Team was comprised of project management, facilitation, and risk assessment professionals from Nuka Research and Planning Group, LLC and Pearson Consulting, LLC.

Emergencies such as the Golden Seas event again illustrate the crucial need for better response mechanisms, such as larger tugs in the Aleutian Island area."

Whit Sheard, Advisory Panel member/NGO Environmental

(Source: Towline.com, December 7, 2010)

3. Technical Studies

3.1 Overview

Phase A (Preliminary Assessment) of the Aleutian Islands Risk Assessment was conceived to include eight separate tasks. The Risk Assessment Team was responsible for conducting and reporting on these tasks, resulting in a set of six Technical Study reports (http://www.aleutiansriskassessment.com/documents.htm). This section summarizes the key findings from the six technical reports completed for Phase A:

- Semi-quantitative Traffic Study Report (DNV and ERM, 2010a)
- Marine Spill Frequency and Size Report (DNV and ERM, 2010b)
- Baseline Spill Study Report (DNV and ERM, 2010c)
- Consequence Analysis Report (DNV and ERM, 2011a)
- Accident Scenario and Causality Study Report (DNV and ERM, 2011b)
- Risk Reduction Options Evaluation Report (DNV and ERM, 2011c)

Phase A started with an analysis of the vessel traffic patterns in the Aleutians for both the present (2008/2009) and in the future year of 2034 (DNV and ERM, 2010a). Next, the Risk Analysis Team used modeling to predict the most likely accidents, spills, and spill sizes (DNV and ERM, 2010b), and then applied these predictions to develop six general spill scenarios (DNV and ERM, 2010). The next step was to analyze the potential consequences of various spill scenarios, which led the Risk Analysis Team to focus on 16 accident scenarios resulting in high spill risk, and the anticipated impacts of these scenarios on environmental and socio-economic resources (DNV and ERM, 2011a).

Figure 6. Vessel in the Aleutian Islands.

The 16 high risk spill scenarios were further analyzed to consider the causes of each incident (DNV and ERM, 2011b). Based on these identified causes, the final technical study under Phase A ranked each of the 16 scenarios based on their likelihood and consequences, and then considered potential

risk reduction options that related back to the causes of the spills (DNV and ERM, 2011c). The risk reduction options were evaluated based on cost, practicality, ease of implementation, and effectiveness for mitigating risks associated with the highest-ranking scenarios. Semi-qualitative approaches were used throughout, with a greater emphasis on modeling for the spill scenarios and a greater reliance on the Advisory Panel's professional judgment in ranking risks and weighing potential risk reduction options.

3.2 Semi-quantitative Traffic Study

The semi-quantitative traffic study included three elements: (1) summarization of vessel traffic patterns in the study area during the base year (2008/2009), including the types of vessels, frequency of transit, routes, and cargo; (2) prediction of anticipated changes in the vessel traffic patterns based on changes in trade, vessel characteristics, and regulations; and (3) forecast of changes in the fleet expected over a 25-year period (2009 – 2034). The final report, completed in September 2010, incorporates comments from the Management Team, Advisory Panel, and Peer Review Panel (DNV and ERM, 2010a).

The report established a baseline of vessel traffic in the study area based on Automated Information System (AIS) data from the Marine Exchange of Alaska (MXAK). MXAK data did not cover the entire study area, nor did it include the small commercial fishing vessels and barges that do not carry AIS onboard. However, it is believed that the areas for which there is no AIS data do not represent a significant portion of vessel activity. Where possible, the authors of the report collected data from shore-based facilities (ports, harbors, and ferry terminals) and the US Coast Guard's database of Vessel Response Plans to enhance MXAK data.

Analysis of the AIS data from MXAK showed that 2,219 vessels transited the study area from August 1, 2008 – July 31, 2009. Many of these were deep-draft vessels transiting through the area along the North Pacific Great Circle Route. Other vessel traffic was from domestic operations, including fishing vessels, tugs and barges, and government vessels. The AIS data was used to estimate main traffic routes for the study area (Figure 7).

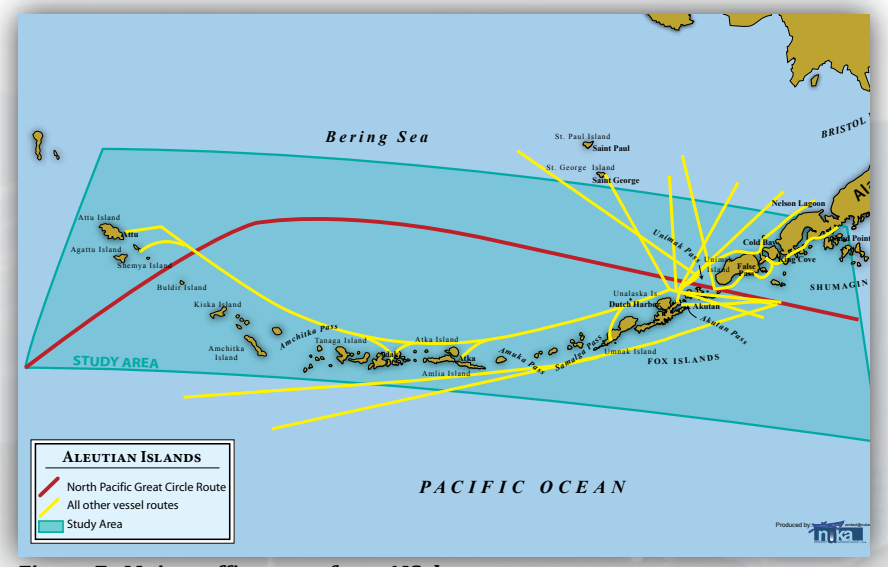


Figure 7. Main traffic routes from AIS data.

The North Pacific Great Circle Route is the primary route for vessels trading between ports on the Pacific coasts of the United States and Canada and the Pacific ports in East Asia. Common commodities transiting this route include commercial goods, machinery,

wood, coal, and agricultural products. Vessels operating in the study area are not expected to change significantly, with the exception of a continued increase in the use of double hulled oil tankers, as mandated by the Oil Pollution Act of 1990 and the 2006 Amendment to the Revised MARPOL Annex 1.

The study found that the following factors *are likely to* impact vessel traffic patterns in the Aleutian Islands over the next 25 years:

- **Transit of chemical carriers & container ships:** Chemical carriers and container ships are expected to transit the study area more than twice as often in the next 25 years due to the anticipated growth in trade between East Asia and North America. Increased trade from East Asia to North America will be driven by four main categories of goods: machinery (including vehicles), chemicals, mixed freight, and base metals. Chemicals and cereal grains are expected to represent the increase in goods traveling from North America to East Asia.
- **Barge delivery of diesel fuel and home heating oil:** Barge activity of this type is expected to increase as the population of the area grows. An increase in barge trips delivering oil to mining operations is possible, but the extent of this potential increase is unlikely to be significant. The increase in barge activity for this purpose will be even smaller if the Donlin Creek mine proceeds with its current plan to supply the operation with diesel via pipeline instead of barge shipments.

The study also considered the following factors for their potential to impact vessel traffic through the study area, but found these *unlikely to* impact vessel traffic patterns in the Aleutian Islands over the next 25 years:

- **Changes in vessel size:** As ships have generally reached their size potential relative to waterway and port depths, it is not expected that the size of ships transiting the study area will increase significantly over the next 25 years.
- **Vessel activity associated with fisheries:** Conservative management of the Aleutians' fisheries means that the number of fishing vessels is not likely to change significantly, though vessel types may be upgraded.
- **Shipping through Arctic regions due to ice melt:** Though shipping via the Northern Sea Route and the Northwest Passage is expected to increase significantly in the next 25 years as sea ice melts in the Arctic region, this is not expected to have a significant impact on vessel traffic in the study area. Instead, an increase in shipping through the Arctic region is expected to represent an increase in the movement of commodities between Russia and Europe (which does not require transiting the study area).
- **Vessel activity associated with oil and gas developments:** Based on a 2009 study commissioned by Shell Exploration and Production, the report concludes that while vessel activity associated with oil and gas activity may increase for short periods of time, it is unlikely to result in long-term changes in vessel types, frequency of transit, or cargo.

3.3 Marine Spill Frequency and Size Study

The second study completed by the Risk Analysis Team estimated the frequency of marine accidents and provided marine spill scenarios for both a baseline year (2008/2009) and future year (2034). The final report, completed in September 2010, incorporates comments from the Management Team, Advisory Panel, and Peer Review Panel. (DNV and ERM, 2010b)

The report used the Marine Accident Risk Calculation System (MARCS), which provides probabilities about spill frequency, size, location, and vessel type. These probabilities laid the groundwork for the development of baseline spill scenarios, and the Risk Analysis team applied the MARCS output to develop six example scenarios involving potential vessel accidents resulting in spills within the study area.

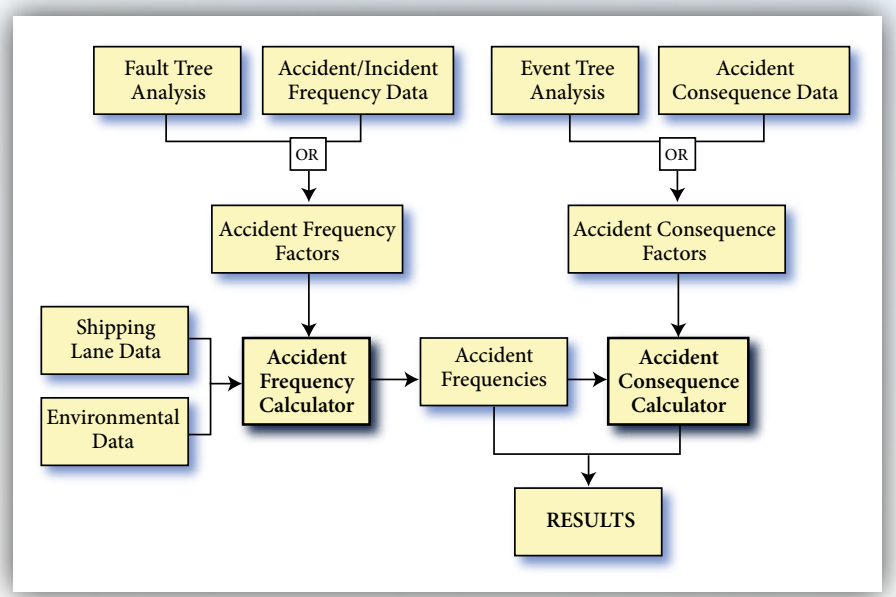


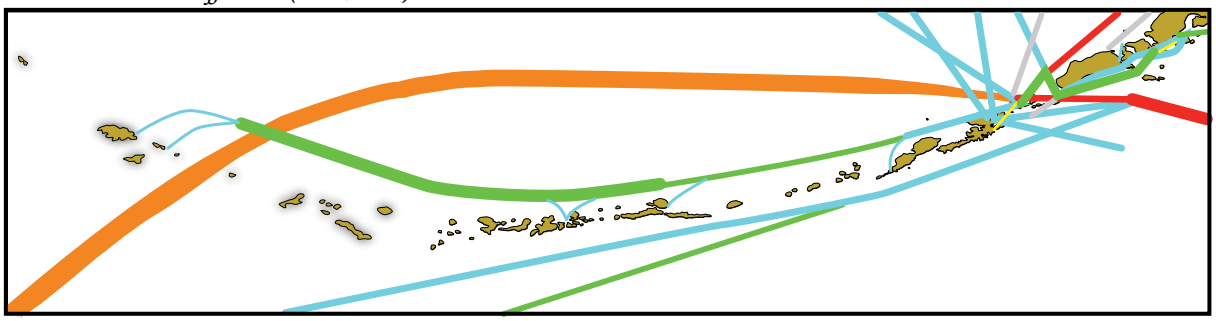
Figure 8. Inputs utilized by MARCS tool.

MARCS relies on data inputs from the following categories: vessel traffic, environment, on-board operations, and external operations (Figure 8). The predicted accidents and spills derived from MARCS modeling for the baseline year were generally similar to actual historical data as collected by the US Coast Guard, with the exclusion of the M/V Selendang Ayu spill in 2004. However, as the report notes, use of MARCS (or any other) modeling requires numerous assumptions and is subject to uncertainties.

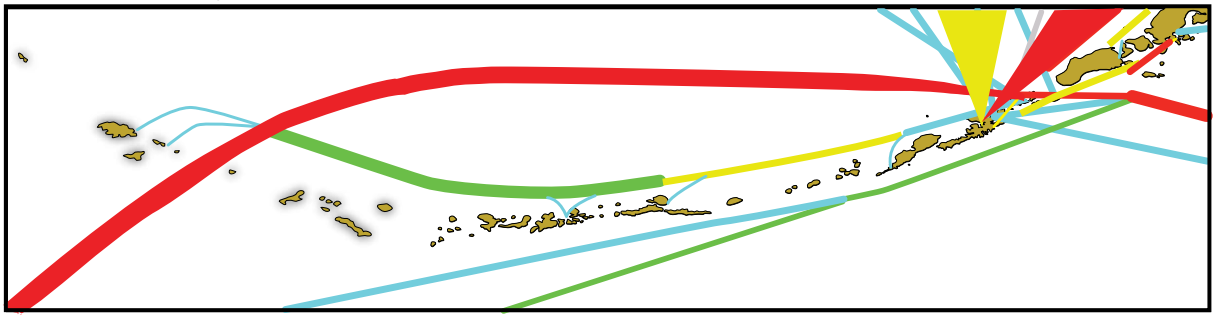
The MARCS model was used to develop vessel transit plots that display the traffic input data based on the frequency of all vessel transits per traffic lane. Figure 9 shows that during the base year (2008/2009) the heaviest amount of traffic (illustrated in red) occurred in Unimak Pass, the traffic lane to the Southeast of Unimak Pass, and the traffic lane to the Northwest from the Unalaska area. During the future year (2034) the heaviest amount of traffic (illustrated in red) is forecasted to occur along the Great Circle Route and the traffic lane to the Northwest from the Unalaska area.

Table 3 summarizes the predicted accidents for the 2008/2009 baseline year and future year of 2034. Overall, the number of accidents was predicted to increase by 11%, from 8.67 accidents per year in the baseline year to 9.61 in the future year. Groundings remain the primary type of accident, changing slightly from 96% in the baseline year to 91% in the future year. However, there was a significant change in the types of vessels associated with these accidents. Fishing vessels were the most common vessel type associated with predicted accidents in the baseline year (72%). By 2034, container ships

Base Year Vessel Traffic Plot (2008/2009)



FutureYear Vessel Traffic Plot (2034)



Key

Color	Transit Frequency (ship movements per day within each calculation location)
	0.0 to 0.1
	0.1 to 0.5
	0.5 to 1
	1 to 5
	5 to 10
	> 10

Figure 9. Vessel traffic plots.

are predicted to be the most common vessel type associated with predicted accidents (65%). This built on the prediction in the Vessel Traffic Study (DNV and ERM, 2010a), which estimated that container vessels are expected to transit the area with increasing frequency as trade between North America and East Asia grows.

Most accidents were predicted to take place in Unimak Pass, Akutan Pass, and the approach to Dutch Harbor. For this reason, these areas were also the most likely to experience a spill.

Overall, both bunker and cargo spills were predicted to increase slightly in the future, largely due to the increasing transit of container ships. However, the increase was expected to be limited by the fact that double-hulled vessels will become more prevalent by 2034, reducing the estimated spill size and outflow per accident.

Table 3. Comparison of predicted accidents and spill risk for base year and future year.

Accidents/Spill Risks	Predicted for Base Year: 2008/2009	Predicted for Future Year: 2034
Total predicted accidents	8.67	9.61
Groundings as % of total accidents (both drift and powered groundings)	96%	91%
Top vessel category associated with accidents	Fishing vessels (72%)	Container ships (65%)
% of accidents resulting in bunker spill	8	8
Total bunker spill risk per year	1,584 bbl (240 tons)	2,904 bbl (440 tons)
Types of vessel most likely to be associated with bunker spill	Container ships (48%)	Container ships (64%)
Types of accidents most likely to be associated with bunker spill	Drift grounding (42%)	Drift grounding (38%)
Total cargo spill risk per year	4,045 bbl (613 tons)	6,006 bbl (910 tons)
Types of vessel most likely to be associated with cargo spill	Tank barges (72%)	Tank barges (39%)
Types of accidents most likely to be associated with cargo spill	Powered grounding (45%)	Drift grounding (40%)

3.4 Baseline Spill Study

The baseline spill study characterizes six example spills resulting from vessel accidents in the Aleutians study area. The final report, completed in September 2010, incorporated comments from the Management Team, Advisory Panel, and Peer Review Panel (DNV and ERM, 2010c).

The six spill scenarios were initially described in the Spill Frequency and Size Study report (DNV and ERM, 2010b). The purpose of modeling potential spill scenarios and their impacts on shoreline and marine ecology was to understand and identify priority hazards.

The spill scenarios and impacts were modeled using the GEMSS® - Chemical and Oil Spill Impact Module (COSIM) models. COSIM used the results from MARCS, which predicted spill sizes and frequencies (Section 3.3). As with all models, numerous assumptions were used which added uncertainty to the outputs. Extensive inputs to COSIM were required, including the information obtained from the vessel traffic study (DNV and ERM, 2010a) and MARCS analysis (DNV and ERM, 2010b), as well as data on winds, currents, salinity, temperature, weather, bathymetry, shoreline and sediment characteristics, and biologically sensitive areas. To test the application of COSIM to the study area, an additional scenario of the actual M/V Selendang Ayu spill was completed and the results compared with observations and reports from the 2004 spill. The comparison was favorable. The spill scenarios were all run for seven days.

3.5 Consequence Analysis

In order to anticipate spill consequences, MARCS data generated during the Spill Frequency and Size Study (DNV and ERM, 2010b) were used to develop 16 scenarios

believed to represent the high risk spills, either in terms of their potential frequency, potential size, or a combination of the two. A Consequence Analysis report presents spill scenarios that were modeled based on locations and vessel types that were considered to pose the highest risk of a spill with the greatest possible consequences (DNV and ERM, 2011a). Scenarios at six locations were developed, all of which were located along the typical transit route for large vessels (Figure 10). Three locations (North Unimak Pass, Sanak Island, and Attu Island) were chosen because they represent areas where spills were most likely to occur, due to vessel traffic and conditions.

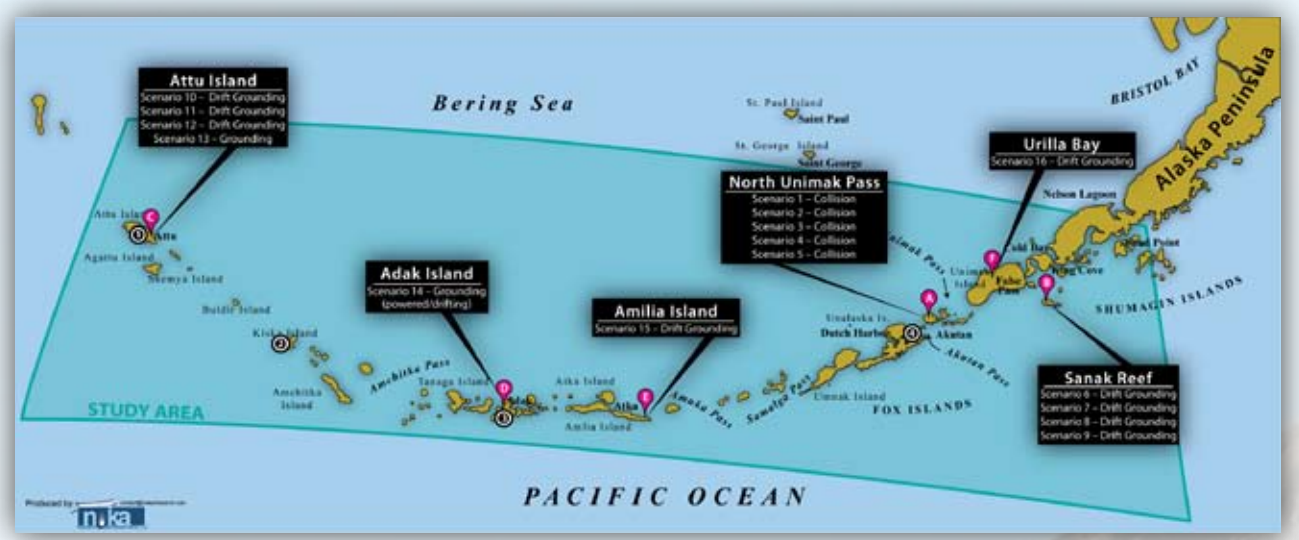


Figure 10. Scenario location map.

Three other locations (Adak Island, Amlia Island, and Urilia Bay) were chosen due to their proximity to environmentally sensitive areas or areas of economic importance – the worst areas for a spill in terms of potential environmental or socio-economic consequences. Multiple scenarios were run for North Unimak Pass, Sanak and Attu; one scenario each was run for Adak, Amlia, and Urilia. Table 4 summarizes all scenarios run for the six locations (16 scenarios total).

The heavily traveled North Pacific Great Circle Route, which intersects the Aleutian Islands study area, passes near critical environmental habitat as well as fisheries of significant economic importance. The consequence analysis report describes the following aspects of the study area: physical conditions, habitat, fish, seabirds, mammals, invasive species (rats), and socio-economic resources including commercial and recreational fisheries, subsistence resources, historic sites, recreation and tourism, and coastal development. There are multiple protected areas, including the Alaska Maritime National Wildlife Refuge, which covers 19,820 sq. km, or almost all of the Aleutian Islands area.

The likelihood of environmental and socioeconomic resources being impacted by the 16 spill scenarios was analyzed along with the nature and extent of the predicted impacts. The analysis focused on impacts related to the release of hydrocarbons or other

chemicals from vessel fuel or cargo, but also included a discussion of the potential for rat infestations and the associated impacts on seabird populations and plants.

Table 4. Summary of spill scenarios and includes resources most likely impacted.

Scenario	Location	Vessel Type & Incident	Volume & Type of Oil	Season	Resources Most Likely to be Impacted Significantly
1	North Unimak Pass	Container Ship Collision	3,050 bbl Bunker C	Summer	Shoreline Benthos Bird habitat Fish (including shellfish and larvae)
2	North Unimak Pass	Bulk Carrier Collision	18,244 bbl Bunker C	Summer	Shoreline Benthos Bird habitat Fish (including shellfish and larvae)
3	North Unimak Pass	Crude Oil Tanker Collision	428,080 bbl Crude oil	Summer	Shoreline Benthos Bird habitat Fish (including shellfish and larvae)
4	North Unimak Pass	Product Tanker Collision	26,754 bbl Diesel	Winter	Marine mammal habitat
5	North Unimak Pass	Tank Barge Collision	40,677 bbl Diesel	Summer	Fish (including shellfish and larvae)
6	Sanak Island	Container Ship Drift Grounding	3,050 bbl Bunker C	Summer	Marine mammal habitat
7	Sanak Island	Bulk Carrier Drift Grounding	18,244 bbl Bunker C	Summer	Marine mammal habitat
8	Sanak Island	Crude Oil Tanker Drift Grounding	428,080 bbl Crude Oil	Summer	Marine mammal habitat Shoreline Benthos Fish (including shellfish and larvae)
9	Sanak Island	Tank Barge Drift Grounding	40,677 bbl Diesel	Summer	Marine mammal habitat
10	Holtz Bay Attu Island	Container Ship Drift Grounding	25,420 bbl Bunker C	Winter	Marine mammal habitat Nesting birds (early spring – late summer only)
11	Holtz Bay Attu Island	Bulk Carrier Drift Grounding	18,244 bbl Bunker C	Summer	Marine mammal habitat Nesting birds (early spring – late summer only)
12	Holtz Bay Attu Island	Crude Oil Tanker Drift Grounding	428,080 bbl Crude Oil	Spring	Fish (including shellfish and larvae)
13	Holtz Bay Attu Island	Product Tanker Grounding	54,561 bbl Diesel	Spring	Marine mammal habitat Nesting birds (early spring – late summer only)
14	Adak Island	Tank Barge Grounding (powered/drifting)	40,677 bbl Diesel	Summer	Marine mammal habitat Nesting birds (early spring – late summer only)
15	Amlia Island	Container Ship Drift Grounding	40,677 bbl Bunker C	Summer	Marine mammal habitat Nesting birds (early spring – late summer only)
16	Urilia Bay	Bulk Carrier Drift Grounding	18,244 bbl Bunker C	Spring	Marine mammals

** It is unclear whether any VTS would provide coverage as far as Sanak Island.*

Table 5 identifies the resources most likely to be impacted by the 16 spill scenarios. Other impacts may occur, but the resources listed in the table are the ones identified by the Risk Analysis Team as being the most likely to suffer significant impacts.

Table 5. Description of RROs as recorded at the workshop (Risk Team summary).

RRO	Description of RRO as Recorded at the Workshop
Enhance Vessel Monitoring Program	
Satellite tracking plus AIS	Increase area coverage, increase number of vessels covered, implement an alarm system; integration of all monitors
Long-range ID and tracking (LRIT)	Enhance ability to identify and monitor vessel movements and communicate with vessels engaged in questionable situation and provide alarm notification to USCG and State and response vessels
Establish Vessel Tracking System (VTS) in Unimak and Akutan Passes	
Manned VTS/Direct Communication with Vessels	Meets IMO procedures and standards; new equipment, personnel, integration of systems
Traffic Separation Scheme in Unimak Pass	Voluntary; mark lanes on nautical chart to control traffic direction
Speed Restrictions	Dropped because low benefits, high unintended consequences, difficult to implement
Increase Rescue Tug Capability	
Dedicated rescue tug(s)	Open sea capability, always available
Non-dedicated rescue tug	Open sea capability, similar capability to dedicated tug but with cost-sharing, variable availability
Seasonal, dedicated tug	Open sea capability, similar capability to dedicated tug but only available seasonally (Oct 1 thru May 30)
Tugs of opportunity program	Tug regardless of size but available to respond; implement a program
Increase Emergency Towing System (ETS) Capabilities	
Expand shore-based ETS	There is an ETS system in Dutch Harbor; expanding system in Dutch Harbor to other locations (e.g., add one in Adak and one in location to be determined); provide greater coverage
Require emergency towing arrangements on deep draft vessels	For vessels not in innocent passage
Enhanced USCG Capabilities	
Enhance towing capabilities on cutters	See tug of opportunity
Increase number of cutters	Self-explanatory
Increase inspections	Not evaluated because there is no practical way to reduce risk further from the current inspection program
Split Captain of the Port (COTP) zones	Currently 3 zones - change or add Unalaska as COTP city to theoretically reduce response time; RRO is very high up in causal chain and within institutional organization/management, which is difficult to evaluate
Establish Restricted Areas	
Identify certain areas (to be defined) that should be avoided to reduce environmental or socioeconomic consequences/impacts	
IMO PSSA/ATB/SA	Measure does not reduce spill severity once it occurs but there is a benefit to reduce severity by preventing the accident from happening
Seasonal Routing	No formal mechanism for implementation; further consideration deferred
Increase Spill Response Capability	
Ocean-rated OSRO/PRAC - Open	No response capability except an Oil Spill Response Organization (OSRO) with only inland capability; this Ocean measure assumes Open Ocean

RRO	Description of RRO as Recorded at the Workshop
Near-shore rated OSRO/PRAC	See Ocean-rated OSRO/PRAC
Increase Salvage and Firefighting Capability via Regulations	New regulations go into effect in Feb 2011 for tank vessels; includes tugs, marine salvagers available, increase capability of lightering; ensure the regulations adequately address and are tailored for the Aleutian Islands. Salvage and marine firefighting regulations (subpart I) would apply
Local Community Response Agreements	Not considered further because part of the existing baseline; no delta in risk reduction effectiveness
Phase Out OPA90 Alternative Compliance	The OPA90 Alternative Compliance should NOT be phased out at this time; therefore, not an option.
Bolster Area Contingency Plans	
Establish requirements for vessels in innocent passage	Not likely to be implementable; therefore not evaluated further
Set area standards for vessels with VRP calling at US ports	Use local contingency plans to set standards; is a mechanism thus not evaluated further
Develop more geographic response strategies	Tail end of causal chain; enables a minimizing of impacts with prompt and proper response
Potential places of refuge planning	Already exists; baseline condition, no need to evaluate
Storm and severe weather rules	Stay the course; part of existing baseline condition; not evaluated further
High-Frequency radar surface current monitoring	Way of tracking oil and where it might go/trajectory; shore-based; assume transportable units set up as needed to monitor currents to help understand where spill might go; a tool in the toolbox; not enough information/knowledge of system to evaluate further
Require more training and drills	New Vessel Response Plan (VRP) regulations require additional training; part of baseline condition and not evaluated further at this time
Raise Liability Limits and Civil Penalties	
Increase liability and civil penalties	Cost of penalties is relatively low compared to response; but need limits within reason to obtain insurance; if raised too high insurance companies won't insure and may increase number of uninsured vessels; the General Accounting Office report states that OPA requires review of insurance
Increase State civil penalties	Intent to encourage better operations of vessel and vessel company

3.6 Accident Scenario and Causality Study

An Accident Scenario and Causality Study report provided additional information and analysis about the 16 scenarios developed in the Consequence Analysis Report, including identifying the potential causes of accidents such as those described in the scenarios (DNV and ERM, 2011b).

The Accident Scenario and Causality Study considered the Accident Fault Trees that underlie the MARCS model estimates of accident frequencies. In MARCS, the accident frequencies are calculated as the frequency of a critical situation, which is accident dependent, multiplied by the probability that an accident will occur given that the critical situation has occurred. Fault trees were developed for the Drift Grounding and Powered Grounding accident types, as shown in Figures 11 and 12.

The causality analysis found that, in general, the collisions (Scenarios 1-5) and powered grounding (Scenario 14) were attributed to human error, while the drift groundings

(Scenarios 6 - 13 and 15 – 16) were attributed to technical failures.

Further analysis of the scenarios as compared to historical data from 15 actual spills showed that the spill volumes used in the scenarios were likely over-estimated, which is consistent with the project's intent to examine high risk scenarios.

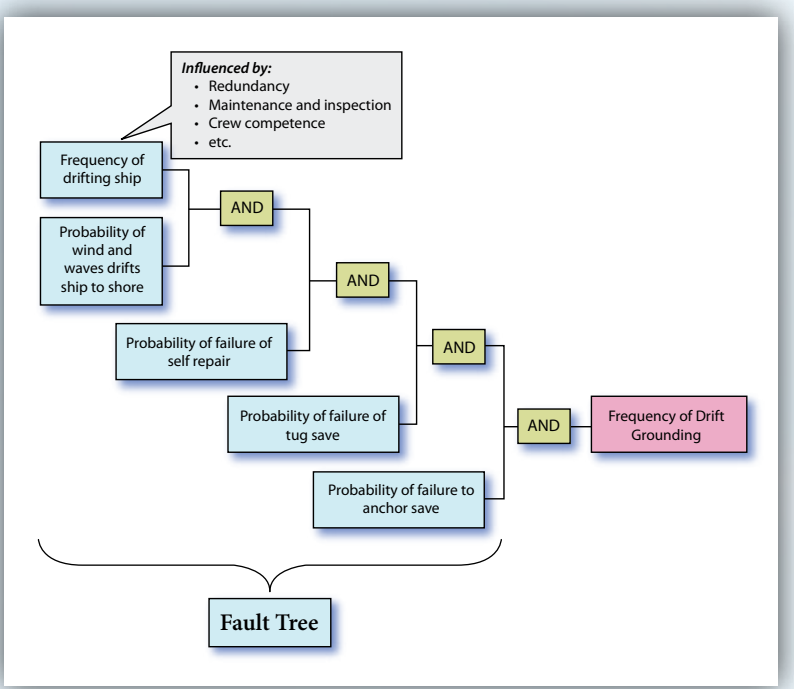


Figure 11. Fault tree for drift grounding accidents.

3.7 Risk Reduction Options Evaluation

The Risk Reduction Options Evaluation report summarized the outcomes of two workshops held in the fall of 2010, during which the Advisory Team, Management Team, Risk Analysis Team and Facilitation Team reviewed the worst case scenarios and their probable impacts developed during the previous technical studies during Phase A (DNV and ERM, 2011c).

The process used to evaluate risk reduction options as they related back to spill causes identified for the 16 worst case scenarios is summarized in Figure 13.

Seventeen potential risk reduction options were considered, each within the context of the 16 scenarios. Table 5 lists the Risk Reduction Options (RRO) considered as recorded at the workshop. An additional 13 RRO were considered but set aside during the workshop. These RROs are discussed in Section 6 of this report.

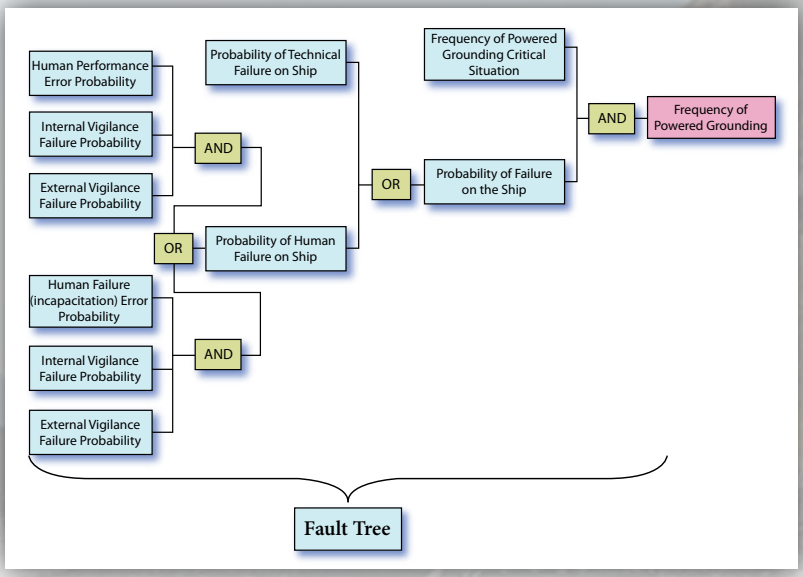


Figure 12. Fault tree for powered grounding accidents.

First, the scenarios were ranked according to their associated consequences (including the area impacted, probability of impact, and sensitivity of affected resources). The five scenarios that ranked the highest in terms

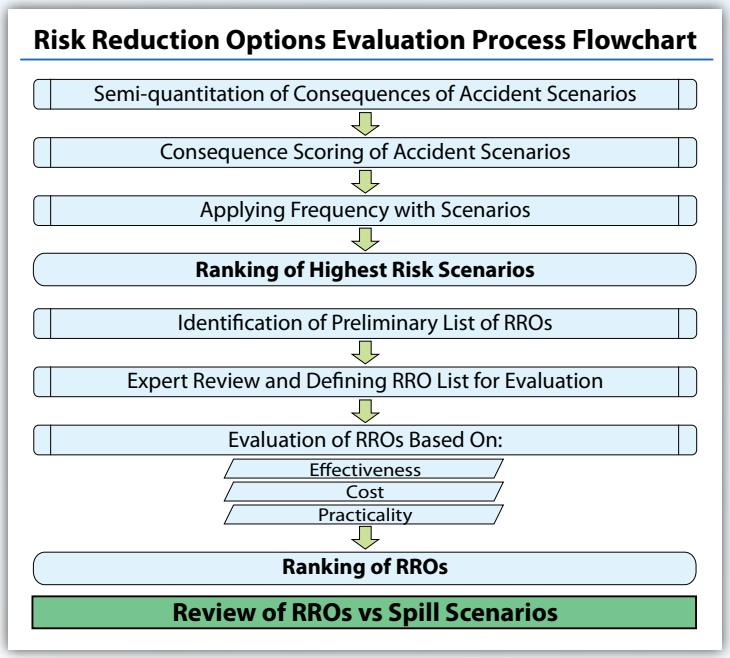


Figure 13. Risk Reduction Options evaluation process.

of their potential consequences were, in order: 2, 16, 3, 8, and 12 (Table 5). Next, the scenarios were ranked according to their estimated frequency, or likelihood of occurring anywhere in the study area. When frequency and consequence were combined, Scenarios 2, 8, and 16 were identified, through this semi-quantitative process, as posing the greatest risk.

Risk reduction options were evaluated based on the three main criteria of effectiveness, costs, and practicability. The factors considered in determining whether an RRO might be effective at reducing risk were:

- RRO might reduce the frequency of a specific accident type (e.g., a tug might prevent a drifting ship from grounding).
- RRO might reduce the frequency of several accident types (e.g., options aimed at improving crew competence should reduce most or all accident types).
- RRO might prevent a spill from occurring if an accident happens (e.g., double-hulled tank barges will prevent the spill of cargo in some accidents).
- RRO might reduce the severity of the consequence of a spill (e.g., by ensuring that ships are routed away from certain areas at certain times of the year to protect migratory species).

The factors considered regarding the cost of an RRO were:

- The capital cost of the RRO.
- The annual operating cost of the RRO.
- Who bears the capital and operating cost directly, and who ultimately pays the cost after cost recovery. Typical cost bearers are the shipping industry, one or more ports, the State of Alaska and/ or the federal government.

The factors considered regarding the practicability of an RRO were:

- Which party can implement the RRO? Some RROs can be implemented by local decision; others require international agreement. Typical implementers are similar to typical cost-bearers, namely the shipping industry, one or more ports, the State of Alaska, the federal government and/ or the IMO.
- How long will it take to implement the RRO (what is the lead time during which the system operates without the full risk-reducing benefit of the RRO)?
- How easy is it to implement or enforce the RRO?

The 9 risk reduction options were evaluated first for effectiveness for all 16 scenarios. The results are summarized in Table 6.

Table 6. Overview of risk reduction options and extent to which they reduce accident frequency and spill severity.

RRO	Extent to which Accident Frequency and Severity are reduced when the accident type is Collisions	Extent to which Accident Frequency and Severity are reduced when the accident type is Drift Groundings	Extent to which Accident Frequency and Severity are reduced when the accident type is Power Groundings
Satellite tracking + AIS	***Frequency***: No change ***Severity***: Moderate (responsible parties can identify accident location quickly)	***Frequency***: Strong (early identification of drifting ship) ***Severity***: Moderate (responsible parties can identify accident location quickly)	***Frequency***: Strong (early identification of drifting ship) ***Severity***: Moderate (responsible parties can identify accident location quickly)
Manned VTS/Direct Communications with Vessels	***Frequency***: Strong (external vigilance applied) ***Severity***: Moderate (responsible parties can identify accident location quickly)	***Frequency***: Weak (early identification of drifting ship) ***Severity***: Moderate (responsible parties can identify accident location quickly)*	***Frequency***: Strong (early identification of drifting ship) ***Severity***: Moderate (responsible parties can identify accident location quickly)
Traffic Separation Scheme in Unimak Pass	***Frequency***: Strong (traffic separated) ***Severity***: No change	***Frequency***: No change ***Severity***: No change	***Frequency***: No change ***Severity***: No change
Dedicated rescue tug(s)	***Frequency***: No change ***Severity***: Moderate (prompt response by tug)	***Frequency***: Strong (tug can take control of drifting ship) ***Severity***: Moderate (prompt response by tug)	***Frequency***: No change ***Severity***: Weak
Non-dedicated rescue tug	***Frequency***: No change ***Severity***: No change (tug is assumed to be absent in summer)	***Frequency***: Strong (tug can take control of drifting ship) ***Severity***: Moderate (prompt response by tug)	***Frequency***: No change ***Severity***: Weak
Seasonal, dedicated tug	***Frequency***: No change ***Severity***: No change (tug is assumed to be absent in summer)	***Frequency***: No change ***Severity***: No change (tug is assumed to be absent in summer)	***Frequency***: No change ***Severity***: Weak
Tugs of opportunity program	***Frequency***: No change ***Severity***: Weak (due to prompt response by tug; though less effective than dedicated tug)	***Frequency***: Weak (partial coverage) ***Severity***: Weak (due to prompt response by tug; though less effective than dedicated tug)	***Frequency***: No change ***Severity***: Weak
Expand shore-based ETS (one exists in Dutch Harbor already)	***Frequency***: No change ***Severity***: Moderate (can take control of ship that starts to drift due to collision)	***Frequency***: Moderate (can take control of ship that starts to drift due to collision) ***Severity***: Weak (can take control of ship that starts to drift due to collision)	***Frequency***: No change ***Severity***: Weak
Require emergency towing arrangements on deep draft vessels	***Frequency***: No change ***Severity***: Moderate (can take control of ship that starts to drift due to collision)	***Frequency***: Strong (can take control of drifting ship; appropriate tow package) ***Severity***: Weak (can take control of ship that starts to drift due to collision)	***Frequency***: No change ***Severity***: Weak
Enhance towing cap on cutters	***Frequency***: No change ***Severity***: Weak (can take control of ship that starts to drift due to collision)	***Frequency***: Weak (enhanced availability of tow-equipped vessels) ***Severity***: Weak (can take control of ship that starts to drift due to collision)	***Frequency***: No change ***Severity***: Weak
Increase number of cutters	***Frequency***: No change ***Severity***: Weak (can take control of ship that starts to drift due to collision)	***Frequency***: Weak (enhanced availability of tow-equipped vessels) ***Severity***: Weak (can take control of ship that starts to drift due to collision)	***Frequency***: No change ***Severity***: Weak
IMO PSSA and associated measures (e.g., ATBA)	***Frequency***: No change ***Severity***: Moderate (route vessels away from sensitive areas)	***Frequency***: Moderate (route vessels away from shore) ***Severity***: Moderate (route vessels away from sensitive areas)	***Frequency***: Moderate (route vessels away from shore) ***Severity***: Moderate (route vessels away from sensitive areas)

RRO	Extent to which Accident Frequency and Severity are reduced when the accident type is Collisions	Extent to which Accident Frequency and Severity are reduced when the accident type is Drift Groundings	Extent to which Accident Frequency and Severity are reduced when the accident type is Power Groundings
Ocean rated OSRO/PRAC – Open Ocean	***Frequency***: No change ***Severity***: Weak (open-ocean response capability)	***Frequency***: No change ***Severity***: No change	***Frequency***: No change ***Severity***: No change
Near shore rated OSRO/PRAC	***Frequency***: No change ***Severity***: Moderate (near-shore response capability)	***Frequency***: No change ***Severity***: Moderate (near-shore response capability)	***Frequency***: No change ***Severity***: Moderate (near-shore response capability)
Increase salvage and firefighting cap through regs	***Frequency***: No change ***Severity***: Strong (state-of-the-art response capability)	***Frequency***: Weak ***Severity***: Strong (state-of-the-art response capability)	***Frequency***: No change ***Severity***: Strong (state-of-the-art response capability)
Develop more geographic response strategies	***Frequency***: No change ***Severity***: Weak (some enhancement of response capability)	***Frequency***: No change ***Severity***: Weak (some enhancement of response capability)	***Frequency***: No change ***Severity***: Weak (some enhancement of response capability)
Increase State civil penalties	***Frequency***: Weak (potential for extra vigilance among crew/vessel owners) ***Severity***: No change	***Frequency***: Weak (potential for extra vigilance among crew/vessel owners) ***Severity***: No change	***Frequency***: Weak (potential for extra vigilance among crew/vessel owners) ***Severity***: No change

The nine risk reduction options targeting Scenarios 2, 8 and 16 were evaluated during the second of the two fall 2010 workshops. Table 7 shows the risk reduction options that ranked highest in one or more categories.

Table 7. Risk reduction options that ranked highest in one or more categories.

Risk Reduction Options	Most Effective	Least Cost	Most Practical	Most Cost Effective	Cheapest & Easiest
Satellite Tracking & AIS (1a)	X		X	X	
Increased state civil penalties (9b)		X	X		X
Traffic separation scheme in Unimak Pass (2b)		X			
Tugs of opportunity program (3d)			X		
Expand shore-based ETS			X		

None of the risk reduction measures under consideration ranked highest across all categories. Taking into consideration the best professional judgment shared at the workshop, the following risk reduction measures were identified as being the most effective at reducing risk for the following worst-case scenarios:

- **Scenarios 1-5 (collisions):** Frequency was reduced by the manned Vessel Traffic System (VTS)/direct communications with vessels and the traffic separation scheme in Unimak Pass. Severity was reduced most by increasing salvage and firefighting capabilities through regulations.
- **Scenarios 6-13, 15, and 16 (drift groundings):** Frequency was reduced by satellite tracking and AIS; dedicated rescue tugs; non-dedicated rescue tug; seasonal, dedicated tug; and requiring emergency towing arrangements on

deep draft vessels. Again, severity was reduced most by increasing salvage and firefighting capabilities through regulations.

- **Scenario 14 (powered grounding):** Frequency was reduced by satellite tracking and AIS and the manned VTS/direct communications with vessels. Again, severity was reduced most by increasing salvage and firefighting capabilities through regulations.

Risks from the highest ranking scenarios, 2 and 16, were most effectively mitigated by: enhancing the vessel monitoring program, establishing VTS in Unimak and Akutan Pass, increasing rescue tug capability, and increasing spill response capability.

Based on the analysis of Risk Reduction Options (RRO) completed during the 2010 workshop, the Advisory Panel has developed recommendations that characterize all RROs considered into three broad categories:

- RRO Recommended for Immediate Implementation
- RRO Recommended for Phase B Study
- RRO Considered but set aside

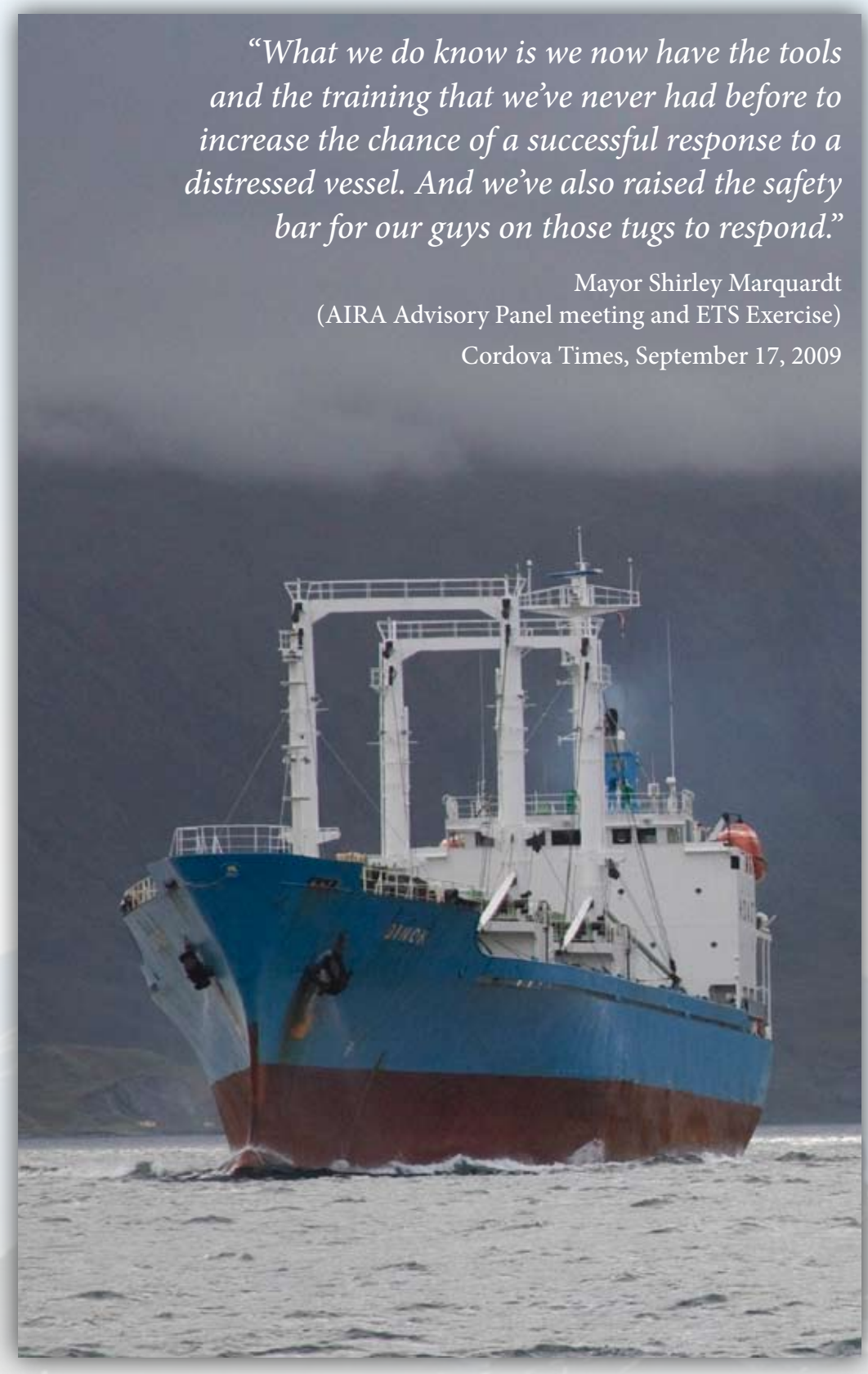
In formulating these recommendations, the Advisory Panel focused on two key principles:

- Prevention measures take priority over response measures.
- All measures should be realistic and practical.

Sections 4, 5, and 6 of this report present the RRO recommendations from the Advisory Panel.

"What we do know is we now have the tools and the training that we've never had before to increase the chance of a successful response to a distressed vessel. And we've also raised the safety bar for our guys on those tugs to respond."

Mayor Shirley Marquardt
(AIRA Advisory Panel meeting and ETS Exercise)
Cordova Times, September 17, 2009



Recommended Options

4. Risk Reduction Options Recommended for Immediate or Future Implementation

The recommendations of risk reduction measures represent a consensus of the Advisory Panel and are presented to the decision makers in the U.S. Coast Guard, State of Alaska, and local governments. The decision as to which measures will be adopted ultimately rests with the decision makers.

Several of the Risk Reduction Options (RRO) considered were found to be sufficiently effective and practicable to warrant immediate implementation. These RROs include:

- Develop an Enhanced Vessel Monitoring and Reporting Program
- Enhance towing capabilities on U. S. Coast Guard cutters and increase cutter presence in the Aleutians
- Stage additional Emergency Towing Systems in the Aleutians
- Initiate the process to establish IMO Particularly Sensitive Sea Areas
- Strengthen the Aleutians Subarea Contingency Plan
- Increase Salvage and Spill Response Capability in the Aleutians

Several of the Risk Reduction Options (RRO) considered were found to show promise but to require additional work or study prior to full implementation. In some cases, the recommendations include immediate implementation of some elements, with further study required for others. These RROs include:

- Increase Rescue Tug Capability in the Aleutians
- Increase Salvage and Spill Response Capability in the Aleutians
- Determine the boundaries of the Particularly Sensitive Sea Area (PSSA) and develop recommendations for associated protective measures
- Strengthen the Aleutians Subarea Contingency Plan

The recommendations are presented here as they were developed by the Advisory Panel. Additional background on each RRO is included in Appendix A.

4.1 Enhanced Vessel Monitoring and Reporting Program

The Aleutian Islands Risk Assessment Advisory Panel recommended that a robust vessel monitoring program be established for the Aleutians Subarea.

The Panel envisioned a program whereby any vessel operating in the area would be monitored by an automated system with alarms in place to report any anomalies in the behavior of the vessel, given a set of assumptions for each vessel type. The system operator would review anomalies flagged by the software, and if appropriate the situation would be reported to US Coast Guard for consideration.

Enhanced vessel monitoring and reporting would have three primary objectives:

- Detect anomalous vessel activity (i.e. identify vessels that are adrift) so a timely and effective response can be undertaken
- Immediately locate vessels that may be able to render assistance such as, tugs, fish processing vessels, etc.

- Validate vessels compliance with Reduced Risk Vessel Routing measures, safety fairways and Areas To Be Avoided (ATBA)

The Advisory Panel anticipated that an enhanced vessel monitoring program would directly reduce the risk of drift groundings by increasing situational awareness for vessel operators and the appropriate agents and agencies. This program would also indirectly reduce the risks of collisions and power grounding by gathering data on vessel movements that can be analyzed in future risk assessments.

The Advisory Panel determined that this risk reduction option is practical, technologically feasible, readily available, and should be implemented without further delay. Identifying the appropriate funding sources for additional build out of the AIS receivers in the Aleutian Island region is a priority.

Implementation options included the addition of AIS receivers at key locations, to expand coverage of the region. Two AIS receivers are scheduled to be added during 2011, at locations in Nikolski (low elevation) and Atka Island. Several other locations were identified by the Advisory Panel as critical to expanding AIS coverage: Unimak Island at Scotch Cap; Shemya, Adak mountaintop (abandoned White Alice site); Akutan mountaintop; and Nikolski mountaintop (abandoned White Alice site).

Other vessel tracking technologies were also identified as having the potential to supplement available information and enhance vessel monitoring and reporting. The Long Range Identification and Tracking (LRIT) System, which operates off secure satellite networks rather than over non-secure VHF radio (as does AIS), may have some limited applicability, although LRIT data is more difficult to access and more limited in detail with position reports sent every six hours. Voluntary vessel monitoring systems, where vessels are equipped with satellite transponders outside of AIS coverage areas, may also provide additional vessel monitoring capability. The Advisory Panel also noted

that maritime insurance clauses covering vessels transiting Unimak Pass specify that the vessels carry navigational equipment that may also be utilized to enhance vessel monitoring.

4.2 Enhance Towing Capabilities on US Coast Guard Cutters and Increase Cutter Presence in the Aleutians

The Aleutian Islands Risk Assessment Advisory Panel recommended increased US Coast Guard (USCG) patrol coverage and emergency towing capability in the Aleutian Island region. USCG vessels often reach the scene of a disabled vessel ahead of rescue tugs, and are the first line of defense against a grounding or oil spill. They recommended that the USCG take two key actions:

- Replace the Acushnet (decommissioned in 2011) with a vessel that has towing capability and maximize cutter patrol time in the Bering Sea/Aleutian Island region. Consider a vessel similar in capability to an ATF 166 Powhatan class tug with a 75- ton bollard pull.
- Evaluate the current towing packages onboard all cutters operating in Alaska and upgrade to best available Emergency Towing System technology such as lightweight floating lines. (Available at http://dec.alaska.gov/spar/perp/aiets/home.htm)

The Advisory Panel determined that increasing the USCG presence in the region is practical, technologically feasible, readily available, and should be implemented without further delay. They concluded that maintaining and improving US Coast Guard towing capabilities in the Bering Sea is imperative for mitigating the risks of drift groundings.

4.3 Stage Additional Emergency Towing Systems in the Aleutians

Not every vessel transiting in or through the Aleutian Island region is required by regulations to have onboard emergency towing equipment or deployment procedures and training for crew. Recognizing these deficiencies, the Aleutian Islands Risk Assessment Advisory Panel recommended that the US Coast Guard, State of Alaska, local governments, and the maritime industry procure and stage one or more additional Emergency Towing Systems (ETS) at suitable locations in the Aleutians. The ETS is a relatively inexpensive risk reduction option and the existing systems have proven, through deployment, to be a successful measure for preventing drift groundings. The Panel and Team also recommended that training and exercises with the ETS be continued on at least an annual basis.

This risk reduction measure would reduce the risks of drift groundings. The Advisory Panel determined that this risk reduction option is practical, technologically feasible, readily available, and should be implemented without further delay.

4.4 Increase Rescue Tug Capability in the Aleutians

Increased rescue tug capability was identified as an obvious option to reduce the number of drift groundings in the Aleutian Islands, based on several recent incidents in the region. The Aleutian Islands Risk Assessment Advisory Panel recommended that additional rescue tug capability be developed for the Aleutians. Further analysis is necessary to determine:

- What management/funding model would most likely be successful in establishing and maintaining a rescue tug capability?
- What capability is required of the rescue tug?
- Where should the rescue tug(s) be stationed?

A rescue tug can reduce risks of drift groundings by preventing the ship from drifting into shoal waters. The Advisory Panel recommended that the maritime industry, US Coast Guard, the State of Alaska, and local governments work together to find a way to develop and deploy rescue tug capability in the Aleutians.

Five options were considered for increasing rescue tug capability:

1. **Dedicated Tug(s):** A vessel with open water capability, stationed at a fixed point until it is summoned for use (100% available for rescue).
2. **Non-Dedicated Tug(s):** A vessel with open water and similar capabilities to the dedicated tug that can be engaged in other activities in addition to emergency response. The vessel may be financially supported by other activities with expected variable availability.
3. **Seasonal Dedicated Tug(s):** A vessel with open water capability, stationed at a fixed point but only available seasonally (October 1-June 1).

4. **Tug/Vessel of Opportunity Program:** A tug or vessel transiting or located in the study area, regardless of size, that's available to assist during an emergency.
5. **Combination** of the four above or stepped approaches.

Each of these options should be considered in further studies recommended for Phase B of the project. This recommendation complements the recommendation to Increase Salvage and Response Capability in the Aleutians, and the Panel recognized that there may be one solution to both recommendations.

They suggested that Phase B studies should include at a minimum:

Management/Funding Study – This study will consider management and funding schemes to operate a rescue tug program for the Aleutians.

Tug Capability Study – This study will determine the desirable and suitable capabilities of a rescue tug for the Aleutians. The study should define the range of tug specifications (size, bollard pull, horsepower, propulsion) suitable for the weather conditions and vessels transiting the Great Circle Route (DNV and ERM, 2010a). It should illustrate the options for suitable tugs by posing three alternatives of vessel specification that would meet a range of rescue capabilities. Capital and operating costs estimates should be provided for each of these options. The study should also describe the current capabilities (year-round and seasonal) that exist in the study area.

Tug Location Study – This study will consider the site options for rescue tug(s), including vessel transit routes, response time, and alternative rescue resources.

4.5 Increase Salvage and Spill Response Capability in the Aleutians

The Advisory Panel recognized the need to increase salvage and spill response capability in the Aleutians. They recommended that the US Coast Guard immediately publish the Nontank Vessel Response Plan (NTVRP) rule (Docket No. USCG-2008-1070) that has been under development since Congress passed the Coast Guard and Maritime Transportation Act of 2004. This rule would require vessel response plans for nontank vessels calling in US ports. This nontank vessel rule, in combination with the tank vessel rule already in place, would place the burden of providing sufficient salvage, firefighting, and response capabilities on all vessels passing through the Aleutians that call on US ports. (Note that vessels engaged in innocent passage – foreign flagged-vessels not calling on US ports or transferring or lightering oil in US waters – are exempted from VRP requirements). The requirement to comply with these rules would provide the necessary incentives for vessel owners/operators to fund increased salvage and spill response capabilities in the Aleutians.

Determining exactly what salvage and spill response capabilities would be necessary and appropriate for the extreme operating environment in the Aleutians requires further study during Phase B of this project. Currently, there are no significant on-water oil spill response resources in the Aleutian Subarea. Federal law requires both tank and nontank vessels calling in US ports, to have contracts with an oil spill removal organization to provide substantial salvage and response resources in the nearshore, offshore, and open ocean operating areas. Yet, the Advisory Panel recognized that the ocean environment in the Aleutian Islands, northern Gulf of Alaska, and Bering Sea present tremendous challenges to oil spill response, and may render existing spill cleanup technologies insufficient most of the time. The Panel recommended that investing in an extensive regulatory driven capability that will not be effective is imprudent. However, increasing response capabilities in the nearshore area, which can reasonably be expected to be effective to remove oil and protect sensitive areas should be pursued.

The Advisory Panel recommended conducting a gap analysis that considers two components:

Capability Gap Analysis – Identify any gap in the existing capabilities in the Subarea Plan and the capabilities required for salvage (including emergency towing) and oil spill response for the largest vessels transiting the subarea in innocent passage.

Response Gap Analysis – Identify the percentage of time that an oil spill response system would be precluded from operations due to environmental conditions, such as wind, sea state, visibility, currents, or ice. A response gap analysis should be conducted for both nearshore and open ocean operating areas.

The results of these analyses should be used to determine the appropriate prevention and response resources necessary for the Aleutian Subarea.

This recommendation will reduce the risks of impacts from all vessel casualty types by increasing the capability to respond to future incidents. Based on these analyses, to be completed in Phase B, a recommendation can be developed regarding the most effective response resources for the extreme operating conditions found in the Aleutians.

4.6 Establish IMO Particularly Sensitive Sea Areas and Associated Protective Measures

The Aleutian Islands and surrounding waters clearly meet the criteria established by the International Maritime Organization (IMO) for designation as a Particularly Sensitive Sea Area (PSSA), in that the Aleutians are ecologically sensitive and vulnerable to impacts from international shipping. Therefore, the Aleutian Islands Risk Assessment Advisory Panel recommended that the US Government petition the IMO Marine and

Environmental Protection Committee to designate the Aleutian Island region, or a portion therein, as a PSSA. A collaborative effort should be undertaken to delineate the boundaries of the PSSA and the associated protective measures concurrent with this international effort to establish the PSSA designation. At a minimum the following protective measures should be considered:

- areas to be avoided (ATBA)
- ship routing
- ship reporting
- recommended tracks for vessels in innocent passage, and
- a traffic separation scheme in Unimak Pass.

The effort to determine the boundaries of the PSSA and establish the associated protective measures should begin with the US Coast Guard, State of Alaska, and members of the Advisory Panel working with the IMO Subcommittee on Safety of Navigation during Phase B of this project.

This risk reduction measure would reduce the risks of drift groundings, power groundings, and collisions; and could lessen the impacts of any spills that do occur.

4.7 Strengthen Aleutians Subarea Contingency Plan

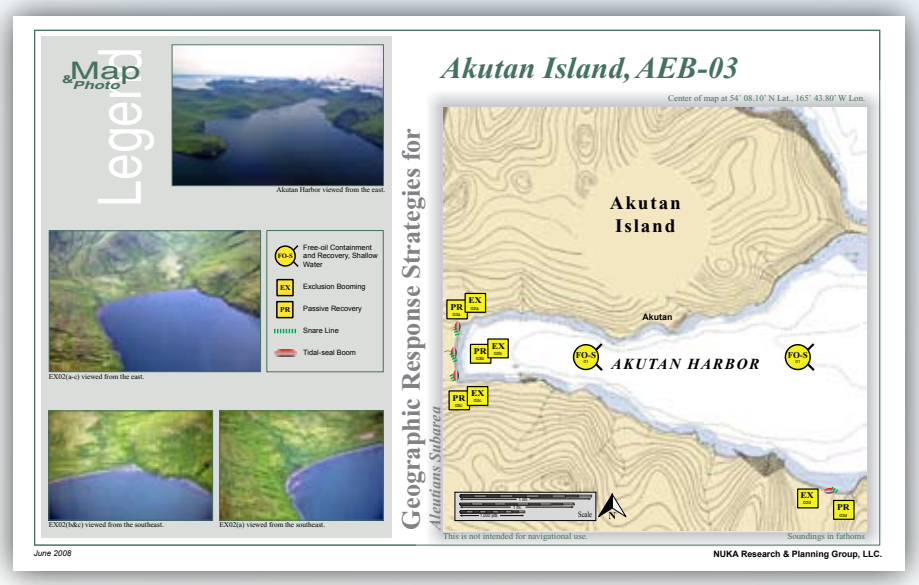
The Aleutian Islands Risk Assessment Advisory Panel recommended that the Aleutians Subarea Committee strengthen the Aleutians Subarea Contingency Plan for Oil and Hazardous Substance Releases (Subarea Plan) to ensure that it is adequate to remove a worst case discharge and to mitigate or prevent a substantial threat of such a discharge from vessels transiting the Aleutian Islands, particularly vessels in innocent passage. The Panel and Team further recommended that the US Coast Guard ensure that vessels transiting the Aleutians Subarea that are required to have an approved Vessel Response Plan have sufficient resources to implement the protection measures specified in the Subarea Plan.

Specific recommendations include:

1. Revise the Subarea Plan to emphasize prevention measures and systems. The current version of the plan is focused on response and does not contain enough planning for measures to prevent the threat of a discharge.
2. The gap analysis recommended in the Increase Salvage and Spill Response Capability in the Aleutians section above will provide the information necessary to determine the appropriate salvage and response resources that should be available in the Aleutian

Subarea for use under both the Subarea Plan and Vessel Response Plans. These resources should be listed in the Subarea Plan.

3. Develop additional Geographic Response Strategies for high priority sites. Geographic Response Strategies (GRS) are site-specific plans to protect high priority sites and have the potential to mitigate damages after a vessel casualty that results in a spill. While some GRS are listed in the current subarea plan, additional GRS should be developed throughout the Aleutians. The Subarea Plan should specify the minimum amount of response equipment necessary to implement GRS likely to be deployed during a worse case discharge.



4. Conduct additional planning for Potential Places of Refuge (PPOR). PPOR planning identifies potential places where a vessel may be moved to either prevent a casualty or minimize damage after a casualty. While some PPOR planning has been done and is listed within the current Subarea plan, additional PPOR planning (such as pre-positioned mooring buoys) should be developed.

5. Once the Subarea Plan has been modified to incorporate these recommendations, the US Coast Guard should ensure that vessels that are required to have Vessel Response Plans to maintain sufficient capability to implement the protection measures described in the Subarea Plan.

Although tasked to plan and respond to a worst case discharge, the Aleutian Subarea Committee is not funded or staffed adequately to do so, plus the equipment caches owned by the federal and state responders are inadequate to respond to a worst case discharge. The Advisory Panel recommended that funding for these measures should come from the Oil Spill Liability Trust Fund to support planning and preventive measures associated with strengthening the Aleutians Subarea Plan.

These recommendations are congruent with existing law and will reduce the risks from all vessel casualty types by increasing prevention and response capabilities in the Aleutians Subarea. The gap analysis should be conducted as part of Phase B of this project. The other recommendations require no further study and should be implemented without further delay. The Subarea Committee should address these recommendations and submit budget requests to pursue implementation.

5. Risk Reduction Options Considered but Not Recommended for Implementation

During the September and October 2010, and March 2011 Aleutian Islands Risk Assessment meetings, the Advisory Panel discussed and evaluated twenty-seven risk reduction options. Of these risk reduction options, thirteen were recommended for immediate or future implementations (Section 4), and fourteen were considered and set aside. Table 8 summarizes the rationale for setting aside these RROs at this point.

Table 8. Consensus Decision and Discussion for RRO considered but not recommended for implementation.

RRO	Discussion & Consensus Decision
Speed Restrictions	The Advisory Panel determined that this risk reduction option would be difficult to implement and enforce considering the amount and various types of vessels transiting through the region. The Panel concluded there was a low benefit and would result in a high-unintended consequence if pursued.
Seasonal Routing	The Advisory Panel concluded that there is no formal mechanism for implementing seasonal routing throughout the study area and further consideration was deferred.
Increase Coast Guard Vessel Inspections	The Coast Guard currently has a vessel inspection program that has been implemented in Alaska and the United States. The Advisory Panel decided not to evaluate this risk reduction option because there is no practical way to reduce risk further based on the current inspection program.
Split Western Alaska Captain-of-the-Port (COTP) Zone	Currently three COTP zones exist in Alaska. The three zones are: Southeast Alaska, Western Alaska and Prince William Sound. The Captain of the Port and their representatives enforce, within their respective areas, port safety and security and marine environmental protection regulations. The Western COTP zone is the largest of the three and includes Cook Inlet, Kodiak, Aleutian Islands, Bristol Bay, the Northwest Arctic and North Slope. There are three Marine Safety Detachment offices within the Western Alaska COTP zone which are located in Kenai, Kodiak and Unalaska. The Advisory Panel discussed the need to create an additional COTP within the Western Alaska zone, thus reducing the area of responsibility for one Captain. It was suggested to change and/or add Unalaska as a COTP city with the intent of decreasing or reducing the response times currently stipulated in the federal Marine Firefighting, Salvage and Emergency Lightering rules. The Advisory Panel concluded that this risk reduction option was very high on the causal chain within the institutional organization/management (USCG) and would be difficult to implement or evaluate.
State of Alaska Local Response Agreements	The Community Spill Response Program administered by the ADEC Prevention and Emergency Response Program began in the early 1990s. The state recognized the importance of local involvement and has worked with communities to provide coordinated and effective responses, and to expand the network of resources available to protect human health and the environment from the risks associated with oil and hazardous substance spills. The Advisory Panel did not consider this risk reduction option primarily because it is an existing program. They encourage local communities without Community Response Agreements to contact the ADEC and work towards establishing agreements with the goal of expanding local capabilities and increasing response coordination.

RRO	Discussion & Consensus Decision
Phase out OPA 90 Alternate Compliance	This risk reduction option was added during the September meeting based on public input. Oil spill prevention programs, contingency planning and preparedness have undergone significant enhancements and changes since the passage of the Oil Pollution Act of 1990 (OPA 90). Due to these changes, the Alaska Petroleum Distributors and Transporters, an ad-hoc group of non-persistent Alaska fuel barge operators have worked with the state and federal regulatory agencies to implement prevention measures and achieve a level of spill prevention and response agreeable to all parties. This agreement is referred to as an "alternate compliance agreement" and was originally established in 1998 after a series of workshops. The agreement was modified in 2002. An Alaska non-persistent tank barge operator may voluntarily elect to subscribe to the alternate compliance agreement as opposed to meeting full compliance with OPA 90 in Alaska. The Advisory Panel concluded that the alternate compliance agreement should not be eliminated due to the unintended consequences placed on commercial operators. Eliminating this option would result in a decrease of operators and a significant increase in the cost of fuel distributed in rural Alaska because of the cost of full compliance with OPA 90.
Establish Requirements for Vessels in Innocent Passage	The Advisory Panel was keen on the concept of establishing requirements for vessels transiting through the Aleutian Island region on innocent passage but after numerous discussions concluded that because of the international maritime rules governing the right of innocent passage it would be difficult to promulgate rules acceptable to the IMO.
Set Area Standards for Vessels with Vessel Response Plans calling at US Ports	The Advisory Panel recommended that rather than attempting to set area standards for vessels required to have a federal vessel response plan, examine the use of local or area contingency plan as a means of establishing standards.
Increase Training and Drills	Training and drills are required under OPA90 and state law and will be expanded and required under the salvage and firefighting rules. Part of the baseline for every new requirement or regulation is a training requirement and component for compliance. Therefore, the Advisory Panel did not consider examining this risk reduction measure further.
Storm and Severe Weather rules	Since the mid-1990s the City of Unalaska, Alaska Marine Pilots, U.S. Coast Guard and local maritime industry have negotiated and established storm and weather rules for the Port of Dutch Harbor. These rules are reviewed annually and adjusted accordingly based on incidents or observations. The Advisory Panel concluded that the existing process is working well and no further evaluation of this risk reduction option was necessary.
High-Frequency (HF) Radar Surface Monitoring Currents	This risk reduction option was added during the September meeting at the recommendation of an Advisory Panel member. Ocean researchers use this technology to measure surface current velocity fields near the coastline. A HF radar system can measure surface currents averaged over 15 minutes as far offshore as 50 miles. The Advisory Panel concluded that HF radar is not a risk reduction measure but a tool that could be used during or after a spill to track and map oil transported by nearshore currents. HF radar is certainly a tool in the oil spill response kit but not considered by the Panel to be a risk reduction option.
Increase Federal Liability and Civil Penalties	The Advisory Panel concluded that the cost of penalties is relatively low compared to the cost of response. The liability limits need to be reasonable in order for operators to obtain insurance. If limits are too high then insurance companies won't insure and this may increase the number of uninsured vessels. The Government Accounting Office GAO report states that OPA requires review of the insurance limits every three years but has not been done since 1990. Essentially, the federal government needs to comply with OPA 90 by reviewing insurance limits every three years and implementing the necessary adjustments.

RRO	Discussion & Consensus Decision
Manned Vessel Tracking System	Due to the volume of traffic passing through Unimak and Akutan Pass there was initial interest from some of the Aleutian Island Risk Assessment Advisory Panel members to consider establishing a manned Vessel Tracking Service (VTS). Based on subsequent discussions, the Advisory Panel recommends reserving this risk reduction option from further consideration for the following reasons: • Under current federal law, the USCG is the only entity authorized to establish a VTS. The VTS would need to meet IMO procedures and standards. • An in-depth study would be required to determine whether the USCG VTS is the best choice over an expanded and upgraded Automatic Identification System (AIS) or a Vessel Traffic Monitoring System (VTMS). • Regulatory changes would be needed to establish the control zone and to mandate who must participate, possibly involving submittal to the International Maritime Organization for review, approval and adoption. • The cost to purchase VTS equipment and increase the number of personnel to implement a VTS in Dutch Harbor would be substantially higher than the USCG's other twelve VTSs. • Establishing and maintaining radar and communications equipment in a remote and hostile environment will not be easy or inexpensive. All mountaintop access is by helicopter only. • There is little technical support in Dutch Harbor for such an enterprise and it would have to be developed. • There is currently no public notice by the USCG to establish a formal, manned VTS for Unimak Pass.
Evaluate and Determine Whether to Increase State Civil Penalties	The original intent of the state civil penalty scheme and law focused on the oil industry and not the entire maritime industry transiting through Alaska waters. Alaska's civil penalties approach is based upon the following premise and intent: • All oil discharges will cause environmental and natural resource harm • For that portion of the damage which is readily identifiable and quantifiable, existing legal remedies provide an adequate means of recovery • A substantial portion of the damage caused by oil pollution cannot be determined with certainty • The public should be compensated for those damages which are not readily identifiable and quantifiable • The scheme is intended to pre-determine the loss from oil pollution which is not readily identifiable and/or quantifiable, through the use of civil penalties based on objective criteria of the characteristics of the oil and the sensitivity of the receiving environment • Provide a meaningful incentive to safe operations by setting out the consequences of the unlawful act in advance in an effort to prevent the discharge of oil before it occurs • It is intended to both compensate the public for damages and to provide an incentive for safe operations. During the March 2011 meeting, the Advisory Panel reached the conclusion that increasing state civil penalties was not a risk reduction option and agreed to set this option aside as a recommendation.

"There is no silver lining once oil hits the water. Loss of human life, damage to resources, and oil spill cleanup costs all underscore the importance of preventing spills in the first place."

Ed Page, Advisory Panel member/General-Mariner
(March 2011 AP meeting)

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Acronyms & Abbreviations

7. Acronyms and Abbreviations

AAC	Alaska Administrative Code
ACP	Area Contingency Plan
ADEC	Alaska Department of Environmental Conservation
AIRA	Aleutian Islands Risk Assessment
AIS	Automated Information System
AMNWR	Arctic Maritime National Wildlife Refuge
AMSA	Arctic Marine Shipping Assessment
APL	American President Lines
ARRT	Alaska Regional Response Team
ATBA	Area to be avoided
AVTEC	Alaska's Institute of Technology
AWCRSA	Aleutians West Coastal Resources Service Area
C/C	Cargo carrier
CFR	Code of Federal Regulations
CMP	Coastal Management Plan
COSIM	Chemical oil spill impact model
COTP	Captain of the Port
DNV	Det Norske Veritas
DWT	Deadweight ton
ERM	Environmental Resources Management
ETS	Emergency Towing System
FEMA	Federal Emergency Management Agency
FM	Frequency modulation
GRS	Geographic response strategy
HF	High frequency
IMO	International Maritime Organization
LA	Louisiana
LLC	Limited Liability Company

LRIT	Long-range identification and tracking system
MARCS	Marine accident risk calculation system
MARPOL	International Convention for the Prevention of Pollution from Ships
MKD	Miniature keyboard display
M/V	Motorized vessel
MXAK	Marine Exchange of Alaska
NCP	National Contingency Plan
NFWF	National Fish and Wildlife Foundation
NGO	Non-governmental organization
NTV	Non-tank vessel
NTVRP	Non-tank vessel response plan
ODPCP	Oil Discharge Prevention and Contingency Plan
OPA	Oil Pollution Act
OSRO	Oil spill removal organization
PPOR	Potential places of refuge
PRAC	Primary response action contractor
PSSA	Particularly Sensitive Sea Area
PWS	Prince William Sound
RRO	Risk reduction option
SCP	Subarea Contingency Plan
SEAL	Sea, air, and land special forces
SOPEP	Shipboard Oil Pollution Emergency Plan
TRB	Transportation Research Board
UK	United Kingdom
US	United States
USCG	United States Coast Guard
USS	United States Ship
VHF	Very high frequency
VMS	Vessel monitoring system
VRP	Vessel response plan
VTS	Vessel Traffic System
WWF	World Wildlife Fund

Appendices

8. Appendices

Appendix A. Background on Risk Reduction Options

This section provides background information about the RROs discussed in Sections 4, 5, and 6 of this report.

A.1 Enhanced Vessel Monitoring and Reporting

The RRO for enhanced vessel monitoring and reporting was recommended for immediate implementation, as summarized in Section 4.1.

Robust vessel monitoring and reporting is a high national priority for the U.S. Coast Guard and Department of Homeland Security. Vessel tracking is a vital component of the U.S. Coast Guard's national plan to increase maritime domain awareness, and the development of National Automatic Identification System (NAIS) is a key initiative to enable the Coast Guard to identify, track, and communicate with marine vessels using the Automatic Identification System (AIS). The genesis of the NAIS mission need comes from the Maritime Transportation Security Act, which directs the Coast Guard to implement a system to collect, integrate, and analyze information concerning vessels operating on or bound for waters subject to the jurisdiction of the United States. The Coast Guards latest projection for building NAIS in Alaska is 2018. Other Coast Guard initiatives proposed and subsequently eliminated for Alaska is Rescue 21, an advanced command, control, and direction finding communication system.

Automatic Identification System (AIS)

On December 31, 2004 the International Maritime Organization (IMO) required that all ships above 300 gross tons engaged on International voyages and cargo ships of 500 gross tonnage and upwards not engaged on international voyages and all passenger ships irrespective of size to be equipped with Automatic Identification System (AIS) equipment. This technology is akin to aircraft transponders and comprised of a VHF/FM based transponder that transmits the vessels GPS acquired position to other vessels and to terrestrial receiving stations where they exist. The regulation requires a ship's name, position, course, speed, destination and other data, based on the nature of the cargo and the voyage, be transmitted continuously in real time. This allows all vessels within the range of the transponder to see the progress and course of other AIS equipped vessels to aid collision avoidance. The information can be displayed onboard on a minimum keyboard display (MKD) or a vessel's navigation plotter. Each AIS equipped vessel in the area is displayed as a character on the screen along with the other information noted above. Currently the Marine Exchange of Alaska has a contract to provide U.S. Coast Guard AIS capability in Alaska.

The AIS shore receiver network operated by the Marine Exchange of Alaska receives vessel data transmitted by nearby vessels (up to 200 miles away) and disseminates it to authorized users. The US Coast Guard and State of Alaska have access to the AIS information through contract with the Marine Exchange as does the maritime industry.

The Marine Exchange of Alaska has installed and operates most AIS receivers in Alaska. The Marine Exchange currently has six AIS receivers along the Aleutian chain from Unimak Island to Adak.

- Adak – two receivers
- Unalaska – two receivers
- Akutan – two receivers

It is unlikely that the entire study area can be covered by AIS in the near future, but additional sites are needed to increase the current coverage. The following locations are considered critical to the success of the system and could be in operation within a year if funding is secured:

- Nikolski low elevation – scheduled for 2011,
- Atka Island – scheduled for 2011,
- Unimak Island at Scotch Cap,
- Shemya,
- Adak mountaintop (an abandoned White Alice site),
- Attu Island,
- Akutan mountaintop and
- Nikolski mountaintop (also an abandoned White Alice site).

Long Range Identification and Tracking System (LRIT)

In addition to IMO requiring the tracking of vessels via AIS, in 2007 IMO implemented the Long Range Identification and Tracking System initiative intended to provide port and coastal states information on vessels operating in or near their coasts in light of emerging security concerns. Unlike AIS which broadcasts across unsecured channels substantial amounts of information on a vessel several times a minute via VHF communications, LRIT is a satellite based system that simply sends a vessel's serial number and location 4 times a day over a secure network. The information may be acquired by authorized coastal and flag states for a fee. As a 20 knot vessel would cover 120 nautical miles between position reports (6 hours polling interval), LRIT does not provide the granularity of data needed to address safety and environmental concerns. LRIT information is not available to the general public and would be inappropriate for a search and rescue vessel tracking option.

Voluntary Vessel Monitoring

In addition to LRIT, many vessels are tracked by other satellite systems to aid safety and efficiency as per company policy (Alaska Marine Highway System, Alaska Marine Lines, Northland Services, etc.) or to satisfy fishing regulations, i.e. VMS (Vessel Monitoring System). The types of satellite transponders and their polling/reporting rates vary from

every 30 minutes to a few times a day. In most cases vessels automatically send reports every three hours with the operating cost of such systems averaging $1-$3 dollars a day with the equipment ranging from $500 to $2,500. In addition to AIS, the Marine Exchange of Alaska also installs and disseminates satellite transponders and its vessel tracking system receives and processes satellite position reports along with AIS reports. Thus vessels, such as the Alaska Marine Highway System ferries, operating outside the range of AIS receiving sites are still tracked when also equipped with a satellite transponder.

Maritime Insurance Clause associated with Vessel Tracking in the Bering Sea

In addition to international and federal vessel monitoring and tracking requirements, insurers for maritime commerce worldwide, such as Lloyds of London, have specific requirements for vessels passing through Unimak Pass. The Bering Sea Transit Clause (b) of their standards reads:

> "Notwithstanding anything contained in this insurance to the contrary, it is hereby agreed that when on through voyage to or from the Far East, the insured vessel may navigate the Bering Sea provided that:
>
> > The vessel has onboard the appropriate Hydrographic Charts corrected up to date Entry is made through the Unimak Pass and exit west of Buldir Island or vice versa and The vessel is equipped and properly fitted with marine radar, a satellite navigator, a sonic depth sounding apparatus, radio direction finder and gyro compass, all fully operational and manned by qualified personnel. (Alternatively the vessel may enter or leave through the Amchitka, Amukta or Attu passes, but only when equipped and properly fitted with marine radar, a satellite navigator, sonic depth sounding apparatus, radio direction finder, gyro compass and a weather facsimile recorder, all fully operational and manned by qualified personnel).
>
> Insurance hereunder permits the insured vessel to use the Bering Sea, entering through Unimak Pass and leaving west of Buldir Island or vice versa, on through voyages to the Far East, provided the vessel is equipped with the marine radar and GPS and also sonic depth sounding apparatus and GMDSS/radio direction finder."

A.2 Increase USCG Presence in the Bering Sea and Aleutian Islands

The RRO for increased USCG presence and towing capability was recommended for immediate implementation, as summarized in Section 4.2.

USCG vessels have rendered assistance by arresting the drift or providing emergency towing to numerous fishing vessels and freighters in the ?Bering Sea and Pacific Ocean. USCG vessels often reach the scene of a disabled vessel ahead of rescue tugs, and are the first line of defense against a grounding or oil spill. USCG vessels operating in Alaska waters include buoy tenders, patrol boats, medium and high endurance cutters, and ice breakers.

There are only two USCG cutters home ported in Alaska, the Alex Haley and the Munro, both stationed in Kodiak. These cutters primarily perform law enforcement and

search and rescue in the Bering Sea/Aleutians region. The recently decommissioned cutter Acushnet was home ported in Ketchikan, but is not scheduled to be replaced. USCG cutters from other Pacific homeports also patrol Alaska waters.

Each USCG cutter has towing capability, equipment and a trained crew. The cutters carry a hawser, messenger line, and line-throwing gun. The crews train for towing at least twice per year and when on patrol respond to vessels in distress, including towing situations. Refresher training is conducted with the US Navy every two years.

The important presence and towing capability of Coast Guard vessels has proven to be valuable during incidents by arresting the drift of a vessel until larger commercial assets can reach the scene. In 2004, the Alex Haley performed a 41-hour tow of a 593-foot, 46,000-ton bulk freighter; and while in service the USS Edenton towed the 58,000-ton battleship USS Wisconsin. During the Selendang Ayu incident the Alex Haley attempted a tow but the messenger line parted. Later the tug Sidney Foss arrived on-scene and the Alex Haley was stood down while the Sidney Foss (3,000 horsepower) prepared a tow; the Sidney Foss' towline eventually parted. The Alex Haley remained on scene to provide assistance (http://www.ntsb.gov/publictn/2006/MAB0601.htm). (Marine Accident Brief, 12/8/2004).

On February 8, 2011 the USCG cutter Morgenthau (home ported in California but on temporary assignment in Alaska) attempted to establish a tow with the 58-foot fishing vessel F/V Terrigail near Unalaska Island, but establishing the tow failed because the tow line became tangled in the Morgenthau's propeller. This incident points to the need to evaluate the towing systems onboard the cutters operating in the region to ensure that the best available technology is utilized. The new Emergency Towing Systems (http://dec.alaska.gov/spar/perp/aiets/home.htm) (ADEC, 2008) utilize lightweight floating lines that are less likely to become entangled in propellers.

Maintaining and improving US Coast Guard towing capabilities in the Bering Sea is imperative for mitigating the risks of drift groundings.

A.3 Stage Additional Emergency Towing Systems in Alaska

The RRO for additional emergency towing systems was recommended for immediate implementation, as summarized in Section 4.3.

A proposed mitigation measure to reduce risk is to enhance the shore-based Emergency Towing System project initially implemented by the City of Unalaska and Alaska Department of Environmental Conservation. Following the near grounding of the M/V Salica Frigo on March 9, 2007, the Mayor of Unalaska convened a Disabled Vessel Workgroup to address the possibility of future groundings and to discuss local emergency response solutions. This initial meeting led to the formation of the ETS workgroup, whose goal was to develop emergency towing capabilities for disabled vessels in the Aleutian Subarea using locally available tugboats in conjunction with ETS equipment stationed in Unalaska (ADEC, 2008). Based on the Aleutian Subarea vessel traffic, the ETS workgroup implemented two ETS in order to serve a wider range of vessels. The City of Unalaska purchased a system suitable for vessels up to 50,000

DWT and the ADEC purchased a system capable of towing vessels greater than 50,000 DWT; both systems are stored in Unalaska. The ETS consists of a lightweight towline, a messenger line to assist in deploying the towline, a line-launcher, a lighted buoy, and chaffing gear. These components may be configured to deploy to a disabled ship from the stern of a tugboat or airdropped to the ship's deck via helicopter.

Since 2007, the project continues to expand and annual exercises/training have been held in Unalaska. An ETS manual was updated in 2008 and the ADEC has purchased and stored a 10-inch (> 50,000 DWT) ETS at the USCG Air Station Kodiak. In 2010, ADEC received additional funds, which will allow them to purchase two more 10-inch ETS packages. Tentative plans are to stage one system at USCG Air Station Sitka and the other at US Navy Supervisor of Salvage warehouse at Fort Richardson, Alaska for deployment to a potential vessel in distress.

A.4 Increase Rescue Tug Capability in the Aleutians

The RRO for enhanced rescue tug capability was recommended for addition study as part of Phase B of the Aleutian Islands Risk Assessment, as summarized in Section 4.4.

In 2004, there were four resident tugs in the study area, all located at Dutch Harbor (Nuka Research & Planning Group and Cape International, Inc, 2006). These four tugs had limited horsepower and sea-keeping ability to potentially respond as a rescue/assist tug for a ship in distress. Additionally, there are about 200 voyages through the region each year by tugs in trade and these transient tugs range from 1,200 to 7,000 horsepower (Nuka Research & Planning Group and Cape International, Inc., 2006). Tugs in trade typically have a barge in tow, which hampers their ability to respond to calls for emergency assistance. There has not been a study conducted that specifically examines tug capabilities and operational/response expectations based on weather conditions typically experienced in the Bering Sea and Gulf of Alaska. Recognizing this limitation, additional information is needed to determine what type of program could or should be implemented for the Aleutian Island region.

Securing funding for a Rescue Tug is expected to be the greatest challenge. Some associated issues that should be considered are:

Requiring funding by shippers through vessel response plan regulations or alternative compliance to those regulations. The Neah Bay rescue tug in the State of Washington is paid for by the Washington State Maritime Cooperative (Washington State Maritime Cooperative, 1995) and was driven by contingency plan regulations.

The Merchant Marine Act of 1920, Section 27, referred to as the Jones Act, deals with cabotage (coastal shipping), and requires that all shipments (including salvage) between US ports be carried in US flagged ships, built in, owned by and crewed by US citizens. Therefore, vessels being considered for use must be compliant with this act. This may reduce the number of available vessels for consideration.

Salvage Laws. Maritime law distinguishes between contract salvage and true salvage. A vessel contractually obligated to respond cannot expect a salvage award other than as

specified under the payment terms agreed in advance (contract salvage). Traditionally, a vessel that voluntarily responds and succeeds in removing another vessel from "maritime peril" (true salvage) can expect remuneration for those services. Depending on the risk involved, the successful volunteer may realize an award equal to a significant percentage of the residual value of the rescued vessel, its bunker, and its cargo. This was given as one of the reasons the captain of the M/V Selendang Ayu delayed allowing rescue operations until it was too late.

In the USA, OPA 90 requires that every vessel's response plan include provisions to activate the services of a tug if needed or so directed by the Federal On-Scene Coordinator (USCG). The UK system includes a statutory requirement that the casualty vessel accept and pay for services from a dedicated tug kept in position by public funding and called out by the government overseer. Wherever transiting vessels pay an annual or per trip fee to keep a dedicated tug on standby contract, that tug cannot respond on commercial terms other than those incorporated in the agreement.

A.5 Increase Salvage and Spill Response Capabilities in the Aleutians

The RRO for increased salvage and spill response capabilities was recommended for additional study as part of Phase B of the Aleutian Islands Risk Assessment, with immediate implementation of the final rule for non-tank vessel contingency plans, as summarized in Section 4.5.

The amount and type of salvage and oil spill response equipment required in the region is under the jurisdiction of two agencies, the USCG and ADEC. In State waters, which extend three miles from shore, ADEC requires tank vessels, tank barges, and nontank vessels to have an approved oil discharge prevention and contingency plan (Cplan) that meets state planning standards for discharge removal (18 AAC 75.400). In State and Federal waters tank vessels (includes barges) and nontank vessels must have an approved vessel response plan (VRP) (33 CFR Part 155). Vessels in innocent passage do not require a vessel response plan, but will likely have a Shipboard Oil Pollution Emergency Plan (SOPEP). The Area Contingency Plan covers spill response for vessels in innocent passage.

It is not known how many vessels are required to carry these plans, but with the exception of the vessels carrying only SOPEP plans, each vessel must have access to equipment and personnel necessary to execute the Cplan and/or VRP for their vessel. In general terms this means contracting with a State Primary Response action Contractor (PRAC) or a Federal Oil Spill Removal Organization (OSRO) to meet the oil spill planning standards for the vessel (USCG, 2008). OSROs are approved for specific operating environments: River/Canal, Inland, Offshore, Nearshore, and Great Lakes based on their response capability. Planning standards differ between vessels and state/federal regulations, but generally the planholder must be able to stop the discharge, lighter unspilled oil from damaged tanks, observe and monitor the oil slick, contain and skim the oil from the water, and prevent oil from reaching wildlife and sensitive areas. The biggest response planning standards that apply to vessels trading in the Aleutians

are for oil tankers carrying persistent oil (1 trip per month with a maximum of 26.8 million gallons cargo) but the planning standards for tank barges (5 trips per month with a maximum of 6.3 million gallons cargo) and large container ships (160 trips per month with a maximum of 2.2 million gallons of fuel) are also substantial (DNV and ERM, 2010a).

The actual oil spill response capability in the Aleutians is a small fraction of the spill response capability in other areas with similar vessel traffic. For example, there is not a single dedicated spill response vessel in the entire subarea nor is there an OSRO that is classified to respond in the Open Ocean, Offshore, or Nearshore operating environments. Outside of ports and harbors, there is no resident oil spill response capability in the Aleutians to respond to the 185 transits per month reported from the Vessel Traffic Study. The reasons for this apparent inequity in response capability are not clear but mostly seem to be due to exceptions being granted to the regulatory requirements through the alternative planning criteria process.

Recently the USCG implemented new Salvage and Marine Firefighting requirements for tank vessels that are required to carry VRP (33 CFR Part 155.4030). Similar requirements will be extended to nontank vessels when the nontank Vessel Response Plan rule is published. These regulations establish specific planning requirements for vessels operating within fifty miles of the nearest COTP city. Vessels operating in the Aleutians would not have to meet the timeframes published in these requirements because the entire Aleutian subarea is more than fifty miles from Anchorage, Alaska, which is the COTP for this area.

Another consideration is the response gap in the Aleutians. A response gap is the percentage of time that the environmental conditions (wind, sea state, visibility, currents, etc.) exceed the limitation of the response system. No response gap analysis has been conducted for the Aleutians but experience has shown that there are substantial periods of time when a marine spill response would not be possible no matter what the oil spill response capability.

A.6 Establish IMO Particularly Sensitive Areas and Associated Protection Measures

The RRO for establishment of IMO particularly sensitive areas was recommended for additional study as part of Phase B of the Aleutian Islands Risk Assessment, as summarized in Section 4.6.

A PSSA is an area that is afforded special protection through action by the International Maritime Organization (IMO) because of its significance for recognized ecological, socio-economic, or scientific attributes where such attributes may be vulnerable to damage by international shipping activities. Although a separate and distinct process from PSSA's is a Ports Access Route Study [1], which the Coast Guard uses to designate fairways and traffic separation schemes to provide safe access routes for vessels proceeding to and from ports. In 1985, the Coast Guard conducted a Ports Access Route

1 Ports and Waterway Safety Act, 33 U.S.C. 1223

Study for Unimak Pass and on December 2, 1986, a safety fairway was established.[2] A PSSA includes one or more associated protective measure appropriate to the particular circumstances of the area. These protective measures can include Areas to Be Avoided: an area within defined limits in which either navigation is particularly hazardous or it is exceptionally important to avoid casualties and which should be avoided by all ships, or by certain classes of ships. Other potential protective measures are ship routing systems, ship reporting systems, or vessel traffic schemes.

An application for PSSA designation should contain a proposal for an associated protective measure or measures aimed at preventing, reducing or eliminating the threat or identified vulnerability. IMO guidelines provide advice to IMO Member Governments in the formulation and submission of applications for the designation of PSSAs to ensure that in the process, all interests - those of the coastal State, flag State, and the environmental and shipping communities - are thoroughly considered on the basis of relevant scientific, technical, economic, and environmental information regarding the area at risk of damage from international shipping activities. The guidelines update resolution A.927 (22) Guidelines for the Designation of Special Areas under MARPOL 73/78 and Guidelines for the Identification and Designation of Particularly Sensitive Sea Areas.

Two PSSAs have been established in the United States—the Northwestern Hawaiian Islands Marine National Monument and the Florida Keys. The IMO has adopted certain areas to be avoided (ATBA) and mandatory Ship Reporting System for the Northern Hawaiian Islands PSSA. Likewise, the Florida Keys' PSSA includes Areas to be Avoided and established three non-anchoring areas within the 3,000 square nautical mile zone.

Areas within the Aleutian Island region have been identified by the Federal government (Marine Protection Areas, Alaska Maritime Refuge and Stellar Sea Lion Critical Habitat), State of Alaska (Most Environmentally Sensitive Areas), Aleutians West Coastal Resource Service Area and East Aleutian Borough as having designations for special significance including subsistence use, areas suitable for study and understanding history and pre-history, important habitat areas, areas suitable for commercial fishing and seafood processing facilities, and natural hazards.

In considering how and where to establish a PSSA in the Aleutian Island region, the unintended consequences and potential impacts to vessel routing will need to be considered. Non-government organizations or state governments through the US Coast Guard, the US Representative to the IMO who makes the final decision, can initiate a PSSA. The application and approval process for obtaining a PSSA designation can take up to a year or more.

A.7 Strengthen the Area Contingency Plan

The National Oil and Hazardous Substances Pollution Contingency Plan (National Contingency Plan or NCP) (40 CFR Part 300), which is part of the Clean Water Act, establishes the organizational structure and procedures for preparing for and

2 Federal Register, 1985. Ports Access Study, Unimak Pass, Alaska. Federal Register 50(52):10.877. U.S Department of Transportation. U.S. Coast Guard, CGD 83-068

responding to discharges of oil and releases of hazardous substances, pollutants, and contaminants. Under the NCP, there are three levels of contingency planning: the NCP which establishes the national response organization; Regional Contingency Plans (RCP) which establish regional response organization; and Area Contingency Plans which establish response organizations and set contingency planning standards for defined Areas within each Region (40 CFR Part 300 Sec. 210). Area Committees (AC) are responsible for development of Area Contingency Plans (ACP) (40 CFR Part 300 Sec. 205).

Alaska is somewhat unique in that the State is both a Region and an Area. The Alaska Federal/State Preparedness Plan for Response to Oil & Hazardous Substance Discharges/Releases (Unified Plan) serves as the Regional Contingency Plan for the Alaska Region. The Unified Plan, supplemented by 10 Subarea Plans, also serves as the ACP for the Alaska Area. In Alaska the Alaska Regional Response Team (ARRT) is responsible for the development of the Unified Plan. Federal regulations direct that the Area Contingency Plans must address both spill prevention and response such that they "shall be adequate to remove a worst case discharge under Sec. 300.324, and to mitigate or prevent a substantial threat of such a discharge, from a vessel, offshore facility, or onshore facility operating in or near the area." (40 CFR Part 300 Sec. 210(c)). Currently, the Aleutians Subarea Plan has very little planning for prevention of spills and there is very little capability to implement the measures necessary to respond to a discharge in the subarea.

Federal regulations require that ACPs describe in detail the responsibilities for preventing or mitigating the threat of a discharge and cleaning up a discharge for owners and operators of vessels and facilities as well as federal, state and local agencies. The ACPs are also required to describe how contingency plans prepared by owners and operators of vessels and facilities operating in the Area must integrate into the spill prevention and response planning system established in the ACP (40 CFR Part 300 Sec. 210(c)(3)).

Owners and operators of tank vessels carrying oil as cargo and nontank vessels over 400 gross tons carrying fuel oil for propulsion are required to develop a US Coast Guard-approved Vessel Response Plan (VRP) for their operations in US waters (33 CFR Part 155). The VRP must include a geographic-specific appendix for each Captain of the Port (COTP) zone through which the vessel will transit. VRPs are required by federal regulation to be consistent with the ACPs in effect six months prior to the submission date for the VRP (33 CFR Part 155 Sec. 1030(h)). The evaluation criteria for VRP state that response resources identified in the plan must meet limitations stated in the applicable ACP (33 CFR Part 155 Sec. 1050(a)(2)).

Foreign-flagged vessels engaged in innocent passage are exempted from the VRP requirements (33 CFR Part 155 Sec. 1015); however, the ACP regulations require that the Area Contingency Plan identify sufficient equipment, resources, and planning to respond to spill risks from any operations in the Area (40 CFR Part 300 Sec. 210). Since vessels engaged in innocent passage may be operating without a VRP, the ACP becomes the default response plan for spills from vessels not subject to US oil spill planning

regulations. Currently, the ACP does not contain sufficient resources to respond to a worst case discharge from a vessel in innocent passage. Phase A of the Aleutian Islands Risk Assessment identified vessels engaged in innocent passage as a significant oil spill risk for the region; therefore, it is important that the ACP include adequate planning and resources to manage a spill from an innocent passage vessel.

The Aleutian Islands are part of the Aleutians Subarea and part of the Western Alaska Captain of the Port Zone. Therefore, vessels operating in the Aleutian Islands that are required under federal regulation to develop VRPs must ensure that the VRPs are consistent with the Unified Plan and Subarea Plan for the Aleutians, as well as with any operating measures put in place by the Captain of the Port of Western Alaska. (Note that vessels engaged in innocent passage – foreign flagged-vessels not calling on U.S. ports or transferring or lightering oil in U.S. waters – are exempted from VRP requirements). ODPCPs prepared by vessel owners and operators under State statutes and regulations must also be consistent with the Unified Plan and Subarea Plans. Currently there is no evaluation of the ability of the VRP holder to meet the requirements established in the ACP during the USCG VRP review process.

Operators of tank vessels and nontank vessels that operate or transfer oil in state waters are required by the State of Alaska to prepare Oil Discharge Prevention and Contingency Plans (ODPCP) or equivalent plans for nontank vessels (AS 46.04.030.). These plans are submitted to the Alaska Department of Environmental Conservation (ADEC) for review and approval under relevant state regulations (18 AAC 75.425, 445 and 455). Alaska Statutes require that ODPCPs are consistent with the state regional and master plans, which include the Unified Plan and applicable Subarea Contingency Plans (AS 46.04.200 and AS 46.04.210). State planning requirements do not apply to vessels operating outside State waters, which extend three miles from shore, so these regulations do not apply to most vessels on the Northern Great Circle route passing through the Aleutians.


Aleutian Islands

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RISK ASSESSMENT PROJECT
Phase A Summary Report

ALEUTIAN ISLANDS RISK ASSESSMENT