Aleutian Islands Risk Assessment

Aleutian Islands Risk Assessment
REGULATORY RESOURCE STUDY

Report to the Aleutian Islands Risk Assessment Advisory Panel

May 2, 2013

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EXECUTIVE SUMMARY

The Aleutian Islands are part of the State of Alaska and the United States, and are also an important area for international shipping. Shipping through the region is subject to state, federal, and international requirements which may depend on a variety of factors, including: vessel location or route, the type of vessel, whether the vessel is under a U.S. or foreign flag, and its planned or most recent port of call.

The National Fish and Wildlife Foundation (NFWF), the U.S. Coast Guard (USCG), and the Alaska Department of Environmental Conservation (ADEC) initiated the Aleutian Islands Risk Assessment to assess the risks and potential mitigation measures associated with maritime transportation in the Bering Sea and the Aleutian Archipelago. An Advisory Panel recommended that emergency towing, salvage, and spill response services should be enhanced in the region. Task 1-2 of Phase B of the assessment is focused on developing a recommended response system.

The purpose of this report is to: (1) identify the international, federal, and state mandates that apply to salvage, towing, and vessel spill preparedness and response in the Aleutian Islands; (2) determine the capabilities needed for full compliance; and (3) estimate the capital and operating costs of full compliance. The intent is that the cost of the recommended system will be no more than the cost of full compliance estimated in this study.

Because this subtask is intended to set a benchmark cost for full compliance, it does not consider options for alternative criteria with federal regulations, such as the current program, at this time.

There are no international requirements that mandate planning, operations, or resources that would be on-scene in the Aleutian Islands area. Both U.S. and State of Alaska law require operators of certain vessels to have contingency plans in place that meet certain standards (set out in regulation). To meet these standards, companies subject to the requirements must have a system and resources in place to provide services such as emergency towing, salvage, and spill response. Because State of Alaska laws apply to a small, though unknown, percentage of the vessels transiting the Aleutian Islands (only those going directly to or from an Alaskan port), this analysis focuses on the resources needed to comply with federal law.

The analysis presented in this report estimates the capital and operating costs of full compliance with federal regulations for the average of the largest category of both tank and non-tank vessels. The estimated cost to provide emergency towing, salvage, and spill response services in compliance with federal law ranges from $30.5 million to $36.9 million in capital costs plus $37.7 million to $41.8 million in annual operating costs.

ACRONYMS

ADEC	Alaska Department of Environmental Conservation
AIRA	Aleutian Islands Risk Assessment
bbl	Barrels
BPD	Barrels per day
COTP	Captain of the Port
DNV	Det Norske Veritas
EDRC	Effective Daily Recovery Capacity
EEZ	Exclusive Economic Zone
ERM	ERM-West, Inc.
GT	Gross tons
IMO	International Maritime Organization
MT	Metric tons
NFWF	National Fish and Wildlife Foundation
NVIC	Navigation and Vessel Inspection Circular
OSRO	Oil spill response organization
RPS	Response Planning Standard
RRO	Risk reduction option
SMFF	Salvage and marine firefighting
TRB	Transportation Research Board
UNCLOS	United Nations' Convention on the Law of the Sea
U.S.	United States
USCG	United States Coast Guard

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Aleutian Islands Risk Assessment: Regulatory Resource Study

Report to
Aleutian Islands Risk Assessment Advisory Panel and Management Team

May 2, 2013

1. INTRODUCTION

The purpose of this report is to: (1) identify the international, federal, and state mandates that apply to salvage, towing, and vessel spill preparedness and response in the Aleutian Islands; (2) determine the capabilities needed for full compliance; and (3) estimate the capital and operating costs of full compliance. This report is Subtask A of Phase B Task 1-2 of the Aleutian Islands Risk Assessment.

The National Fish and Wildlife Foundation (NFWF), the U.S. Coast Guard (USCG), and the Alaska Department of Environmental Conservation (ADEC) initiated the Aleutian Islands Risk Assessment to assess the risks and potential mitigation measures associated with maritime transportation in the Bering Sea and the Aleutian Archipelago, as defined by the project study area (see Figure 1). At the conclusion of Phase A, an Advisory Panel recommended that emergency towing, salvage, and spill response services should generally be enhanced in the Aleutian Islands. Phase B will produce a recommended optimal response system. The intent is that the cost of that recommended system must be less than, or equal to, the costs of full compliance estimated in this study. Currently, the remoteness of the location and other factors challenge compliance with both federal and state requirements.

Nuka Research and Planning Group, LLC (Nuka Research) has prepared this study for the Aleutian Islands Risk Assessment Advisory Panel and Management Team with support from Pearson Consulting, LLC, Moran Environmental Recovery and Moran Towing, The Glosten Associates, Northern Economics, and Baldwin & Butler, LLC on contract to NFWF.

1.1 Aleutian Islands Risk Assessment

NFWF, the USCG, and the ADEC are implementing a multi-phase risk assessment of maritime transportation in the Bering Sea and the Aleutian

Archipelago. The December 8, 2004 grounding and subsequent oil spill from the *M/V Selendang Ayu* prompted this effort, along with other marine casualties.

1.2 Transportation Research Board Approach and Phase A

Both the ADEC and the USCG have had experience with maritime risk assessments, and both understand the complexity of the problem at hand, as well as the need for a well-designed process to ensure a successful outcome. Consequently, in 2007 they asked the National Academies to examine the available data and develop an appropriate framework that included the most scientifically rigorous approach possible for a comprehensive risk assessment, and to design the assessment with a logical sequence of building blocks so that it could be conducted in discrete steps with input from local stakeholders and technical experts incorporated throughout the process.

In 2008, the Transportation Research Board (TRB) of the National Academies released Special Report 293, "Risk of Vessel Accidents and Spills in the Aleutian Islands: Designing a Comprehensive Risk Assessment." The TRB recommended a two-phased approach to the Aleutian Islands Risk Assessment: a Preliminary Risk Assessment (Phase A) followed by a Focused Risk Assessment (Phase B).

1.2.1 RISK ASSESSMENT PHASE A

Phase A involved the establishment of a management structure comprised of four groups: a Management Team, an Advisory Panel, an 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. Next, a risk matrix was created to analyze the potential consequences of spills from vessels. Finally, Phase A concluded with a qualitative assessment and prioritization of potential risk reduction options. This first phase was completed in 2011. A summary report is available online at: http://www.aleutiansriskassessment.com/documents/110826AIRA_SummaryReportvFINALlr.pdf

At the end of Phase A, one of the Advisory Panel's recommendations was that emergency towing, salvage, and spill response services should generally be enhanced in the Aleutian Islands, and that additional study should be undertaken during Phase B to refine the understanding of these options and develop more specific information about what these enhancements should look like (Nuka Research, 2011).

1.3 Scope of this Study

The AIRA is focused on vessels of 300 gross tons (GT) or greater, or those with at least 10,000 gallons of fuel capacity. This study considers the state, federal, and international mandates codified in regulation or other policy that govern towing, salvage, and vessel spill response in the Aleutian Islands region (see Figure 1). Specifically, this study includes:

- **Salvage.** This study considers the resources needed to assess the damage sustained by a vessel and to recover the vessel, including the lightering of any remaining oil on board.
- **Emergency towing.** This study considers the resources needed for a tug to control and arrest a vessel that has lost steering or propulsion.
- **Spill response.** This study considers the resources needed to meet requirements related to tracking, containing, and recovering oil spilled to water. (This study focuses on mechanical response because alternative response methods such as the use of dispersants or in situ burning are not required by the applicable regulations in Alaska.)

This study focuses on regulations governing the ability to respond to an incident, or a potential incident, rather than preventing one from happening in the first place. This study does *not* consider the following:

- **Requirements that would not be *implemented* within the Aleutian Islands region.** International Maritime Organization (IMO) conventions and protocols mandate standards or other provisions associated with vessel construction and operations ranging from the training of crew to radio communications to security measures related to piracy or terrorism. Although some of these measures may also serve to reduce the risk of oil spills, this study does not consider them because they do not dictate the scale or location of towing, salvage, or spill responses in the Aleutian Islands region.
- **Aspects of spill response plans that are not directly related to establishing the level of resources that must be available within the Aleutian Islands region per regulation.** Spill response plans are a key component of both state and federal requirements relative to this effort, but this study does not consider regulations related to the timing or process of plan submittal, review, or update; specific planning requirements; personnel; drills; or response to spills from facilities. This study focuses only on those elements of the regulations that are critical to determining the towing, salvage, and spill response resources that must be in place for vessels transiting the Aleutian Islands region in order to be in compliance.
- **Any requirements not currently codified or pending in statute, regulation, or international law.** Under international law, the U.S. has the option of establishing additional requirements on vessels transiting its

waters in order to protect safety or the environment. This study does not speculate about, or recommend, what such measures could be. This study does, however, analyze the response resources that would be necessary under pending federal regulations related to non-tank vessels.

- **Alternative planning compliance.** For the purpose of the analysis in this subtask, we are not addressing alternative compliance options such as those currently in place for the tankers and tank barges transiting the Western Alaska Captain of the Port (COTP) zone, because the purpose of the study is to define a baseline system (and costs) that would represent *full* compliance. Plan holders and the USCG may agree on alternative compliance measures if full compliance is not feasible, as specified at 33 CFR 155.1065(f). There is no mechanism for alternative compliance in the applicable State of Alaska regulations.

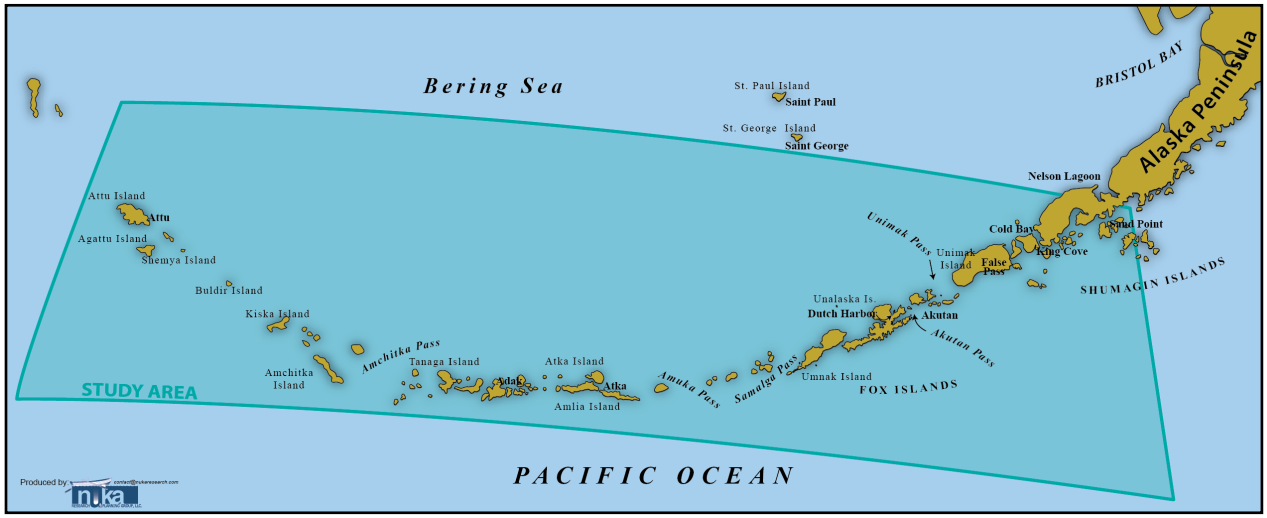

Figure 1. Study area for the multi-phase study assessing the risks from maritime transportation in the Bering Sea and Aleutian Archipelago

1.4 Role of this Study within Phase B Task 1-2 of the Risk Assessment

Phase A of the AIRA, completed in 2011, involved the establishment of a management structure and completion of a series of technical studies resulting in a set of recommended Risk Reduction Options (RRO). The four RRO identified in Phase A requiring additional study were: (1) increase rescue tug capabilities in the Aleutian Islands; (2) increase salvage and spill response capabilities in the Aleutian Islands; (3) strengthen the Aleutian Islands Subarea Contingency Plan; and (4) determine the boundaries of potential International Maritime Organization (IMO) Particularly Sensitive Sea Areas (PSSA) and propose recommendations for associated protective measures.

This study represents the first step in Task 1-2, which addresses RRO 1 and 2 from the list above. Emergency towing, salvage, and spill response are "response services" that may be employed during an emergency

response to a marine casualty. Task 1-2 focuses on options for the development of an organization or resource that would coordinate the suite of necessary services in a manner that is tailored to the environment and maritime trade operating in the Aleutians.

This study establishes a benchmark for the cost of the response organization based on the cost of providing all services mandated in regulation. Each service was studied to determine the percentage of time that the service could be employed in Aleutian Islands conditions, likely effectiveness of that service when it could be employed, the cost of the service, and the feasibility of providing that service based on consideration of logistics and other factors. Once these studies were completed, the Analysis Team recommended the best combination of services and organization(s) that could provide these services at a cost that did not exceed the costs of full compliance estimated in this study. A benefit-cost analysis was then performed on the recommended response system and potential modifications considered accordingly. Task 1-2 concludes with the recommendation of an optimal response system that was based on the studies conducted and best professional judgment of the Analysis Team. This study became the basis of recommendations from the Advisory Panel, Management Team, and/or the Subarea Committee.

The general approach and subtasks for Task 1-2 are summarized in Figure 2, with the workflow moving from top to bottom.

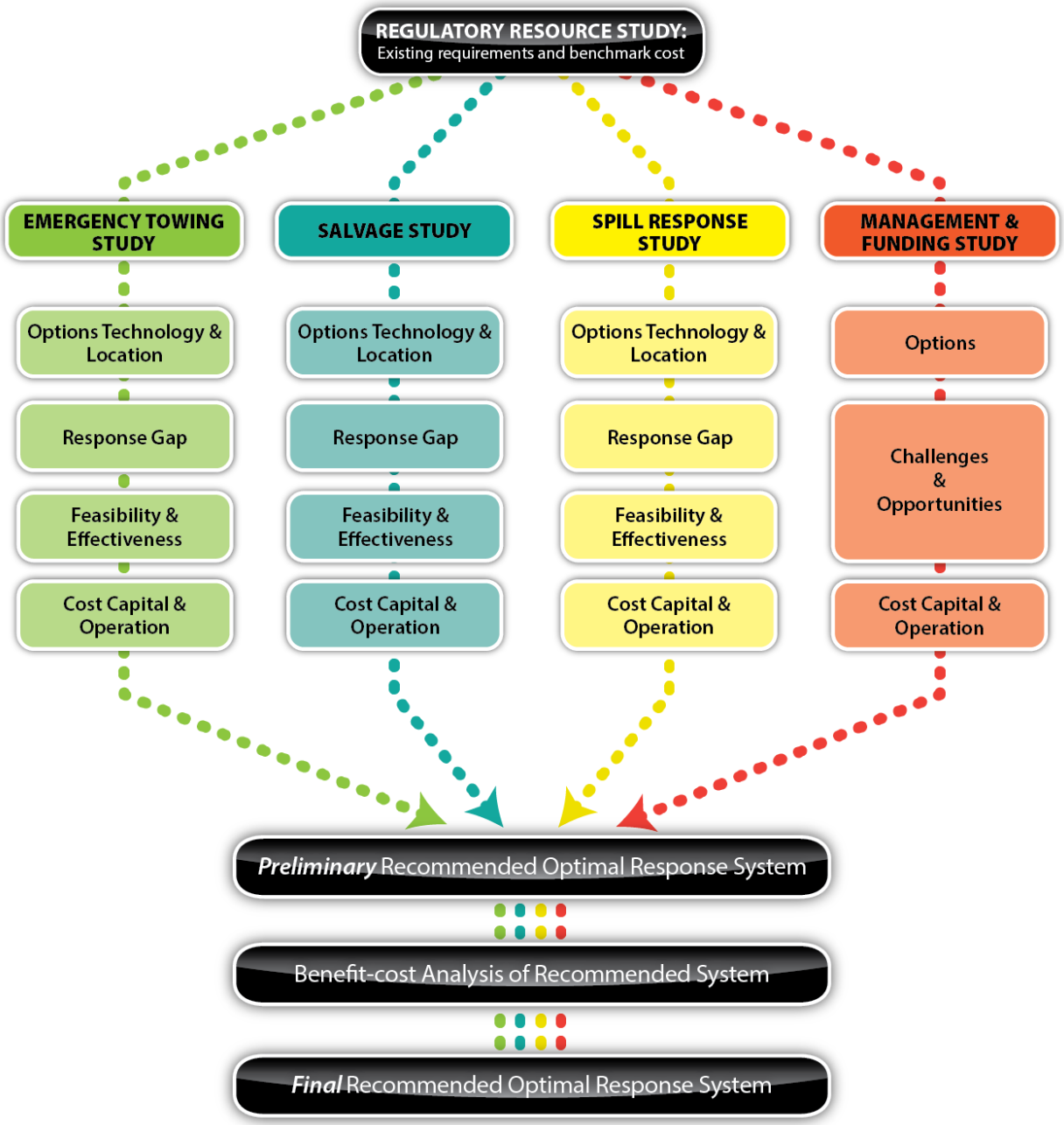

Figure 2. Workflow for Task 1-2

2. BACKGROUND

This section describes the international, federal, and state requirements related to salvage, towing, and spill response in the Aleutian Islands. While international requirements relate to ship construction, crewing, and equipment, it is the federal and state regulations that establish response capability minimums.

2.1 Applicable Jurisdictions Governing Towing, Salvage, and Spill Response in the Aleutians

The Aleutian Islands are part of the State of Alaska and the United States, and are also an important area for international shipping. As such, shipping through the region is subject to state, federal, and international requirements which may depend on a variety of factors, including: vessel location or route, the type of vessel, whether the vessel is under a U.S. or foreign flag, and its planned or most recent port of call.

The location of the vessel will determine whether it is in state waters, U.S. territorial waters, the U.S. Exclusive Economic Zone (EEZ), or international waters. U.S. territorial waters extend to 12 nautical miles from the low-water line, per Section 2 of the United Nations Convention on the Law of the Sea (UNCLOS).[1] The EEZ, per Article 57 of the UNCLOS, extends out another 200 nautical miles beyond the territorial waters (see Figure 3). State waters extend three geographical miles from shoreline under the Submerged Lands Act of 1953 (43 USC §1312). Within state waters, vessels are subject to both U.S. law and State of Alaska laws, as they are applicable.

[1] The United States became a signatory to the Convention on the Law of the Sea in 1994, though President Ronald Reagan had already declared that the U.S. would abide by the Convention as customary law in 1983 (TRB, 2008). However, the U.S. has never actually ratified the treaty with the two-thirds vote in the U.S. Senate that is required by the U.S. Constitution.

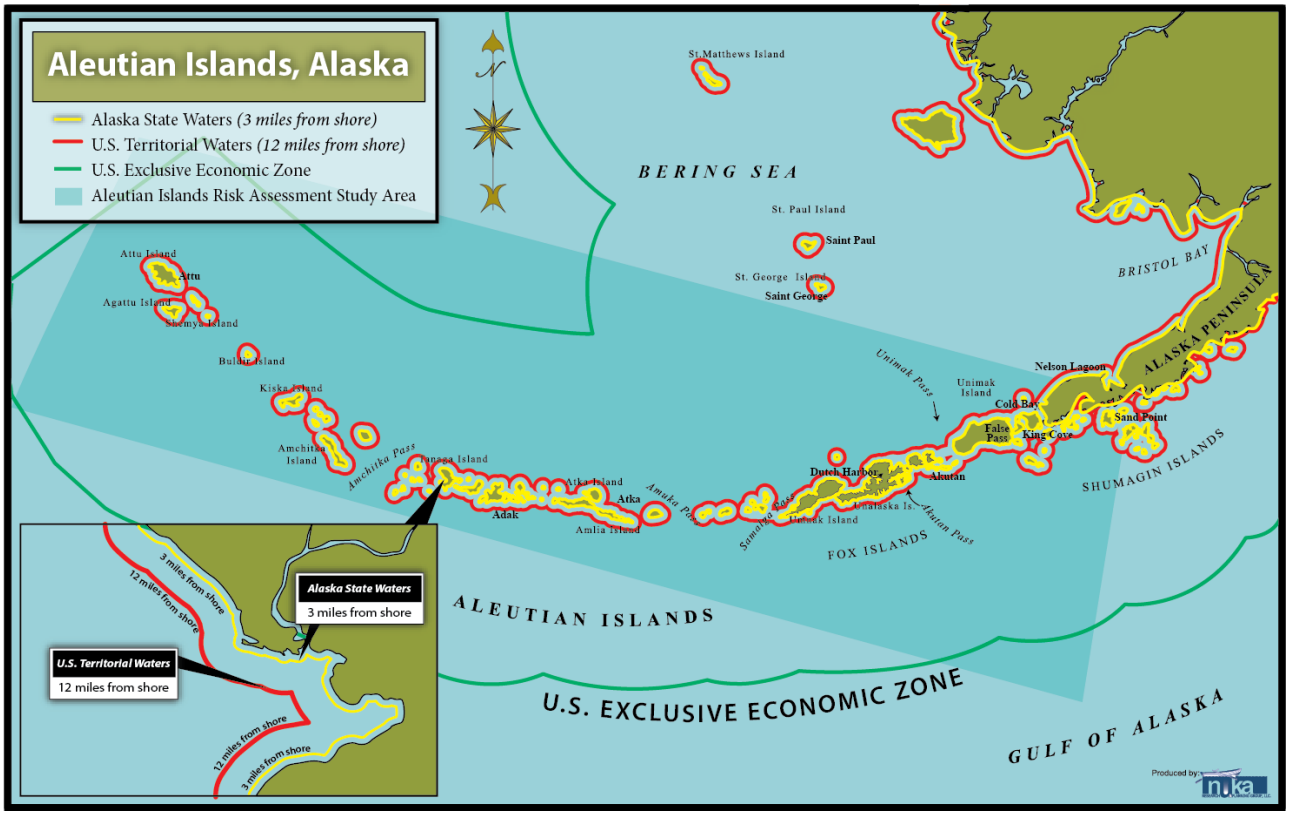

Figure 3. Geographical areas related to state, federal, and international jurisdictions in the vicinity of the Aleutian Islands study area

2.1.1 INNOCENT PASSAGE AND THE APPLICATION OF U.S. REGULATIONS

Many vessels transiting through U.S. territorial waters and Alaska state waters are exempt from federal and state laws and regulations governing emergency towing, salvage, and spill response. Nearly 75% of the vessels transiting the Aleutian Islands study area that are large enough to fall within the scope of this study are moving commercial goods and raw materials along the North Pacific Great Circle Route between western North America and East Asia (DNV and ERM, 2010). These vessels typically pass through Unimak Pass in the Aleutian Islands on the way between East Asia and North America. An unspecified number of them are considered to be in innocent passage or transit passage as defined in UNCLOS.

The USCG considers vessels in innocent passage to be those foreign flag vessels passing through U.S. territorial waters without stopping at a U.S. port or engaging in other activities prohibited in Article 19 of UNCLOS.[2] While the U.S. is allowed by international law to apply rules to vessels in innocent passage for "the preservation of the environment…and the prevention, reduction and control of pollution" (per Article 21 of UNCLOS), U.S. regulations exclude "foreign flag vessels in innocent passage" from the federal requirements related to oil spill response plans, which are described below [33 CFR 155.1015(c)(7)]. The USCG

[2] Article 19 prohibits activities such as spying, engaging in any military activities, willful pollution, etc.

discusses this issue in commentary provided with proposed amendments to the language that would change the exemption to apply to: "Foreign flag vessels engaged in innocent passage through the territorial sea or transit passage through a strait used for international navigation, unless bound for or departing from a port or place of the United States."[3]

The USCG provides commentary on the issue of innocent passage and transit passage (when a foreign flag vessel is passing through an international strait such as Unimak Pass) with specific reference to Unimak Pass:

> *One area of the United States where transit passage is of special concern is Unimak Pass in the Aleutian Islands…Because the pass narrows to as little as 10 nm, the 12-nm territorial sea of the United States overlaps the waters of Unimak Pass. Although the United States is not yet Party to UNCLOS, the United States has long accepted the navigational provisions of the Convention, including Art. 34 through 44 relevant to transit passage, as reflecting the applicable rules of customary international law. Vessels transiting Unimak Pass, other straits used for international navigation, and their approaches enjoy the right of transit passage. The United States may only exercise jurisdiction over foreign-flagged vessels engaged in transit passage through Unimak Pass if the vessel is either bound to or from a port or place in the United States, or has engaged in activities that international law proscribes, such as intentional acts of serious pollution. Acknowledging the applicable rules of customary international law, we propose to exclude foreign vessels in transit passage from [vessel response plan] VRP requirements when not bound for, or departing from, the United States."* (74 FR 44973-44974)

2.1.2 INNOCENT PASSAGE AND THE APPLICATION OF STATE OF ALASKA REGULATIONS

At the state level, the State of Alaska also applies the concept of innocent passage to determine which vessels passing through state waters are subject to the state requirements related to oil spill prevention and response. Vessels that pass through state waters but are not coming from or going to a port in the State of Alaska are not subject to state laws and regulations, whether U.S. or foreign-flagged.[4]

2.1.3 SUMMARY OF REQUIREMENTS CONSIDERED

Table 1 summarizes the international, federal, and state requirements that are considered as part of this analysis. The regulations and policies are described further in this section; this table simply indicates whether they relate to towing, salvage, spill response, or other areas.

[3] Proposed amendment to 33 CFR 155.1015(c)(7); included in 74 CFR 44989.

[4] AS 46.04.055 includes this exemption for non-tank vessels. For tank vessels, the state interprets the pre-emption clause in regulations at 18 AAC 75.007(c) excludes tank vessels because it makes clear that state authority, in this case, is pre-empted by federal jurisdiction.

Table 1. International, federal, and state mandates related to emergency towing, salvage, and spill response resources in the Aleutian Islands

Mandate	Towing	Salvage	Response
International			
International Convention on the Safety of Life at Sea (SOLAS)			
International Convention on the Prevention of Pollution from Ships (MARPOL)			Ship Oil Pollution Emergency Plan only
International Convention on Standards of Training, Certification, and Watchkeeping for Seafarers (STCW)			
International Convention on Oil Pollution Preparedness, Response, and Co-operation (OPRC)			
U.S. – Federal			
33 CFR 155 Vessel Response Plans, including:			
Ensuring that the Salvors and Marine Firefighters are Adequate 33 CFR 155.4010 - 4055			
Determining and Evaluating Required Response Resources for Vessel Response Plans 33 CFR 155 Appendix B			
Proposed Regulations for Non-tank Vessels 74 FR 44970			
State of Alaska			
Oil Discharge Prevention and Contingency Plans and Non-tank Vessel Plans (18 AAC 75):			
Section 438: Response planning standards for crude oil tank vessels and barges			
Section 441: Response planning standards for non-tank vessels			

2.2 International Requirements

International mandates are developed by the IMO. While UNCLOS is the overarching and aptly named "Law of the Sea," several conventions and their associated protocols provide more specific requirements (or, in some cases, guidelines) related to the safety of ocean shipping. While the U.S. has signed but not ratified UNCLOS, the U.S. *has* ratified the conventions described in this section.

2.2.1 INTERNATIONAL CONVENTION ON THE SAFETY OF LIFE AT SEA (SOLAS)

The International Convention on the Safety of Life at Sea (SOLAS) was first negotiated in response to the sinking of the Titanic, though it has been updated and amended many times since it was first adopted in 1914. SOLAS is focused on the safety of shipping operations for crew and passengers, though any measure that is designed to prevent an accident for the sake of protecting human life would also have the benefit of preventing the loss of cargo or fuel that may result from such an incident.

SOLAS includes the following provisions:

- Survey and certification requirements to ensure that the vessel complies with the provisions of SOLAS.
- Structural requirements to subdivide passenger ships so that they will remain afloat (and to protect critical equipment) even if one part of the hull is compromised.
- Safety requirements related to fire protection, life-saving equipment and procedures, communications, navigation and routing, and manning.
- Documentation and stowage requirements for both dangerous and other cargoes; also includes some provisions related to ship construction.
- Additional safety requirements specific to nuclear-powered ships and high-speed craft.
- Requirements to have a safety management system in place.
- Security-related requirements related to both ships and port facilities.

The IMO's Maritime Safety Committee adopted amendments in 2010 that require new tankers and bulk carriers to be constructed in an "environmentally-friendly" manner that includes minimizing the risk of losing the ship or polluting the environment as a result of structural failure. (IMO, 2012a) Recent amendments to SOLAS also require that ships have on-board plans for engaging in emergency towing if needed (IMO, 2006).[5] However, SOLAS does not include specific requirements related to towing, salvage, or response in the Aleutian Islands.

2.2.2 INTERNATIONAL CONVENTION FOR THE PREVENTION OF POLLUTION FROM SHIPS (MARPOL)

The International Convention for the Prevention of the Pollution from Ships (MARPOL) focuses on reducing both intentional and accidental pollution of ocean waters from vessels. It was first adopted in 1973, but did not take effect until updated language from a 1978 protocol was added. There have been numerous subsequent amendments.

[5] This requirement is codified in U.S. regulations 33 CFR 155.235. These regulations also require that tankers of 20,000 DWT or more will have an emergency towing arrangement fitted at both ends.

MARPOL includes the following provisions:

- Requirement that oil tankers have double hulls (with a phase-in schedule for retrofitting existing tankers) or an approved alternative design.
- Prohibition on the release of noxious substances within 12 miles of land, including a list of 250 substances that may never be released to open waters.
- Specifications of labeling and other limitations related to stowage of harmful substances transported in packaged form.
- Requirements for certain treatment and other limitations on the release of sewage to the sea.
- Prohibition on the disposal of all but certain types of garbage to the sea (at specified distances from land). This includes a ban on the disposal of plastic waste.
- Limitations on air emissions from ships, including a new provision mandating the use of energy efficient technology and procedures to take effect in 2013. (IMO, 2012b)

MARPOL also requires that oil tank ships of 150 GT or greater, and other ships of 400 GT or greater, have a Shipboard Oil Pollution Emergency Plan (SOPEP) approved by the flag country. MARPOL sets the minimum requirements for these plans: (1) procedures for notification in the event of a spill, (2) authorities to be notified, (3) actions to be taken by crew in the event of a spill, and (4) the point of contact on board the vessel who will coordinate with national or local authorities in responding to the spill (MARPOL Annex 1, Ch. 5, Reg. 37). U.S. regulations establish SOPEP requirements for U.S-flagged vessels, including the requirement that notification take place in the event of probable discharge even without an actual spill. This includes loss of propulsion or steering. (33 CFR 151.26)

While a SOPEP must be carried by all vessels of the appropriate sizes, these plans do not establish any requirements regarding the scale or timing of resource mobilization to respond to a spill, and are therefore not considered further in this study.

2.2.3 INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION, AND WATCHKEEPING FOR SEAFARERS (STCW)

The International Convention on Standards of Training, Certification, and Watchkeeping (STCW) focuses on ensuring that a ship's crew is sufficiently skilled to be able to safely operate the vessel and respond to emergencies at sea, such as piracy. It does not include requirements related to towing, salvage, or response in the Aleutian Islands. (IMO, 2012c)

2.2.4 INTERNATIONAL CONVENTION ON OIL POLLUTION PREPAREDNESS, RESPONSE, AND CO-OPERATION (OPRC)

The International Convention on Oil Pollution Preparedness, Response, and Co-operation (OPRC) was developed to enhance spill preparedness and response around the world. Countries that are party to the Convention (including the U.S.) must have a national contingency plan, training and exercise program, and minimum level of "pre-positioned oil spill combatting equipment, commensurate with the risk involved, and programmes for its use." The latter provision, found in Article 6(2)(a) of the 1990 Convention, can be implemented either by the government or through cooperation with other countries, industry, or ports, though Resolution 5 of the Convention encourages that industry take the lead. The Convention also includes provisions related to the cooperation and information sharing among countries as it relates to spill notification, potential spill impacts, research and development, and cost reimbursement (IMO, 1991; Moller and Santner, 1997).

While the Convention specifies, in general terms, several requirements related to oil spill response capacity, these are implemented in the U.S. through the federal requirements described in Section 2.3.

2.3 U.S. Federal Government Requirements

At the federal level in the U.S., the USCG, within the Department of Homeland Security, implements and enforces laws and regulations related to towing, salvage, and spill response in the U.S. EEZ. The critical regulations related to the focus of this study were promulgated under the Oil Pollution Act of 1990 and are found at 33 CFR Part 155, which require tank vessel operators to hold an approved Vessel Response Plan (VRP) with the USCG for all U.S. Captain of the Port (COTP) zones in which the vessel operates. The Aleutian Islands fall within the Western Alaska COTP zone, with headquarters in Anchorage, AK (see Figure 4). Related regulations are pending for non-tank vessels.

VRP regulations require planning for the use of dispersants according to set timelines *if* an operating area is pre-authorized for dispersant application. Because Alaska is not pre-approved for dispersant application, dispersant capacity is not required in the VRPs and is not included in this study (74 FR 45007).

VRPs are also required for non-tank vessels. The USCG proposed regulations in 2009 (74 FR 44970) and has issued interim guidance in a Navigation and Vessel Inspection Circular (NVIC 01-05, Change 1).

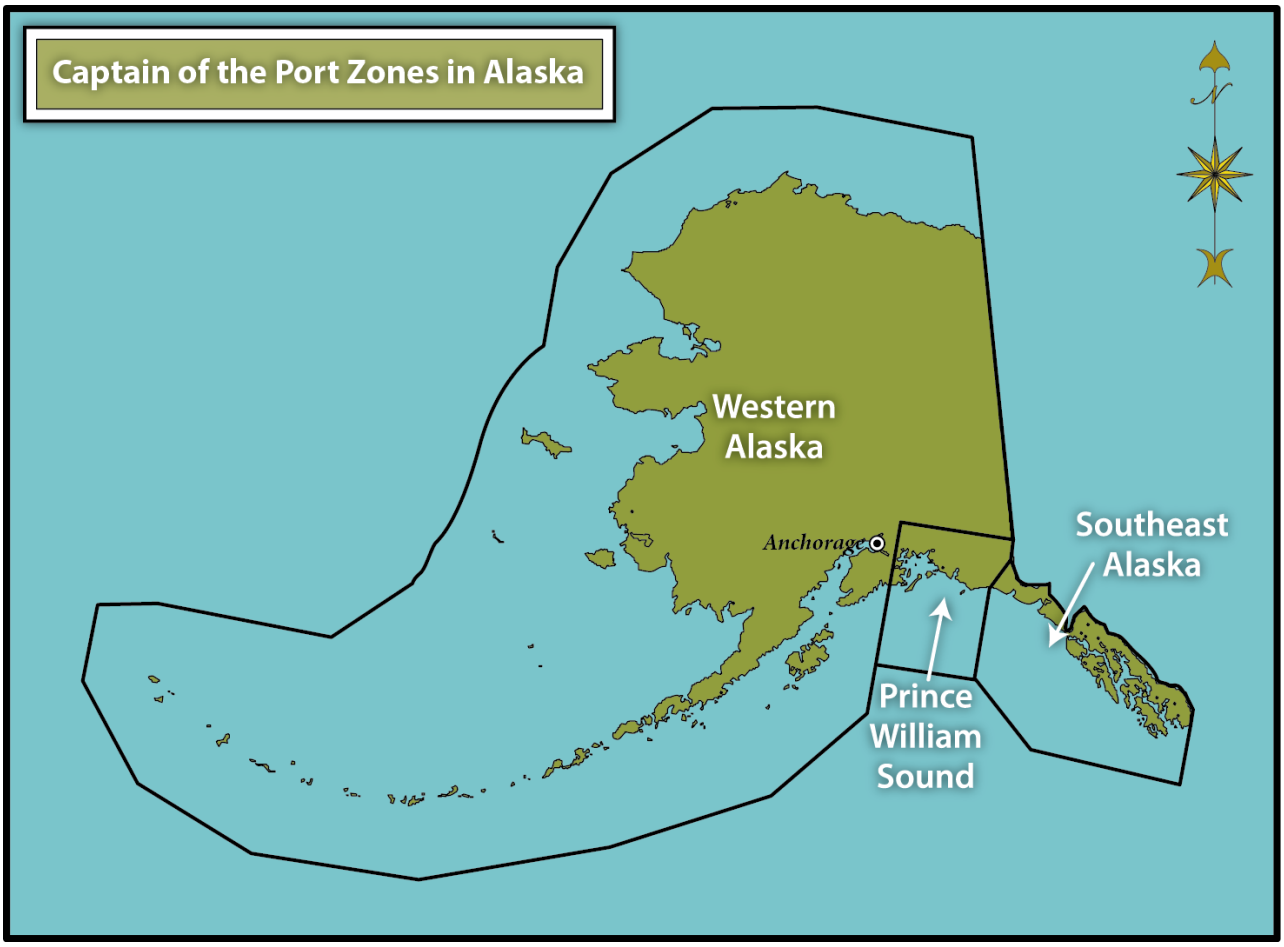

Figure 4. U.S. Coast Guard Captain of the Port Zones in Alaska

2.3.1 TANK VESSELS

Federal regulations at 33 CFR 155 require certain tank vessels to have in place a Vessel Response Plan (VRP) in case of a spill. The regulations described below apply to all tank vessels that carry oils in groups I-IV as primary cargo, including tank barges as well as tankers [33 CFR 155.1050(a)]. This applies to U.S.-flagged tank vessels and foreign-flagged tank vessels transiting U.S. territorial waters unless they are in innocent passage. These regulations require plan holders to demonstrate that they have sufficient services and resources for towing, salvage, and spill response on contract (or otherwise available) in each COTP zone in which the vessel operates.

SALVAGE

Regulations require several different types of salvage-related services, each with different timeframes by which actions must be taken or resources must be on-scene. A VRP must specify that salvage services, which include emergency towing, will be on-scene at different times depending on whether the incident takes place within 12 or 50 miles of the COTP city [33 CFR 155.4030(b)] (see Table 3). Because Anchorage is the COTP city for the Aleutian Islands (and is more than 50 miles away), these timeframes do not apply. Instead, plan holders are required to describe how they will "address salvage and marine firefighting needs in the event these services are required." [33 CFR 155.4040(a)(3)]

Regulations make clear that contracts for salvage and firefighting services must be in place, and the VRP must specify expected response times, but the mandated timeframes do not apply. [33 CFR 155.4040(d)(6)]

A VRP must also specify that the salvage contractor can deliver pumping resources to the scene that are capable of offloading the vessel's largest cargo tank in 24 hours of continuous operation [33 CFR 155.4030(f)], even if the deadlines in Table 2 do not apply. Similarly, if the vessel will travel in waters of 40 ft. or deeper, resources must be available to remove cargo and fuel in the depth of water traversed (up to 150 ft.), per 33 CFR 155.5030(h).

Table 2. Response timeframes for salvage services, based on location (hour ranges represent different services under each category), per 33 CFR 155.4030(b)

Service(s)	Incident occurs < or = 12 miles from COTP city (hours)	Incident occurs 12 - 50 miles from COTP city (hours)
Assessment and survey		
Remote assessment and consultation	1	1
Begin assessment of structural stability	3	3
On-site salvage assessment	6	12
Structural stability assessment	12	18
Hull and bottom survey	12	18
Stabilization		
Emergency towing (see below)	12	18
Salvage plan	16	22
External emergency transfer operations	18	24
Emergency lightering	18	24
Other refloating methods	18	24
Making temporary repairs	18	24
Diving services support	18	24
Specialized Salvage Operations		
Special salvage operations plan	18	24
Subsurface product removal	72	84
Heavy lift[6]	Estimated	Estimated

TOWING

Emergency towing is included in the salvage and marine firefighting requirements of the VRP. Regulations define emergency towing as "the use of towing vessels that can pull, push, or make-up alongside a vessel…to ensure that a vessel can be stabilized, controlled or removed from a grounded position. Towing vessels must have the proper horsepower or bollard pull compatible with the size and tonnage of the vessel to be assisted." (33 CFR 155.4025)

[6] Contracts for heavy lift services are required, but there is no set timeframe for their arrival on scene.

A VRP must also identify towing vessels suitable for the vessel, including bollard pull, horsepower, and other characteristics. The towing vessel must be able to operate in winds of 40 knots. [33 CFR 155.4030(e)]

RESPONSE

Plan holders must have sufficient resources available (including for containment, recovery, and storage) to respond to the average most probable discharge (during transfer operations), maximum most probable discharge, and worst-case discharge (33 CFR 155 App. B, Parts 3-5).[7] The regulations include methods for estimating the planning volumes associated with these different discharges based on the vessel size, type of oil, and location, with the effective daily recovery capacity (EDRC) of the equipment, emulsification, natural dispersion and evaporation, and other factors taken into consideration. The location is also important; requirements related to the ability of equipment to operate in certain environments as well as the time by which various resources need to be on-scene will vary depending on whether the vessel is in open ocean, offshore, nearshore, inland waters, or rivers. (33 CFR 155.1050 and 33 CFR 155 App. B) Finally, a tier system is used to classify equipment. Tier 1 equipment must be able to be on-scene first, followed by Tier 2 and Tier 3 equipment which may be coming from other regions or ownership.

Per 33 CFR 155.1050(l), response plans must specify the resources they will use for aerial tracking of a spill, including ensuring that the personnel are qualified, and that sufficient personnel and resources are available to support the response operations in general and, more specifically, over at least three 10-hour operational periods during the first 72 hours of the response [33 CFR 155.1050(l)(2)(iii-iv)]. Aerial resources must arrive in advance of other resources identified for Tiers 1, 2, or 3 for a worst-case discharge, and up to 50 nautical miles from shore [33 CFR 155.1050(l)(1)].

Table 3 describes the general requirements that relate to the mechanical response capacity for vessels operating in the Aleutian Islands, considering both the maximum most probable discharge and worst-case discharge.[8] Section 3 will calculate the level of resources needed based on a specific vessel size. Depending on the location of the spill, and how far from shore it is, some of these resources may need to be on-scene by 24 hours from notification.

[7] Plan holders and the USCG may agree on alternative compliance measures if full compliance is not feasible, as specified at 33 CFR 155.1065(f). In the regulations, a worst-case discharge refers a discharge of the entire cargo in adverse conditions.

[8] Response plan requirements related to dispersants only apply for vessels transiting areas that are pre-authorized for dispersant use [33 CFR 155.1050(k)]. Alaska waters are not one of these areas.

Table 3. Response capacity requirements for tank vessels in federal regulations (33 CFR 155) for oil groups I-IV

Response equipment must meet/exceed these criteria for all planning volumes[9]		
General	Significant wave height	Up to 6 ft.
	Sea state	3-4
Boom-specific	Height (draft + freeboard)	At least 42 in.
	Reserve buoyance to weight ratio	3:1 to 4:1
	Total tensile strength	Over 20,000 lbs.
	Skirt fabric tensile strength	500 lbs.
	Skirt fabric tear strength	125 lbs.
Capable of responding to <u>average most probable</u> discharge volume *(applies to transfers only)*		
Planning volume[10]	Any vessel	50 bbl. *or* 1% of cargo at time of transfer
Boom[11]	Quantity	Twice the length of the largest vessel involved in transfer
	Timing	1 hour (0-12 mi. from shore) 1 hour + travel time[12] from shore (12-200 mi. from shore)
Recovery equipment	Timing	2 hours (0-12 mi. from shore) 1 hour + travel time from shore (12-200 mi. from shore)
Capable of responding to <u>maximum most probable</u> discharge volume		
Planning volume[13]	Vessels with oil cargo capacity *less than* 25,000 bbl.	10% oil cargo capacity
	All other vessels	2,500 bbl.
Response resources must be on-scene	Nearshore and offshore areas	24 hours[14]
	Open ocean	24 hours + travel time *from shore*[15]
Requirements for response resources	Total effective daily recovery capacity (EDRC)	50% of the planning volume (calculated based on Section 6 of Appendix B)
	Boom	"Sufficient" quantity for containment and protection of shoreline areas
	Temporary storage capacity[16]	Double the EDRC

[9] 33 CFR 155.1050(c)(2) and 33 CFR 155 App. B, Table 1
[10] 33 CFR 155.1020
[11] 33 CFR 155.1050(d)(i)
[12] Assumes on-water speed of 5 knots.
[13] 33 CFR 155.1020 (Definitions)
[14] 33 CFR 155.1050(e)(1)(i)
[15] 33 CFR 155.1050(e)(1)(ii)
[16] 33 CFR 155 App. B, Part 4.5

Response equipment must meet/exceed these criteria for all planning volumes[9]		
Capable of responding to worst-case discharge volume		
Planning volume	Calculated based on vessel's total cargo, considering behavior of oil and other factors	
Response resources must be on-scene (including aerial tracking, up to 50 mi. offshore) [17,18]	Tier 1	24 hrs. + travel time from shore
	Tier 2	48 hrs. + travel time from shore
	Tier 3	72 hrs. + travel time from shore
Maximum response resources needed (caps) – based on EDRC and sufficient boom to serve skimming systems used	Tier 1	12,500 bbl./day
	Tier 2	25,000 bbl./day
	Tier 3	50,000 bbl./day
Percent response equipment that must be capable of operating in waters 6 ft. deep or shallower[19]	Open ocean	None
	Offshore	10 percent
	Nearshore	20 percent
Additional boom needed for shoreline protection[20]	Offshore spill	15,000 ft. of boom by 48 hrs.
	Nearshore spill	30,000 ft. of boom by 48 hrs.
Temporary storage capacity[21]		Double EDRC

2.3.2 NON-TANK VESSELS

In 2009, the USCG proposed regulations under 33 U.S.C. 1321(j)(5) that would require operators of non-tank vessels to have VRPs in place (74 FR 44970).[22] As noted above, although these regulations have not been finalized, the USCG has provided preliminary guidance to vessel operators regarding non-tank vessel plan contents and submission (see Navigation and Vessel Inspection Circular No. 01-05, Change-1, January 13, 2006).

In the pending federal regulations, non-tank vessels are defined as self-propelled vessels of 400 GT or larger which carry oil as fuel but are not tank vessels. The proposed regulations would apply to vessels operating on U.S. navigable waters. Vessels in innocent passage or transit passage would be exempted from the planning requirements unless they are traveling to or from a U.S. port (proposed at 33 CFR 155.5015(c)(2) at 74 FR 44989).

[17] 33 CFR 155.1050(l)(1) and App. B, 7.2.3 (travel time = 1 hr./nautical mile from shore beyond 12 mi. for nearshore areas as defined in 33 CFR 155.1020).

[18] 33 CFR 155.1050(g)

[19] 33 CFR 155.1050(f)(6). Significant wave height requirements do not apply to this subset of equipment, per 33 CFR 155.1050(f)(7).

[20] 33 CFR 155 App. B, Part 5.8

[21] 33 CFR 155 App. B, Part 5.4

[22] Though final regulations have not been promulgated, the USCG indicated in June 2008 that it would begin enforcing the non-tank vessel VRP requirement in August of that year (73 FR 35405). This followed a 2005 Navigational and Vessel Inspection Circular (NVIC) 01-05 – modified in January 2006 with "Change 1" -which provided guidance on the submission of VRPs for non-tank vessels, though was not enforceable.

SALVAGE

Non-tank vessel plans will have to identify the company that will provide salvage, lightering, and marine firefighting services. Those non-tank vessels with an oil capacity (fuel and/or cargo) of 2,500 bbl. or greater must meet the same standards described above for tank vessels with resources for salvage operations already contracted, per 33 CFR 155.5050(i)(1) as proposed. Non-tank vessels with a capacity less than 2,500 bbl. will not need to have these resources on contract, but will need to plan for their use. [33 CFR 155.5050(i)(2)]

TOWING

Emergency towing is included in the salvage requirements described above, and will therefore be the same as the requirements for tank vessels, as applicable.

RESPONSE

Similar to tank vessels, non-tank vessel operators will be required to indicate that they have contracts in place to respond to an average most probable discharge, maximum most probable discharge, and worst-case discharge (33 CFR 155.5035(i)(5)(i-iv), as proposed*).*[23] Many of the requirements for tank vessel response plans are incorporated by reference into the proposed regulations for non-tank vessel response plans. These include:

- Conditions in which equipment must be able to operate, as summarized in Table 4, and described in 33 CFR 155 App. B, Table 1.
- Requirements for response to the **average most probable discharge** will also be the same for non-tank vessels. In this case, non-tank vessels that carry some oil as cargo will be required to have the necessary resources on contract; those that carry oil only as their own fuel will be required to describe the resources they will use but will not be required to have contracts in place, per 33 CFR 155.5050(d), as proposed.
- Requirements for the **maximum most probable discharge** will be the same for non-tank vessels (with oil capacity of 250 bbl. for fuel and cargo) as for tank vessels, per 33 CR 155.5050(e), as proposed.
- Non-tank vessel plans must also indicate the **aerial tracking** resources[24] that will be used. These must meet the same standards as those applicable to tank vessels at 33 CFR 155.1050(l). Personnel must be qualified, and personnel and resources must be sufficient to support operations for three 10-hour operational periods during the first 72 hours of the response.

Table 4 summarizes the requirements for the worst-case discharge volume for non-tank vessels. These apply only to non-tank vessels carrying 2,500 bbl. or more as fuel or cargo, per 33 CFR 155.5050(f), as proposed. Non-tank vessels need only plan for Tier 1 response resources, but these must arrive on-scene in 24 hours, per 33 CFR 155.5050(g) as proposed.

[23] Non-tank vessels with a fuel capacity less than 250 bbl. are not required to have contracts in place, but are required to plan for a maximum most probable discharge.

[24] 33 CFR 155.5050(k), as proposed

Table 4. Summary of worst-case discharge planning requirements for non-tank vessels capable of carrying at least 2,500 bbl. of oil as fuel and/or cargo (oil groups I-IV)

Type of requirement	Specific requirements	
Planning volume	Entire oil fuel and cargo capacity[25]	
Response resources must be on-scene (including aerial tracking, up to 50 mi. offshore) [26]	Tier 1	24 hrs.
Maximum response resources needed (caps) – based on EDRC and sufficient boom to serve skimming systems used[27]	Tier 1	12,500 bbl./day
Percent response equipment that must be capable of operating in waters 6 ft. deep or shallower[28]	Open ocean	None
	Offshore	10 percent
	Nearshore	20 percent
***Additional* boom needed for shoreline protection**[29]	Offshore spill	15,000 ft. of boom by 48 hrs.
	Nearshore spill	30,000 ft. of boom by 48 hrs.
Temporary storage capacity[30]		Double EDRC

2.4 State of Alaska Requirements

State of Alaska regulations require vessel owners or operators of both tank and non-tank vessels operating in state waters to have an approved Oil Discharge Prevention and Contingency Plan. ADEC reviews and, as appropriate, approves plans according to the requirements described in 18 AAC 75.400 – 420 and 18 AAC 75.425 – 496, as applicable.

State regulations specify the outline and review process for the plans, which must contain information about the vessel; spill prevention measures in place; and the resources and procedures that would be used in the event of a spill (including specific response scenarios) to contain, control and recover oil as well as to protect

[25] 33 CFR 155.5020 and 33 CFR 155.1050(l)(1)

[26] 33 CFR 155.5050(g)

[27] Proposed non-tank vessel regulations at 33 CFR 155.5050(n) specify that if EDRC exceeds the specified cap, then the plan holder must identify commercial sources of additional equipment equal to *the lower of:* double the cap or the calculated planning volume.

[28] 33 CFR 155.1050(f)(6). Significant wave height requirements do not apply to this subset of equipment, per 33 CFR 155.1050(f)(7).

[29] 33 CFR 155 App. B, Part 5.8 [proposed in non-tank vessel regulations at 33 CFR 155.5050(m)].

[30] 33 CFR 155 App. B, Part 5.4

sensitive areas. Central to the planning requirements is a response planning standard (RPS) which is based on the cargo volume, type of cargo, and vessel type. The plan holders must demonstrate that they have adequate resources positioned to contain and recover a certain amount of spilled oil within a specified time period. Table 5 shows the RPS required for different vessels. In addition to the RPS, regulations state that, "the plan must demonstrate the general procedures to clean up a discharge of any size, including the greatest possible discharge that could occur." [18 AAC 75.430(a)]

Table 5. State-mandated RPS for crude oil tank vessels and barges (18 AAC 75.438), non-crude oil tank vessels and barges (18 AAC 75.440), and non-tank vessels (18 AAC 75.441)

Vessel	RPS Volume *Must have sufficient resources in region to contain, control and clean up this amount.*	Timeframe *Must contain, control, and clean up RPS volume within this time.*
Crude oil cargo volume < 500,000 bbl.*	50,000 bbl.	By 72 hours (in-region equipment)
Crude oil cargo volume > 500,000 bbl.*	300,000 bbl.	By 72 hours (in-region equipment)
Non-crude oil cargo	15% total cargo capacity (contain and control in 48 hours; *clean up as soon as possible*)	By 48 hours[31] (equipment in-region or another approved location)
Non-tank vessel	15% of maximum oil capacity (based either on total fuel tankage or amount of fuel that will be carried in state waters)	By 48 hours (equipment must be in region within 24 hours)
*Regardless of vessel size, a tanker plan holder must be able to *deploy* sufficient resources to contain, control, and clean up at least 60% of the total cargo volume of the vessel within 72 hours. (Resources may come from out of region.)		

State of Alaska regulations require plan holders to describe the resources and procedures they would use for stopping the discharge and lightering, but do not set specific requirements for the scope of services required. See 18 AAC 75.425(e)(1)(F)(i) and 18 AAC 75.425(e)(1)(F)(viii) for tankers and 18 AAC 75.427(b)(2)(i) and 18 AAC 75.427(b)(2)(vii) for non-tank vessels.

[31] Spilled cargo reaching water must be *contained* and *controlled* within 48 hours, and cleaned up "within the shortest possible time."

3. EMERGENCY RESPONSE RESOURCES REQUIRED BY REGULATION FOR THE ALEUTIAN ISLANDS

This section describes the scope of services that would be needed to achieve full compliance with the federal regulations governing emergency towing, salvage, and spill response in the Aleutian Islands.

For the purposes of this analysis, we focused on the federal regulatory requirements. While compliance with the State of Alaska regulations would likely require the use of more resources, at least for tank vessels carrying crude oil, these regulations would only apply to the vessels that are covered by the state regulations and are either stopping in the Aleutian Islands or passing through the study area en route to or from an Alaskan port. Federal regulations will not apply to all vessels in the area, but would apply to covered U.S. flag vessels as well as any covered vessel traveling to or from any U.S. port.

3.1 Vessels Used in Analysis

The vessel sizes used for the tank vessel and non-tank vessel are based on the average size of the largest category of tank and non-tank vessel in the project study area, according to the 2010 vessel traffic study conducted as Phase A of the risk assessment (DNV and ERM, 2010).

3.1.1 TANK VESSEL

For ***tank vessels,*** we calculated the requirements for a 600,000 bbl. crude oil tanker. The vessel traffic analysis conducted as part of Phase A found that the average cargo carried on crude oil tank ships in the study area from 2008-2009 was 620,000 bbl., with a fuel oil capacity of 18,000 bbl.) (DNV and ERM, 2010).

Additionally, the tug analysis presented in Section 3.2 required consideration of vessel characteristics beyond the tank vessel's cargo and fuel oil capacity. For the purpose of the tug analysis, the *Overseas Ohio* (now the Greek-flagged Ecomaster) was used, with the characteristics described in Figure 5.

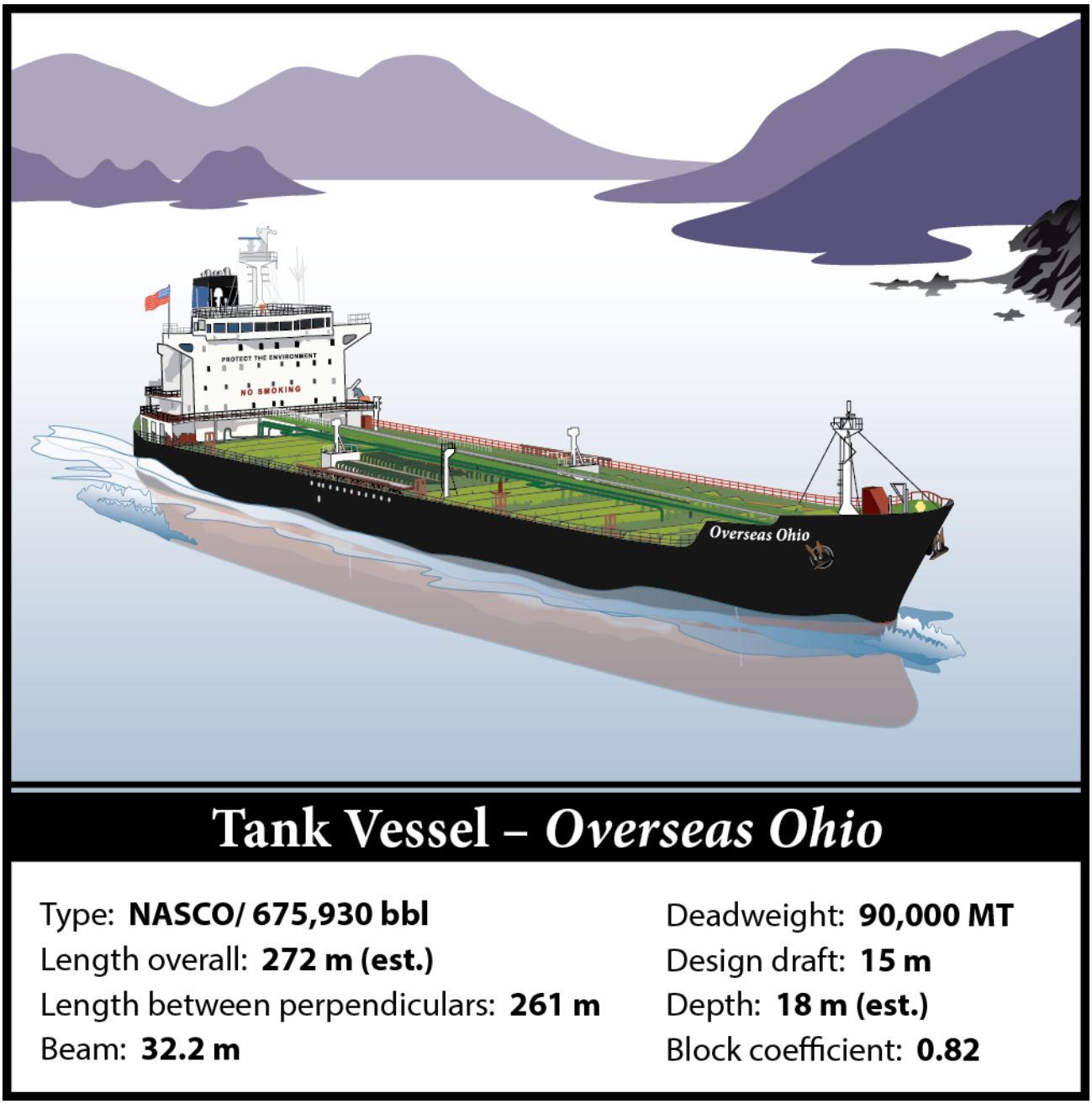

Figure 5. Overseas Ohio vessel characteristics

3.1.2 NON-TANK VESSEL

For ***non-tank vessels***, we calculated the requirements for a 68,000 DWT container ship, with an average fuel capacity of 53,000 bbl. The vessel traffic analysis conducted as part of Phase A found that the larger[32] container ships transiting the study area from 2008 – 2009 averaged 68,235 GT (DNV and ERM, 2010).

[32] The vessel traffic analysis divided container ships into two groups: those greater than 4500 TEU and those less than 4500 TEU.

As was the case for the tank vessel, the tug analysis in Section 3.2 required consideration of additional vessel characteristics. The *Maersk Djibouti*, described in Figure 6, was used as the non-tank vessel when considering minimum tug requirements. The fuel capacity is assumed to be 58,000 bbl.

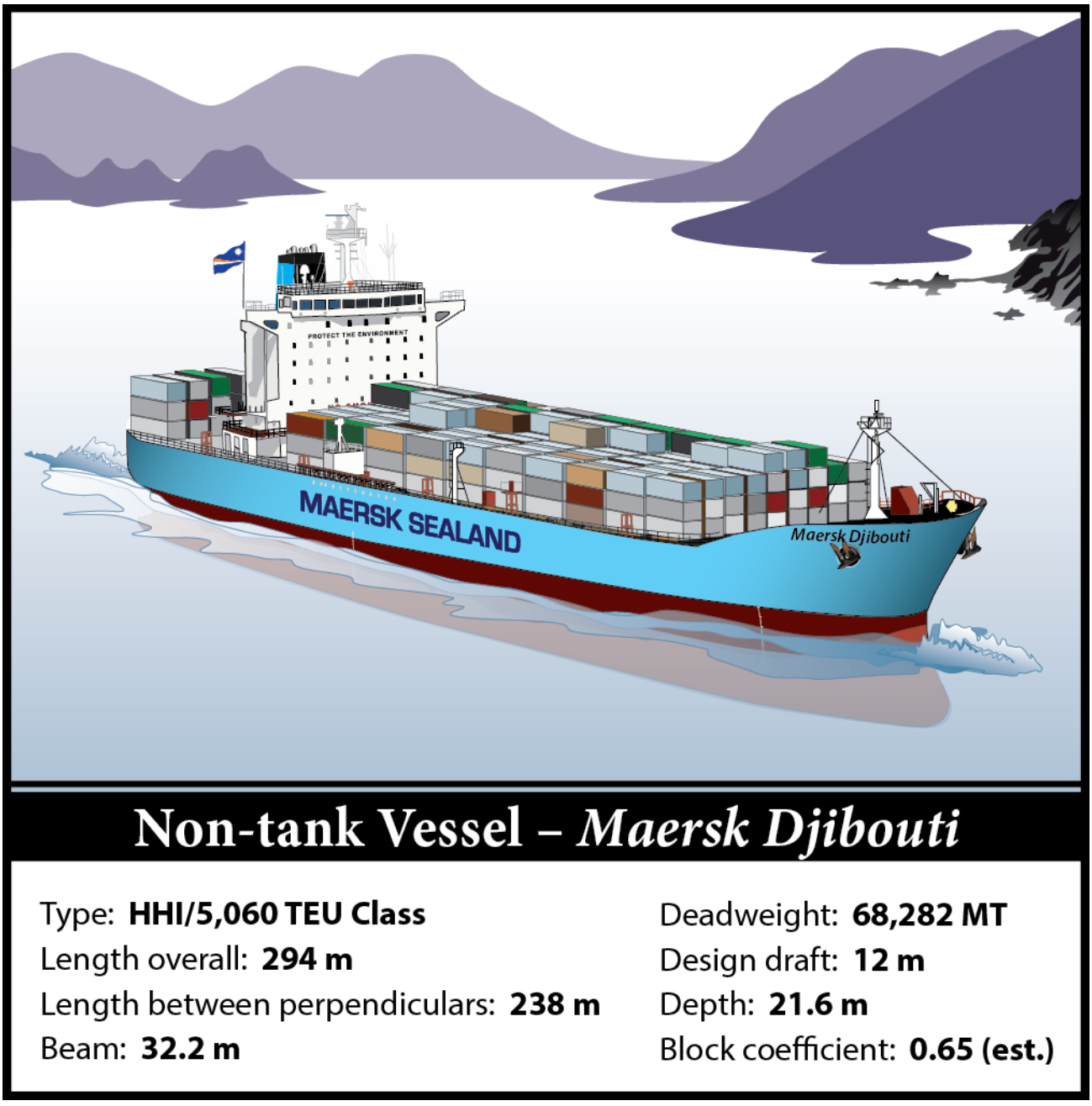

Figure 6. Maersk Djibouti vessel characteristics

3.2 Towing

As noted in Table 2, there is no time requirement for emergency towing services due to the fact that the study area is outside of 50 miles from Anchorage. However, the regulatory intent clearly exists that emergency towing services would be available, albeit not on a specific timeline, and in order for this service

to achieve its safety and environmental protection purpose, a suitable tug would need to be in the vicinity. The Glosten Associates (2013) determined that a tug with a bollard pull rated at 81 MT would be the minimum required for either the tank vessel or the non-tank vessel described above in order to comply with federal regulations at 33 CFR 155.4025 and 33 CFR 155.4030(e). (See Appendix A for the full analysis, the results of which are summarized here.)

The minimum tug requirement analysis was conducted using the following assumptions regarding what "compliance" would mean in this context:

- The tug had to be able to control the specified vessel in 40-knot winds, as specified at 33 CFR 155.4030(e). A corresponding sea state of 6 was used in the analysis.

  Winds in the Aleutian Islands often reach 60-knots or more; however, the purpose of this analysis was to establish the resources needed for compliance with the regulations. (The conditions in the Aleutian Islands and how these influence towing, salvage, and spill response will be analyzed in Task 1-2B).

- The analysis was based on the force necessary to achieve the following:

  - Turn a drifting vessel into the wind and waves, without towing crosswind to develop forward speed.

  - Tow the vessel to windward at one knot.

  These procedures were used to represent the tug's ability to "stabilize" or "control" the two specified vessels, as required at 33 CFR 155.4025. The same regulation also states that a tug should be able to remove the vessel from a grounded position, but this was omitted from the analysis: the tug size recommended would likely be able to assist a vessel that was floated off of a grounded position, but not one that needed to be dragged across the sea bed. In the latter case, the tug requirements and procedures would depend greatly on other aspects of a salvage operation.

Bollard pull is the primary tug vessel attribute critical to enabling the tug to achieve the regulatory requirements. In considering the bollard pull required, this analysis used an overall tug efficiency that included additional forces on the tug and factors such as sea state, wave and wind drag, drag on the tow line, propeller ventilation, and reductions in throttle settings to prevent over-speeding the engines.

As shown in Table 6, which summarizes the results of the analysis for both vessels, it is the non-tank vessel that requires the greater force in order to be towed against 40 knots of wind in sea state 6 at one knot.

Table 6. Summary of force requirements specified to tow tank and non-tank vessel in 40 knots of wind at sea state 6 (modified from The Glosten Associates, 2013)

Vessel	Towing force at 1 kt (MT)	Turning force (MT)	Tug efficiency	Rated bollard pull (MT)
Non-tank vessel 68,282 DWT container ship	40	62	0.76	81
Tank vessel 675,930 bbl. crude tanker	18	14	0.76	24

3.3 Salvage

As described outlined in Section 2.3.1, all VRP holders are, as of February 22, 2011, required to comply with the Salvage and Marine Firefighting (SMFF) regulations contained within 33 CFR 155 Subpart I.

The SMFF regulations define services and resources that Tank Vessel owners and operators must contract for, establish planning timeframes for response, and provide criteria for determining resource provider adequacy. These updates also require the submission of contracts and funding agreements between vessel owners/operators and SMFF resource providers for the 19 SMFF services defined in the regulation and in Table 3.

The Aleutian Islands fall far outside the 50-mile radius of the COTP City of Anchorage, AK; the COTP city for planning purposes. Therefore, as outlined in 33 CFR 155.4040(d)(6), while VRP holders must still contract for SMFF services and provide a description of how they intend to respond and an estimated response time when these services are required, none of the time limits in Table 155.4030(b) will apply to these services.

3.4 Spill Response

Nuka Research and Moran Environmental Recovery analyzed the response resource requirements applicable to the Aleutian Islands, including considering the existing analysis related to the Western Alaska Alternative Planning Criteria (Marine Exchange of Alaska, 2011). VRP holders are required to plan for the resources needed to respond to different sizes of spills based on their cargo capacity. This section presents the analysis of the planning volumes that would be required for different operating environments based on a worst-case discharge from both a tank vessel and a non-tank vessel. Not surprisingly, higher planning volumes would be required for the tank vessel as compared to the non-tank vessel, so the minimum spill response resource requirements shown in Section 3.4.3 are based on those that would need to be contracted for a tank vessel.

3.4.1 TANK VESSEL

For this analysis, we assume that a 600,000 bbl. tank vessel is carrying Group III oil. Table 7 shows the specific planning volumes for Tier 1, 2, and 3 resources required for a worst-case discharge (the largest planning volume) from this vessel. As required in the regulations, these resources must be suitable for use in

different operating areas: nearshore, offshore, and open ocean. The total planning volumes for each of these operating areas are different: inland and nearshore resources must be sufficient to contain and recover 600,000 bbl.; 480,000 bbl. for offshore; and 240,000 bbl. for the open ocean. Table 7 also shows the caps, or maximum requirements set out in 33 CFR 155 Appendix B.

Table 7. Planning volumes required in regulations based on worst-case discharge from 600,000 bbl. tank vessel carrying Group III oil (bbl.)

	Inland & Nearshore			Offshore			Open Ocean		
	Tier 1	*Tier 2*	*Tier 3*	*Tier 1*	*Tier 2*	*Tier 3*	*Tier 1*	*Tier 2*	*Tier 3*
Group III	**90,000**	**150,000**	**240,000**	**48,000**	**79,200**	**100,800**	**14,400**	24,000	28,800
Caps	12,500	25,000	50,000	12,500	25,000	50,000	12,500	25,000	50,000

Because the resource requirements exceed the caps (maximums) specified at 33 CFR 155 Appendix B in all cases, the caps represent the minimum requirements for resources that must be contracted. Additional resources must be identified, but not necessarily contracted.

3.4.2 NON-TANK VESSEL

For the non-tank vessel analysis, we assume that the proposed regulations (described above) are in effect. Non-tank vessel spill response planning requirements are based on the fuel capacity of the vessel, which, in this case, is assumed to be 53,000 bbl. of Group III oil. Similar to the tank vessel requirements, overall planning volumes for non-tank vessels are expected to vary with the operating area: in this case, the planning volume required will be 53,000 bbl. for the nearshore, 42,400 bbl. offshore, and 21,200 bbl. for the open ocean. Table 8 shows the planning volumes required for each resource tier in each operating area for this non-tank vessel.

Table 8. Planning volumes required in regulations based on worst-case discharge from 68,000 DWT non-tank vessel carrying Group III oil (bbl.)

	Inland & Nearshore	Offshore	Open Ocean
	Tier 1	*Tier 1*	*Tier 1*
Group III	7,950	4,240	1,272
Caps	12,500	12,500	12,500

3.4.2 MINIMUM RESOURCES REQUIRED FOR SPILL RESPONSE

As noted above, because the tank vessel requires resources that are calculated to be able to contain and recover significantly more oil than the non-tank vessel, the planning volumes for the tank vessel described in 3.4.1 are used as the basis for determining the quantity and type of spill response resource that would be needed. These are shown in Table 9. The resource needs are calculated based on containment requirements in the regulations, effective daily recovery capacity

(EDRC) calculated for skimming equipment based on guidance in the regulations and manufacturer-rated EDRC, and best professional knowledge about the vessels that would be required to deploy the containment and recovery systems. The resource requirements also include secondary storage barges. See Appendix B for the calculations used to develop the list shown in Table 9.

Table 9. Major Resources[1] needed to achieve worst-case discharge planning volumes for 600,000 bbl. tank vessel carrying Group III oil

Resource	Quantity	Operating Area	EDRC (bbl. per day)	Temporary Storage Capacity (bbl.)
BOOM				
Shoreline Protective Boom[2], 18-42 in.	30,000 ft.	Nearshore		
Containment Boom[2], ≥ 42 in.	1,000 ft.			
Containment Boom, ≥ 42 inch (300' per skimmer)	# skimmer x 300	Nearshore Offshore Open ocean		
OIL RECOVERY AND STORAGE				
Oil spill response vessels (OSRV) (Class 1)	5	Offshore/Open ocean		4000
Workboat, 32 ft., OSRV (1 per OSRV)	5	Offshore/Open ocean		
Transrec 350 Skimmer	5	Offshore/Open ocean	10,567	
Offshore Oil Storage Barge	3	Offshore/Open ocean		40,000
Shallow Water Capability (20% - 10K bbl.)				
Bay class skimming vessels (Class 4) w/ 2-LORS2 skimmers	3	Nearshore	4,954 (each boat)	
Landing Craft (Class 5)	2	Nearshore		
Small Boats, Nearshore (Class 6)	10	Nearshore		
Mini-Barge	3	Nearshore		249

[1] Additional equipment and supplies will be required beyond those listed in this table. See Section 3.5.2.

[2] In addition to the boom identified in the table, and in order to support booming operations, ground tackle including anchors and line, as well as an adequate supply of shackles, snap hooks, buoys and chain of various sizes and types will be required to complete booming "systems."

3.5 Other Infrastructure

All of the resources described in this section require some level of support infrastructure and oversight. This section describes briefly some of the additional infrastructure that would be required in the region to sustain the required resources.

3.5.1 TUG

The tug would require dock space commensurate with its size as well as ship-to-shore power connections and fueling facilities.

3.5.2 SALVAGE

Because the regulatory requirements applicable to the study area do not require resources to be available in the Aleutian Islands, salvage operations would likely rely on resources from other locations in Alaska or elsewhere. Extensive salvage resources are available elsewhere in Alaska and on the U.S. West Coast.

3.5.3 SPILL RESPONSE

Locating and maintaining pre-positioned spill response resources for timely mobilization and response within the Aleutian Islands will require an infrastructure equivalent to that of an Oil Spill Removal Organization (OSRO).

Depending on the location of the spill, and how far it is from shore, some resources will likely need to be on scene within 24 hours and therefore located in more than one location within the study area. (The regulatory timelines do not dictate the timelines for all spill response-related equipment, as the timelines for some resources include unlimited travel time. As the number of response hubs is not clearly dictated, we have assumed a range of four to six potential sites will be needed. While the number is more likely closer to six, there may not be six viable locations for response hubs.)[33]

Response Resource Sites should be located at an appropriate waterfront site that can accommodate:

- Office facilities
- Warehouse facilities
- Dock facilities (for vessels up to approx. 250 ft. and 1,400 GT)
- Additional resources to support on-water oil recovery operations

Resources not already staged at pre-determined locations will need to be transported to the Aleutians by air (to meet response time requirements) and airports are few with limited capacity to accommodate large cargo aircraft.

3.6 Management and Organizational Structure

An OSRO or other organization will also provide the management and organizational structure needed to build, sustain, deploy and track the personnel, equipment, and vessel resources for a response. The size and organization of the

[33] As noted, subsequent phases of Task 1-2 will focus on recommending the configuration.

entity will vary depending on the services it provides; for example, a relatively small operation could be used for emergency towing only, but a larger operation would be required for multiple spill response centers, tow vessels, and salvage services. It is likely that any organization providing services in the Aleutian Islands area would have contractual relationships and/or mutual aid agreements in place to leverage resources from other response organizations in Alaska or the U.S. as needed (particularly for the type of salvage services that are not required to be on scene immediately).

Figure 7 presents one option for the organization of response personnel.

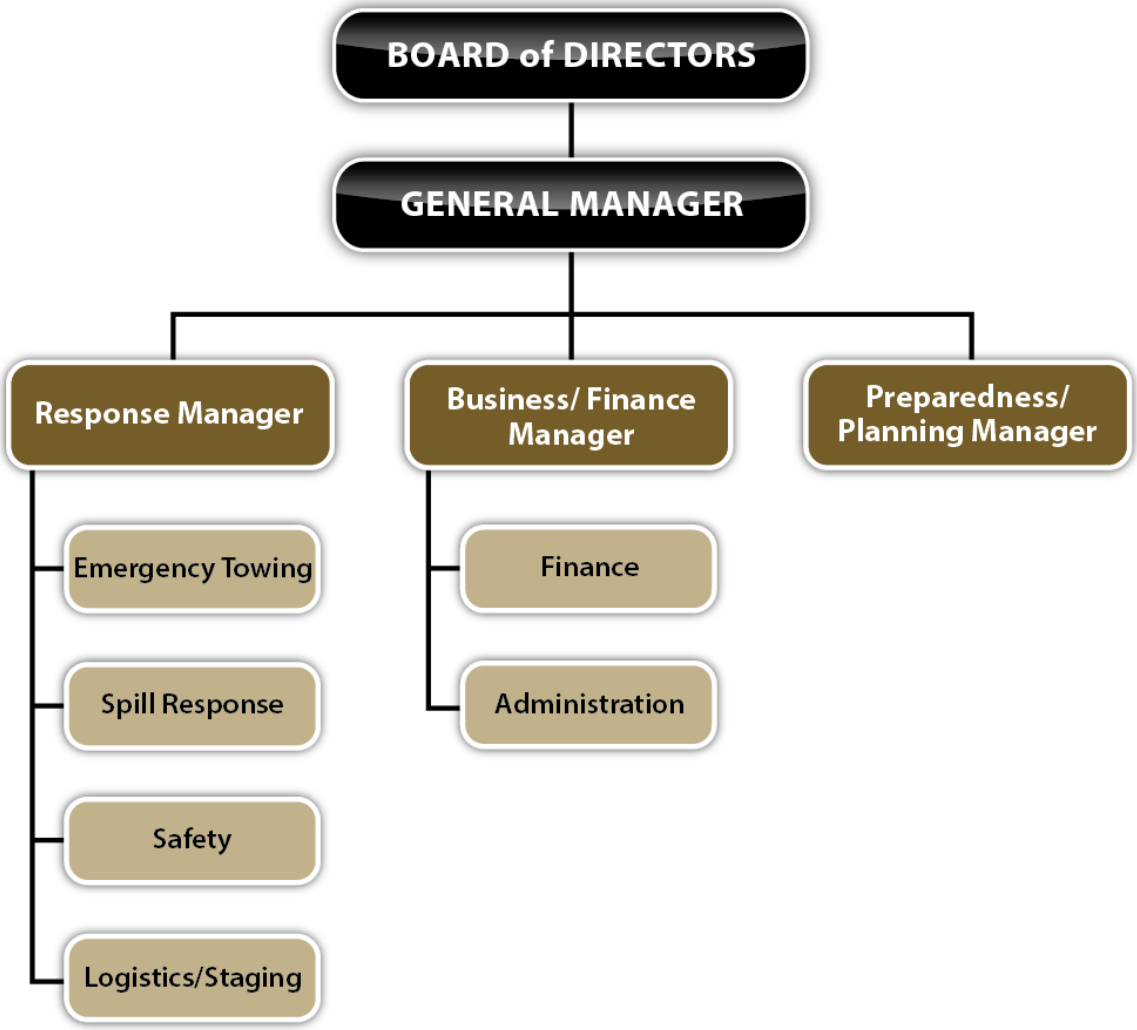

Figure 7. Potential organizational structure for response resources

An OSRO's response resources and capabilities are intended to provide planning and preparedness support to a company's oil spill contingency plan(s). The size of the organization is typically dependent on the required planning criteria (see Section 3.2) and on the magnitude of the incident, and can be expanded or reduced, as necessary.

The number of personnel needed to support a response depends on numerous factors. The OSRO may respond to oil spills where the Responsible Party (RP) is a non-member, or on behalf of state or federal agencies when the RP is not available or capable of managing the response.

The *Guidelines for the U.S. Coast Guard's Oil Spill Removal Organization Classification Program* sets out requirements for OSROs, including:

- The number of personnel required for a classification for each COTP city is based on the location of resources.
- During the application process, an OSRO must identify the number of personnel required to mobilize and operate the resources at each of its resource sites.
- Each site that meets the time requirements for a classification must have its personnel requirements totaled for that classification.
- If sufficient personnel have been identified by the OSRO that meet the response time requirements and concurrently can deploy and operate all equipment necessary for that level of classification, then an OSRO qualifies for that classification. (USCG, 2013)

4. COST OF SERVICES

This section estimates the costs of services that would be needed to achieve full compliance with the federal regulations governing emergency towing, salvage, and spill response in the Aleutian Islands. All cost estimates are reported in 2013 U.S. dollars.

4.1 Towing

The capital cost of a tug that meets the minimum requirements described above ranges from $15.1 million to $21.5 million, depending on where the tug is built and the vessel's characteristics (ranging from a boat with a render/recovery winch to be used for other services such as escorting a vessel through Unimak Pass but also available for some emergencies, up to a fully outfitted ocean towing tug with a render/recovery system, water cooled brake, and towing winch dedicated as an emergency tug).

The annual operating cost depends on whether the tug is primarily used to provide escorting services through Unimak Pass but is available for some emergencies, or is dedicated as an emergency tug. A tug active in other services such as escorting would require a full crew 24-hrs per day. The estimated operating cost would be $4.3 million to $5.1 million per year plus fuel. A tug operating for drills and emergencies only would have a lower crew requirement, making the tug less expensive to operate.

Feedback was provided that the cost estimates did not reflect the high cost of transporting people and equipment to, from, and within the remote region. To address this, without developing more detailed estimates, a 7.5% "Aleutians surcharge" has been added to both the capital and costs for towing.[34]

4.2 Salvage

The estimated annual cost of contracted salvage services and resources is $500 per vessel.[35] This annual fee does not include drill costs. Discounts may apply from multiple vessel entry and multiple year enrollments.

Recognizing the uncertainty of future vessel traffic in the study area, the analysis assumes a range of 2,000 vessels to 4,000 vessels per year. This range seems plausible as 2,219 vessels transited or operated in the Aleutians Islands from August 2008 to July 2009 (DNV & ERM, 2010), which was a period when a global economic recession had a negative impact on vessel traffic. Nuka Research estimated a pre-recession level of 3,100 ships per year (2006) based on the same data source used by Det Norske Veritas & ERM-West, Inc.

[34] One respondent indicated that the original cost estimates seemed appropriate, while another suggested a 15% increase.

[35] This amount is based on the market price for complying with regulations by having a contract in place; it does not represent the cost of actually providing salvage services or the infrastructure and personnel necessary to provide those services.

Multiplying the number of vessels by the enrollment fee per vessel provides an estimated cost of salvage coverage of $1 million to $2 million per year. This figure assumes that federal regulations would apply to non-tank vessels.

4.3 Spill Response

Estimates of the capital cost of the spill response resources that would be needed to achieve worst-case discharge planning volumes for 600,000 bbl. tank vessel carrying Group III oil are provided in Table 10. Similar to the approach used for the tug in Section 4.1, a percentage increase was applied based on input during the public comment period. For spill response resources, 5% "Aleutians surcharge" was added to all capital costs to represent the increased cost of moving resources to and from this remote area. Similarly, a 10% "Aleutians surcharge" was added to the annual operating costs to reflect the transport of personnel and goods to, from, and within the region.

Table 10. Capital cost estimates

Resource	Quantity	Increment	Base Price
BOOM			
Shoreline Protective Boom, 18-42 in.	30,000 ft.	$18/ft. (20-in. boom)	$540,000
Containment Boom, ≥ 42 in.	$1,000 ft.	$70/ft. (50 in. boom)	$70,000
Containment Boom, ≥ 42 in. (300 ft. per skimmer)	8 x 300 ft. per skimmer	$70/ft.	$168,000
OIL RECOVERY AND STORAGE			
Workboat, 32 ft, OSRV (1 per OSRV)	5	$40,000 ea.	$200,000
Transrec 350 Skimmer	5	$2,000,000 ea.	$10,000,000
SHALLOW WATER CAPABILITY (20% - 10K bbl.)			
Bay class skimming vessels (Class 4) w/ 2-LORS2 skimmers	3	$700,000 ea.	$2,100,000
Landing Craft (Class 5)	2	$200,000 ea.	$400,000
Small Boats, Nearshore (Class 6)	10	$30,000 ea.	$300,000
Mini-Barge	3	$300,000 ea.	$900,000
SUBTOTAL CAPITAL COSTS			**$14,678,000**
5% "Aleutians Surcharge"			**$733,900**
TOTAL CAPITAL COSTS			**$15,411,900**

In addition to the above capital costs, the estimated total costs for charter vessels would be $26.4 million per year (see Table 11). The cost is calculated by multiplying 365 days times the daily charter rates of $12,000 for each Class 1 OSRV and $4,100 for each offshore oil storage barge. It is assumed that the vessels would be stationed out in the Aleutian Islands during the year.

Table 11. Annual charter vessels cost estimates

Resource	Quantity	Increment	Base Price
OIL RECOVERY AND STORAGE			
Oil spill response vessels (OSRV) (Class 1) annual charter cost	5	$4,380,000	$21,900,000
Offshore Oil Storage Barge annual charter cost	3	$1,496,500	$4,489,500
TOTAL CHARTER COSTS			**$26,389,500**

Locating and maintaining pre-positioned spill response resources for timely mobilization and response within the Aleutian Islands will also require an infrastructure equivalent to that of an OSRO. The total administrative and indirect costs associated with operating a pre-position site with 100-mile response capabilities would be $1.38 million per year for each hub and $1 million per year for each additional site. Table 12 provides detailed cost items for a typical hub site needed for full compliance of the federal planning standards.

Resources will likely be placed in more than one waterfront location within the study area. For example, Dutch Harbor and Adak are potential hub locations considering the existing infrastructure and proximity to eastern and western Great Circle Route entry and exit points in the Aleutians. Assuming there would need to be two hubs and two to four additional sites (each at 30% less cost than a hub), the total annual operating costs for all pre-position sites is estimated to range from $5.98 million to $8.36 million.

Table 12. Annual operating cost estimates of a typical hub pre-positioned site

Annual Operating Costs per Site	
INDIRECT COSTS	
Wages - PTO/Training	$180,000
Wages - Equipment Maintenance	$30,000
Indirect Benefits	$100,000
Supplies	$50,000
Wages - Vessel Maintenance	$10,000
Parts	$40,000
Equipment Leases	$12,000
Insurance - Vessels	$12,000
Registration - Vessels	$3,500
Training & Compliance	$49,000
Field Communications	$15,000
Insurance - Other	$12,000
Shop Disposal	$5,000
Fuel	$100,000
Uniforms	$5,000
Housing	$219,000
Wages - Supervision	$40,000
TOTAL INDIRECT COSTS	**$882,500**
Administrative Expenses	
Wages - Administrative	$275,000

Employee Benefits	$70,000
Training & Compliance	$8,000
Insurance - General Business	$200,000
Equipment Lease	$15,000
Telephone & Utilities	$20,000
Office Expenses	$12,000
Marketing	$10,000
Travel	$20,000
Professional Fees	$5,000
Taxes and Licenses	$20,000
Rents	$100,000
TOTAL ADMINISTRATIVE EXPENSES	**$755,000**
SUB-TOTAL EXPENSES PER HUB	**$1,637,500**
10% "Aleutians Surcharge"	**$63,750**
TOTAL EXPENSES PER SITE	**$1,801,250**

4.4 Cost Summary

Estimates of the capital and operating costs of services that would be needed to achieve full compliance with the federal regulations governing emergency towing, salvage, and spill response in the Aleutian Islands are summarized in Table 13. The estimated total capital cost range from $30.5 million to $36.9 million, and the total annual operating cost range from $37.7 million to $41.8 million. These total costs are calculated as the sum of providing the three services separately and do not consider potential savings from utilizing the same resource for more than one purpose.

Table 13. Capital and operating cost estimates of services required to comply with federal regulations related to emergency towing, salvage, and spill response in the Aleutian Islands

	Capital Costs	Annual Operating Costs (*)
Towing	$15.1 million - $21.5 million	$4.3 million - $5.1 million
Salvage	Not Applicable	$1.0 million - $2.0 million
Spill Response	$15.4 million	$32.4 million - $34.7 million
TOTAL	**$30.5 million - $36.9 million**	**$37.7 million - $41.8 million**

Note: Annual operating costs exclude vessel fuel costs.

5. CONCLUSION

The Analysis Team applied the federal vessel response plan regulations to a tank vessel of the average largest size currently transiting the Aleutian Islands, and the proposed federal non-tank vessel response plan regulations to a container ship representing the average of the largest of those vessels passing through the area. The analysis resulted in mid-point estimates of $31.5 million for capital costs and $38.1 million for annual operating costs to provide emergency towing, salvage, and spill response services required for regulatory compliance.

This subtask does not consider what an "optimal" response system would look like nor does it consider current or potential future alternative planning compliance schemes. The next step in the project will be to develop a recommended, optimal response system that takes into consideration the costs, logistics and feasibility, vessel traffic patterns, and environmental conditions of the Aleutian Islands and Bering Sea. The Advisory Panel has directed the Analysis Team to conduct subsequent analysis in this task using an 85,000 DWT container ship, which is the 75th percentile for vessel size based on vessels passing through the area in 2012. While there is the potential for much larger vessels to be in the study area in the future due to pending energy export projects on the West Coast of the U.S. and Canada, the Advisory Panel is focused on the known vessel traffic and identified the need to plan for larger containerships based on changes in vessel traffic since the initial vessel traffic study was conducted in 2010. The proposed optimal response system will be reviewed by the Advisory Panel and analyzed to understand its potential benefits and costs.

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Appendix A:
Minimum Required Tug Analysis

PROJECT NAME

Minimum Required Tug

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DOC: 12127.02.1-2b	REV: A	FILE: 12127.02	DATE: 14 January 2013

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Introduction

As part of the Aleutian Islands Risk Assessment Phase 2 work plan (Reference 1), it is required to identify the towing performance capacity required of a tug to handle existing vessels in the prevailing weather conditions. The work plan identified two vessels as being the largest typically found on routes passing close to the Aleutians; a 600,000 BBL crude oil tanker and a 68,000 DWT container ship.

Weather

The evaluation was run for a range of conditions that might be found in the Aleutians. Winds from 20 to 60 knots with sea states to match were examined. Reference 2, Table 7, shows a typical relationship between wind speed and sea state for the North Pacific and was used in this study. It is summarized in Table 1 below. Reference 8 requires an emergency towing vessel suitable for 40 knots. This wind speed and its associated sea state 6 are used in the conclusions for specifying the minimum required bollard pull.

Table 1 Wind and Sea State conditions.

	SS4	SS5	SS6	SS7	SS8
Mean Significant Wave Height (m)	1.88	3.25	5.00	7.50	11.50
Modal Wave Period (s)	8.8	9.7	13.8	13.8	18
Mean Wind Speed (kt)	20	25	40	50	60

Vessels

Actual vessels were selected to match the requirements in the work plan. The vessel particulars are summarized below in Table 2.

Table 2 Vessel Particulars.

	Tanker	Container Ship
Type	NASCO 675,930 BBL	HHI 5,060 TEU Class
Name	*Overseas Ohio*	*Maersk Djibouti*
Length Overall (m)	272(est.)	294
Length Between Perpendiculars (m)	261	238
Beam (m)	32.2	32.2
Deadweight(MT)	90,000	68,282
Design Draft (m)	15	12
Depth (m)	18(est.)	21.6
Block Coefficient	0.82	0.65(est.)

Analysis Methods

The tug force required to handle the vessels was computed for each vessel at each wind speed/sea state for a complete range of wind angles. Different components of the required force were computed for waves, wind, and current. No actual current was applied; the current loadings were used to represent smooth water towing resistance. One knot was used as a tow speed to allow hydrodynamic forces on the vessels to help with steering and control. Current, wave, and wind forces were calculated using the methods presented in References 3, 4, and 5 respectively. All forces were assumed to be aligned.

The towing force was calculated as the worst case of the straight ahead pull or the forward yawing force represented as the maximum turning force at approximately +/- 40 degrees. The towing force for the container ship was dominated by the yawing force due to the high windage while the towing force for the tanker was maximum in the straight ahead condition.

From the force components, the forces for holding the vessel in position, turning the vessel into the wind, and towing the vessel are computed.

Analysis Results

The figures below show the tug forces in MT required to handle the container ship and tanker for a range of wind speeds in knots. At higher wind speeds the wind forces dominate the solution which makes the container ship the limiting case for turning and arresting drift.

The three operations are:

- Arresting drift; the tug force required to prevent the vessel from drifting down wind when it is beam to the wind and waves
- Turning; the tug force required to turn a drifting vessel into the wind and waves without towing crosswind to develop forward speed
- Towing; the tug force required to tow the ship to windward at 1 knot.

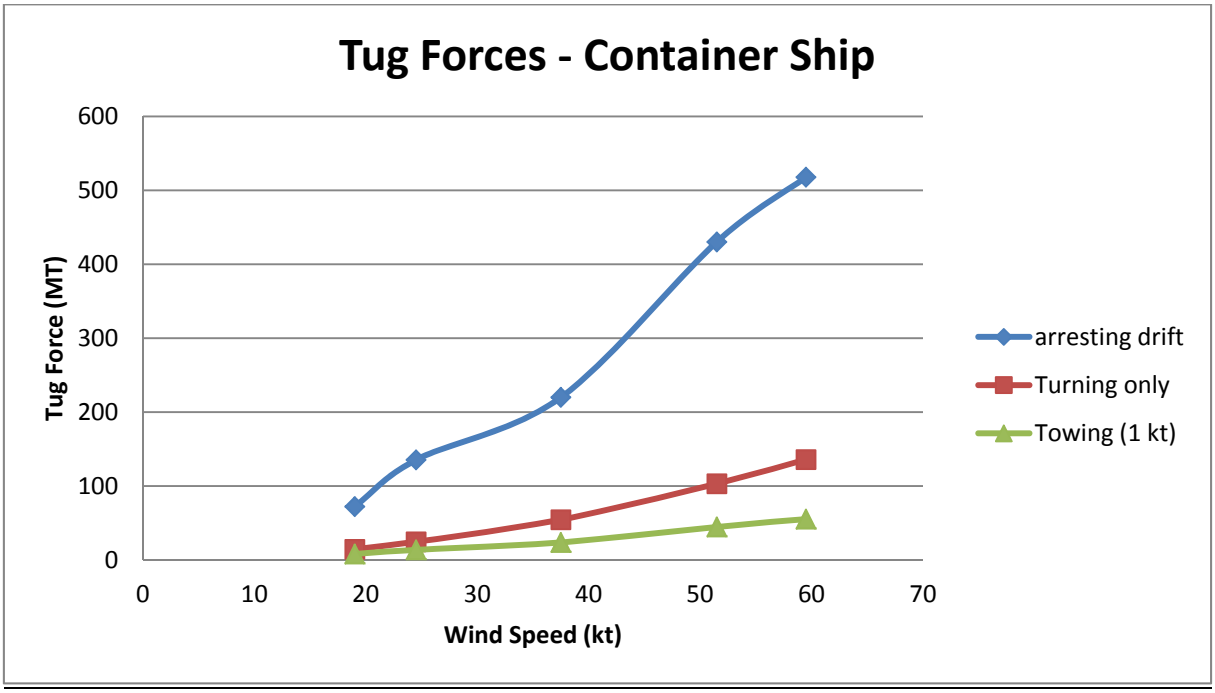

Figure 1 Tug forces on Container Ship.

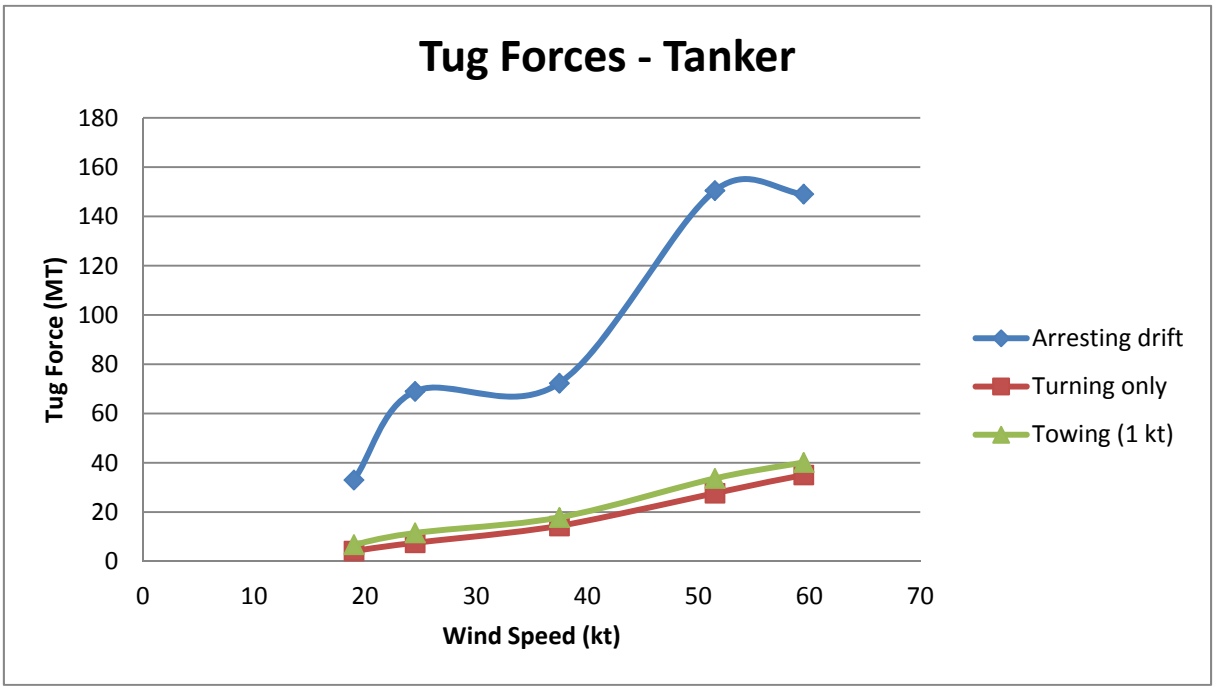

Figure 2 Tug forces on Tanker.

Simulations

As a check on the analysis a series of simulations were undertaken for comparison using Glosten's "SHIPMAN" maneuvering simulator, Reference 6. These simulations were run for the two vessels using 35 to 100 MT tugs with a wind speed of 40 knots. Two scenarios were

studied. The first has the tug pulling into the weather until the ship is under control. The second has the tug aligned with the ship to start and gradually heading up wind as the simulation progresses. The second scenario is designed to get the ship moving to allow hydrodynamic forces to assist with the turning. The scenario was considered a success if when/if the vessel was moving forward into the wind. Table 3 shows the minimum tug force required for each vessel. Figures 3 and 4 show examples of the simulator output.

Table 3 Tug forces in Maneuvering Simulations

	Scenario 1 (Tow directly to windward)	Scenario 2 (Tow crosswind, then to windward)
Tanker	45 MT with 76% efficiency factor	35 MT with 76% efficiency factor
Container Ship	65 MT with 76% efficiency factor	55 MT with 76% efficiency factor

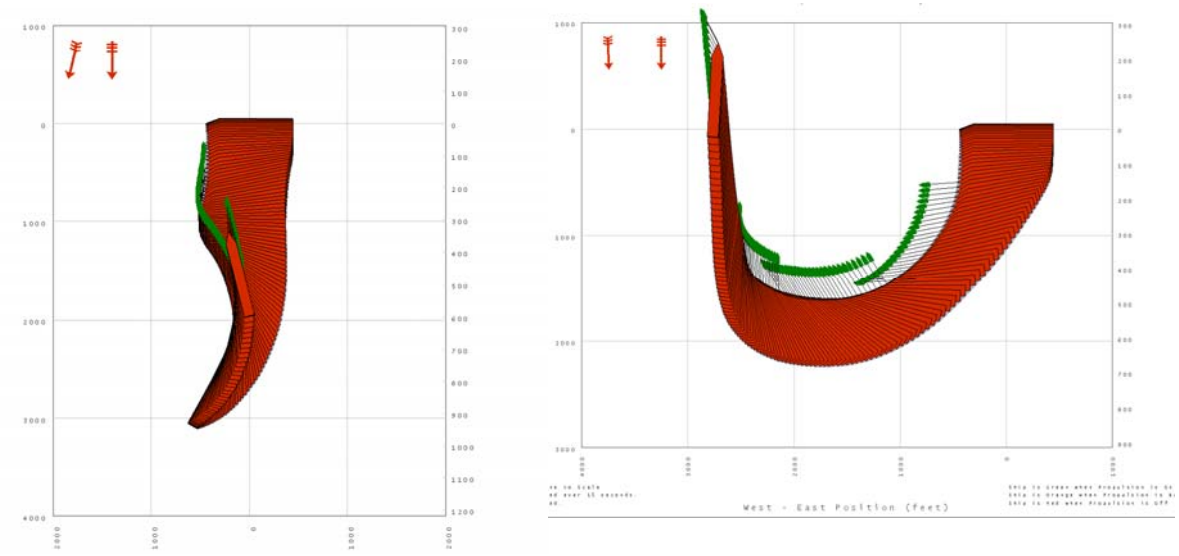

Figure 3: Drifting Simulation – 90,000 DWT tanker – 40 kts wind, 8ft waves
45 MT bollard tug Tow directly to windward (left), 35 MT bollard tug Crosswind tow (right)

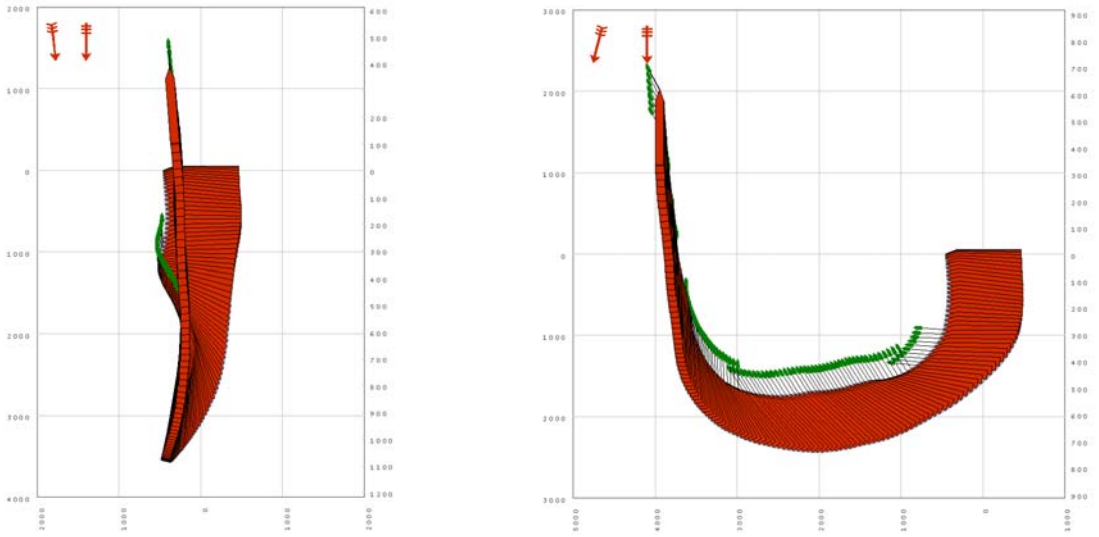

Figure 4: Drifting Simulation – 5060 TEU Containership – 40 kts wind, 8ft waves
65 MT bollard tug - Tow directly to windward (left), 55 MT bollard tug - Crosswind tow (right)

Discussion

Reference 8 requires a tug that can control the drifting vessel. It was not felt that immediate ship arrest would be necessary. The requirement is more important in a situation with extremely limited sea room and the required force for higher winds would be impossible to generate. In a narrow channel or near a rock a cross wind tow would be adequate in most situations to remove the drifting vessel from danger. Reference 8 also requires that the tug be able to tow a grounded vessel. This would greatly depend on the salvage method. If the vessel were floated off, the tug sized in this report would be perfectly adequate. If the tug needs to drag the vessel across the sea bed it would most likely not be adequate. This analysis only addresses towing a floating vessel.

Because the forces on the vessel are greatly reduced with the bow pointed into the weather, the strategy for this analysis is to turn the vessel while allowing drift to leeward. As such the required tug force would be the worst case of the turning or towing requirements. The simulations show less tug force required than the analysis. For scenario 1 this is due to using the worst case turning moments. These occur with the bow lying about 130-140 degrees off the wind. In the simulations the vessels start at about 100 degrees off the wind. The hydrodynamic hull forces due to the downwind drift are tending to turn the vessels more broadside than their worst case positions. The analysis shows that the turning moment is very sensitive to the precise drift angle. Because the actual vessel will be unknown and because both the analysis and the simulation depend on a few representative parameters it was felt that the precise drift angle was unknown and therefore the worst case tuning moments should be used for the tug requirements. Figure 5 shows the variation in turning force related to the drift angle to the wind. The bow is into the wind at zero degrees.

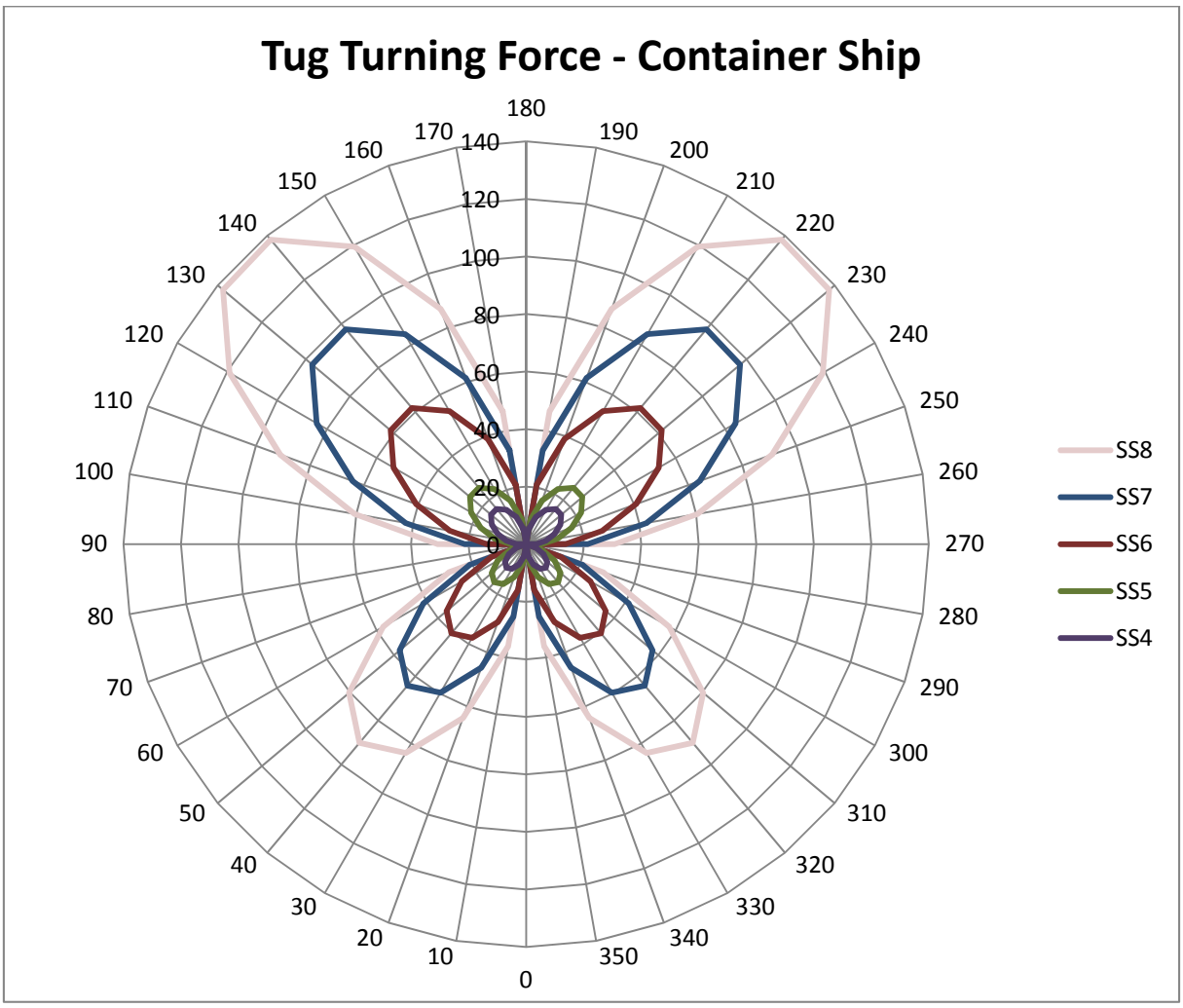

Figure 5 Container Ship Turning force

Similarly with scenario 2, the tug forces from simulation are even smaller than the analytic calculation. Starting the vessel moving allows its own hydrodynamic forces to generate a turning moment and is a good strategy for a smaller tug. It was felt, however that this was another area in which we did not want to be too optimistic. The smaller tug might not be able to operate safely beam on the weather in the worst conditions.

The downwind drift allowed by the smaller tugs in the simulations while gaining control of the vessels ranged from 700 to 1100 meters.

Tug Efficiency

The rated bollard pull of a tug is for ideal, calm, conditions. To equate a tug bollard pull to the tug force computed in this study tug efficiency is applied. This efficiency encompasses additional forces on the tug and decreases in performance due to the high sea states involved. The tug efficiency factors taken from Reference 7 include an allowance for the wave and wind drag on the tug, the drag on the tow line, propeller ventilation, and reductions in throttle settings to prevent over-speeding of the engines.

Conclusions

The tug force required for turning either of the representative vessels in 40 knots of wind and sea state 6 is approximately 62 MT. The tug force required for towing either of the representative vessels against 40 knots of wind and sea state 6 at 1 knot is about 40 MT. A tug with a rated bollard pull of 81MT will be able to handle either of the representative vessels in these conditions. The complete results are summarized in Tables 4 and 5 below.

Table 4 Container Ship.

Sea State	Wind (kt)	Towing Speed (kt)	Towing Force (MT)	Turning Force (MT)	Tug Efficiency	Tug Rated Bollard Pull (MT)
4	20	1	11	16	0.80	20
5	25	1	17	26	0.78	33
6	40	1	40	62	0.76	**81**
7	50	1	64	98	0.74	132
8	60	1	90	138	0.72	192

Table 5 Tanker.

Sea State	Wind (kt)	Towing Speed (kt)	Towing Force (MT)	Turning Force (MT)	Tug Efficiency	Tug Rated Bollard Pull (MT)
4	20	1	7	4	0.80	9
5	25	1	12	8	0.78	15
6	40	1	18	14	0.76	**24**
7	50	1	34	28	0.74	45
8	60	1	40	35	0.72	56

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Appendix B: Calculations for Estimating Spill Response Resource Requirements

This table provides basic calculations for the primary on-water recovery and oil storage equipment listed in Table 9 and is intended to demonstrate compliance with those worst-case discharge planning volumes listed in Tables 7 and 8. These calculations do not include assumptions for specific crude oil API gravity or viscosity, decanting or emulsion factors, worst average weather conditions and other scenario-specific factors.

Operating Area	Task Force	# Recovery Systems	Recovery System	Oil Recovery Rate per Unit (EDRC/BPD)	Operating Time (hrs)	Primary Storage Capacity (bbl.)	Secondary Storage	
							Name	Capacity (bbl.)
Offshore/ Ocean	OSRV-1	1	Transrec 350	10,567	10	4,000	Oil Storage Barge	40,000
	OSRV-2	1	Transrec 350	10,567	10	4,000	Oil Storage Barge	40,000
	OSRV-3	1	Transrec 350	10,567	10	4,000	Oil Storage Barge	40,000
	OSRV-4	1	Transrec 350	10,567	10	4,000		
	OSRV-5	1	Transrec 350	10,567	10	4,000		
Nearshore	NS-1	2	LORS2	4,954	10	65	Mini-Barge	249
	NS-2	2	LORS2	4,954	10	65	Mini-Barge	249
	NS-3	2	LORS2	4,954	10	65	Mini-Barge	249
TOTAL				**67,697**		**20,195**		**120,747**