APPROVED WORK PLAN

PHASE B – Aleutian Islands Risk Assessment

November 29, 2012

Prepared By:

Nuka Research & Planning Group, LLC.
Pearson Consulting, LLC.

In Partnership With:

Baldwin & Butler
Cape International, LLC.
Moran Environmental Recovery
Northern Economics, Inc.
The Glosten Associates, Inc.

nuka Research & Planning Group, LLC.

RESEARCH & PLANNING GROUP, LLC.
P.O. Box 175
Seldovia, Alaska 99663
tel 907.234.7821
fax 509.278.4406
contact@nukaresearch.com

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INTRODUCTION

Nuka Research and Planning Group, LLC (Nuka Research) has amended the work plan for Phase B of the Aleutians Island Risk Assessment based on input provided at an Analysis Team meeting in Anchorage, AK on September 19, 2012 and a meeting of the Analysis Team, Management Team, and Advisory Panel on October 2, 2012 in Unalaska, AK.

Background

In July 2012, Nuka Research and its team of expert consultants[1] (the Analysis Team) was selected to facilitate and implement Phase B of a two-phase process initiated by the National Fish and Wildlife Federation (NFWF), U.S Coast Guard (USCG), and Alaska Department of Environmental Conservation (ADEC) to assess the risks and potential mitigation measures associated with maritime transportation in the Bering Sea and the Aleutian Archipelago. The Aleutian Islands Risk Assessment (AIRA) is being implemented according to an approach developed by the Transportation Research Board of the National Academies.

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 IMO Particularly Sensitive Sea Areas (PSSA) and

[1] The team of subcontractors includes: Pearson Consulting, LLC; The Glosten Associates; Moran Environmental Recovery; Moran Towing, Northern Economics; Baldwin & Butler, LLC; and Cape International.

propose recommendations for associated protective measures.

This project will be implemented, informed, and overseen by four groups: (1) an Analysis Team including Nuka Research, Pearson Consulting, and six additional subcontractors; (2) a Management Team comprised of representatives of the NFWF, ADEC, and USCG; (3) an Advisory Panel comprised of stakeholders; and (4) a Peer Review Panel assembled by the National Academy of Sciences. The Management Team, Advisory Panel, and Peer Review Panel played the same roles and were comprised of the same membership during Phase A of the project. (Several of the contractors, including Nuka Research and Pearson Consulting, contributed to Phase A as well.)

Phase B Scope

Phase B will focus on three primary tasks based directly on the results of Phase A:

- **Task 1 - 2. Increase Rescue Tug, Salvage, and Spill Response Capability.** The Team will analyze existing and potential future resources providing the following services to the Aleutian Islands: emergency towing, salvage, and oil spill response. The team will also consider options for organizational management and funding for a potential future system to provide these services. The task will conclude with a detailed description of a recommended Optimal Response System (ORS) that considers operating environment, logistics, cost, and benefits, along with a proposed organizational structure for the system. *This task addresses RRO 1 and RRO 2 from Phase A.*
- **Task 3. Strengthen the Subarea Contingency Plan.** This task will begin with reconvening the Alaska Regional Response Team's (AKRRT) Subarea Committee to guide the revision and update of the Aleutian Islands Subarea Contingency Plan (SCP). The Subarea Committee will consider incorporating findings and recommendations from Phase A of the AIRA, develop new sections and complete currently unfinished sections, and incorporate additional Geographic Response Strategies and Potential Places of Refuge. *This task addresses RRO 3 from Phase A.*
- **Task 4. Initiate the Process for Establishing Particularly Sensitive Sea Areas (PSSA) and Associated Protective Measures (APM).** The Analysis Team will develop a communications and outreach plan to build consensus among key stakeholders about the development of associated protective measures for establishing a PSSA in the Aleutian Islands area. The PSSA must provide a mechanism through which to implement associated protective measures and law enforcement strategies that are amenable to respective regulatory and law enforcement agencies. *This task addresses RRO 4 from Phase A.*

Nuka Research and Pearson Consulting will manage the project and coordination among subcontractors (the Analysis Team), the Management Team, Advisory Panel, and Peer Review Panel. The measures of success will be the adoption by industry and government, of the proposed plan for an optimal response system, adoption of an improved Subarea Contingency Plan, and establishment of PSSA with the concurrence of the Management Team and Advisory Panel.

SECTION 1 WORK PLAN

The narrative that follows describes how the Analysis Team will approach the Scope of Work for Phase B of the AIRA. The series of tasks will provide information and analysis for options to reduce the risk of maritime incidents in and around the Aleutian Islands. A project schedule and task summary is provided at the end of this document.

TASK 1-2

Increase Rescue Tug, Salvage, and Spill Response Capability (Risk Reduction Options 1 and 2)

Two of the Advisory Panel's recommendations at the conclusion of Phase A are closely related: 1) Increase Rescue Tug Capability in the Aleutians and 2) Increase Salvage and Spill Response Capability in the Aleutians. Emergency towing, salvage, and spill response are "response services" that may be employed during an emergency response to a marine casualty. This work plan 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. The workflow is designed to establish a benchmark for the cost of the response organization based on the cost of providing all services mandated in regulation. Each service will then be studied to determine the percentage of time that the service can be employed in Aleutian Islands conditions, likely effectiveness of that service when it can 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 are completed, the Analysis Team will recommend the best combination of services and organization(s) that can provide these services at a cost that does not exceed a design benchmark. A benefit-cost analysis will then be performed on the recommended response system and potential modifications considered accordingly. Task 1-2 will conclude with the recommendation of an Optimal Response System that is based on the studies conducted and best professional judgment of the Analysis Team. This study may become 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 Table 1, with the workflow moving from top to bottom.

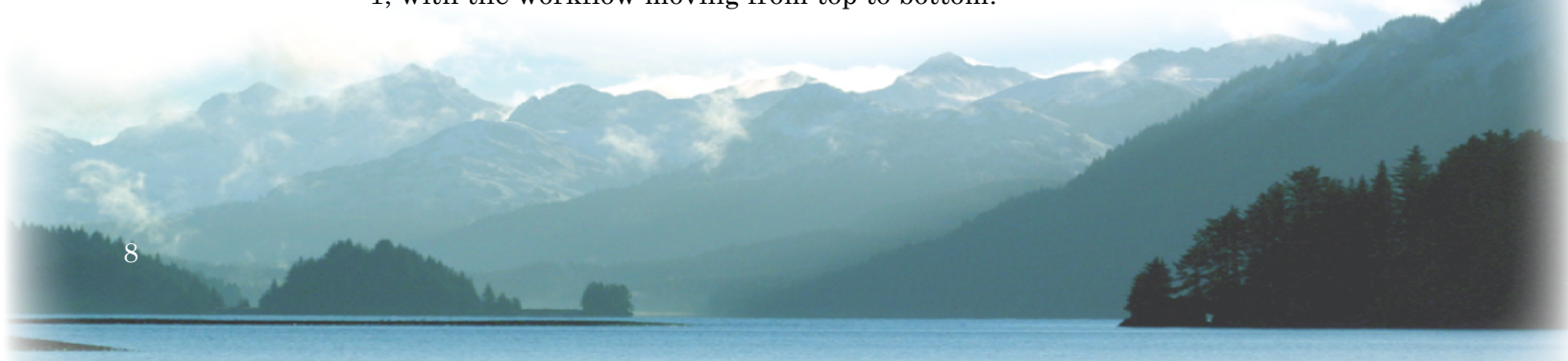


Table 1. Workflow for Task 1-2

REGULATORY RESOURCE STUDY: Existing requirements and benchmark cost			
EMERGENCY TOWING STUDY	**SALVAGE STUDY**	**SPILL RESPONSE STUDY**	**MANAGEMENT & FUNDING STUDY**
Options Technology & Location	Options Technology & Location	Options Technology & Location	Options
Response gap	Response gap	Response gap	Challenges & opportunities
Feasibility and effectiveness	Feasibility and effectiveness	Feasibility and effectiveness	
Cost capital and operation	Cost capital and operation	Cost capital and operation	Cost capital and operation
***PRELIMINARY* RECOMMENDED OPTIMAL RESPONSE SYSTEM**			
BENEFIT-COST ANALYSIS OF RECOMMENDED SYSTEM			
***FINAL* RECOMMENDED OPTIMAL RESPONSE SYSTEM**			

SUBTASK 1-2A – REGULATORY RESOURCE STUDY

Marine vessels transiting the Aleutian Islands fall under existing state, federal, and international mandates related to towing, salvage, and spill response services. However, the remoteness of the location and other factors challenge compliance with these requirements.

Nuka Research will take the lead on a Regulatory Resource study to identify all relevant policies and regulations, determine the capabilities that are needed to comply with regulations, and determine the capital and operating costs of this compliance. Once we have established the minimum required capability to respond to a worst-case discharge from tank vessels and non-tank vessels, we will estimate the capital and operating costs of providing these capabilities in the Aleutians. These costs will become the benchmark for designing a system for the Aleutians: the Optimal Response System that will be recommended at the conclusion of Task 1-2 must be less than, or equal to, these costs.

Approach

The Regulatory Resource Study will begin by investigating the capability requirements mandated in regulations governing oil spill response and marine salvage in the Aleutian Islands area, such as:

- Code of Federal Regulation- 33 CFR 155.1030, Tank Vessel Response Plan Requirements, Non-Tank Vessel Plan Requirements (currently a proposed final rule by USCG), Salvage and Marine Firefighting Requirements, policies such as Navigation & Vessel Inspection Circulars (NVICs) and laws that framed the regulations.
- International Maritime Organization (IMO) requirements including the International Convention for Safety of Life at Sea (SOLAS)

- Environmental Protection Agency (EPA) requirements
- State of Alaska - Statutes and Regulations governing oil spill response preparedness and planning
- Others identified in Phase A of the AIRA

Once the regulatory drivers are identified, the Analysis Team will identify the minimum response capability required to comply with all state, federal, and international laws, regulations and policies governing oil spill response and marine salvage in the Aleutian Islands.

For tank vessels, we will apply a methodology that aligns with the USCG method for Determining and Evaluating Required Response Resources for Vessel Response Plans (33 CFR 155, Appendix B) to identify the type and quantity of resources required to respond to a worst-case discharge (as defined in 33 CFR 155). We will use a 600,000 bbl. crude oil tanker to calculate required capability for tank vessels.

For non-tank vessels, we will apply the criteria specified in the proposed USCG rulemaking for Non-tank Vessel Response Plan and Other Vessel Response Plan Requirements (74 FR 44970). We will calculate the non-tank vessel requirements for a 68,000 DWT container ship.

The outcome of both analyses will be an estimate of the spill response and marine salvage resources and capabilities needed to support immediate and long-term incident response in the Aleutians. The Regulatory Resource Study will consider the overall availability of resources as well as the mobilization and deployment timelines.

This subtask will include:

1. Identifying and describing state, federal, and international laws, regulations and policies applicable to the Aleutian Islands.
2. Defining the response capacity needed to comply with the regulations identified.
3. Estimating the capital and operating costs of complying with all applicable laws, regulations and policies.

SUBTASK 1-2B – RESPONSE GAP ANALYSIS

A response gap is defined as the percentage of time when environmental conditions exceed the limitations of a response technology. The purpose of conducting a response gap analysis is to gain a realistic picture of the feasibility of operating the equipment needed for towing, salvage, and spill response in environmental conditions typical of the Aleutian Islands. Where possible, meteorological information used in the Phase A Consequence Analysis study will be considered.

The response gap analysis, led by Nuka Research, will quantify the frequency and duration of the response gap based on meteorological observation, seasonal effects (fog, icing conditions) and established

operating environment limits of key equipment or vessels needed for towing, salvage, and spill response.

Approach

Nuka Research will collect and verify environmental data from National Data Buoy Center and National Weather Service archives to create a "hindcast" of conditions in the Aleutian Islands over a period of time. Hindcast methods have been established to estimate the response gap for a given response technique in a given operating environment. The primary limiting factors in the Aleutian Islands region include high winds, severe storms, heavy seas, low visibility, and cold temperatures.

Nuka Research, in conjunction with The Glosten Associates and Moran Environmental Recovery, will determine maximum response operating limitations appropriate to the response services (emergency towing, salvage and marine firefighting, and oil spill response) that may be used in the Aleutians and establish a response gap for each. The response gap estimate will describe, for example, the percentage of time that wave height exceeds the limits for effective collection and containment using available boom, or the percentage of time that dense fog precludes the observation and tracking of an oil slick (and thus any kind of effective response).

The response gap is independent of the effectiveness of the response; it is instead a measure of the percentage of time various response options are not possible. No response gap estimate has been performed for the Aleutian Islands region.

This subtask will include:

1. Assembling and characterizing environmental factors datasets.
2. Applying operational limits for response services, described below to calculate a response gap estimate for each service.

SUBTASK 1-2C – EMERGENCY TOWING STUDY

Increased rescue tug capability for emergency towing was identified in Phase A as a critical part of a future Aleutian Islands system, warranting additional understanding of the options for tug capabilities (subtask 1-2C) as well as potential tug locations (subtask 1-2D). The Glosten Associates will lead both studies to determine the appropriate capabilities of a rescue tug for the Aleutian Islands region.

Per the request for proposal, this subtask will consider three options for expanding tug capabilities in the Aleutians as well as a Tug/Vessel of Opportunity program and technologies suitable for a dedicated tug, non-dedicated tug and seasonally dedicated tug in the region. The Glosten Associates will define the range of tug specifications (size, bollard pull, horsepower, propulsion, sea keeping, maneuverability, crewing, fuel range, etc.) suitable for weather and rescue towing of transiting oceangoing

vessels. The Analysis Team will also engage Moran Environmental Recovery's parent company, Moran Towing, to inform the analysis.

Approach

The possibility of a Tug/Vessel of Opportunity Program will be evaluated. This evaluation will include reviewing recommendations of the *West Coast Offshore Vessel Traffic Risk Management (WCOVTRM) Project* conducted by the Pacific States-British Columbia Oil Spill Task Force in 2002[2]. A review of the Washington State International Tug of Opportunity System (ITOS) will also be conducted. A study of the availability of underway and standby tugs in the Aleutian Islands regions will be conducted by:

- Reviewing automatic information system (AIS) data and communication systems
- Evaluating capabilities of tug/vessels of opportunity in the study area
- Identifying vessel activities such as the type of vessel under tow and the ability of a tug to hand off a tow if needed
- Completing a distance/time study which examines the location of tugs and how long it would take them to respond to high-risk scenario locations

Three alternatives for dedicated, Aleutian Islands tug(s) will be developed. These alternatives include:

(1) a Best Available Technology (BAT) analysis of Emergency Towing Vessel (ETV) designs in the worldwide fleet;

(2) BAT analysis of ETV currently existing in the Jones Act fleet; and

(3) a concept design by The Glosten Associates for a purpose-built ETV meeting the Aleutian Islands' requirements.

Each alternative will be reviewed and analyzed with an equal level of effort. These options will be delineated for consideration as part of an overall optimal system, including:

- Specifications and capabilities (maneuverability, propellers, bollard pull, vessel design, range, seakeeping, tow winch, number of vessels that may be needed, and any modifications for Aleutians Island service, etc.),
- Capital and operating costs (including, as appropriate, any costs associated with design modification), and
- Other factors related to the feasibility of application in the Aleutian Islands.

[2] http://www.oilspilltaskforce.org/notesreports/wcovtrm_report.htm

This subtask will include:

1. Evaluating the options for providing emergency towing services in the Aleutians.
2. Establishing the limitations of emergency towing operations in the Aleutians for each option.
3. Applying the Response Gap Analysis findings (subtask 1-2B) to determine the amount of time emergency towing can be employed for each option.
4. Considering the likely effectiveness and logistical feasibility of providing emergency towing services for each option.
5. Establish the likely capital and operation cost for each option.
6. Presenting a recommendation for consideration of the Analysis Team and Management Team as part of a recommended Optimal Response System.

SUBTASK 1-2D – TUG LOCATION STUDY

In anticipation of the identified need for a dedicated tug or tugs to achieve RRO 1, The Glosten Associates will evaluate siting options for a tug or tugs serving the Aleutian Islands. The Analysis Team will use this information in proposing an Optimal Response System.

Approach

This subtask will use the 16 spill response scenarios developed in Phase A as potential homeport locations for each tug alternative. Distance and time will be calculated to each scenario location. The six potential locations, based on the scenarios, are:

- Attu Island
- Adak Island
- Amilia Island
- North Unimak Pass
- Urilia Bay
- Sanak Reef

The Glosten Associates will also identify homeport infrastructure requirements and improvements.

This subtask will include:

1. Assessing the existing infrastructure for the six potential tug homeport locations.
2. Assessing the relative merits of each potential homeport in the context of the 16 spill response scenarios established in Phase A.

3. Recommending homeport options for consideration by the Analysis Team and Management Team for the Optimal Response System.

SUBTASK 1-2E – SALVAGE STUDY

Enhanced salvage and marine firefighting capabilities were identified during Phase A as part of RRO 2.

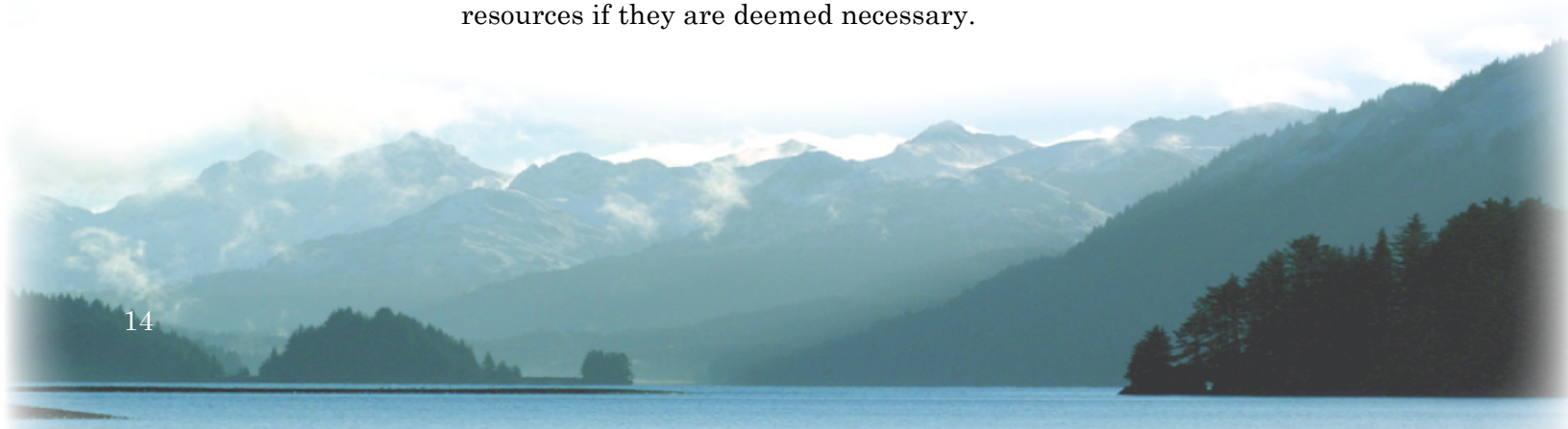
Nuka Research and Moran Towing will lead this subtask study to consider salvage needs for the Aleutian study area.

Approach

For the purpose of this study, salvage will exclude emergency towing but will include all other traditional salvage activities, including emergency pumping, firefighting, lightering, underwater repairs, refloating, and wreck removal. The Salvage Study will consider the appropriate equipment and personnel to conduct these activates and the worldwide location and availability of organizations capable of implementing these services. A mobilization analysis will be conducted to determine the time necessary to cascade salvage assets into the region from existing locations. This information will be used to recommend the need for additional salvage resources in the Aleutians.

This subtask will include:

1. Determining the options for salvage resources.
2. Establishing the limitations of salvage operations in the Aleutians.
3. Applying the Response Gap Analysis findings (subtask 1-2B) to determine the amount of time salvage service can be employed.
4. Considering the likely effectiveness and logistical feasibility of providing salvage services.
5. Analyzing the existing USCG-classified Salvage Contractors' abilities to service the Aleutian Islands and to meet planning requirements.
6. Reviewing the need for any additional salvage equipment / services.
7. Establishing the likely capital and operation cost for any additional services (or access costs for existing services).
8. Recommending the location of and requirements for additional resources if they are deemed necessary.



SUBTASK 1-2F – SPILL RESPONSE STUDY

Effective spill response requires careful and realistic planning; trained personnel; vessels; containment, recovery, storage, and waste management resources; and myriad layers of logistical coordination. Nuka Research, Pearson Consulting, and Moran Environmental Recovery will lead this subtask to develop recommendations for the spill response component of the future, proposed Optimal Response System.

Approach

This subtask will consider the available information about the operating environment, spill equipment limits, logistics, and applicable regulations related to developing a spill response system that will be both economically and logistically feasible while also having the greatest possible chance of success in the remote location and challenging conditions of the Aleutians. Other considerations will include:

a. Open water vs. nearshore operating environments

b. Current research and development efforts

c. Trade-offs between supplementing resources vs. cascading

d. On-going USCG/BSSE/EPA work groups

- Effective Daily Recovery Capacity (EDRC)
- Response Resource Inventory (RRI)
- Equipment Surge
- Subpart J of the National Contingency Plan

This subtask will include:

1. Determining the options for spill response resources and services.
2. Establishing the limitations of spill response operations in the Aleutians.
3. Applying the Response Gap Analysis findings (subtask 1-2B) to determine the amount of time spill response service can be employed.
4. Considering the likely effectiveness and logistical feasibility of providing spill response services.
5. Analyzing the existing USCG-classified Spill Response Contractors' abilities to service the Aleutian Islands and to meet planning requirements.
6. Reviewing the need for any additional spill response equipment / services.
7. Establishing the likely capital and operation cost for any additional services or access costs for existing services.

8. Recommending the location of and requirements for additional resources if they are deemed necessary.

SUBTASK 1-2G – MANAGEMENT AND FUNDING STUDY

The successful operation of the Optimal Response System needed to achieve both RRO 1 and RRO 2 will rest on the development of an effective management structure and sustainable funding.

Baldwin & Butler, LLC and Pearson Consulting will lead this subtask to provide a recommended business model with sufficient organizational and administrative structure to develop and manage systems anticipated in RRO 1 and 2.

Approach

A number of factors will be considered while conducting this study. The factors are:

- The business form, scope and funding mechanism will likely be an organizational model that includes management and funding of RRO 1 and RRO 2 (or components of each).
- The business will manage preparedness and compliance. In the event of a response, the responsible party, or an agency asserting jurisdiction or control, will direct and pay for all resources requested.
- Input regarding business form and contracting options will likely be a part of or included in evaluating other elements of RRO 1 and RRO 2.

The review will evaluate various business options for owning and/or managing and operating response resources included in RRO 1 and RRO 2.

A review of U.S. based Oil Spill Response Organizations (OSROs) will be conducted to identify characteristics related to successful business structure and financial support. The expertise of Moran Environmental Recovery will be utilized regarding OSRO business structure and management. Consideration will be given to governance and strategic management (i.e. board) and the customers benefitting from the services provided by business entities (i.e. members, participants, subscribers, etc.). Advantages and disadvantages associated with various governance options and organizational stability/sustainability will be explored. In addition, we will research and evaluate options for how customers benefitting from the services provided by the business entity (i.e. members, participants, subscribers, etc.) will fund the business. This evaluation will be conducted and reviewed with an eye toward equity, reliability, and ease of administration.

The Analysis Team will work cohesively and collaboratively to identify associated issues from other subtasks of Task 1-2 as we evaluate suitable vessel options and locations.

This subtask will include:

1. Estimating the costs associated with a future Optimal Response System (based on previous subtasks as well as overall management and administration).
2. Reviewing existing OSRO business models around the country to identify models that would work for an Aleutians system.
3. Recommending management and funding options for consideration by the Analysis Team and Management Team.

SUBTASK 1-2H – OPTIMAL RESPONSE SYSTEM

Nuka Research will lead the Analysis Team in reviewing the information gained in the studies described above to devise a proposed Optimal Response System for the Aleutian Islands. This response system will consider the following factors for each response technology:

- Cost
- Response gap
- Effectiveness
- Logistics
- Maintenance
- Operational requirements

The response system and attending organization will be tailored to the Aleutian operating area but designed to cost no more than the amount identified in the Regulatory Resource Study (subtask 1-2A). It will be based on the best professional judgment of the analysis team, data collected during subtasks 1-2A – 1-2G. The Analysis Team and Management Team will recommend a *preliminary* Optimal Response System, which will be subject to the Benefit-Cost Analysis (see below). Based on the results of the Benefit-Cost Analysis, modifications may be made before the Optimal Response System is presented by webinar to the Management Team and Advisory Panel for their input prior to the development of the final report for Task 1-2.

SUBTASK 1-2I - BENEFIT-COST ANALYSIS

A Benefit-Cost Analysis (BCA) will be conducted in order to support the evaluation of the risk reduction options as presented in a preliminary recommended Optimal Response System (see subtask 1-2I). The results of the BCA will then be used to inform any last modifications of the proposal before the development of the final recommended Optimal Response System.

Northern Economics, Inc. will lead this subtask with inputs from all other subtasks under Task 1-2.

Approach

The BCA will focus on the costs and benefits under the 16 representative accident scenarios identified in Phase A, and will include diesel and bunker C spills ("oil spills") from collisions, powered groundings, and drift groundings involving vessels operating in, or transiting through, the vicinity of the Aleutian Islands within the U.S. Exclusive Economic Zone. The vessel types identified in the 16 scenarios are bulk carriers, tankers, container ships, and tank barges of more than 300 gross tons or a fuel capacity of 10,000 gallons or greater. BCA is well-suited to analyze the costs and benefits associated with the proposed Optimal Response System, including the tug options identified in the RFP— Dedicated Tug(s), Non-Dedicated Tug(s), Seasonal Dedicated Tug(s), and the Tug/Vessel of Opportunity Program.

The following paragraphs describe the costs and benefits that will be estimated for the preliminary Optimal Response System, under each of the 16 scenarios from Phase A.

Costs: In general terms, the cost of an RRO includes the costs of implementation (capital and recurring costs), costs of compliance (changes in transit times), and the government's enforcement costs. The compliance and enforcement costs are considered negligible in the case of rescue tugs because they would not require additional USCG equipment and personnel, nor would they significantly affect vessels' transit times (as would be the case with escort tugs, for example).[3]

The implementation cost would constitute the costs of increasing the number of operating tugs or establishing a base for rescue tug operations in the region. Information from subtasks 1-2C – F on the capital and operating costs to implement RRO 1 and RRO 2 will be incorporated into the BCA. The capital and recurring operating costs of equipment acquisitions, including vessels, will be annualized over the 25-year period. Since the service life of a rescue tug is assumed to be 15 years, the annualized costs assume that a replacement tug of similar cost will be purchased in 2024.

Benefits: The main benefits of an increase in rescue tug, salvage and spill response capabilities are the reductions in spill frequency and severity (which would in turn translate into avoided costs from spilled oil), human fatalities and/or injuries, vessel and cargo damage, and environmental damage.

- *Avoided cost of spilled oil.* For each alternative, we will estimate a relative effectiveness factor in averting spills from collisions, powered groundings, and drift groundings of bulk carriers, tankers, container ships, and tank barges. This factor represents the proportional reduction in baseline oil spills expected under the

[3] This proposal assumes that rescue tugs are not utilized as escort tugs; however this possibility could be discussed with the Management Team and incorporated in the analysis if needed.

alternative and will be estimated from national historical data on the frequency and size of spills for the United States, adjustments for location factors, and expert opinion. These factors will be applied against the baseline spill rates to forecast the avoided spillage in barrels of oil on an annual basis for the period 2009-2033. The volumes of avoided spillage will be multiplied by the forecast oil prices to obtain an estimate of the avoided cost of spilled oil in monetary value. This cost would be added to avoided cleanup and containment costs obtained from available literature, such as Etkin (1998, 1999) (Do you want to list this at the end?).

- *Avoided costs of fatalities and injuries.* The average cost per avoided fatality/injury will be multiplied by the number of casualties avoided under each of the rescue tug alternatives. The conditional probability of the fatality/injury occurring, given an accident, will be taken from published literature. The values recommended by the U.S. Department of Transportation per fatality or injury avoided will be adjusted according to the consumer price index into 2009 dollars.
- *Avoided cost of vessel and cargo damage.* The probabilities and costs of ship and cargo damage will be estimated separately for the different vessel types using a weighted average of the severity of damages. The average damage costs will be multiplied by the conditional probability of a casualty resulting in damage. The average idle vessel cost given a casualty will be estimated based on historic data.
- *Avoided environmental damage.* The Phase A Consequence Analysis Report developed a probability table describing the probability of an oil spill impacting each of five main receptor groups: habitat, mammals, seabirds, fish, and socioeconomic. However, the Phase A report only provides a qualitative evaluation of benefits from the various RROs related to these impacts. To develop a quantitative estimate, we will conduct a literature review, including natural resource damage assessments, to identify, where possible, a value or range of values for each of the receptor groups.

Combining Costs and Benefits: The BCA will follow the Office of Management and Budget and U.S. Environmental Protection Agency (EPA) guidelines and cover the Phase A time period from 2009 to 2033. The benefits will be subtracted from the costs to obtain the annual net benefits from each alternative. The stream of annual net benefits for the 25-year period will be discounted at seven percent to obtain an expected net present value (and the corresponding benefit-cost ratio) for each alternative under each of the 16 scenarios. A weighted average of all the scenarios according to their probability will also be presented.

The net benefits of each rescue tug alternative will be analyzed independently. Due to the overlapping effects of the various alternatives, the sum of net benefits from individual alternatives would produce an

overestimation of total benefits if more than one alternative is implemented. Experts' judgment will be used to adjust for this issue.

Sensitivity and Risk Analysis: Northern Economics will use Palisade Corporation's @Risk add-in for Microsoft Excel to perform simulations and analyze the sensitivity of the economic analysis results to variability in estimates of benefits and costs. This approach will allow the team to develop a probabilistic range of benefits, costs, and results, as requested in the RFP. The advantage of this approach is that it will identify those RROs that are economically sound, those that are not, and those that may be economically justifiable a certain percentage of the time. This approach will also provide the Management Team with a powerful decision-making tool to assess and rank the different rescue tug alternatives.

Sensitivity analysis refers to the effect that a change in an input value or assumption has on the model's output (the net present value of a rescue tug alternative). The proposed risk analysis will determine the effect of simultaneous changes in multiple input values through the use of simulation, which is well suited for evaluating a probabilistic BCA. Northern Economics has used @RISK software to conduct such simulations and provide similar valuable information for its clients to make decisions in a highly uncertain environment.

As part of a probabilistic BCA, we will develop a Microsoft Excel and @RISK model that uses probability analysis and simulation to incorporate information on:

- Vessel traffic growth rate
- Accidents rate
- Spill frequency and size
- Price of crude oil
- Capital costs of rescue tugs
- Discount rate
- Other factors as identified by the Management Team

Cost-Effectiveness: Cost-effectiveness analysis (CEA) is less demanding in terms of informational requirements. CEA allows the analyst to use two different units of value. Costs are measured in monetary units while benefits or "effectiveness" is typically measured in other units, such as avoided barrels of oil spilled. CEA is well suited to the analysis of externalities and intangibles, since these types of effects are difficult to express in dollar terms. Cost effectiveness analysis is particularly appropriate for questions involving the most efficient alternative to attain a given common objective.

We will report the cost per barrel of oil *not* spilled under each of the rescue tug alternatives, taking into account the 16 scenarios identified in Phase A.

This subtask will include:

1. Analyzing the costs associated with a preliminary optimal response system.
2. Analyzing the benefits from a preliminary optimal response system.
3. Conducting a sensitivity analysis and cost-effectiveness analysis (CEA).
4. Analyzing the impact of any changes to the BCA based on modifications to the proposed Optimal Response System made by the Management Team and Analysis Team upon review of the BCA results.

SUBTASK 1-2J – REPORTING

Subtask 1-2A Regulatory Resource Study will be completed and offered for review and comment by the Management Team and Advisory Panel by webinar in early 2013.

Once subtask 1-2I Optimal Response System is complete, the findings will be presented by webinar to the Management Team and Advisory Panel before developing the Draft Final Report.

The Draft Final Report will present a summary and consolidation of the findings from Subtasks 1-2A – 1-2Ias they are described above. The Draft Final Report will be provided to the Management Team, Advisory Panel, and Peer Review Panel, as well as the public, and discussed at an in-person meeting. Based on feedback received and discussion at the meeting, a Final Report will be prepared. This Task and the Final Report will be completed by the end of the third quarter of 2014.

TASK 3
Strengthen Aleutians Subarea Contingency Plan (Risk Reduction Option 3)

The Aleutian Subarea Contingency Plan (SCP) supplements the Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases (the Unified Plan). The SCP, in conjunction with the Unified Plan, describes the strategy for a coordinated federal, state, and local response to a discharge or substantial threat of discharge of oil or a release of a hazardous substance from a vessel, offshore or onshore facility, or vehicle operating within the boundaries of the Aleutians Subarea. The SCP is used as a framework for response mechanisms and as a pre-incident guide to identify weaknesses and to evaluate shortfalls in the response structure *before* an incident. The plan also offers parameters for vessel and facility response plans under the Oil Pollution Act of 1990. The Aleutian Subarea Committee is responsible for developing and updating the SCP. The plan was last updated in 2009 following the *M/V Selendang Ayu* response.

The primary role of the Subarea Committee is to act as a preparedness and planning body for the subarea. The principal membership of the Subarea Committee is composed of the pre-designated Federal On-Scene Coordinators (EPA and USCG) for the subarea and the pre-designated State On-Scene Coordinator from ADEC. Depending upon the event, or the issues to be addressed, a representative from the Aleutians East Borough or local or tribal government representatives may also serve on the Aleutians Subarea Committee.

The Subarea Committee seeks to solicit advice, guidance or expertise from all appropriate sources and establish work groups as necessary to accomplish the preparedness and planning tasks. The Subarea Committee selects the work group members and provides general direction and guidance for the work groups. In addition to federal, state and local agency representatives, work group participants may include facility owners/operators, shipping company representatives, cleanup contractors, emergency response officials, marine pilot associations, academia, environmental groups, consultants, and response organizations. The following work groups exist currently and are activated on a project-specific, or as-needed, basis:

- Sensitive Area Work Group
- Logistics Work Group
- Operations Work Group
- Geographic Response Strategy Work Group
- Potential Places of Refuge Work Group
- Emergency Towing System Work Group

The goal of Task 3 is to bolster the Aleutian SCP, which will require activating the Aleutian Subarea Committee, and necessary work groups. The Analysis Team will seek concurrence from the Subarea Committee to incorporate appropriate findings from Phase A Technical Reports, Task 1, 2 and 4 into a revised SCP.

SUBTASK 3A – SUBAREA COMMITTEE AND PLAN UPDATE

This subtask is intended to enhance the planning and preparedness programs administered by the USCG and ADEC so they can effectively address an offshore Spill of National Significance and protect the near shore environment of the Aleutian subarea. Subarea Committees represent the core element of oil spill response planning and preparedness for a region. The Subarea Contingency Plan development process has been ongoing for more than a decade, yet some sections of the plan still remain "To Be Developed." This subtask will require the following:

1. Convene the Aleutian Subarea Committee.
2. Incorporate information and findings from the AIRA Phase A

Technical Reports and Phase B Task 1, 2 and 4 into sections of the Subarea Plan that can be improved or are listed as "to be developed," such as:

a. The Marine Response and Salvage Recovery section of the Aleutian SCP is listed as "to be developed."

b. The worst-case scenario, which does not reflect a Spill of National Significance and does not include offshore response, marine salvage and nearshore response tactics and capabilities.

c. The Hazardous and Vulnerability Analysis of the SCP, which has not been updated.

3. Identify any new section(s) that should be developed and incorporated into the Aleutian SCP such as:

   a. Prevention. Prevention measures may include vessel tracking and reporting requirements, local operating parameters and measures currently implemented by industry under the federal Alternate Planning Criteria.

   b. Nearshore operations response strategies, which are not currently included and should be added to the SCP.

4. Incorporate the new information into a revised draft of the Aleutian SCP for public review and comment.

5. Gain approval of the revised Aleutian SCP by the Subarea Committee.

SUBTASK 3B - GEOGRAPHIC RESPONSE STRATEGIES (GRS)

Nuka Research will take the lead on this subtask based on our experience in 2007 organizing and facilitating the Aleutian Islands GRS Work Group for the State of Alaska. Through the original facilitated workgroup process, the Aleutian Islands Subarea was delineated into five (5) zones: East A Zone, East B Zone, West A Zone, West B Zone and the Pribilof Islands Zone. All of the zones, excluding the Pribilof Islands fall within the Aleutian Islands Risk Assessment study area. In 2007, 354 candidate sites were listed throughout the region and 42 have been developed as GRS. For this task, we propose developing 25 sites each in the West A and West B zones. The nomination of these sites will include a two-part process allowing for input from resource agencies and local communities. Field surveys will be conducted on the high priority sites selected to gather information on local conditions and resource protection concerns, geography, viability and feasibility to implement the GRS. An exercise plan will be developed to test specific tactics commonly used in the region. The exercise will include partnering with OSROs operating in the region as well as local responders. This will increase local responder skills in deploying the GRS. The experience and lessons learned from select GRS

tests will be generalized to sites with similar environments and conditions.

This subtask will require the following:

1. Reconvene the Aleutians Subarea GRS Work Group and consider expanding work group membership.
2. Outreach to and engagement of local communities
    a. Engage Tribal Environmental Coordinators
    b. Introductory letter to stakeholders/governments
    c. Email contact
    d. Telephone contact
3. Work group Site Selection Meeting in Anchorage/Unalaska
    a. Map-based selection process mailed/faxed to the remote communities for input in advance of meeting
    b. Meeting pace determined by Workgroup
4. Site Survey/Community Visits
    a. Visit Atka, Adak, and Unalaska
    b. Local community meetings for site selection
    c. Site surveys, data collection, interviews with subsistence users
5. Development of draft GRS using collected data and draft GRS documents.
6. Meeting of Tactic Committee to review and edit draft GRS.
7. Organize and conduct a deployment exercise to test the common tactics proposed in the GRS and validate the tactic.
8. Work group review draft GRS and incorporate edits, then finalize GRS for inclusion into the updated SCP.

SUBTASK 3C - POTENTIAL PLACES OF REFUGE (PPOR)

Nuka Research will take the lead on this subtask, based on past experience organizing and facilitating the Aleutian Subarea PPOR Work Group for the State of Alaska. Phase 1 of the Aleutian PPOR project was completed in September 2007. The objective of the Phase 1 project was to identify docking, anchoring, mooring, and grounding locations that may be selected as a PPOR in order to enhance the overall response process. This subtask will require the following:

1. Reconvene the Aleutian PPOR Work Group and research and expand the work group membership.
2. Review all PPOR maps for accuracy and information gaps.
3. Incorporate the new information gathered from the work group

members into revisions of the PPOR maps. New information may include port and airport expansions, new mooring locations and dock improvements.

4. Finalize PPOR maps for inclusion by reference into the Aleutian SCP.

TASK 4

Initiate the process for Establishing IMO Particularly Sensitive Sea Areas (PSSA) and Associated Protective Measures (APM) (Risk Reduction Option 4)

SUBTASK 4A - EDUCATION/COMMUNICATION PLAN

Cape International will take the lead, supported by Pearson Consulting and Nuka Research, to develop a communication strategy to educate the public, agencies, and industry about what an IMO Particularly Sensitive Sea Area (PSSA) is and what it might mean if one was created in the Aleutian Islands region. The communication plan will be used to build consensus for the project. While we will vet all communication/education materials and tactics through the Management Team, we anticipate that this plan will include a website component as well as targeted outreach techniques that disseminate information through other established marine conservation organizations or e-mail distribution lists.

SUBTASK 4B - ESTABLISH AND FACILITATE ALEUTIAN ISLANDS PSSA WORKGROUP

Cape International will take the lead and Pearson Consulting will assist on this subtask by establishing an Aleutian Islands PSSA Workgroup. Interested members of the AIRA Advisory Panel, NOAA International, USCG IMO representative/staff and a member from the Alaska Governor's Office will be encouraged to participate in this collaborative effort. We intend to consult NOAA, who recently helped conduct a PSSA study/proposal for Northern Hawaii, to ensure the most diverse and qualified parties are identified and solicited.

Using IMO resolution A.982 (24) Revised guidelines for the identification and designation of Particularly Sensitive Sea Areas (PSSAs), we will facilitate the workgroup process to:

- Identify associated protective measures (APM) suitable for establishing PSSA's, The APMs may include, but are not limited to, mandatory installation of on-board tracking equipment, areas to be avoided (ATBA), special routing, and the implementation of strict discharge requirements.
- Compare identified APMs with other options to determine whether these options serve to provide equivalent protection, thus eliminating or reducing the scope of a PSSA.

- Identify the boundaries of Aleutian PSSA(s) using historic, cultural, scientific, ecological, and economic value-based criteria, as well as using marine pilots, USCG and nautical chart information that could provide the rationale to restrict certain international vessel traffic through high risk areas.
- Evaluate these ecosystems' vulnerability to degradation from international vessel traffic.
- Addressing the degree of burden that the PSSA may place on the USCG and other regulatory agencies.
- Research requirements for law enforcement and ensure that before the PSSAs are forwarded to IMO, the law enforcement agencies have agreed to the various requirements of the PSSA to ensure compliance.

We envision two in-person meetings (initial/final) and up to six web conferences of the Workgroup. A web page will be developed and added to the AIRA public website to communicate workgroup activities and actions. Once the PSSA boundaries and the list of associated protective measures are identified, the Management Team, in consultation with the Analysis Team, will determine whether Subtask 4C should be conducted.

SUBTASK 4C - BENEFIT-COST ANALYSIS OF THE PSSA PROTECTIVE MEASURES

Northern Economics expects a list of PSSA protective measures will be created by the Work Group. Once this list has been developed, and if the Management Team concurs, Northern Economics will assist in the evaluation of the alternatives by conducting Benefit-Cost Analysis (BCA) for each. As previously mentioned, a BCA helps determine whether or not it is economically justifiable to spend money on a project. In this case, if the protective measure yields a benefit greater than the cost, then the project is economically justified.

The costs of the protective measures will vary with the method of implementation. For example, the cost of rerouting can be quantified through a measure of operating expenditures; vessels that must lengthen their voyages to adhere to new vessel routings will incur the cost of additional fuel and time for avoidance. This cost, in combination with additional expenses incurred for regulatory agency enforcement, will be compared to the expected value of benefits. The main benefits of PSSA protective measures, as with all RROs, are the reductions in spill frequency and severity (which would in turn translate into avoided costs from spilled oil), vessel and cargo damage, human fatalities and/or injuries, and environmental damage.

In some instances it may be difficult to quantify the costs and benefits for PSSA protective measures. In order to generate a BCA that is appropriate at this stage of analysis, assumptions will need to be made regarding

capital and operating costs of relevant protective measures. For example, should additional on-board equipment be required for vessels transiting the PSSA (i.e., advanced tracking systems), the study team will use an estimated cost of installation that does not vary within vessel type.

Where available, data for the evaluation of RRO 4 will be sourced from AIRA Phase A. For example, Phase A assumptions for vessel speeds and existing routings are presented within the current body of work. Given that specific protective measures were not analyzed in Phase A, and that the costs and probabilistic benefits of each are not available within the current body of work, Northern Economics will rely on both the Analysis Team and external data sources to obtain information, such as vessel operating costs and likelihoods of benefits afforded by each proposed protective measure.

SUBTASK 4D - APPLICATION TO IMO FOR CONSIDERATION OF PSSA AND PROTECTIVE MEASURES

Pending the results of Subtasks 4B and 4C, Nuka Research anticipates that the final product of this task will be a completed application. The objective to prepare a nearly 'turn-key' application that the U.S. government can submit to IMO's Environmental Protection Committee (MEPC) for the consideration and establishment of PSSA and associated protective measures in the Aleutian Islands region. If the Management Team decides to proceed with the application, we will use the application procedures in IMO resolution A.982 (24) and lessons learned from other successful US applications (Florida Keys in 2002 and Papahānaumokuākea Marine National Monument in 2007). The application shall include a comprehensive PowerPoint presentation to assist the U.S. delegation and IMO technical workgroups, subcommittees, and committees in evaluating the proposal.

SECTION 2 PROJECT MANAGEMENT PLAN

Nuka Research will be the prime contractor for this project. As such, Nuka Research will serve the administrative role of liaison with the contracting officer(s), invoicing, and managing sub-contractors. Tim Robertson will be designated as the single point of contact for all administrative issues.

Project management will be co-managed by Tim Robertson and Leslie Pearson (Pearson Consulting). They will jointly manage the project to ensure that all project tasks proceed on-schedule and within the established sub-task budgets. Tim and Leslie have successfully co-managed a number of similar projects including: the Cook Inlet Risk Assessment, the Aleutian Island Risk Assessment Phase A Advisory Panel Facilitation, and the Alaska Risk Assessment North Slope Spills Analysis.

Nuka Research has assigned primary and contributing roles to each of our subcontractor organizations by sub-task, based on the capabilities and experience of each project team member. Table 2 shows the roles for each organization for each task.

Table 3 shows the schedule for each task.

Table 2. ***Assignment of project roles by task.***

TASK	Nuka Research	Pearson	Glosten	Northern Econ.	Baldwin & Butler	Cape Intl	MER
Task 1-2a	**P**	C	C				C
Task 1-2b	**P**	C	C		C		C
Task 1-2c	C	C	**P**		C		C
Task 1-2d	C	C	**P**		C		
Task 1-2e	C	C	C				**P**
Task 1-2f	C	C					**P**
Task 1-2g	C	C			**P**		C
Task 1-2h	**P**	C	C		C		C
Task 1-2i	C	C	C	**P**	C		C
Task 1-2j	**P**	C	C	C	C		C
Task 3a	C	**P**					C
Task 3b	**P**	C					
Task 3c	**P**	C					
Task 4a	C	C				**P**	
Task 4b	C	C				**P**	
Task 4c	C	C		**P**		C	
Task 4d	C	C				**P**	

P= primary responsibility for task; C- contributor to task

Table 3. Project and Task Schedule.

TASK	Task Name	2012	2013				2014		
Task 1-2a	Regulatory Resource Study	**X**							
Task 1-2b	Response Gap Analysis	X							
Task 1-2c	Emergency Towing Study		X	X	X				
Task 1-2d	Tug Location Study		X	X	X				
Task 1-2e	Salvage Study		X	X	X				
Task 1-2f	Spill Response Study		X	X	X				
Task 1-2g	Management System Analysis		X	X	X				
Task 1-2h	Optimal Response System					X			
Task 1-2i	Benefit-Cost Analysis				X	X	X		
Task 1-2j	Draft/Final Reporting						X	**X**	X
Task 3a	Subarea Committee and Plan Update		X	X	X	X	X	X	X
Task 3b	Geographic Response Strategies		X	X	X	X	X	X	
Task 3c	Potential Places of Refuge		X	X	X	X	X	X	
Task 4a	Education & Communication Plan		X	X	X	X	X	X	
Task 4b	PSSA Workgroup Facilitation		X	X	X	X	X	X	
Task 4c	Benefit-Cost Analysis						X	X	
Task 4d	PSSA Application								X
X= Project Team webinar and/or meeting									

SECTION 3 ORGANIZATIONAL STRUCTURE