Environmental Resources Management

341 W. Tudor Road
Suite 206
Anchorage, AK 99503
(907) 770-1994
(907) 770-2531 (fax)
www.erm.com

3 September 2010

Mr. Jay Wright
AIRA Program Manager
National Fish and Wildlife Foundation
1133 15th Street, NW Suite 1100
Washington, D.C. 20005

Subject: Phase A – Aleutian Islands Risk Assessment
Final Task 1 and Task 2 Reports Submittal Package

Dear Mr. Wright,

ERM-West, Inc. (ERM) and Det Norske Veritas (U.S.A.), Inc. (DNV) appreciate the opportunity to provide our consulting services for the Phase A – Aleutian Islands Risk Assessment (AIRA). This submittal package transmits the final Task 1 Semi-quantitative Traffic Study Report, Task 2A Marine Spill Frequency and Size Report, and Task 2B Baseline Spill Study Report.

This transmittal letter provides an introduction and overview of Tasks 1 and 2, as well as background to the Phase A AIRA. The following sections include:

1) Introduction, which provides the background and objectives;
2) Objectives and Overview of Task 1 and 2 Studies;
3) Next Steps; and
4) Closing.

1.0 INTRODUCTION

The AIRA program was created to produce a comprehensive evaluation of the risk of vessel accidents and spills in the Aleutian Islands. The goal of the AIRA program is two-fold: 1) to produce a comprehensive evaluation

of the risk vessel accidents and spills in the Aleutian Islands; and 2) to identify the highest priority risk reduction measures that can be implemented to improve safety related to shipping operations in the region.

The AIRA Program is administered by the National Fish and Wildlife Foundation (NFWF), in cooperation with the United States Coast Guard (USCG) and the Alaska Department of Environmental Conservation/ Department of Natural Resources. These three entities comprise the AIRA Management Team (MT).

The Risk Analysis Team conducting the AIRA Phase A Preliminary Risk Assessment (PRA) consists of ERM and DNV. This submittal package includes the following reports (NFWF, 2009):

- Task 1 Semi-quantitative Traffic Study Report;
- Task 2A Marine Spill Frequency and Size Report; and
- Task 2B Baseline Spill Study Report.

Additional information regarding the background and development of the Phase A AIRA program is described below.

1.1 BACKGROUND OF THE AIRA PROGRAM

The multi-phase risk assessment of maritime transportation in the Bering Sea and the Aleutian Archipelago has been an important issue for the region for some time. The 8 December 2004 grounding of the *M/V Selendang Ayu* and subsequent oil spill that impacted the shoreline and resulted in other marine casualties in the region brought more attention to this important issue.

In 2007, Alaska and USCG asked the National Academies to examine the available data and develop an appropriate framework that includes 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.

To conduct this study, the Transportation Research Board (TRB) within the National Academies empanelled the Committee for Risk of Vessel

Accidents and Spills in the Aleutian Islands: A Study to Design a Comprehensive Assessment. The committee included individuals with expertise in risk assessment methods and practices; risk assessment data and analyses; risk analyses, with emphasis on evaluation and prevention of ship accidents; commercial shipping, with emphasis on North Pacific operations; navigation safety and voyage planning; USCG missions and operations related to waterway management and accident response; environmental protection; and regulatory approaches to ship safety and accident prevention.

The resulting report, Special Report 293 – Risk of Vessel Accidents and Spills in the Aleutian Islands: Designing a Comprehensive Risk Assessment (TRB, 2008), describes the structure and design of an appropriate risk assessment and presents the committee's recommendations for organizing, managing and conducting a comprehensive assessment of the risk of vessel accidents and spills in the Aleutian Islands.

The AIRA follows the process recommended in the Special Report 293 and is divided into two phases of which, Phase A - PRA and Phase B – Focused Risk Assessment. Phase A includes the following:

1) Establishing the Advisory Panel (completed),
2) Contracting a Risk Analysis Team (completed),
3) Selecting a Peer Review Panel (completed),
4) Drafting a spill risk report on vessel traffic and spill likelihood (this submittal),
5) Developing a risk matrix and consequence analysis (ongoing), and
6) Conducting a qualitative assessment and prioritization of risk reduction options (forthcoming).

The Phase A PRA consists of the following eight main tasks:

- Task 1 - Traffic Study
- Task 2 - Baseline Spill Study
- Task 3 - Characterizing Spills from Highest-Risk Accidents
- Task 4 - Phase A Consequence Analysis

- Task 5 - Accident Scenario and Causality Study
- Task 6 - Qualitative Assessment and Preliminary Prioritization of Risk Reduction Options
- Task 7 - Evaluation of Risk Reduction Options
- Task 8 - Prioritization of Risk Reduction Options

1.2 PURPOSE

The purpose of this submittal is to present the findings of the first two tasks of the Phase A PRA, Task 1 - Traffic Study and Task 2 - Baseline Spill Study (includes subtasks 2A- spill frequency and size study, 2B – baseline oil spill study, and 2C baseline spill report).

This document, the Task 1 and 2 Submittal Package, provides information on the background and status of the Phase A PRA. The following three reports complete the Task 1 and 2 report submittal:

- The Task 1 Semi-quantitative Traffic Study Report;
- The Task 2A Marine Spill Frequency and Size Study Report; and
- The Task 2B Baseline Spill Study Report.

1.3 DRAFT REPORTS AND COMMENT REVIEW

Draft reports of the three Task 1 and 2 documents were submitted to the MT on 18 January 2010. After the initial review period, comments from the MT, Advisory Panel members and the Peer Review Panel were summarized and submitted to the Risk Analysis Team.

Following receipt of initial comments, a series of meetings and teleconferences were held in January, February, and April 2010 with the Peer Review Panel and Advisory Panel members to refine and clarify comments. Based on further discussions and clarification of the comments, the Risk Analysis Team then categorized comments based on degree of complexity and submitted proposed initial responses to comments. Consensus on how to respond to comments and suggested revisions to the reports was achieved between the Risk Analysis Team and MT. The comments for the draft reports, initial risk team's response, MT

reply and final resolution to the comments are summarized in tables provided as Attachment A.

2.0 OBJECTIVES AND OVERVIEW OF TASK 1 AND 2 STUDIES

2.1 OBJECTIVES

The objectives of these reports are to summarize the preliminary findings of the Traffic Study and Baseline Spill Study and provide detailed documentation of the studies completed for Tasks 1 and 2 of the Phase A PRA so that data sources, methodology, and path to conclusions are clear and understandable.

Task 1, Semi-quantitative Traffic Study, serves as the Hazard Identification component of the PRA. Specifically, the objectives are to characterize the existing fleet and traffic in the region and the quantities of oil and other hazardous cargos being moved and estimating the current and future fleet makeup over a 25-year study period (2009 through 2034). This also required projecting growth in trade, changes in vessel design and size, and the impacts of known and reasonably expected regulatory changes.

Task 2, Baseline Spill Study, serves as the initial identification of spill risk which have been generated on the basis of the spill frequency and size and development of the oil spill baseline. Task 2A, Marine Spill Frequency and Size Report serves to identify likely baseline spill scenarios based on vessel type, cargo, and related data. Task 2B, Oil Spill Baseline, serves to model spill size by geographical location based on wind, currents, spill substance characteristics, to identify potential receptors for the spilled material.

2.2 OVERVIEW AND RELATIONSHIP OF THE STUDIES

The first two tasks are the foundation of the Phase A PRA and provide a basis for understanding the risks by identifying the likelihood of occurrence and environmental impact of marine accidents that could result in spills and the dominant accident scenarios. The results will assist with the ranking of accidents and accident scenarios by level of risk. The

studies are intended to provide a high-level understanding of relative risks taking into consideration vessel types, types of oil and hazardous substances, and the locations where discharges are most likely to occur.

The Traffic Study was the first step in the process. Recent data of vessel type, ship routes, cargo movements, and fleet and traffic forecasting was identified to establish the basis for estimating spill frequency and size of the Baseline Spill Study task. Spill frequency and size evaluation extracted the vessel, route, and cargo data and identified preliminary risk factors related to an accident and type of cargo that could be released to the sea. High risk accident areas based on vessel type were identified and spill scenarios were then developed for input into an oil spill model that was developed for the Aleutian Islands.

The oil spill model was developed using region-specific data (e.g. wind, currents, bathymetry, temperature, etc) and calibrated against a known spill event, the December 8, 2004 grounding of the *Selendang Ayu*. Results of modeling the spill scenarios identified, 1) how the various types of substances partition in the sea, 2) travel times to potential receptors, and 3) mass/concentration estimates in the environment as well as other factors relevant to assess impact to the environment, regional economy, and other potential receptors.

2.3 TASK 1 - TRAFFIC STUDY

As described in the AIRA Phase A Request For Proposal (NFWF, 2009), the study area is a rectangle bounded by 50° North to 55° 30' North and 160° West to 170° East. The area is approximately 1080 nautical miles by 330 nautical miles and the Aleutian Islands extend through the center of the area. As most of the study area is open water away from the shore, there is no shore-based surveillance for most of the study area. This limits the quality of the traffic data that can be derived for some parts of the study area.

Collection of shipping traffic data in the Aleutian Islands area is a challenging task because it involves multiple countries and ports, vessels transiting in innocent passage, and numerous maritime activities in a large area. As such, multiple sources are required to provide the necessary comprehensive understanding.

The general approach, vessel makeup and traffic patterns, movement of commodities, fleet forecast and summary are described in the detailed Task 1 - Semi-quantitative Traffic Study Report.

2.4 TASK 2 – BASELINE SPILL STUDY OVERVIEW

A baseline spill study was conducted by ERM and DNV as part of the AIRA Phase A PRA. The spill baseline study utilized multiple data sources to estimate the spill characteristics such as spill rates, substance, frequency, and location, etc. Frequency was developed from the traffic pattern for each type of ship. Consequence was then initially expressed in terms of the expected or average spill outflow, which together with the spill frequency defined the spill rate. This projection was designed to provide an understanding of the most important hazards and serve as a baseline for later assessment benefits.

The subtasks that make up Task 2 are the spill frequency and size assessment and the oil spill baseline study. To conduct these studies, modeling tools were utilized for each subtask and the Risk Analysis Team combined our risk assessment modeling capabilities. This was achieved by using the expertise on the two models used by the team as described below.

DNV uses the Marine Accident Risk Calculation System (MARCS) model. MARCS calculates its main outputs as accident frequencies and quantities of cargo and bunker fuel spilled at a particular location. The MARCS model uses traffic data (vessel types and location), ship failure data (including both human error and mechanical failure frequencies), environmental data (such as wind speed and direction), and operational data [such as TSS (traffic separation schemes] to calculate accident frequencies. These frequencies are calculated for each vessel type and each accident type as a function of location within the study area. The accident frequencies are then used with event tree models of probable material lost into the sea to deliver risk results in terms of quantity of material released into the sea. These results can be developed separately for the various cargo types (e.g., crude oil, refined products, etc.) included in the traffic data, and for bunker fuel oil.

ERM uses the Chemical and Oil Spill (COSIM) module of the Generalized Environmental Modeling System (GEMSS®) (Kolluru, 2006), which is an integrated system of three-dimensional hydrodynamic and transport models embedded in a geographic information and environmental data system. The constituent transport and fate computations are grouped into modules. The COSIM module, created in the early 1990s was specifically designed to assess the fate and transport of oil and chemical spills.

COSIM computes the fate and transport of cargo spills using spill scenarios developed from MARCS and provides results for consequence analysis.

A flow chart that describes relationship between the MARCS and COSIM models as well as relationship to the next phases of the PRA is provided in Figure 2-1. The top portion of the figure identifies the technical inputs required and the outputs produced from the modeling components of the Phase A PRA. The bottom portion of the figure shows how the modeling information is used to inform and guide the subsequent tasks of the Phase A PRA, namely, the consequence analysis and risk reduction options.

Each study of Task 2 is further described in separate reports included with this transmittal: Task 2A - Marine Spill Frequency and Size Report and Task 2B – Baseline Spill Study Report.

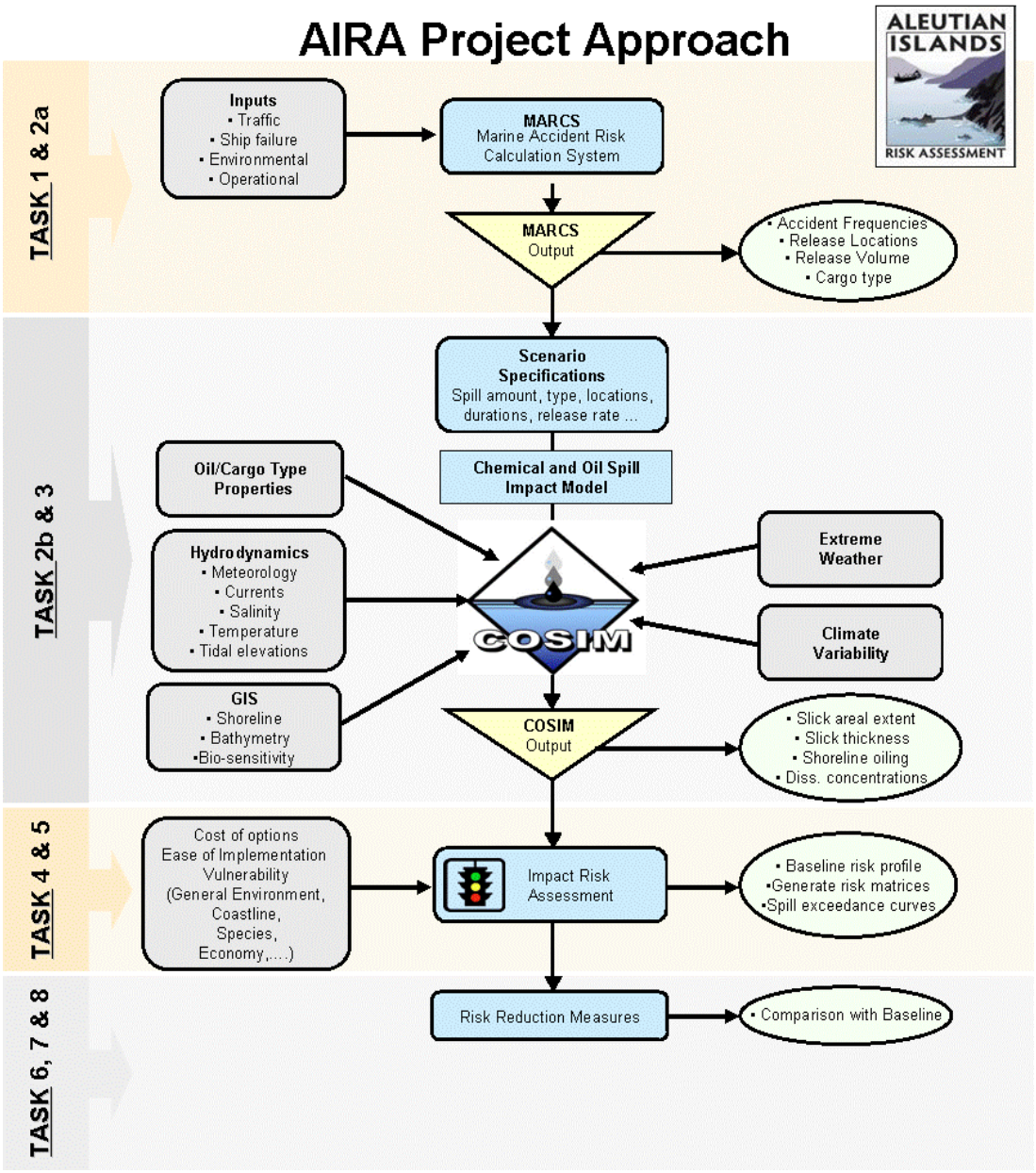
3.0 NEXT STEPS

The results of the Task 1 and 2 studies were used to develop the inputs for the next steps of the AIRA Phase A program, mainly the Task 3 Risk Matrix. A webinar to discuss and develop consensus on the approach for the Risk Matrix was held at the end of April 2010. The results of the Task 3 Risk Matrix were presented and discussed during a webinar in June 2010.

Based on the preliminary risk matrix results from Task 3, a total of 14 scenarios were developed with consensus from the MT and Advisory Panel members for evaluation of the Task 4 /5 Consequence Analysis and Causality Study. The activities associated with tasks 4 and 5 are ongoing

and preliminary results will be incorporated into the upcoming Task 6 Workshops.

Figure 2-1 Flow Chart Relationship of the Phase A PRA Tasks



4.0 CLOSING

The Risk Analysis Team is appreciates the opportunity to work with the MT and other stakeholders as part of the AIRA Phase A program. If you have questions concerning this submittal, please contact Ms. Laura Tesch at 206-418-8893 or laura.tesch@erm.com.

Sincerely,

Laura Tesch
Program Director

LAT/jjr/0105563

cc: Mr. David Pertuz, DNV
Ms. Leslie Pearson, Pearson Consulting
Mr. Timothy Robertson, Nuka Research

Attachments:
Resolutions/Response to Report Comments Tables
Task 1 Semi-quantitative Traffic Study Report
Task 2A Marine Spill Frequency and Size Study Report
Task 2B Baseline Spill Study Report

References:

Kolluru, V. S. 2006. Technical White Paper on GEMSS. Environmental Resources Management, Inc., Exton, PA.

NFWF, 2009. Phase A – Aleutian Islands Risk Assessment: Request for Proposals. National Fish and Wildlife Foundation. Washington, D. C. June.

TRB, 2008. Risk of Vessel Accidents and Spills in the Aleutian Islands: Designing a Comprehensive Risk Assessment – Special Report 293 Committee on the Risk of Vessel Accidents and Spills in the Aleutian Islands. A Study to Design a Comprehensive Assessment. Transportation Research Boards (TRB), Washington, D.C. 2008. www.TRB.org.

Attachment A
Response/Resolution to Report Comments Tables

- *Advisory Panel Consent Comments*
- *Advisory Panel Draft Summary Report Comments*
- *Advisory Panel Draft Traffic Study Report Comments*
- *Advisory Panel Draft Baseline Spill Study Report Comments*
- *Peer Review Panel Comments*

Consent Report Comments

#	Report Section	Page(s)	Actual Reference	Comment	Recommended Changes	Risk Assessment Team Response	MT Reply	Report Revisions/ Actions
1	Baseline Spill Study (BSS) Overall Comment	46	Same	Table 6.7 longitude is incorrect and results are for a different area	Correct to E Longitude and rerun scenario	Category I: Rerun Scenario 4 with the corrected longitude 174E	Concur: Proceed with CAT I revision	Correction made in the Task 2B Baseline Spill Study (BSS) Report.
2	BSS 1.0 INTRODUCTION	46	Same	Wrong longitude.	Need to redo with correct longitude 174E. Also scenario 4 write up page 57	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Correction made in the BSS Report.
3	BSS 2.3 MODELING PROCEDURE	3	Same	Figures Section: Fig 3-3. Unreadable	Break into smaller sections	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Additional figures were added in BSS report.
4	BSS 4.1 SCENARIOS	17	Same	FIGURES SECTION: Scenario 4 Figures 4-8 and 4-9.	Redo for correct longitude	Category I: Rerun Scenario 4 with the corrected longitude 174E	Concur: Proceed with CAT I revision	Scenario was rerun and text and figures were updated in BSS report.
5	BSS 4.1.1 Baseline Scenarios	84	Same	FIGURES SECTION: Fig 6-26, 6-27, 6-28,6-29, 6-30, 6-31, 6-32, 6-33.	Redo for correct longitude Scenario 4	Category I: Rerun Scenario 4 with the corrected longitude 174E	Concur: Proceed with CAT I revision	Figures updated in BSS report.
6	BSS 4.1.2 Calibration Scenario	7	Task 2A	Edit	Table 2-1 Cargo spill column description: 3rd sentence "the majority of cargo spill risk originates from ship categories 6,9,11, and 12. These ship categories can carry hydrocarbons and hazardous cargo in large quantities. Vessel types 1-5, 8, 9 and 13-18. Vessel type 9 should be deleted from the 5th sentence since it contradicts what's stated in sentence 3	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Corrected text in Task 2A Spill Freq and Size Report (SFS) Sect 2.2
7		9	Task 2A	9 2.4 Determination of Cargo Status Please provide a diagram that illustrates the double hull of vessels, with the assumption that the bunker tanks are not double hulled. This would help in understanding hull configuration.	It would be beneficial for the general audience to have a diagram or two of the various hull configurations in order to understand what's protected (fuel tanks) and what's not protected	Category I: Will attempt to provide adequate figure.	Concur: Proceed with CAT I revision	Added Figure of tank ship general tank arrangement under Task 2A SFS Sect. 2.4 (fig 2-3)

Consent Report Comments

#	Report Section	Page(s)	Actual Reference	Comment	Recommended Changes	Risk Assessment Team Response	MT Reply	Report Revisions/ Actions
8	BSS 6.4 SCENARIO 4	35	Task 2A	Revised report Section 7; paragraph 2.Statement, "In addition, bunker fuel spills are not very likely because bunker tanks are usually localized towards the stern of the ship and hence will probably not be damaged in the majority of accidents to ships."	Recommend striking this statement based on review of historical spill data. There's plenty of examples in the Aleutian Island regions where ships ran aground and spilled bunker oil. To lead the reader to believe that it's not very likely without specifying vessel type is concerning.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Removed paragraph as recommended under Task 2A SFS sect 7
9	BSS 8.0 REFERENCES	1	Summary Report	Correction on who administers the project and "real" Management Team structure. Spell out acronyms prior to use.	Second paragraph, first sentence should read: The AIRA is administered by the National Fish & Wildlife Foundation (NFWF), in cooperation with the United States Coast Guard (USCG) and Alaska Department of Environmental Conservation. second sentence: Spell out Environmental Resource Management (ERM)- West	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	SR replaced with Introduction with Final Report submittal, Not found in TS or SFS
10	BSS 8.0 REFERENCES	5	Summary Report	It would useful to add a map of the study area here to augment the coordinates. This is the report summary and this may be all that some people read.	Figure 3-1, Annex C, would do but add study area boundary.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Figure 3-1 revised as suggested in Task 2B BSS report
11	BSS 8.0 REFERENCES	36	Summary Report	Add: 7.6 Example of Scenario 6	A new scenario was added to Appendix C and a short summary should be included in Section 7	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Added Scenario 6 to SFS 7.6
12	SFS 2 MARCS INPUT DATA	12	Summary Report	Editorial	First sentence- strike USCG vessels and replace with Government vessels.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Replace USCG with government vessels in Traffic Study Report (TS) Section 3.2 and 6 (three ocurrences)
13	SFS 2 MARCS INPUT DATA	19	Summary Report	Editorial	Table 4-1 Number of vessel mile by vessel type Please add a column that identifies the categories	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	No change needed on TS or SFS

Consent Report Comments

#	Report Section	Page(s)	Actual Reference	Comment	Recommended Changes	Risk Assessment Team Response	MT Reply	Report Revisions/ Actions
14	SFS 3 BASE YEAR ACCIDENT FREQUENCY AND RISK RESULTS	19	Summary Report Page 29	Correction.	Scenario 4 change longitude to 174E	Category I: The comment does not reference the correct location. We think this comment pertains to Table 5-1, page 29 of the Spill Frequency Report. Will amend as recommended	Concur: Proceed with CAT I revision	No change needed on TS or SFS
15	SFS 5 BASELINE SPILL SCENARIOS	23	Summary Report	Editorial	Delete the first two sentences since the revised report now includes Accident frequency	More Clarification Requested from MT. Cannot find referenced comment.	Concur: Proceed with CAT I revision	No change needed on TS or SFS
16	SFS 5 BASELINE SPILL SCENARIOS	24	Summary Report	Editorial	Table 4-4: Add Scenario 6 to this	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Added Scenario 6 to SFS 7.6
17	SR 1.0 INTRODUCTION	29	Same	Agattu Island, located in the western Aleutians, in scenario 4 is 174 East and NOT 174 West. The 180 longitude of E and W hemisphere division occurs near Amchitka pass. The accident happens out west (good for a scenario) but the affected area is in the central Aleutians (incorrect).	Correct the longitude to Agattu in the eastern hemisphere and rerun the model. This is the best thing to do since so much traffic exits the Aleutians in the west, it would be great to have a scenario out there in a remote location, near extensive wildlife resources and no human resources available. Alternatively, you could change the initial spill to the Western position listed and keep the results and change the accident origin	The alternative recommendation is within Category I. ERM and DNV to correct. NOTE: consider recommended scenario for Task 4	Concur: Proceed with CAT I revision	Scenario was rerun and text and figures in Baseline Spill Study report were updated.
18	SR 2.0 TASK 1 - TRAFFIC STUDY	29	Same	Scenario 4. Change longitude to 174E. This also affects the narrative on page 35 about impact on Atka which is 400NM from Aggatu	Not sure what impact this has on other modeling results.__	Category I. Will rerun scenario	Concur: Proceed with CAT I revision	Scenario was rerun and text and figures in BSS report were updated.

Consent Report Comments

#	Report Section	Page(s)	Actual Reference	Comment	Recommended Changes	Risk Assessment Team Response	MT Reply	Report Revisions/ Actions
19	SR 2.5.3 Invasive Species (Rats)	29	Same	Table 5-1	Add scenario 6 from Appendix C	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Summary Report was prepared for initial Draft only; Replaced with Introduction to Task 1 and 2 Reports.
20	SR 4.2 TRAFFIC DATA	31	Same	Refers to coast of Unalaska which is several islands away.	More descriptive to say Unimak Pass.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Summary Report was prepared for initial Draft only; Replaced with Introduction to Task 1 and 2 Reports.
21	SR 4.5.1 Accident Frequency	32	Same	Typo	Bullet 8 should be Tigalda Island not Tigaldi	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	correction made in Task 2B BSS report, Section 6.1
22	SR 4.6 BASELINE SPILL SCENARIOS	32	Same	Cover 18KM2 of shoreline	Add length of shore impacted since this is easier to visualize.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Revision made in Task 2B BSS report, Section 6.1
23	SR 5.1.2 Use of Baseline Spill Scenarios	33	Same	refers to LNG entering Unimak Pass.	Assuming the vessel is westbound, the position given looks like it is exiting the Pass.	Category I: Will review and amend as needed	Concur: Proceed with CAT I revision	Revision made in Task 2A SFS Sect 7.2 and Task 2B BSS Sect. 4.1.2.
24	SR 5.1.2 Use of Baseline Spill Scenarios	34	Same	Spelling correction	Change “Pank off” to Pankof”	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Correction made in Task 2B BSS report.
25	SR 5.1.2 Use of Baseline Spill Scenarios	35	Same	Scenario does not make sense because of problems with Longitude	Change the longitude to 174 E and rerun the scenario.	Category I: Will review and amend as needed	Concur: Proceed with CAT I revision	Correction made to Scenario 4 in BSS.
26	SR 5.2.1 Baseline Scenario 1	1	Same	Title Page Comment	Title page says prepared for NFWF. Isn’t the report really for USCG and State of Alaska and NFWF is just being the banker?	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	All report title pages revised to include USCG and ADEC.
27	SR 5.2.1 Baseline Scenario 1	8	Same	Table 2-1, Category 14. Does the term product tanker include tank barges?	Please clarify	Category I: The term does not include tank barges, will clarify as recommended	Concur: Proceed with CAT I revision	Clarified Task 1 TS Table 2-19

Consent Report Comments

#	Report Section	Page(s)	Actual Reference	Comment	Recommended Changes	Risk Assessment Team Response	MT Reply	Report Revisions/ Actions
28	SR 5.2.1 Baseline Scenario 1	24	Same	These scenarios seem realistic based on past accidents. Not all are concentrated at Unalaska, but reflect a nice mixture of possibilities. Good that 1 remote western area is addressed	None needed	**No Action or Revision Required.**		No Action
29	SR 5.2.2 Baseline Scenario 2	18	Same	Figure 3-1.	Explain the difference between this figure and the one on page 21 of the summary.	Category I: Summary Report data (figure 4-3) was updated. Revised Figured will be placed in SR	Concur: Proceed with CAT I revision	SR replaced with I Submittal Package transmittal letter.
30	SR 5.2.3 Baseline Scenario 3	19	Same	The reference to ship "tracks" is somewhat unclear to me. The report says it means when a vessel is in an AIS covered area. Would a bulk cargo ship sailing west through the Aleutians that is picked up by an AIS receiver in Unimak Pass then two days later show up off of Adak continuing on that same West bound voyage be counted as two "tracks"	A clearer explanation of tracks would be helpful. I also think in the future counting "transits" would be a better indicator of risk and exposure, than "tracks".	Category I: Will amend as recommended, A better clarification will be provided	Concur: Proceed with CAT I revision	Added Clarification in Task 1 TS 2.1
31	SR 5.2.4 Baseline Scenario 4	53	Same	In a few areas the report refers to barges "weighing 1,500 tons"....in this context tonnage is either a volumetric measurement of the vessel, not weight, or the "displacement tonnage" which is the weight of the cargo.	Clarify if the statement is referring to gross tons or displacement tons	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Added approx 24,000 bbl) wherever refernce was made (multiple locations)
32	SR Table 4-4 Summary of Baseline Spill Scenarios	56	Traffic Study	Spelling correction.	3RD Line from bottom. Coast vice coat.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	made correction on Task 1 TS 4.3.2.1
33	Summary Report (SR) Overall Comment	34	Traffic Study	Edit	Paragraph: Delete USCG and replace with Government when referring to vessel type.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Made corrections as needed Task 1 TS 3.2
34	Summary Report (SR) Overall Comment	34	Traffic Study Page 35	Typo	Change to Kagalaska Island non Kangalaska	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Made correction Task 1 TS 3.2
35	Summary Report (SR) Overall Comment	39	Traffic Study Page 35	Edit	Second paragraph, first sentence: delete "that" after the word "important"	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Made correction in Task 1 TS 3.2

Consent Report Comments

#	Report Section	Page(s)	Actual Reference	Comment	Recommended Changes	Risk Assessment Team Response	MT Reply	Report Revisions/ Actions
36	Summary Report (SR) Overall Comment	45	Traffic Study		Check these figures!	Category I: Will review and amend as needed	Concur: Proceed with CAT I revision	Figures Checked, no changes
37	Summary Report (SR) Overall Comment	51	Traffic Study	Figure 4-7	THIS DOES NOT LOOK LIKE A BULK CARRIER!!!!!!!	Category I: Will replaced with better picture	Concur: Proceed with CAT I revision	Replaced Task 1 TS Figure 4-7
38	Summary Report (SR) Overall Comment	53	Traffic Study Page 17	Sentence: Tank barges weighing less than 1,500 gross tons that operate in the waters of the Aleutian Islands are specifically exempt from the double-hull provisions of OPA 90. Please clarify by providing the capacity of these vessels. How does this relate to Tables 2-11 and Table 2-12 on Page 17?	A more detailed explanation is need to understand the capacity and number of tank barges operating or transiting through the area are exempt from the OPA 90 double-hull provision.	Category I: Will review and amend as needed	Concur: Proceed with CAT I revision	Added table 2-13 to Task 1TS report
39	TS 3.2 Current Movement Non-Native/Invasive Species	64	Same	Edit	Sentence after Figure 5-4: Add a period	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Added period as noted in Task 1 TS sect. 5
40	TS 3.2 Current Movement Non-Native/Invasive Species	65	Same	Edit	First Sentence, after the word Section: default text reads Error! Reference source not found. Please correct.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Corrected and reinserted reference
41	TS 3.3.1.2 Exports – West Bound Traffic	39	Same	Edit	Second paragraph, first sentence: delete "that" after the word "important"	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Corrected Task 1 TS 3.3.1.2
42	TS 4.1 Ship Building and Market Trends	45	Same	Vessels laid up– over 560 ships corresponding to 1.400.000 TEU • Bulk Carriers – around 200 vessels • Oil tankers – 10% of the Very Large Crude Carrier (VLCC) and Suezmax vessels are being used as storage • Car carriers –50 vessels removed from the market – old tonnage to be scrapped	Check these figures!	Category I: Will review and amend as needed	Concur: Proceed with CAT I revision	Figures Checked, no changes
43	TS 4.2.1.2 Bulk Carriers	51	Same	Figure 4-7	THIS DOES NOT LOOK LIKE A BULK CARRIER!!!!!!!!	Category I: Will replaced with better picture	Concur: Proceed with CAT I revision	Replaced figure 4-7 in Task 1TS report

Consent Report Comments

#	Report Section	Page(s)	Actual Reference	Comment	Recommended Changes	Risk Assessment Team Response	MT Reply	Report Revisions/ Actions
44	TS 4.2.1.5 Barges	53	Same	Sentence: Tank barges weighing less than 1,500 gross tons that operate in the waters of the Aleutian Islands are specifically exempt from the double-hull provisions of OPA 90. Please clarify by providing the capacity of these vessels. How does this relate to Tables 2-11 and Table 2-12 on Page 17?	A more detailed explanation is need to understand the capacity and number of tank barges operating or transiting through the area are exempt from the OPA 90 double-hull provision.	Category I: Will review and amend as needed	Concur: Proceed with CAT I revision	Added table 2-13 in Task 1 TS report
45	TS 5 TRAFFIC FORECAST	64	Same	Edit	Sentence after Figure 5-4: Add a period	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Added period TS Sect 5
46	TS 5.1 Transpacific Forecast Approach	65	Same	First Sentence, after the word Section: default text reads Error! Reference source not found.	Please correct.	Category I: Will amend as recommended	Concur: Proceed with CAT I revision	Corrected and reinserted reference

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
5	SR 1.1 BACKGROUND	1	Says the risk assessment became an important issue after SELANDANG AYU.	I believe people have been thinking of risk in the Aleutians well before SELANDANG AYU and the USCG had a program in place to do risk assessment in different areas of the country.	**AP recommendations: The report should acknowledge that there was an interest in conducting a risk assessment prior to the Selendang Ayu incident. The interest and need increased following the Selendang Ayu.**	Category I: revise report as recommended.	Concur: Proceed with CAT I revision	Summary Report was prepared for initial Draft only; Replaced with Submittal Package Letter for final Task 1 and 2 Reports.
6	SR 2.2.2 Routes	9	Confirm if the term “transit passage” should be used here or if both innocent and transit passage are appropriate to use. Also page 11.	Terminology needs to be consistent throughout the report.	**AP recommendation: Review how the term "transit passage" and "innocent passage" are used throughout the report to insure they're being used accordingly to the definition found in SR293 report.**	Category I. Will add transit passage to Task 1 Traffic Report definitions and revise report as necessary	Concur: Proceed with CAT I revision	Added transit passage definition to Traffic Report. Made the use of transit passage term consistent throughout the Traffic Study Report (TS).
7	SR 2.5.1 Ships in Passage	11	roll-on/roll-off.	Don’t the car carriers go up the Columbia to Portland OR?	**AP recommendation: report should acknowledge that RO/RO carriers call in Portand, OR**	Category I. Will revise Task 1TS 2.4 General Cargo Vessels (Category 5) and add Oregon to Ro-Ro Destinations. Will revise other areas as necessary.	Concur: Proceed with CAT I revision	Added Oregon to Task 1 Traffic Report 2.6
8	SR 2.5.2 Future Traffic	12	I was not clear what this paragraph meant:Based on a 2009 oil and gas development study for the Beaufort Sea,Chukchi Sea, and North Aleutian Basin commissioned by ShellExploration and Production, it was concluded that any increases in vessel activity due to these operations will not sustain high levels of long-term activities due to unique vessels needed under each stage over the lifetime of an oil and gas development.	Please explain what is meant by "any increases in vessel activity. . . will not sustain high levels of long-term activities" due to "unique vessels needed". In the long term (eg 25 years from now) we may be in a long period of offshore production, so it seems that any vessels associated with production would need to be considered? Also, it is possible there will still be exploration, and therefore we may see a somewhat long term increase in vessels associated with exploration, it seems to me. Shell has stated that one development scenario for the Chukchi is to transport the oil and gas by tanker so i think this could be very significant; but even if we're just talking support vessels i can't understand why we'd dismiss them outright. Also the AMSA estimates that oil and gas traffic is one of the two main areas where traffic is expected to increase in the US arctic so it seems that we should attempt to quantify this acknowledged increase.	**AP Recommendation: AP members agree that the report should consider other oil company (in addition to Shell) offshore exploration & production activities that could increase the risk within the study region.**	Category I. TS 5.3 Potential Impact from Oil and Gas Developments states the study was “Commissioned” by Shell. The write up goes on to explain that “The study examines a reasonable set of exploration, development, and production scenarios for three Alaska OCS areas - The Chukchi Sea, Beaufort Sea and North Aleutian Basin Planning Areas - with a sought after conservative regulatory atmosphere assumed in place. The scenarios were developed based in part on previous reports prepared by the Minerals Management Service (MMS), as well as insights provided by industry.” The study title (as reflected under reference /56/ Northern Economics, Economic Analysis of Future Offshore Oil and Gas *“Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin*, It is not based on Shells plans alone. Note: We conducted an exhaustive research on the subject, and the Northern Economics study was the most complete data we were able to obtain. We will review and clarify the text as needed.	Concur: Proceed with CAT I revision	Clarified text on Task 1 TS Report Sect 5.3 to indicate the study was commissioned by Shell but included all exploration on the area not only Shell’s

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
9	SR 2.5.2 Future Traffic	12	I believe that the report is presumptive to state that the "Northwest Passage Route is not projected to impact the study region traffic movement forecast given the risk ice drifts pose on passing ships in narrow passes and given the low magnitude of need to transport international trade above Canada."	In that this risk assessment is forecasting out to year 2034 it should acknowledge the conflicting science on retreating sea ice and the possible opening of the Northwest Passage as an alternative direct shipping route from Europe to Asia across the Arctic Ocean. The passage has the potential of a strategic cargo route that would increase sea traffic because of the shortcut it would provide between the northern parts of the Atlantic and Pacific Oceans. Reference should be made to the Arctic Council's Arctic Marine Shipping Assessment 2009 Report that focuses on current and future Arctic marine activity. Additional Information: http://www.arctic.gov/publications/AMSA_2009_Report_2nd_print.pdf	**AP Recommendations: The report should acknowledge and consider the information in the AMSA report.**	Category I: revise report as recommended Will revise to acknowledge AMSA report was used.	Concur: Proceed with CAT I revision	The report did acknowledge and consider the information from the AMSA report, though not stated in the Summary report, it is referenced in the Task 1 TS Report Sect. 5.2.2
10	SR 2.5.2 Future Traffic	12	Regarding Outer Continental Shelf oil and gas development the Risk Assessment Draft Summary Report has "concluded that any increases in vessel activity due to these operations will not sustain high levels of long-term activities due to unique vessels needed under each stage over the lifetime of an oil and gas development." The only reference to substantiating this assumption is based on a 2009 development study commissioned by Shell Exploration and Production. It does not seem objective to base future traffic potential solely on one industry commissioned study when there is extensive data available that projects potential for increased exploration and development in the Outer Continental Shelf.Additionally, were there to be continued interest in the OCS based on prior and future OCS Oil and Gas Lease Sales in the Beaufort and Chukchi Seas	Based on current and tentatively scheduled OCS Oil and Gas Lease Sales in the Beaufort Sea and Chukchi Sea, as well as the North Aleutian Basin, by the Minerals Management Service the Aleutian Island Risk Assessment should reference that future traffic relating to this maritime sector will include seismic operations, infrastructure support in the vicinity of established and future ports, as well as exploration operations. These activities, which are of a longer duration per vessel due to sustained presence in the study region are equally quantitative in risk. In addition the activities they are engaged in such as vessel to vessel operations could have an increased risk. Additional Information: http://www.star.nesdis.noaa.gov/star/documents/2009Ice/Day3/Walker_day3.pdf	**SEE ITEM # 8 for AP Recommendation**.	Category I. Please see response to Comment #8 above. Note: The link provided does not provide any information on additional marine traffic activities not already known. Concerning the comment “These activities, which are of a longer duration per vessel due to sustained presence in the study region are equally quantitative in risk. In addition the activities they are engaged in such as vessel to vessel operations could have an increased risk.” The Risk Team does not disagree with the statement, however the activities would take place outside the study region, the scope was to analyze how additional oil and gas activities would impact the study area, the vessel that would support exploration at Beaufort Sea and Chukchi Sea would transit the study area while heading to the location and when being demobilized. These activities were addressed. We will review and clarify the text as needed.	Concur: Proceed with CAT I revision	Clarified text on Task 1 TS 5.3 to indicate the study was commissioned by Shell but included all exploration on the area not only Shell’s

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
			the Aleutian Island Risk Assessment should consider expansion of the what constitutes risk beyond historical routes and traffic patterns.					
1 1	SR 2.5.3 Invasive Species (Rats)	12	Personally I don't consider USCG cutters as part of the "greatest risk of transfer"; sanitation rules are strictly enforced on cutters throughout the chain of command. As far as cutters and other small vessels transferring rats, think about it. Most vessels only moor in the known ports (Adak, Shemya, Atka, Dutch Harbor, Akutan, Cold Bay, Amchitka (if the dock is still standing)) – the ones that put people ashore in remote areas anchor the vessel out an use small boats to put people ashore – and these do not likely have rats. Don't forget the threat posed by USFWS research vessels in the area.	Need to discuss.	**AP Recommendation: Concurred with the focus being only on Rats, per recommendation in SR 293 study. USCG vessels should be referred to as Government vessels, per vessel categories**	Category I: Will revise reference to Government vessels in report as recommended.	Concur: Proceed with CAT I revision	Task 1TS Report Sect. 3.2 revised as recommended
1 2	SR 4.0 TASK 2A – MARINE SPILL FREQUENCY AND SIZE ANALYSIS	19	Sec 4 Number of Vessel-Miles by Vessel Type for the Base Year (2008/2009)Although the Vessel Miles is an appropriate indicator how does it relate to actual time spent in the Risk Assessment (RA) area. A container ship moving at 24 knots covers a lot of miles in one day. However, a tug and barge moving 8 knots spends 2/3 more time in the AIRA for the same miles. Likewise fishing vessels spend months in the area and may travel very few miles.	If the model was calculated at how much time they spend in the RA area rather than miles traveled what would be the difference?	**AP recommendation: Address this comment in the final report. Peer Review Panel also recommended a review of this issue (i.e. miles traveled vs. time spent in study area)**	Category I Vessel miles is a convenient measure of both absolute and relative traffic intensity. The relationship between vessel-miles and vessel-hours is mostly straightforward in the Task1/ Task 2 report because a single average vessel speed is used independent of vessel location (but dependent on vessel type). The main exception is for fishing vessels. However fishing vessel lanes mostly interact with other ships when the fishing vessels are transiting to and from the fishing grounds. The MARCS model does not fully represent vessels while not in transit (i.e. fishing vessels while actually fishing) as these activities do not interact with the main ship traffic lanes. The Risk Analysis Team does not consider it would add value to the assessment. We will review and revise the repot as needed to provide clarity. An analysis of time spent on the study area could be done under future RRO task 6, but would be out of scope (additional budget needed) and the Risk Team does not believe it	Concur: Proceed with CAT I revision	Explanation / justification added to Task 2A Spill Frequency and Size (SFS) report Sect. 2.5

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
						would add additional value under the Phase A parameters.		
18	Summary Report (SR) Overall Comment	19	The Marine Exchange recently observed via AIS located near Dutch Harbor a bulker sailing south of the Aleutians show up a day later north of the Aleutians by our newly installed AIS in Adak that has a better range. This data indicated the vessel (the Bianco Bulker) cut through the Aleutians west of Unimak Island. (I can provide the screen shot that shows this transit).	Some discussion that the absence of AIS in the central area of the Aleutians makes it difficult to determine the actual routes vessels are taking and that there are indications that at times they may transit through the middle of the Aleutians or seek storm refuge nearshore. Additional Information: The Coast Guard periodically receives calls from vessels seeking shelter from heavy weather close to shore which can reduce the safety margins for U.S. waters and shorelines while reducing risk for the vessel and crew. There presently is no way to monitor this very effectively, however, IMO LRIT legislation can provide position reports every 6 hours to the Coast Guard if they request and pay for the data.	**AP Recommendation: concurs with the comment and need for inclusion in final report.**	Category I: We will review and revise the statement to indicate the Marine Exchange continues to improve the coverage area by adding additional stations when possible and include the improved capabilities in ADAK as an example. Note: The reported improvement to the ADAK station took place outside the study period; same as the transit of the vessel in question that took place in January 2010. (we reported the information known at the time) and were not aware of any improved capabilities until we received the comment	Concur: Proceed with CAT I revision	Commentary added to Task 1 TS Report Sect. 2.14.1
19	Summary Report (SR) Overall Comment	20	3.2. Relation between powered and drift grounding.	See comment #34	**See comment #34**	Category I: Under definitions section, the TS did not include definitions for Powered and drift groundings. We will add those definitions and others as needed.	Concur: Proceed with CAT I revision	Added definitions of powered and drift grounding to Task 1 TS Report sect. 8.2
13	SR 4.5.1 Accident Frequency	23	Question.	Will MARCS be re-run using the traffic data?	**AP Recommendation: Drop comment. Addressed in revised report.**	No Action Required		No action taken
20	Summary Report (SR) Overall Comment	23	The report in a statement that there are "no tugs with significant open water capabilities" discounts that the tugs presently staged in Adak and Dutch as well as passing tugs can provide some emergency response capability, especially when augmented with a Emergency Towing System (ETS).	The report recognize that the transiting tugs which could potentially drop their tow off if there is a port nearby, are a resource that could assist a disabled vessel in moderate sea conditions provided they have an ETS delivered to them. Additional Information: Incidents such as the Selendang Ayu could have been averted if the incident was reported earlier and an ETS was available for the responding tugs to use. Simply holding the vessel's bow into the seas in lieu of rolling in the trough, would have made it easier for the crew to effect repairs or provide time for a more suitable tug to take the tow.	**AP Recommendation: Final report needs to recognize that tugs exist in the study region and take into consideration the capabilities of the existing assets, and location of the assets.**	Category I: Statement in question will be removed. SFS 2.9 Fault Tree / Event Tree Input Data Regarding the AP Recommendation: Category: III or IV. The request is Out of Scope as Task 1 and 2 does not require evaluating response capabilities in case of emergencies. The issue of the availability and capabilities (quantitatively speaking) of response vessels would be better addressed in Phase B but will also be considered, in qualitative terms, in Tasks 5, 6 and 7. Category III. The MT may also consider investing into addressing the issue at this point as a semi quantitative study. If the scope of the report	Concur: Proceed with CAT I revision	Removed statement from Task 2A SFS sect 2.9

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
						changes to assess the benefits of applying tugs, the MT (and AP) and the Risk Team need to agree on the types of tugs (performance), their locations and their availabilities, as the type and numbers of tugs available are relevant to provide assistance depending on the type and size of vessels in distress, The research could be complex, as it would need to take into consideration potential tug locations, response times, response capability on different type of sea states, and potentially other parameters. MARCS could also be run to assist in determining the impact the response capabilities could have in the reduction of spills. As the complexity of running such a study could vary depending on the decision from the MT, a cost estimate cannot be provided at this time		
14	SR 4.6 BASELINE SPILL SCENARIOS	24	Scenario 3. It might be more realistic to a tank barge scenario due to higher risk associated with multiple entry/exit form ports	Consider running a scenario for a tank barge.	**AP Recommendation: Include a tank barge scenario in the final report.**	Category II Recommend that the barge scenario is included as part of Task 4.	Concur: Proceed with CAT II recommendation.	No action taken on Task 1 or 2
21	Summary Report (SR) Overall Comment	24	General Question.	How do these scenarios compare to the worst case spills contemplated in the USCG/ADEC unified plan for this sub-area?	**AP Recommendation: Review and discuss how the scenarios in the Aleutian SubArea plan compares to these scenarios.**	**No Action or Revision Required** The Risk Team does not see a correlation between the Aleutian SubArea Plan and the current study. The Aleutian Subarea Plan scenarios were prepared qualitatively based on certain parameters and were not prepared using a quantitative risk based approach (considering frequency AND consequence) The purpose of the Aleutian SubArea Plan is to address mitigating actions in case such scenario was to occur. The results from this current study should be considered as an input for those scenarios. Note: Comparing the study scenarios with the Aleutian SubArea plan is not within the Scope of Work.	The MT and AP reviewed proposed subareas submitted by RAT. During Task 3 Webinar, AIRA team concluded not to subdivide area as part of Tasks 1-4.	No action taken
22	Summary Report (SR) Overall Comment	25	There are some other strategic factors that will play into the risk of environmental damage caused by vessels. These are: 1. The use of low sulfur fuels which are less persistent if spilled 2. The planned promulgation of Coast Guard	Where the report addresses the IMO and OPA-90 regulations these new regulations should be addressed as well as the State of Alaska's NTV regulations.	**AP Recommendation: Consider and address the implications of the following rules in the final report:** **1) EPA low sulfur fuels rule** **2) USCG and State of Alaska NTV rules** **3) USCG Salvage and Marine Firefighting rule**	Category: III. Task 1C required consideration of "Regulations adopted by IMO and applicable to the international fleet also will influence the design and arrangement of ships. The impact of these regulations (e.g., OPA 90 and MARPOL double-hull regulations for tankers; MARPOL Regulation 12A; MARPOL Regulation 23, etc.) on ships expected to transit the Aleutians during the study period, including any phase-in	No revision required.	No action Taken

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
			non tank vessel and salvage and marine firefighting regulations that will require the staging of additional response equipment (tugs, firefighting equipment and oil spill response equipment) that should reduce the potential for oil spills as well as the impacts.			period for the regulations' implementation, should be considered." It did not require consideration of all or other Federal or State regulations. In the case of EPA low sulfur fuels rules, a potential implication is addressed in the TS 2.8 Tank Ships (Categories 9, 10 and 11) In the Case of USCG and Alaska NTV and Marine Salvage and Firefighting rules, the regulations primarily applies to staging of response equipment, and response capabilities. These topics were not on the purview of Task 1 or 2. <u>Estimated cost to include a description of other risk management organizations but **not** evaluate implications</u>: **$ 3,700** (Research, verification, reporting)		
15	SR 4.7 SUMMARY OF THE DRAFT MARINE SPILL FREQUENCY AND SIZE REPORT	26	Comment:	LNG/ gas carriers as highest risk for cargo spills is not significant other than the fuel oil they burn.	**AP Recommendation: The AP concurs with this statement.**	**No Action or Revision Required** The Risk Team concurs with the statement, no action needed		No action taken
23	Summary Report (SR) Overall Comment	27	Immediate concerns are over the projected levels of activity--I don't think either the mining or oil/gas development analysis equals the level of activity that is being planned--especially in Western Alaska and the Arctic. Despite the delays from litigation, nothing has changed on the oil and gas front and we should be evaluating scenarios where at a minimum development is planned by numerous operators in the Chukchi, Bering and Beaufort. Out of these the lowest probability is probably the Bering, which is the only place LNG tankers have been envisioned.	As such, I am also concerned that the spill scenario focused on LNG tankers as opposed to the more likely scenario of a tank barge or an oil tanker getting into trouble. Numerous scenarios with the most attention paid to those most likely to occur would be more ideal.	**AP Recommendation: Include a tank barge scenario in the final report.**	Category II. Recommend the barge scenario is included in Task 4. Note: The Risk Team believes the comment is out of context. A number of scenarios were selected based on preliminary results; there are LNG carriers that routinely transit the Aleutian Islands. The preliminary results identified LNG carriers as presenting the highest cargo spill risk (largest quantity of an accidental release) the consequence of the release were considered in task 2. As such, the Risk Team stands by the decision to select the LNG tanker scenario.	Concur: Proceed with CAT II recommendation.	No action taken on Task 1 or 2; tank barge scenario to be included as part of Task 4 scenario(s).

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
24	Summary Report (SR) Overall Comment	27	The report goes into 6 accident scenarios which is a good overview, however, the accidents that have happened in the past (Kuroshima grounding, Swallow, Selendang Ayu, Tae Wong 603, and Aoyagi Maru) are refers, bulk cargo ships and fishing vessels, none of which are addressed in the risk scenarios presented	I recommend risk scenarios for the highest probability incidents, bulkers, refer ships and fishing vessels be explored.	**AP Recommendation: Consider running a scenario for a high probability incident, either a bulker, reefer or F/V.** **The Management Team concurs with this comment and requests that the final report contain a bulker scenario at a minimum.**	Category II Recommend the barge scenario is included in Task 4.	Concur: Proceed with CAT II recommendation.	No action taken on Task 1 or 2; tank barge scenario to be included as part of Task 4 scenario(s).
16	SR 5.1.2 Use of Baseline Spill Scenarios	29	Table 5-1, Scenario 6. For amount spilled suggest include both tons and gallons. Tonnes, bbl, and gallons for all scenarios would be helpful. APPENDIX C, page 16/17 shows spill in tonnes.	Difficult to relate back to this scenario table unless the reader does the math.	**AP Recommendation: Consistent units of measure should be used throughout the report.**	Category I: Report will be revised as needed to be consistent with the use of measurements and units. Note: Tons, Bbl and Gallons cannot be used for all scenarios, only for hydrocarbons. We will use Metric Tons for LNG, and lbs or other appropriate measurement for hazardous materials.	Concur: Proceed with CAT I revision	Revised tons to bbl formula used to a more accurate representation; added clarification to both Task 1 TS 8.3 and Task 2A SFS 5. Where applicable the term tons was used (removed tonnes) and bbl included.
17	SR 5.1.2 Use of Baseline Spill Scenarios	29	Table 5-1. Weather for 2007 and 2008 was used.	How does this compare to the norm and worst case winters?	**AP Recommendation: Describe in more detail how the 2007/2008 weather relates to normal or worst case weather in the region.**	Category I: Report will be revised to include following discussion: Table 5-1 refers to spill parameters used for Selandang Ayu spill which was run for the time period Dec 8, 2004 to January 5, 2005. For all other scenarios, we used currents for the year 2007and 2008. But for winds, Markov wind matrix was developed for each season using long time records starting from year 1987 to 2009 to capture all types of seasonal effects. Thus, the scenarios do include norm and worst case weather patterns for Wind. For worst case scenario, one has to run the model using worst case conditions (maximum wind speed) in each wind direction using Markov wind matrix. Currently this is outside the scope of Task 2B. It will be studied in consequence analysis.	Concur: Proceed with CAT I revision	Discussion added in modeling methodology Task 2B Baseline Spill (BS) Report Section 4.0
25	Summary Report (SR) Overall Comment	35	See page 29 comments.	Page 29, Table 5-1, Scenario 4. Change longitude to 174E. This also affects the narrative on page 35 about impact on Atka which is 400NM from Aggatu. Not sure what impact this has on other modeling results. Page 29, Table 5-1. Add scenario 6 from Appendix C	**AP Recommendation: Re-run model with correct longitude. Scenario should remain in a remote westward location.**	Category I: Will rerun Scenario 4 using correct location.	Concur: Proceed with CAT I revision	Model was rerun for Scenario 4 and text was updated in the Task 2B BS Report wherever necessary -

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
30	TS 4 FLEET FORECAST	21	Future Year Accident frequency. This says 9.61/year in 2034.	What is it now as a point of reference? [See summary, page 20, 4.3. Is this a 8 fold increase?] How does this relate to THE grounding frequency reduction from ECDIS?	**AP Recommendation: Clarification needed in the report on frequency reduction and relationship to ECDIS and other operational changes.**	Category I The statement made on TS 4.3.2.1 concerning EDCIS is misleading as written, it will be clarified to read: Use of electronic navigational charts may provide an estimated risk reduction potential of up to one-third on selected routes for power grounding scenarios (Reference DNV Research and Innovation Technical Report, ECDIS and ENC Coverage – Follow- Up Study, 2008).	Concur: Proceed with CAT I revision	Clarified comment on Task 1 Traffic Study (TS) Report Sect. 4.3.2.1 and added reference.
26	TS 3.2 Current Movement Non-Native/Invasive Species	34	Comment:	Only the rat is mentioned. The aquatic variety may be more problematic as more difficult to eradicate. The focus on the rat may be misleading if there is any data to suggest aquatic invasive species are a threat. i.e. if ship goes aground the rats go ashore but if the ballast tanks or ship bottom have zebra mussels, Asian clams and etc that may gain a foothold.	**AP Recommendation: Comment withdrawn. The focus with this study will be rats. Need to explain/discuss in more detail- why only rats**	Category I Discussion will be added to report	Concur: Proceed with CAT I revision	TS Sect 3.2 revised to include discussion.
27	TS 3.2 Current Movement Non-Native/Invasive Species	35	Fishing vessels/cutters rarely touch the shore except in established ports.	Doubt this constitutes a “significant” risk.	**AP Recommendation: Strike the word "significant". Risk exists. Refer to CG vessel as "government" vessel.**	Category I: Will revise report as recommended	Concur: Proceed with CAT I revision	Deleted the word “significant” from TS 3.2
28	TS 3.3 Future Movements of Commodities	35	Comment	Looking at GDP is a good indicator and is related to the strength of the US dollar. I would argue that for commodities exported in Bulk it is more valid to look at strength of US dollar and abundance of commodities shipped. May have no effect on study.	**AP Recommendation: Comment withdrawn.**	**No Action or Revision Required**.		No Revision to report
29	TS 3.8 Future Movement Non-Native/Invasive Species	44	Sentence: Meanwhile the native species of the Aleutian Islands are likely to be adversely affected by climate change, even in the absence of rats.....How? Why? What data was used to draw this conclusion?	Please explain or describe in more detail the information used to infer this conclusion.	**AP Recommendation: modify the comment, overly broad and irrelevant to the study.**	**No Action or Revision Required**.		No Revision to report
31	TS 4.2 General Trend in Ship Sizes	49	Figure 4-5: Comment	Although larger ships create a greater risk of single incidents, it actually reduces the risk as fewer ships are needed.	**AP Recommendation: Report needs to recognize the change in risk and evaluate the change.**	**Request Clarification**. It is unclear where the comment comes from in relation to the portion of the report cited. TS 4.2 General Trend in Ship Sizes is a discussion on ship size trends, not on potential risk reduction trends from ship size trends. Figure 4-5 has no discussion on ship sizes or risk reduction trends. A discussion on the potential risk reduction from ship size trend may be more appropriate on Task 3 or 4.	Concur: Proceed with CAT II recommendation.	No revision to report

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
32	TS 4.2.1.2 Bulk Carriers	51	Comment	The Berge Stahl (Figure 4-7) is the largest bulk carrier in the world. The ship has length of 343.00 meters and beam is 65.00 meters. The bulk carrier has a draft of 23.00 (75 ft) meters and deadweight of 364,767 metric tons. The ship was built by Hyundai Heavy Industries in the year 1986. The Berge Stahl is a "fit for purpose" dedicated ore carrier and there are only two ports with water deep enough to handle her, Terminal Maritimo de Ponta da Maderia (loading port Brazil) and Europort (discharge port Rotterdam). These ports have a draft of 78 ft and the ship must transit on the high tide only.	**AP Recommendation: Wrong picture in report and needs to be changed to a bulk carrier.**	Category I: Photo will be replaced with a better photo.	Concur: Proceed with CAT I revision	Replaced TS Figure 4-7 Photo
33	TS 4.3 IMO and Other Statutory Conventions	53	Comment	Mention Industry efforts at reducing risks. Namely OCIMF (Oil Company International Marine Forum) and TMSA2. Even companies that have both tank and non-tank will soon be required to comply with TMSA2 principles by the oil majors if they want cargo. This will further reduce risk as TMSA2 is a commercial requirement with robust conformance guidelines and economic impact for vessel owners that do not conform. The industry commercial requirements will become more important as the Regulatory aspects, such as ISM, have failed.	**AP Recommendation: Report needs to recognize that there are other risk management efforts being implemented by industry that may be effective at reducing risk than regulatory changes.**	Category III. Task 1C required "Regulations adopted by IMO and applicable to the international fleet also will influence the design and arrangement of ships.. The impact of these regulations (e.g., OPA 90 and MARPOL double-hull regulations for tankers; MARPOL Regulation 12A; MARPOL Regulation 23, etc.) on ships expected to transit the Aleutians during the study period, including any phase-in period for the regulations' implementation, should be considered." It did not require consideration or implementation of "risk management efforts being implemented by industry that may be effective at reducing risk than regulatory changes." <u>Estimated cost to include a description of other risk management organizations but not evaluate implications</u>: **$3,700** (Research, verification, reporting)	Include recognition of stated risk management efforts. Additional costs declined. Marc Smith on AP will provide relevant language to include in the report free of charge. Please contact Marc Smith.	Received Comment from Adv Panel Member Marc Smith Added to TS Section 4.5 (new) entitled Industry Risk Reduction Measures
34	TS 4.3.2.1 SOLAS	58	ECDIS. I can understand how ECDIS can reduce the frequency of grounding but don't necessarily see a correlation to collision reduction. A 1/3 reduction is impressive.	Does this relate to drift or powered groundings or both and the graph on page 21 of the summary report?	**AP Recommendation: See Summary Report Comment #19. Fix in both sections of the report.**	Category I. See Response to Comment 30 above Comment will be applied to other section of the report as needed.	Concur: Proceed with CAT I revision	Clarified comment on TS 4.3.2.1 and added reference.
35	TS 5 TRAFFIC FORECAST	62	Domestic Tank Barge Forecast: Additional research is needed to project the future forecast of this traffic type. The projection relies only on population growth and does not take into consideration future mineral extraction in the Bristol Bay, Western AK, and Northwest Arctic. Nova Gold-Donlin Creek feasibility study estimates production beginning in 2015 and will require a high need for refined product delivery to Bethel. Northern Dynasty-Pebble mine? Nova Gold, Nome Operations?	Expand on this forecast by including resource development, mineral extraction and petroleum delivery demands. Additional Information: http://novagold.com/section.asp?pageid=3359 http://www.pebblepartnership.com/	**AP Recommendation: The AP concurs with this comment and recommends that the report consider impacts of future projects on the tank barge forecast.**	Category: III. RFP Task 1D required the Risk Analysis Team to "When projecting movements of petroleum products, consideration should be given to the anticipated increase in exploration for and the production of gas and oil in the Bering Sea, the Chukchi Sea, and other Arctic regions.." . The mineral exploitation activities stated in the comments are outside the study region and are not oil and gas projects. <u>Estimate cost to acknowledge mining and mineral extraction exists and description within report</u>: **$3,700** (Research, verification, reporting)	Additional costs declined. Incorporation of resource development is within the scope of work. RFP Task 1B required that when developing yearly estimates for the movement of cargoes through the region over the 2009-2034 study period "alternative growth scenarios should be investigated." As affirmed under Task 1B of the Risk Analysis Team proposal, "For each commodity it is necessary to identify the	Additional information on resource development in area is provided to TS Section 5.5.

#	Report Section	Page	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
							factors that could affect future transport levels," including the consideration of "factors [that] might influence the volume of trade," and "changing patterns of shipping activity due to changes in natural resources." Pending mining and mineral extraction activities need to be acknowledged under Task 1B and incorporated into the traffic flow and fleet makeup projections for the study period at no extra cost.	
36	TS 5 TRAFFIC FORECAST	65	Page 65, Figure 5-5. Oil Shipment Forecast Based on High Population Growth Scenario	Does this reflect energy conservation measures for both shore side and fishing vessels?	**AP Recommendation: Acknowledge that the oil shipment forecast is based on population growth alone and that it does not consider energy conservation measures or geo-political changes.**	Category I. Will acknowledge as recommended.	Concur: Proceed with CAT I revision	Added acknowledgement at the end of TS 5.0
37	TS 5.3 Potential Impact from Oil and Gas Developments	70	The future oil and gas activity considered should be expanded beyond the Shell study. It appears that the traffic estimated is based solely on Shell's plans for the US. However, other companies also hold leases in the Chukchi and plan to explore and develop them. Also, as stated in a previous comment, the amount of traffic could be significantly greater if tanks are used for transport - a scenario that should be considered. It would also be advisable to consider where there will be oil and gas activity from Russia (Sakhalin, potential future offshore gas on Kamchatka coast, etc) to Europe.	Perhaps estimated activity could be based on estimated recoverable oil and gas in the area, rather than relying on anecdotal information about individual companies' plans.	**AP Recommendation: See Summary Report Comment #8 and #10.**	Category I. The comment and recommended changes are not accurate. TS 5.3 Potential Impact from Oil and Gas Developments states the study was "Commissioned" by Shell. The write up goes on to explain that "The study examines a reasonable set of exploration, development, and production scenarios for three Alaska OCS areas - The Chukchi Sea, Beaufort Sea and North Aleutian Basin Planning Areas - with a sought after conservative regulatory atmosphere assumed in place. The scenarios were developed based in part on previous reports prepared by the Minerals Management Service (MMS), as well as insights provided by industry." The study title is (as reflected under reference /56/) Northern Economics, Economic Analysis of Future Offshore Oil and Gas, *Development: Beaufort Sea, Chukchi Sea, and North Aleutian Basin*. It is not based on Shells plans alone. Note: An exhaustive research was conducted on the subject, and the Northern Economics study was the most complete data available. We will review and clarify the text as needed.	Concur: Proceed with CAT I revision	Clarified text on TS 5.3

#	Report Section	Page	Actual Reference	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
1	SFS 2 MARCS INPUT DATA	7	same	2.2 Marine Vessel Types. Why is it assumed that no bunker tanks are protected by double hulls in the base year? Please explain.	Interested in understanding why this assumption was applied.	**AP Recommendation: Concur with comment, please explain in report.**	Category I. Will add explanation in report. Double hulled bunker tanks requirements went in effect in 2006 for ships with aggregate oil fuel capacity of 600 m^3 for which the building contract was placed on or after 1 August 2007; or delivery of which is on or after 1 August 2010. There are a couple of dozen vessels on the base years with build dates beyond 2008, however it does not mean the building contract was placed on or after 1 August 2007 (most likely there were not). There non indicators that are readily available that provides an indication of what vessels may be transiting the Aleutian Islands that have double hulled bunker tank protection. With the lack of reliable indicators, the assumption was based on expert judgment (Senior DNV class surveyor).	Concur: Proceed with CAT I revision	Explanation added in SFS (task 2A Report) paragraph 2-2
2	SFS 2 MARCS INPUT DATA	7	Same	Explanation for Tables 2-1 Bunker Spill Model. "The bunker spill risk for barge towing vessels is included under Vessel Type 15 (Tugs). Please explain. Tug's typically don't burn bunker fuel.	Recommend clarifying this statement so the reader has a better understanding as to why Tugs were included in the bunker spill model.	**AP Recommendation: Concur with comment, please explain in report.**	Category I. Will add explanation in report. Several of the vessel categories do not burn bunker fuel, most of the vessels in the study do, Bunker was used as a generality intended to address fuel oil (bunker or diesel)	Concur: Proceed with CAT I revision	Clarification added to SFS table 2-1
3	SFS 5.2 Example Scenario 2	36	same	Why was an LNG tanker selected for a scenario? Please justify.	LNG tankers represented less than 3% of the individual vessels and <1% of the track lines of the AIS data analyzed and minimal information (no discussion) on the increase of future traffic projections, why was this vessel type selected over a domestic traffic scenario such as a tank barge, in-shore route foundering thus resulting in a remote western Aleutian location resulting in a grounding. Additional Information: Reference RFP SOW page 19 for categories to be considered.	**AP Recommendation: Concurs with comment and recommends a tank barge scenario be run.**	Category II. LNG Scenario Explanation. On the first MARCS Run, LNG Vessels represented the largest cargo spill risk. The selections were done during that time. Tank barge data was not available during the first MARCS run so they were not considered. The RFP statement in page 19 is a general statement, LNG carriers fall within that statement. The Risk Analysis Team recommends adding a tank barge scenario under Task 4.	Concur: Proceed with CAT II recommendation.	No action taken on SFS; tank barge scenario included in Task 4.

#	Report Section	Page	Actual Reference	Comment	Recommended Changes Additional Information	Advisory Panel Consensus Comment	Risk Analysis Team Initial Response	MT Reply	RAT Actions
4	SFS ATTACHMENTS - Attachment 1 - MARCS Model Methodology	10 (II)	same	Comment	The following elements should be considered. The higher the wind speed a. Less likely any scenario will be successful b. Ship will move forward in water due to sailboat affect and may ground at location significantly different than simple downwind prediction. Even with zero currentc. c. The longer the vessel drifts the more speed it picks up over the ground and anchoring becomes less effective.	**AP Recommendation: Concur with comment, revise report to acknowledge.**	Category I. Will amend, to be included in a revised methodology attachment.	Concur: Proceed with CAT I revision	Addressed in Sensitivity and Uncertainty Analysis discussion of final SFS (Task 2A) report

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
Summary of Key Comments					
1	The assumptions on traffic data, vessel size, and trade growth are a combination of “best estimates” and “conservative estimates.” The mixing of “best estimates” with “conservative estimates” makes it very difficult to interpret results and impossible to complete a systematic uncertainty analysis. Phase A should be updated to reflect “best estimates.” This will assist in the qualitative risk assessment of Phase A and enable the systematic uncertainty analysis to be conducted in Phase B	Category I. We will clarify to indicate which estimates are best estimates (most), and some may be more conservative than others.		Concur: Proceed with CAT I recommendation.	Added best estimate indications as approprioate (multiple locations)
2	All statistical analyses of the data applied in both Phase A and Phase B assessments need to be done with explicit consideration of the uncertainties in the data sources and the impact of assumptions made by analysts. Estimates or model parameters such as traffic rates should be “best estimates” accompanied by corresponding uncertainty distributions	Category I. Report will be reviewed and comment addressed as deemed appropriate. The overall report is qualitative so the benefit of a statistical analysis will be lost. However, it is still important to address certainty and how the data used was evaluated. Please Note: As stated in the RFP Concerning Phase A (page 15) "The Preliminary Risk Assessment should utilize relatively simple tools, avoiding detailed event tree analysis and complex simulation models to the extent practical. The Phase A studies should rely primarily on historical data, expert opinion, and lessons learned from prior studies.”		Concur: Proceed with CAT I recommendation.	Added best estimate indications as approprioate (multiple locations), uncertainty distribution added for AIS data in AIS discussion
3	Assumptions are stated throughout the report without justification. Justification should be provided by reference to data, cross-reference to other work, or further explanation. Description and verification of the MARCS and COSIM basic assumptions and algorithms as they pertain to the Aleutian Islands should be provided	Category IV. Please see response to Comment 2 above. All risk assessments are full of judgements and assumptions, and vary in terms of level of quantification conducted. Even when based on data, the data selected and the methods for analyzing and presenting that data to the risk assessment involve assumptions and judgements. The Risk Analysis Team was selected on the basis of their expertise and experience of delivering similar projects, and descriptions and method verifications of MARCS and COSIM models were part of the proposal stage of the Phase A process. The RFP stated the requirement of Task 1 and Task 2 was to produce a “semi-quantitative risk assessment”. This makes good sense because a “first look” evaluation of risk helps to focus later project tasks effectively onto the more significant issues. However it must also be recognized that the standards that should be applied to judge such a “first look” risk assessment should not be the same as those standards that would apply to judge a more quantitative risk assessment produced at the end of a program, such as during Phase B. Please Note: References were provided throughout the report, other assumptions are based on expert opinion from the Risk Team members and consultations within the risk team's organizations. If there are disputes about specific justifications/assumptions, the risk team requests that the specific justifications/assumptions in question be identified in order to be addressed.		Further discussion with PRP Required.	Per MT/PRP discussion, no specific changes are need for this item

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
4	Projections on accident rates and spill volumes developed with MARCS should be compared to historical spill data. Where the values from MARCS differ significantly from the historical data, rationale for these differences should be given in the report.	Category I. Data was compared. The report will be revised to include comparative discussion For the calculations risk team used worldwide averages; the results were within a factor of 10 from historical data.		Concur: Proceed with CAT I recommendation.	Added discussion end of Section 3.1 Spill Frequency and Size Report (SFS), Task 2A report
5	More details on the frequencies and probabilities along the event chain are needed in order to be able to assess the reasonableness of the results and to apply these findings to the qualitative risk assessment. For example, for drift groundings of containerships in the Unimak Pass vicinity, it would be helpful to have the following probabilities: probability of loss of power, probability of recovery of power by ship, probability of saving of vessel by emergency tow, probability of drift grounding, and given drift grounding, the conditional probability of oil discharge and probability of total vessel loss.	Category IV: Phase A is semi quantitative. The results are reasonably close to the historical data and thus validates the model. The specifics requested is proprietary information, and DNV cannot release the inner workings of MARCS (See comment under 2.2 below).		Further discussion with PRP Required.	Addresses as part of conference calls with the PRP; Task 2A report includes new sections that provide additional information within limits of proprietary knowledge.
6	The distribution of spill sizes should be provided in addition to the mean value.	Category I. We will provide an indication of the upper limit of the spill size as well as the mean spill size on the basis of the ship size distribution. Category III / IV. An analytical analysis of the distribution of spill size is really part of a severity assessment and is beyond the scope of the present work. To do such a study would take multiple calculations of the risk module (one for each spill size range) and would take considerable time to present and discuss in a report.		Concur: Proceed with CAT I recommendation.	Task 2A Report, MARCS Attachment Section II.4.5
7	There are no clear-cut criteria for how the scenarios applied in the Task 2B COSIM analysis were selected, and how the findings from the baseline spill analysis were utilized in the determination of those scenarios.	Category I: The spill scenarios evaluated under Task 2B were based on the scenrios developed using the output results of MARCS. A description was added to revised Task 2B report, however this will be clarified further.		Concur: Proceed with CAT I recommendation.	Discussed in 4.1 of Task 2B report (Baseline Spill Study or BSS Report)
8	The correlations between the environmental conditions leading to the critical scenarios as determined by MARCS and the conditions applied in the COSIM model are not defined.	Category I. The report will be revised to include a discussion of the correlation between MARCS and COSIM. Six baseline scenarios were identified based upon an examination of the results from MARCS. In addition, a calibration scenario using the Selendang Ayu spill was performed to assess the model setup against a known release. The six baseline scenarios are representative example descriptions and are not outputs from MARCS. Each scenario could, in theory, result from a wide range of environmental conditions (different visibilities, wind speeds and directions, different sea states, etc.). Based on the probabilistic output from MARCS, the identified scenarios represent a range of release and environmental conditions to prepare the COSIM baseline oil spill model setup. Therefore, it is each scenario's release conditions, defined by examining the MARCS output, that bridge to the COSIM model. ERM has translated these descriptions into input data that would represent the scenario descriptions. COSIM and MARCs model share an overlapping environmental dataset (e.g. NOAA buoy data) in addition to their own unique dataset to process their respecti Category IV. It is possible to generate 10s or 100s of similar scenarios examples, though it would not be appropriate to analyze additional scenarios without agreement with the MT. The Risk Assessment Team considered that six representative examples was sufficient for Tasks 1 and 2 since these critical scenarios are used for COSIM's baseline setup by addressing a range of release conditions (i.e. spill volume, contaminant characteristics, weather, etc.) and risk-based locations. The purposes of the baseline spill scenarios are to set-up the model for the region of interest and provide general characteristics of the transport dynamics of the system. More detailed information, scenario development, and consequence analysis is the scope of Task 4.		Concur: Proceed with CAT I recommendation.	Discussed in 3.2 of Task 2B report

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
9	The seven-day simulated time frame applied for the COSIM model can be too short for heavy fuels such as bunkers and conditions found in the Aleutian Islands, and model results should be compared whenever possible with real-world results and expectations.	Category I: The 1 week simulation period was selected based on the response time from a typical emergency response team for a spill. Also, running spill simulations for a longer time period for each scenario would take enormous amount of computational time since such runs have to be repeated 25 times for each scenario. For Phase A, it is our judgement that 7 day results provide enough qualitative information that it can be analyzed and scenario modifications, if any, can be done in Phase B.		Concur: Proceed with CAT I recommendation.	Discussed in 6.0 of Task 2B report
10	Phase B risk reduction measures may be more effectively evaluated using deterministic wind time series and well-correlated environmental data. For example, using the wind field that drove the ocean circulation model would ensure dynamical consistency. Use of daily averages appears to mask the strong effect of the tides in trajectory calculations.	Category III or IV: For Phase A analysis, we searched for online available data for Aleutian Islands. Our search identified NRL-NLOM as the most useful public data available for the Aleuitian Islands. But NRL-NLOM data is available as daily average and not hourl which is traditionally used in COSIM. Hourly data captures tidal excursion which is especially important in the shallow regions close to the shoreline. This is especially true for hindcasting spills. For Stochastic spill modeling, we tried to estimate probabilities instead of deterministic values for this reason, we decided to use the daily averaged currents. If hourly spatial data is publicly available for Aleutian Islands, we recommend to use it for Phase B. We need to know the contact information for such type of data. Running of all simulations for Phase A can be done at an additional expense of time and cost. Time: 6 weeks	**$ 30,000**	Do Not Concur: No Revision Required	No action taken

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
Traffic Study (Task 1)					
(1.1) Development of Transit Miles for Each Vessel Type	Does the Contract Team consider the number of recorded tracks shown in Appendix A, Table 2-1 to represent the total voyages in the study zone over the study period, or do they believe these totals likely under-estimate (because of under-reporting, failed automatic identification system (AIS), downtime on surveillance, etc.) or over-estimate (because of double counting, etc.)? If the Table 2-1 data are regarded as the best estimate, then this should be stated. An estimate of uncertainty around the best estimate should be provided. There is a need to understand the limits of AIS data: the potential for biased availability, the lack of coverage on the western edge, the possibility of manual data entry errors, etc. Including a sensitivity analysis could help to assess these issues.	Category I The limits of AIS will be added based on information received from the Marine Exchange and Ports of Vancouver and Seattle.		Concur: Proceed with CAT I recommendation.	Added limits of AIS data discussion to Task 1 Traffic Study Report (TS) Sect. 2.1.4.1
	It is unfortunate that the United States Coast Guard (USCG) did not release Vessel Traffic Service (VTS) data for vessels transiting the Strait of Juan de Fuca, as this data would prove helpful in assessing the completeness of the data set in Table 2-1, Appendix A. This data has been effectively utilized in prior studies (e.g., Regulatory Assessment: Use of Tugs to Protect Against Oil Spills in the Puget Sound Area, USCG Report No. 9522-002 dated November 1999). If there is not a high level of confidence in the completeness of the traffic data from the AIS observations, another request to USCG for this data should be considered.	Category IV. The Risk Analysis Teams sees very little benefit to the study and results from incorporation of this comment. Obtaining and using the data from the USCG will be complex because of timeliness and how it is categorized (most likely not as the base year). It also would need to cover the same time span as the base year.and most likely it would not be provided in a timely basis. Finally, because the information that would be received and limited to the Strait of Juan de Fuca, it would add very little value, if any, to the study and may only serve, depending on the information provided, to validate a portion of the data analyzed.		Do Not Concur: No Revision Required	No action taken
	It will help future deliberations on risk reduction measures if Table 2-1 of Appendix A is expanded to break down the number of recorded tracks for each ship type into the following three categories: Transpacific westbound voyages, Transpacific eastbound voyages, and domestic voyages within the Aleutian region.	Category III. The information requested is available in the report. The West and East bound tracks are broken down under each vessel category discussion, it can be reasonably assumed that the vast majority of Category 1-11 vessels are in transpacific voyages and 12-19 in domestic voyages. Since the request is to change how the information is presented, additional budge is required. <u>Additional cost to implement changes</u>	**$ 700**	Concur: Proceed with CAT III recommendation.	Budget later not approved, No changes made to final reports. Can be incorporated into future tasks.
	It is not clear how the summary of tracks in Table 2-1 of Appendix A was used to derive the vessel miles data in Table 4-1 of the Summary Report. If the number of tracks shown in Table 2-1 was adjusted when applied in Table 4-1, then the underlying assumptions should be explained. Table 4-1 should be expanded to include each vessel type, the assumed number of voyages for the three types of routes (westbound, eastbound, domestic), and the average distance traveled for each route type. In Table 2.1 and elsewhere, it seems that a critical variable is percentage of miles rather than percentage of tracks or vessels.	Part I of Comment: Category I. The approach will be explained in the text. Part II of Comment: Category III. Again it is a request of how the information is presented, and not within Scope. This request will require additional effort. <u>Additional cost to implement changes</u>	**$ 2,700**	Concur: Proceed with CAT III recommendation.	Summary Report not re-issued. Budget later not approved, thus no changes made to final report. Concept could be included in future tasks.
	Seasonality of traffic flow on the North Pacific Great Circle Route is shown in Figure 2-3 of Appendix A. As noted, containerships >4500 TEU in size show a significant spike. The mean for large containerships is 107 “movements” per month, whereas the Jan 2009 value of about 150 is approximately 40% above this mean. Further investigation is needed as to the reasonableness of such a spike. These figures should be compared to U.S. West Coast port data and Unimak Pass transit data for prior years. It is not clear how such a spike influences study results. If the MARCS software applies these seasonal variations, such a spike will influence collision probability. Perhaps a sensitivity analysis can be carried out with the spike eliminated (smoothed into surrounding months).	Category IV Outside the SoW, The task was to determine the seasonality of traffic flow, not to analyze why the transit may vary by seasons. Analysis of why this spike occurrs within the data set may require significant research beyond contacting the ports but also contacting the different shipping agencies. MARCS calculations are average for the year. We could run MARCS independently per month or per season, this however may be a function of PHASE B. As the task can be complex, no cost estimate is provided at this point.		Further discussion with PRP Required.	Added discussion following TS Figure 2-2, also covered by sensitivity analysis

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(1.2) Development of Commodity Flows during the Study Period	Commodity flows over the study period are shown in Figures 3-3, 3-4 and 3-5 of Appendix A. It is not specified whether the 2009 data shown in these graphs represents actual data or projected data (i.e., based on a forecast developed prior to the economic downturn in mid 2008). The basis of the 2009 data should be explained.	Category I. Text will be clarified.		Concur: Proceed with CAT I recommendation.	Added discussion in Task 1 report addressing how the 2009 data is not actual data but rather the values forecasted from the base year of the FAF forecast.
(1.3) Determination of the Number of Vessels Transiting the Study Region during the Study Period	When forecasting future values (e.g., number of transits), it is helpful to show the past decade of historical data to provide a context for the forecast. Section 5 of Appendix A explains that the frequency of each ship type is forecast by applying the commodity trade growth statistics against the baseline vessel movement data. The baseline data is for the period August 2008–July 2009, which was a time of great economic contraction. Directly applying the commodity forecast data (which is presumed to have been developed prior to the economic downturn and does not incorporate its effects) to the baseline transit data may under-estimate transits over the study period. Uncertainty analysis relative to expected trade growth is needed.	No Action or Revision Required. The RAT used the best data available at the time (AIS from the Marine Exchange). However, any data before the base year would be incomplete as it does not have the full complement of AIS stations as the base year did. The report mentioned three years of reports of traffic data through UNIMAK Pass, this data was analyzed and serve to validate the base year data. Category I. The report will be revised to further explain the methodology used. This forecast was performed before the economic downturn. However given the semi-quantitative scope, an updated, robust forecast (that would be required) of the commodity trade between different world regions was well beyond current scope of Task 1. Economic forecasts which developed the commodity trade growth were created by a private contracted company the Department of Transportation (DOT) utilizes to maintain their trade statistics. The details of their models are proprietary. We determined it would not be scientifically prudent to adjust the results of this complex economic forecast which we had no access to. A high level discussion was held on the affects of the economic contraction related to GDP forecasts by the Congressional Budget Office which could be used to bring the forecast results into context. A direction reduction application was not applied due to the lack of information of each forecast model – a separate analysis would be needed to compare model parameters and data utilized. <u>Category III/IV</u>. An uncertainty analysis related to expected trade growth is reasonable but due to No cost estimate at this point as it may be a complex approach.		Concur: No Revision Required Further discussion with PRP Required.	No action taken Added Sensitivity analysis discussion

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(1.3) Determination of the Number of Vessels Transiting the Study Region during the Study Period	The number of vessels operating in out years is a function of the number of vessels operating in the base year, the assumed growth in commodity movements through the study region, and the average capacity of the vessels transiting the study region. Thus, changes in ship size are the third factor which will influence ship frequency. In Section 2.4 of the Summary Report, it is stated that "..it is not expected that vessels will continue to grow in size, because ships have reached their size potential due to limitations in waterway depths in most of the world's busiest ports." The Peer Review Panel does not believe this is a reasonable assumption. Though it is possible that the size of future ships will not exceed the largest sizes built today, it is reasonable to expect that significant changes in the distribution of vessel size will occur. Containerships will be used as an example to illustrate this point, but size distribution for all ship types should be given further consideration. The table below breaks down the distribution by ship size given in Table 2.3 of Appendix B as a function of TEU's per transit mile. We find that 63.5% of the movements are in Post Panamax size containerships (typically 5,500 to 6,000 TEU), and only 15.8% are moved in ultra-large containerships (>=8000 TEU in capacity). Note: For developing this table, regression data of existing ships was used to determine TEU capacity based on DWT, as the breakdown of ship size by TEU-slot capacity was not given in the report. **<4500 TEU** SLL DWT / TEU / DWT / TEU / average TEU / Table 2-3 vessel mi / % by TEU-mi 14000 / 903 / 30000 / 2094 / 1499 / 39400 / 0.6% 30000 / 2094 / 50000 / 3681 / 2888 / 405000 / 12.5% 50000 / 3681 / 90000 / 7305 / 5493 / 126000 / 7.4% **>4500 TEU** 30000 / 2094 / 50000 / 3681 / 2888 / 3550 / 0.1% 90000 / 3681 / 90000 / 7305 / 5493 / 1080000 / 63.5% 130000 / 7305 / 130000 / 11986 / 9646 / 153000 / 15.8%	Growth on Ship Size. Category I. TS 4.2 General Trend in Ship Sizes discusses the trend in ship sizes. The report states "Although ship sizes for oil tankers and container carriers may creep slowly upward in specified trades, size will be limited to existing, planned port infrastructure upgrades." These upgraded ports will not drive any significant ship size increases within the next decade or two, which maintains the current risk profile of large vessels transiting Unimak Pass. The reviewer states that they believe our assumption is not reasonable. We disagree, though we accept that the reviewer's assumption is equally valid as our own. Neither the trade volume in 2034, nor the size range of ships in 2034 is under dispute. Only the distribution of ships within the size range today is disputed. The effect of including a greater proportion of larger ships, and reducing the transit frequency by a compensating amount, would make a small reduction in the average risk but increases the worst case severity of an individua event. Since the Risk Team considersed average risk in the semi-quantitative risk assessment reported in Task 1 and Task 2, it is our view that the assumption we make (which does not reduce the risk) is the more valid. Thus, we propose expanding the discussion in the report but not changing the approach. Distribution of vessel size. Category IV. Task 1 scope is to address ship size not ship size distribution. The report indicated there will be an increase in movement of commodity which will translate in a need for a large fleet, the results indicate there will be a larger number of larger vessels operating in the area, and the size distribution was kept constant from base year. A November 2009 SAI (Institute of Shipping Analysis) report "The SAI Shipbuilding Markets Forecast" has a "Container carrier Contracting, Incliuding Prognosis" up to year 2019, the article discusses the projected growth in the container ships size distribution, however, these numbers are for the global fleet; additional market analysis would need to be conducted to forecast how the ship distribution of these type of vessel (or other types) may impact the Transpacific transit in the future. The risk team believes this is a task that could be considered during Phase B		Concur: Expand discussion in the report by documenting the investigation of alternative growth scenarios.	Added discussion on container vessel size distribution to TS 4.2. Traffic data may be re-examined as part of Task 4-5.
	Containership size has undergone explosive growth. The first Post-Panamax containerships were built in the mid-1980s, and this size only became a significant portion of the world fleet in the early 2000s. Ultra-large containerships (<8,000 up to about 13,000 TEU) were introduced in the middle part of this decade. Few had been delivered at the time of the study period (2008-2009). However, the order book stands at about 40% of the existing fleet capacity, and the majority of these orders are for larger ships. Although new orders have largely dried up since the downturn in the economy, only a few of the existing orders for the bigger containerships have been canceled. Also, in coming years, the Panama Canal will be enlarged to accommodate containerships up to about 12,000 TEU in size. It is expected that a growing percentage of the Transpacific movements will be on the ultra-large containerships. In verbal discussions with the Port of Seattle, they indicated that the average containership calling the port is currently about 6,500 whereas they expect the dominant size to be about 8,000 during the next five years. They can handle up to 12,500 TEU size vessels, but to date	No recommendation provided in the comment. As indicated above, the task was to analyze the trend on ship size not the distribution of ship sizes.		Further discussion with PRP Required.	Added discussion on container vessel size distribution to TS 4.2

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(2) Baseline Spill Study (Task 2)					
(2.1) Accident Risk and Spill Risk (as Presented in Appendix B)	At the 29 January 2010 meeting, it was explained that the methodology was refined and the ship speeds were derived from the AIS data. Data showing the distribution of speeds attained from the AIS data together with the final assumptions on average speed and speed variation should be provided. Section 2.3 of Appendix B should explain how these speeds were determined.	Category I. Text will be clarified. AIS data was not reliable, thus expert judgment was used for ship speeds		Concur: Proceed with CAT I recommendation.	Added clarification at SFS Sect 2.3
	Section 2.8 of Appendix B states that environmental data is assumed to be constant over the full study region. Explanation is needed as to why this is a reasonable assumption.	Category I: The report will be clarified to explain this. This assumption is justified by the requirement to perform a semi-quantitative risk assessment. A single dataset was judged to be sufficient because the risk assessment models are not very sensitive to minor variations of weather data. The alternative requires an analysis of multiple meteorological datasets and an understanding of how each dataset should be applied within the study area (which sub-areas should be allocated to which sets of data). This would require input from, and consensus with, local experts which would have been impossible to obtain within the available timeframe. If there are any specific areas of concern, the Risk Analysis Team recommends this areas to be considered during Phase B		Concur: Proceed with CAT I recommendation.	Added clarification at SFS 2.9
	Section 2.4 of Appendix B states that 25% of crude oil tankers are assumed to be single hulled and 75% are assumed double hulled. As all single-hull tankers will soon be phased out and few, if any, single-hull tankers currently call on U.S. West Coast ports, this appears to be an overly conservative assumption. This is especially true if only the 2008-2009 year and the 2034 year are analyzed, and intermediate years are interpolated from these data. As it is likely that all single-hull tankers will be retired before significant risk reduction measures are implemented based on this study, it is more appropriate to assume 100% double-hull tankers.	Category I: A best estimate approach for the base year not for the year risk reduction measures are implemented. The Risk Analysis Team does not believe 25% of crude oil tankers could be transiting over the base year to be "overly" conservative as only 11 crude oil carriers were identified (3 of them being single skin would constitute 25%), but it is a conservative assumption. The Risk Analysis Team agrees that 100% assumption for double hulls on crude oil tankers beyond 2010 would be an appropriate assumption.		Concur: Proceed with CAT I recommendation.	Added clarification at SFS 2.4
	Section 2.4 of Appendix B does not define assumptions related to the quantities of bunkers carried on vessels. What is the assumed bunker capacity for each ship type and size? What percentage of capacity is assumed onboard? What fuel type is assumed for each ship type? Tables 2-2 to 2-9 of Appendix A were updated to include “Average Fuel Oil Carried.” If these were the quantities assumed for the MARCS analysis, provide background on how they were determined.	Category I Report will be reviewed and revised as needed. The bunker fuel capacity in tons of each ship type is given in the table. This is based on data in the traffic study 1 Container Ships < 4500 TEUs 5410 2 Container Ships > 4500 TEUs 8433 3 Bulk Carriers < 60,000 DWT 1830 4 Bulk Carriers > 60,000 DWT 2944 5 General Cargo Vessels 1973 6 LNG and Gas Carriers 3283 7 Ro/Ro and Car Carriers 2944 8 Cruise Ships 1750 9 Crude Oil Carriers 2864 10 Product Tankers 1432 11 Chemical Carriers 1034 12 Tank Barges 13 Cargo Barges 14 Fishing Vessels 95 15 Tugs 375 16 Government Vessels 3182 17 Refrigerated Cargo Ships (Tramp trade) 1177 18 Other Vessels 2582 It was assumed that all ships are 70% full of bunker fuel oil at the time of the accident and that the bunker capacity of all ships is sub-divided into 2 tanks. The type of bunker oil is assumed to be the same for all ship types		Concur: Proceed with CAT I recommendation.	Added table and explanation SFS 2.5

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(2.1) Accident Risk and Spill Risk (as Presented in Appendix B)	Accident frequency is presented as a function of accident type, vessel type, and location in Figures 3-1, 3-2, and 3-3 of Appendix B. A table showing the matrix of these probabilities is needed to evaluate trends and relative risks. If the study region is subdivided into zones (say 8 to 12), then a table showing for each vessel type the probability of each accident type within each zone will prove most helpful for the Advisory Panel and Management Team as they perform the qualitative assessment of risk mitigation measures to be undertaken at the conclusion of the Phase A work.	Category. I. The plots provide an idea of the areas of greater concern. Category III or IV. Breaking the area in zones can be done but this would be outside SoW. Analysis of zones of concern may be a better function for Phase B. To consider a breakdown of the study area in zones, concurrance will need to be reached with the MT (and AP) as the total number of zones or no specific zones is known, no cost estimate can be provided at this time.		Concur: Proceed with CAT I recommendation	No action
	A matrix of the spill risk in tonnes per year broken down by vessel type, accident type, location, and fuel type will assist in evaluating the relative effectiveness of risk reduction measures.	Category III: Not within the SoW for Task 1 and 2. However, could be developed for future tasks if needed, and would require an additional cost. Unable to provide cost estimate at this point without a detailed scope.		Proceed with CAT III recommendation	Sub-dividing the area may prove beneficial when discussions begin regarding risk mitigation measures and location.
	The discussion of the MARCS output places too much emphasis on the expected (mean) value of spills per year and extrapolates the outcomes in a way that might not be consistent with the output. A plot of frequency and size is needed because the logic in paragraph 4.4.1 of the Summary Report makes assumptions that are very unlikely to hold in reality (e.g., a 360,000 bunker spill every 1,000 years?). More importantly, interventions might be very different if the primary risk is a few large spills vs. many small spills. The current description ignores this critical issue.	Category III / IV. The scope of Phase A is semi-quantitative and the report presents the Preliminary Risk Assessment as scoped for Tasks 1 and 2. In order to generate, present and interpret the results in terms of spill size ranges would agreement with MT of spill ranges to be evaluated and then a cost estimate could be provided.		Further discussion with PRP Required.	Task 4-5 will examine spill size & range; MARCS can generate results.
	Certain high-risk scenarios have been identified in the study (e.g., drift groundings of containerships and bulk carriers in the vicinity of Unimak Pass). For these high-risk scenarios, an indication of the distribution of spill size will be helpful in the qualitative assessment. This could be in the form of a probability distribution function (similar to Figure 11.12 of Attachment 1), or an indication of the median and 10% largest spills should suffice.	Category I or III. In addition to the spill size estimate provided, a discussion will be added to include possible ranges. However, this will be a qualitative assessment, as a quantitative analysis of spill size distribution is not within the scope of Task 2. This could be developed and provided at an additional cost.		Concur: Proceed with CAT I recommendation	New sections in Task 2A report (SFS) added to discuss uncertainty and sensitivity.
	Consequences and confidence intervals for spill-model predictors are needed: The meaning of the outcomes was not clear and so it was hard to judge what represents meaningful differences between the model outcomes.	Category I. A more detailed discussion of uncertainty and sensitivity analysis of key assumptions will be provided in the revised report.		Concur: Proceed with CAT I recommendation	Tsk 2A Report, MARCS Attachment Section II.4.5
	The outcomes are stated as point estimates, but would be much more interpretable if they included confidence intervals and a sensitivity analysis of key parameters.	Category I. See response to comment above. Note, a quantitative sensitivity analysis is out of scope fro Phase A.		Concur: Proceed with CAT I recommendation	MARCS Attachment Section II.4.5
	Paragraph 4.4.1 of the Summary Report states that total bunker spill risk is 57.6 tonnes per year. Section 5 of Appendix B states that the bunker spill risk in the base year is 240 tonnes per year. These figures should be reconciled.	Category I. The report will be reviewed and revised as needed.		Concur: Proceed with CAT I recommendation	Summary Report pre-dated the SFS revised report. No action needed (SR not being re-issued)
	International data has largely been used because of the scarcity of local data. This is appropriate; however, the results obtained with the MARCS model utilizing the international database should be compared to spill statistics for the Aleutian Islands region.	Category I Report will be reviewed and revised as needed Note: Data were compared. Spill Statistics from the previous 10 years were requested and received from ADEC, also we reviewed the USCG data		Concur: Proceed with CAT I recommendation	A regional accident data comparision has been conducted and added to the report.
	The NAS report Oil in the Sea III provided estimates of accidental spillage from non-tank vessels in North American waters based on historical spill data for the period 1990-1999. Its “best estimate” was 1,200 tonnes, with minimum/maximum estimates of 1,100 to 1,400 tonnes. The Task 2A estimate of bunker spills of 240 tonnes per year is 20% of the total “best estimate” for North American waters. Considering the relatively low density of traffic in the Unimak Pass compared to many of the major ports, it does not appear plausible that 20% of spills will occur in the Aleutian region. The need for comparison of the MARCS results to historical data is emphasized.	Category I. The task was not scoped to compare results to any other specific study studies, historical data was compared and description will be added to report.		Concur: Proceed with CAT I recommendation	No action taken

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(2.2) MARCS Model Methodology	The assumptions on traffic data, vessel size, and trade growth are a combination of “best estimates” and “conservative estimates.” The mixing of “best” estimates with “conservative” estimates makes it very difficult to interpret the results and impossible to complete a systematic uncertainty analysis. The scenarios should be run using best estimates, and confidence levels should be indicated on those values. Sensitivity analysis should be conducted where uncertainty is significant.	Category I. The report will be reviewed and revised as needed with the use of terms. In most cases best estimates were used. Also, a qualitative discussion of uncertainty and sensitivity analysis will be included in the report.		Concur: Proceed with CAT I recommendation	Revised report and added “best Estimate" where appropriate, second part Sensitivity analysis MARCS Attachment Section II.4.5
	Attachment 1 provides a high-level description of the approach taken by MARCS to calculate the probability of ship failure, the probability that the failure leads to an accident, the probability of oil discharge given an accident, and the expected quantity of oil discharged into the environment given an accident that involves oil outflow. However, it is not clear which components of MARCS are utilized in this analysis. For instance, it was explained in the 29 January 2010 meeting that the recovery by emergency tow was not considered in this study (i.e., assumption of 0% recovery), whereas Appendix I states that this is a capability of MARCS. A detailed explanation of how MARCS is applied specifically to this Phase A study is needed.	Category I: Inclusion of ETS into the model was not part of the task, inclusion of ETS into the model would require specific input from the stakeholders to determine availability (access and delivery) range etc. this could be a complex task. Attachment 1 will be revised to be more specific to this Phase A study.		Concur: Proceed with CAT I recommendation	MARCS Attachment Section II.4.5 and II.4.6
	It is assumed that, where available, AIS data was used to develop shipping lane width and the distribution of vessels across the lane. Explanations are needed as to how this information was developed, and how it varies with ship type. What was the approach taken for determining the lane location and width outside the AIS coverage? What are the assumed widths and locations in the high-risk regions? It is noted in the report that a normal distribution is assumed for distribution of vessels across lanes. What is the standard deviation?	Category I Shipping lanes width was derived from AIS, the report will be reviewed and revised as needed to clarify		Concur: Proceed with CAT I recommendation	Additional discussion was provided to address how lane widths were determined for the study area and their standard deviation.
	More detail on frequencies along the event chain is needed in order to be able to assess the reasonableness of the results and to apply these findings to the qualitative risk assessment. For example, for drift groundings of containerships in the Unimak Pass vicinity, it would be helpful to have the following probabilities: probability of loss of power; probability of recovery of power by ship; probability of saving of vessel by emergency tow; probability of drift grounding; and given drift grounding, the conditional probability of oil discharge and probability of total vessel loss. Similarly, for collisions, the following probabilities would be useful: probability of near encounter; probability of collision (for overtaking, crossing, and loss of steering); and, given collision, the conditional probability of oil discharge.	**Not Categorized**. Providing this information would require DNV to release proprietary Information. The methodology and results of MARCS has been validated by many other studies. The model database and interactions of the inputs used by MARCS is proprietary information. If this information must be reviewed by a member of the MT, AP or PR panel, special arrangements could be made for 'in-person' review and under a confidential agreement.		Further discussion with PRP Required.	No change for Task 1-2. Enhance results by describing in general terms probability and assumptions during Task 4-5.
	Potential correlations in input data and model parameters in MARCS could have a significant impac on risk calculations. Such correlations and other types of parameter interdependencies need to be identified in the report in relation to how MARCS runs were made.	See comment above		Further discussion with PRP Required.	A discussion on major correlations will be include in Task 4-5; Will need to look at geophysical data (wind, sea state) to incorporate variations in the region.
	MARCS bases its analysis on a uniform grid of the study area that may fail to provide sufficient resolution around islands. Given that the islands seem central to the risk analysis, a two-tiered approach seems as though it would be useful in which a fine grid that focuses on key areas would be used after the coarse grid. Resources may make it impossible for this to be applied in a comprehensive manner, but a targeted example would help identify how much error is associated with the coarse grid.	Category IV. As required under Phase A, a semi-qualitative traffic study was conducted of a very large area and a general assessment was provided of the area, not port/islands specific. This could be a Phase B task.		Concur: CAT IV recommendation will be considered for Phase B.	No action taken
	The Summary Report indicates that accident frequency and spill analysis for the year 2034 was developed based on escalation factors rather than the MARCS analysis. The panel has been told that they will be included in a future addendum to this report. Thus, no comments are provided on this aspect.	Category I: The MARCS model was run for future data after SR submited - we will review and revise the SR as needed		Concur: Proceed with CAT I recommendation	No action taken, SR will not be revised

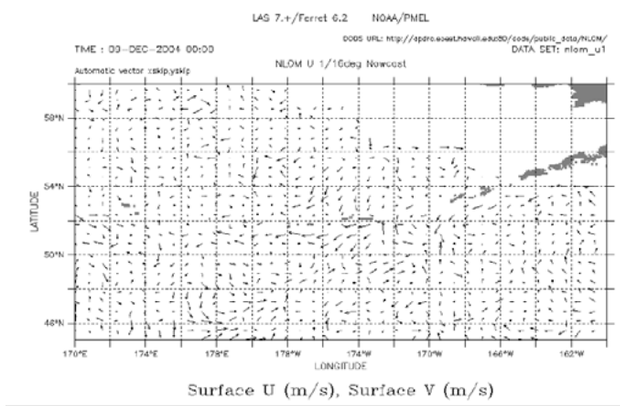
AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(3) Developing Scenarios for the COSIM model (Task 2B study)					
(3.1) Scenario Development	It was not clear what problem space was being represented and explored by the scenarios. For example, were scenarios selected to focus on high-likelihood or high-consequence events? Were the elements that define a scenario considered independently or are they coupled? How are these scenarios related to potential interventions? There are no clear-cut criteria for the scenarios that were selected: they are not adequately justified and some obvious ones area not considered. Wha was done to select scenarios that would best inform the risk mitigation investigation in Phase B? In Phase A, given that only a limited number of scenarios are evaluated, careful justification of the basis for determining scenarios is important.	Category I. Scenarios were developed based on a preliminary output results from MARCS and knowledge of the area taking in consideration a wide selection of scenarios based on professional judgement from the RAT, as well as input received from the Advisory Panel members during project kickoff meetings. A description of the scenario development will be included in the revised Task 2 reports. Category II. Please note - a more detailed analysis of spill scenarios will be developed and analyzed as part of Task 4.		Concur: Proceed with CAT I recommendation	added explanation SFS 7
	At a minimum, the key parameters that *de facto* vary from scenario to scenario should be explicitly identified, and the scenarios should be justified in terms of some explicit overarching rationale. Realization that parameters that are key to variation in risk outcomes are not adequately represented in the scenarios should lead to the selection of additional scenarios.	Category I. A table comparing parameters and rationale for each scenario will be developed for the revised report.		Concur: Proceed with CAT I recommendation	Tables summarizing input parameters for each scenario included in Task 2B report.
	How did stakeholders influence scenario development, and what selection process led to the ones that were used. What significant underlying characteristics of the problem is the contract team attempting to capture with the scenarios?	Category I and II. As stated above, the baseline scenarios were developed based on results of MARCS modeling, professional judgement. Stakeholders were not consulted on the specific development of the baseline scenarios (nor was this a requirement). The report will be revised to include a description of the baseline scenario development. Again, Task 4 will include development of more specific scenarios which will rely on Stakeholder input for the selection process.		Concur: Proceed with CAT I recommendation	No Action taken
	There is a need for sensitivity analyses across multiple variables used in the scenarios. Many assumptions had to be made because of the tight schedule and the long computing time needed to complete a scenario run. Given this, the model should have been designed so that critical variables could be investigated individually without rerunning the entire simulation (e.g., the size of container ships, the transition period to different hull designs, and the mix of vessel types in the fleet). How would results change if there were more double-hull vessels in the mix than reported?	Category I. As stated above, a qualitative discussion of uncertainty analysis and sensitivity analysis of parameters used will added to the report. However, re-designing the model is not within scope of the current tasks.		Concur: Proceed with CAT I recommendation	Qualitative discussions added; MARCS Attachment Section II.4.5
	If one (or two, or three) additional scenarios were to be run, which ones would they be and why?	Category II: Additional scenarios will be developed based on results of baseline set-up and stakeholder input and analyzed as part of Task 4.		Proceed with CAT II recommendation	No Action Taken
	The scenario construction and simulation input should consider the correlation structure of data (between data elements and for an individual element across time), but it is not clear from the report if this was done. A case in point is the use of synthetic winds in the COSIM modeling. Absent demonstration that the synthetic wind methodology works to reasonably capture reality, it might be preferable to use wind time series to develop "seasons" for the model and subset sampling of the time series to create the wind fields that drive the modeling.	Category III or IV: For Phase A analysis, we used stochasitc approach to predict the variations in the transport of oil for a specific scenario that would happen in the next 30 years. To do this, we used synthetic time variation of winds that would happen in the next 30 years. The development of synthetic winds were obtained by using historic long term wind records of same or more number of years. Online search for historic data that varies spatially and temporally for the AI resulted in the use of OceanWatch 6 hour wind data for 27 years. The historic long term wind record was then analyzed to get a direction and bin frequency matrix. This matrix was then used to develop synthetic winds. The synthetic winds developed from this frequency matrix for a specific season would then capture all types of wind events happend in the prehistoric data. Similar wind events was assumed to happen in the next 30 years. We ran 25 stochastic iterations per scenario at an incremental probability of 4% resolution. Transport of oil using synthetic winds would approach realistic historic results by running many iterations (ie. with smaller % resolution) p approach for all types EIA work we have done for many world wide applications. We can rerun all scenarios using nearby time series wind station data for the base year at an additional expense of time and cost. Time: 4 weeks	**$ 26,000**	Further discussion with PRP Required.	Discussed in Section 2.3 of Task 2B report

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(3.2) Linkage between the Baseline Spill Study (Phase 2A) and COSIM model (Task 2B)	There appears to be a modeling disconnect between the two parts of the simulation (accident/spill generation and fate and transport of the spill). If spills are more likely in harsh weather conditions (MARCS output), then weather conditions should be similar (COSIM input). It appears that they treated as being independent.	Category IV: Both models were run in probablistic modes. MARCS used 2007 and 2008 meterological data for setting up environmental forcings. On the other hand, COSIM used synthetic winds created form long records from 1987 to 2009. The idea behind using synthetic winds is that it captures both norm and extrem weather conditons that could have happened during the past 20 plus years. we are tryin to use this approach to forecast wind events for the next 30 years.		Further discussion with PRP Required.	Discussed in Section 2.3 of Task 2B report.

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(4) COSIM Analysis (Task 2B study)					
(4.1) Environmental Fields	There are potential limitations with the COSIM model and this implementation for the Aleutian Islands, some of which are described below. The COSIM model could be adequate for this high level assessment, provided that these results are carefully evaluated to ensure reasonableness with expected real world fate and transport	Category IV: For Phase A analysis, we searched for online available data for Aleutian Islands. Our search identified NRL-NLOM as the most useful public data available for the Aleuitian Islands. But NRL-NLOM data is available as daily average and not hourl which is traditionally used in COSIM. Hourly data captures tidal excursion which is epecially important in the shallow regions close to the shoreline. This is especially true for hindcasting spills. For Stochastic spill modeling, we tried to estimate probabilities instead of deterministic values for this reason, we decided to use the daily averaged currents. If hourly spatial data is publicly available for Aleutian Islands, we recommend to use it for Phase B. We need to know the contact information for such type of data. Also, if we need to rerun all simulations, this would take an additional one month of time and labor.		Further discussion with PRP Required.	Discussed in Section 3.3 of Task 2B report.
	An example: The Naval Research Laboratory's Navy Layered Ocean Model (NRL-NLOM) was used in this study. No information is provided on the boundary conditions and environmental fields used to drive this model implementation. Of particular concern are 1) the use of daily averaged current fields in areas where the tides between the islands can be 4 knots and are asymmetrical between islands (e.g., stronger flood on the east side, weaker ebb mostly on the west side) and 2) the lack of information on fresh water fluxes and simulation of the Alaska Current. The Alaska Current is a narrow highly variable, shallow freshwater current that is very difficult to simulate, and has source waters in the freshwater runoff from the coastal rivers. Also, the NLOM model does not simulate currents on the Bering Shelf (see copy of Figure 4-18 below) and detail is lacking in the Aleutian Islands as they are represented in the model. **Figure 4-18 Currents on Dec 8, 2004 few hours after the incident of *Selendang Ayu* spill**  	Category IV: NRL-NLOM is a public domain data. We can provide the boundary conditions and environmental fileds used in NRL-NLOM model which is available in their website We were aware of the limitations posed by NRL-NLOM data as pointed out by the reviewer. The missing spatial data was obtained from the nearest active NRL-NLOM grid cell with currents data. This was adopted for all scenarios.		Further discussion with PRP Required.	Discussed in Section 3.3 of Task 2B report.

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(4.1) Environmental Fields	These limitations in NLOM imply that it may generate results that are inconsistent with expectations. For example, oil reaching the Bering Shelf can only be wind driven in the COSIM model while the combination of wind and currents might produce very different results in reality. At a minimum, caveats should be added in the name of transparency and implications discussed. NLOM may not be the best choice for modeling near coasts of high environmental concern, particularly due to the high freshwater input in coastal Alaska. Consider using the shorelines inherent in NLOM as well as the original wind fields that drive it to create dynamically consistent winds and currents.	Category IV: Our search for publicly available data resulted in the choice of using NLOM. Also, running a hydrodyamic model for Aleutian Islands using the hydrodynamic module of GEMSS along with all freshwater inputs is outside the scope of work in Phase A. The main focus in Phase A task 2B spill modeling is to get a probabilistic approach rather than exact impacts at a specific region. It is strongly suggested that in Phase B, a hydrodynamic model is run for Aleutian Islands so that coastal current information can be obtained accurately for oil/shoreline interaction.		Further discussion with PRP Required.	Discussed in Section 3.2 of Task 2B report.
	The environmental data used in this study, such as currents, winds, shoreline, and circulation state variables (temperature and salinity) should be correlated.	Category I: Correlation is not necessary in the preliminary modeling since even though data came from different sources, the time period of usage was kept the same for all data sets. If we are trying to use environmental data from a different time period for a season, then it is necessary to correlate this data with the time period used in the simulations. The report will be revised to discuss the correlation.		Concur: Proceed with CAT I recommendation	Discussed in Section 3.2 of Task 2B report.
(4.2) Seasonality and Inter-annual Variability	In the report, seasonality is defined by the calendar, rather then by the environmental data. The wind field should be used to determine the seasonality. The Aleutian Low dominates from late fall to late spring, while the North Pacific High dominates during the summer, with transitional phases in between. The wind record should be used to determine the environmental seasonality and then the scenarios related to these "seasons." This would improve consistency, and allow the Management Team to examine risk reduction strategies that are based on the environmental conditions. For example, accidents that occur during the stormier period may be very different than the type of accidents during the calmer season. Low and high pressure systems rotate in the opposite direction, so the trajectories of any spills would be different as well.	Category IV: We identified the simulation time period based on each scenario description. In other words, spill scenarios were first identified based on traffic study results obtained from MARCS. For example, Scenario 1 was hypothesized to occur in the winter. The long wind record (1987 to 2009) was then used to develop the Markov wind matrix for the winter season. The winter season months were selected based on the Aleutian seasons as defined in Chapter 4 (Basic Weather Regimes of the Aleutian Islands) FORECASTERS HANDBOOK FOR THE BERING SEA, ALEUTIAN ISLANDS, AND GULF OF ALASKA R.W. Fett and R.E. Englebretson and D.C. Perryman (1993)		Further discussion with PRP Required.	Discussed in Section 6.0 of Task 2B report
	These environmentally-defined "seasons" should be related to the parameters that they influence in the MARCS and COSIM models. In the North Pacific there are two seasons and two transition zones, a cold season and a season dominated by the North Pacific High.	Category II. A three-tier modeling approach was used for the baseline spill study. MARCS (tier-1) and COSIM (tier-2) models were used in Task 1 and 2 to characterize the risk associated with movement ocean going vessels or barges and the movement of oil or hazardous chemical from these vessels. This characterization was done by first using tier-1 MARCS as a coarse level probabilistic model to obtain accident characteristics based on traffic and environmental data. Wind data from NOAA buoy station 46073 (extracted 4 wind speeds and 8 directions probability distribution data) was used to represent the environmental field conditions for the study domain. This approach is sufficient for the traffic study and subsequent oil spill baseline because the MARCS model computes results in terms of risk probabilities. That is, MARCS modeling does not result in a deterministic output. The MARCS output annual trend remains the same with possibility of some seasonal variations. Seasonal variation is addressed in the tier-2 COSIM model. The critical scenarios developed based on the results of MARCS were modeled in COSIM by selecting a specific time period for each spill accident to evaluate the seasonal variations. The time period for each spill scenario was selected based on the Aleutian Islands basic weather regimes. Environmental data such as wind, current, salinity and temperature were obtained for each season to assess the impact on the movement of a spilled substances in the study region. This approach captured the seasonal variability in the study domain and the COSIM results remain in the probabilistic mode. In the final tier-3 modeling, the COSIM can be used with high frequency environmental data such as hourly tidal currents to predict the movement of spilled substance in the vicinity of the shorelines of the AI in detail. But this modeling approach is outside the scope of Phase A. In addition, the cold and North Pacific seasons can be modeled under Task 4 after consultation with the MT regarding scenario development. However, this can be done only for the tier-2 COSIM model.		Further discussion with PRP Required.	Discussed in Section 6.0 of Task 2B report
	The definition of season should identify whether there are different seasons relative to the MARCS and COSIM models.	Category I: Report will be clarified. In COSIM seasons were identified based on the time of spill occurrance for the six scenarios developed using MARCS results.		Concur: Proceed with CAT I recommendat	Discussed in Section 6.0 of Task 2B report

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(4.3) Inter-annual Variability	The Pacific Decadal Oscillation (PDO), the El Niño/La Niña and the North Pacific Gyre Oscillation (NPGO) are modes of inter-annual variability in the North Pacific. For an introduction to variability in this region, please see a diagram of the two phases of the Pacific Decadal Oscillation (PDO) (http://jisao.washington.edu/pdo/), a brief introduction to the El Niño/La Niña (El Niño/La Niña), and a diagram that shows the linkage between the PDO and the North Pacific Gyre Oscillation: (http://www.o3d.org/npgo/slides/pdo_npgo_upw.png). A short discussion of the PDI and the intensity of the Aleutian Low can be found here (http://www.atmos.washington.edu/~mantua/REPORTS/PDO/PDO_cs.htm) with a discussion of the intensification of the Aleutian Low related to the PDO index. The cycles alter aspects of the overall patterns of winds, circulation, and productivity in the North Pacific, though they do not change the overall dynamics. There is potential that shipping-accident frequencies relate to the alterations in the Aleutian Low intensity and storm tracks. By using synthetic winds, this inter-annual variability is averaged together and lost to the analysis. Using actual time series instead gives an ability to compare and discuss different scenarios regarding the presence or absence of the phenomena above, should that be of interest to the AIRA Management Team or the stakeholders.	Category IV: The reviewer identified the importance of local oscillations and gyres that needs to be taken into account when predicting the transport of a pollutant in the Aleutian Islands. But again, this is outside the current scope of work described in Phase B. Such complex hydrodynamic conditons can be implemented in Phase B work. Category III or IV: Synthetic winds were not generated just using 2007 and 2008 dats sets. Synthetic winds were created using Markov wind matrix which was created from 20 + years of wind data obtained from OceanWatch. Long time record was used to capture all wind events for all seasons so that it can be used effectively for future scenarios. The synthetic winds frequency is hourly. Rerunning all the scenarios using real time 2008 winds can be done if deemed necessary for Phase A, resulting in additional expense of time and cost. Time: 4 weeks.	**$ 25,000**	Further discussion with PRP Required. Further discussion with PRP Required.	Discussed in Section 2.3 of Task 2B report. Discussed in Section 2.3 of Task 2B report.
(4.4) Numerical Issues [Note: This list is exemplary rather than exhaustive]	Comparing models to other models is not the best method for verification. Models should be compared to observations. Observational fields exist for currents, winds, temperature and salinity. For the M/V *Selendang Ayu* incident re-creation, oil spill overflight, and oil beaching (SCAT) reports are available. Comparing models to models provides no information on whether either model is getting a right answer or getting an answer for the right reason.	Category III or IV: The model is generally calibrated using observations. We have done this on many projects for the past 20 plus years. We can submit technical papers in which observed data was used for model verification. In the present case, model calibration was done based on the report provided to us by the client on Selandang spill. In the report, ASA compared their model predictions with field observations obtained from SCAT. We have done the same for early hours of the spill. But for the 28 day simulation, there was no SCAT data available in the report and so COSIM results were compared with ASA results. This was done based on the fact that the report done by ASA was approved for public release. Additional model verification using SCAT observations can be done at an additional cost. Time: 1 week	**$ 7, 000**	Further discussion with PRP Required.	No additional information received from PRP members. Additional comparison was made using SCAT observations obtained from AK Dept of Conservation Selendang Ayu website
	Attention can focus on whether the combination of COSIM and the selected environmental inputs provide adequate representation of where spills will go on a gross level (e.g., islands contacted). Perhaps knowing how the refloating of oil spreads the oil out along beaches of a particular island is of less interest.	**No Action Required**: COSIM has complex oil-shoreline interaction algorithm that use shoreline properties based on ESI. In a strong wave and tidal activitity region, the refloating of oil is very importrant as it provides a way to naturally wash the beach like the way it happened in some of the islands in Prince William Sound. We have not completely focussed on the refloatation process. In a stochasitc modeling, our focus of probability of impact on the shoreline of the islands and also approximate amount of oil that would be deposited on them.			
	Use of shoreline other than the shoreline used by the circulation models (e.g., NLOM) generally results in inaccurate beaching calculations. These can be masked or made to be more realistic by high horizontal diffusivity and refloating to "spread" the oil around on the shoreline. The test would be to run the oil spill surface model with no wind and no diffusion. In this test case, no beaching should occur.	Category III or IV: It is normal practice in the spill modeling to use currents and winds (spatial and temporal) on available grid dimensions and then extrapolate the data to the particle location using 4 point averaging in space and time. COSIM model has different methods available to apply horizontal diffusion coefficient. In the current analysis, constant diffusion coefficient was applied. Sensitivity analysis on diffusion coefficient using other types such as Okubo's mixing length and Smagorinsky method can be done in Phase B for a more detailed near field analysis of shoreline impact. The suggested test case can be run at an additional expense of time and cost. Time: 1 week	**$ 5, 000**	Further discussion with PRP Required.	Discussed in Section 4.3 of Task 2B report
	Lagrangian Elements (LE) in the COSIM models. In the surface water, the 1000-4,800 LEs were reported to be used, with the same number in the subsurface (1000-4,800). The number of LEs in the subsurface is too low. The methodology of combing LEs that are close together creates an artificial convergence of mass that is likely to add errors.	Category IV: Again, one can run a simulation with large number of sub surface particles. But the computational time increases as square of the number of particles. If we are running only one scenario and one simulation and no stochastic runs, then we would have used very large number of particles. But the idea in the current work is to evaluate overall impact in the probablistics mode and this can be achieved by running many number of stochastic iterations with less number of particles.		Further discussion with PRP Required.	Discussed in Section 6.0 of Task 2B report

AIRA Peer Review Panel Comments

SECTION/ Number	PRP COMMENT	RAT Category	Estimated Budget	MT Decision	RAT Actions
(4.4) Numerical Issues [Note: This list is exemplary rather than exhaustive]	Spill scenarios were run for seven days. This is a very short time for heavy persistent products. Longer integration would provide information on other potential islands that could have been contacted by floating oil. For example, the T/V *Prestige* oil spill contacted thousands of miles of coastline and three different countries.	Category IV: Seven day time period is assumed as the time period for immediate emergency response. Also most of the weathering process high high rates in the first week of the spill. In addition, time and computational constraints limited our efforts to run simulations for longer time. For example, in each stochastic scenario, we are running 25 iterations for 7 days. During each iterations, lot of data is saved for post processing. A typical output size for a scenario with all 25 iterations comes to about 20 GB. If we are running only iteration as we normally do for a hindcast spill modeling, then we would have run the model for one to 3 months. We agree with the reviewer that based on actual spill events, it is important to run a very long term simulation to evaluate the far field transport of oil. But this can be done in Phase B. In Phase A, the primary focus is to get a semi-qualitative impact analysis due to oil and chemical spills.		Further discussion with PRP Required.	Discussed in Section 6.0 of Task 2B report
	In Scenario 1, what creates the ~40 km long convergence (yellow curving line in Figure 6-6) north of Urilia Bay and the increase of oil thickness in this area? Travel time to this area from Figure 6-1 appears to be on the order of days, at which point Bunker C would be expected to break into tarballs.	**No Action Required:** This must have happened because of the release of thick patchy oil from the shoreline when favorable conditions exist for oil refloatation from the shoreline. This clearly shows that the shoreline refloation is an important process due to continous washing of the shoreline oil from waves and tides. It will be difficult to release too many particles from the shoreline because of the computational limitations. The oil coming from the shoreline onto the water surface is a sporadic process and hence some discrete patterns on the water surface. This is also supported by the high thickness area around the shoreline in the southern region of Unimak in which the refloated oil from the shoreline is contained within a narrow region in the vicinity of the shoreline.			
	The diagrams for Scenario 4 Crude Oil Spill, Figures 6-27, 6-31 and 6-32 do not seem physically reasonable, so they need explanation. There appears to be grid and numerical issues in the COSIM model or the use of inadequate underlying environmental variables. Note the north-south "wall" north of Atka Island that divides the oil and no oil areas. The effect is shown in many of the diagrams, but most notably in Figure 6-31 and Figure 6-32. The higher concentrations of surface oil occur along a north/south line away from the spill start site, with thinner oil in between the spill start site and this feature. What causes this mass convergence?	Category I: The combination of currents, waves and winds sometimes create convergence zones. We have seen similar occurrences in Gulf of Mexico simulations. Further analysis of the results is not warranted since Scenario 4 has to be rerun because of the incorrect use of longitude. Scenario 4 was modeled using 174 W but the actual scenario longitude is 174 E. We will rerun the simulation at no extra cost and evaluate the results for convergence issues.		Concur: Proceed with CAT I recommendation	Scenario 4 was rerun using the corrected longitude and report revised accordingly.
	Such numerical issues are perhaps inevitable when models whose algorithms and verification have not been published are relied upon. They create a burden to keep comparing model-derived results to reality and judging them by criteria of both reasonableness and utility. Efforts should be made to explain model limitations and how those limitations might influence the results obtained. Results should be presented with explicit acknowledgement of how they might be influenced by modeling limitations and with an eye to their role in the assessment and mitigation of risk in the work still to be done.	Category I: Model algorithms have been published in many leading journals. The report will be revised to include references for the algorithms and verification for the COSIM model. COSIM model is a derivative of many other similar models such as OILMAP, WOSM, NRDAM-CME, NRDAM-GLE,GNOME etc. A complete review of algorithms available for spill modeling was published in the year 1996 in ASCE Journal of Hydraulic Engineering. Many algorithms have been updated since 1996. ERM is willing to submit a set of techinical papers to support COSIM's modeling methodology.		Concur: Proceed with CAT I recommendation	Discussed in Section 2.2 of Task 2B report
(4.5) Chemistry Issues	Scenario 6: Phorate and Linoleic Acid spills. No mention is made of the reaction of these chemicals with seawater.	Category I: The report will be revised to discuss the reaction as summarized here. **Hydrolysis** is the main chemical reaction that occurs in water. Phorate is unstable in water especially under alkaline conditions. As it breaks down in water, non-toxic water soluble products are formed. We are not concerned about the byproducts. So, hydrolysis is normally achieved simular to the biodegradataion process using a proper decay coefficient that depends on the pH of water. In COSIM, hydrolysis process is handled using first and second order decay processes. The result of the chemical interaction of linoleic acid and water is a saturated hydroxy fatty acid. Again this conversion process was modeled using first order decay process in COSIM.		Concur: Proceed with CAT I recommendation	Discussed in Section 6.6 of Task 2B report