Ecological Risk Assessment Workshop

Environmental Tradeoffs Associated With Oil Spill Response Technologies

Cape Flattery, Washington

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A Report to Regional Response Team X

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Ecosystem Management & Assoc., Inc.

Ecosystem Management & Associates, Inc.
Report 05-01

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LIST OF ABBREVIATIONS, SYMBOLS, AND ACRONYMS

Term	Abbreviation, Symbol, or Acronym
Automated Data Inquiry for Oil Spills	ADIOS
Barrels	bbls
Centistokes	CSt
Compact Disk	CD
Department of Natural Resources	DNR
Ecological Risk Assessment	ERA
Ecosystem Management & Associates, Inc.	EM&A
Endangered Species Act	ESA
Environmental Impact Statement	EIS
Environmental Protection Agency	EPA
General NOAA Oil Modeling Environment	GNOME
In-Situ Burn	ISB
Marine Safety Office (USCG)	MSO
Meters	m
National Academy of Sciences	NAS
National Oceanic and Atmospheric Administration	NOAA
National Research Council	NRC
Northwest Area Contingency Plan	NWACP
Parts per million	ppm
Polynuclear Aromatic Hydrocarbons	PAH
Regional Response Team	RRT
Special Monitoring of Applied Response Technologies	SMART
United States Coast Guard	USCG
United States Coast Guard, Headquarters	USCG HQ
United States Fish and Wildlife Service	USFWS
Washington Department of Ecology	WA DOE
Washington Department of Fish & Wildlife	WA DFW

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Ecological Risk Assessment Workshop

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Cape Flattery, Washington

Executive Summary

Between January and November, 2005 Regional Response Team (RRT) X sponsored three workshops to evaluate the relative risk to natural resources from an oil spill off the straits of Juan de Fuca which threatened the northwest coast of Washington. The primary purpose of the workshops was to increase understanding of the overall risk, and the role different response technologies might play in mitigating that risk, relative to other response options. The workshops generated considerable discussion and provided an important training opportunity but the participants did not feel that there was sufficient consensus on the risk ranking process to publish the results. Instead, they developed a list of recommendations for the RRT, which will form the basis for future discussions by RRT workgroups.

1.0 Objectives of the Cape Flattery Workshop

1.1 Background and Process

In 1998, the U.S. Coast Guard (USCG) began sponsoring efforts to develop a comparative risk methodology to evaluate oil spill response options. Interest in selecting response options based on a risk/benefit analysis predates the 1998 initiatives, but the current effort is different in that it emphasizes a consensus-building approach to evaluate risks and benefits.

Headquarters, USCG Office of Response (G-MOR), (now Office of Incident Management and Preparedness (G-RPP), sponsored the development of a guidebook on this process. The document, *Developing Consensus Ecological Risk Assessments: Environmental Protection in Oil Spill Response Planning: A Guidebook*, is available from G-RPP (Aurand *et al*., 2000). It can also be downloaded from the contractor's web site at www.ecosystem-management.net.

The process is designed to help planners compare ecological consequences of specific response options, especially in nearshore or estuarine situations. This is particularly important for consideration of dispersants and in-situ burning (ISB), which present difficult analytical issues. The process focuses on ecological "trade offs" or cross-resource comparisons. Through a structured analytical approach participants find "common ground" for evaluating impacts and they develop defensible logic to support their conclusions. The process is consistent with the U.S. Environmental Protection Agency's Ecological Risk Assessment (ERA) guidelines (US EPA, 1998), but emphasizes development of group consensus among stakeholders. The process uses a series of analytical tools specifically developed for use in a group environment. It is designed as a planning tool and should not be used during an actual event. However, knowledge gained by participants in the consensus-building process facilitates real-time decision-making.

Training usually involves two 2- or 3-day workshops lead by a facilitator. The ideal size is 25 to 30 participants, including spill response managers, natural resource managers and trustees, subject matter experts, and non-governmental organizations. The goal is to achieve consensus interpretations of potential risks and benefits associated with selected response options based on a scenario developed by local participants. Time between the two workshops is used by participants to research issues of concern before developing final conclusions. The process focuses heavily on achieving a consensus interpretation of the available technical information. Therefore, it is important to have broad stakeholder representation in the decision process; otherwise, results may not be accepted by all stakeholders involved in an actual spill event.

The workshop process includes three primary phases - **problem formulation, analysis,** and **risk characterization**. Details of the process are described in the Guidebook. In the first phase, **problem formulation**, participants develop a scenario for analysis, identify resources of concern along with associated assessment thresholds, and prepare a conceptual model to guide subsequent analysis. In the **analytical phase**, participants characterize exposure and ecological effects. The conceptual model, developed in the problem formulation phase, directs the analysis using standard templates and simple analytical tools that define and summarize the analysis for each resource of concern and each response option. Finally, participants complete a **risk characterization**. During this phase,

participants interpret their results in terms of the costs and benefits of each response option to overall environmental protection as compared with natural recovery (i.e., baseline).

1.2 Sponsor's Objectives

The Cape Flattery workshop was sponsored by RRT X. The workshop's overall purpose was to evaluate the ecological resource impacts of spilled oil and oil spill response operations in the Cape Flattery Outer Coast area.

The results of this ERA process were intended to improve oil spill response strategies and to enhance existing oil spill contingency planning. Exercises such as this are intended to help identify natural resources at risk during a spill as well as to address benefits and inherent tradeoffs associated with various spill response tools. As stated by the sponsor in the invitation to participants:

> Resource trustee consultation is essential to identifying those tradeoff priorities that drive spill response strategies. In the spirit of promoting as much pre-spill consultation and tradeoff dialogue as possible, ERA training will be provided adjunct to the ERA process. It has been noted that in many of the ERA's that have occurred around the United States, that once familiar with the ERA process and its methodology, resource and response agency stakeholders are better able to engage in effective risk assessment and tradeoff identification for pre-spill and spill-specific consultations. The result is a better understanding of resource trustee and response agency concerns, more timely and effective response decisions, and greater resource protection and recovery. It is critical to have as many of the federal and state, natural and cultural resource trustees involved in this ERA in order for the final product to have any merit.

1.3 Participants and Responsibilities

A total of 39 individuals participated in workshops one, two, or three, or some combination of the three. Their names and affiliations are provided in Appendix A. In addition, seven agency managers were invited to the preliminary presentations during the first workshop, so that they would be familiar with the process. They did not participate in the ecological evaluation sessions. Finally, several outside experts were asked to provide briefings on specific oil spill response topics of interest to the participants. They are identified when their presentations are discussed.

1.4 Organization of the Report and the Associated Compact Disk

This report is one of a series of files on a Compact Disk (CD) prepared as a project deliverable product. The report summarizes the results of the workshops, and presents the conclusions of the participants. It is formatted to be printed as an independent, double sided report. In addition, the CD contains copies of some of the presentations made at the

workshops by the sponsors or by subject matter experts, as well as copies of some of the documents provided as reference material by the sponsors. These files are cited at appropriate locations in the text of the report.

2.0 Overview of Workshop Events

This training exercise consisted of three workshops of varying length held on 19-21 January, 15-17 February and 8 November 2005. The original schedule included only the first two workshops; however, at the second meeting it was decided to delay discussion of dispersant use until after the release (in August 2005) of the National Academy of Sciences (NAS) report entitled "Oil Spill Dispersants: Efficacy and Effects (NRC, 2005)" and so the third meeting was added. The activities of the organizing committee prior to the first meeting, and summaries of the results at each workshop are presented below.

Prior to the meeting, the Assessment Steering Committee had agreed on the spill scenario, the response options for consideration and had prepared a draft table of the resources at risk. Additionally, NOAA HazMat (Seattle) prepared trajectory and weathering forecasts based on the spill scenario.

The first workshop began with an overview presentation on the ERA process by Dr. Don Aurand (see "ERA Overview" on the workshop CD), followed by an open discussion. The discussion of the risk ranking process was very extensive, and a number of participants expressed concern that there was insufficient information available for them to use the proposed approach effectively. There was concern from the Makah Tribe that this assessment process should address the cultural significance of biological organisms. Each focus group used different methods to take into account the cultural significance of biological organisms. These methods were noted when those organisms became the focus of cultural concern. This discussion occupied the entire morning of the first day. After lunch, LCDR Cocanour of Marine Safety Office (MSO) Puget Sound and Matt Bernard of USCG District 13 gave an overview of the responsibilities of the USCG in oil spill response management. This was followed by a series of presentations on the following topics:

- Birds – Kevin Ryan, USFWS
- Marine mammals – Mary Sue Broncato, Olympic Coast National Marine Sanctuary, NOAA (on workshop CD)
- Oil and salmonids – Dr. Ron Heinz, NOAA Auke Bay Laboratory
- Fate of oil in the environment – Bill Lehr, NOAA HazMat

A copy of the marine mammal presentation is included under the listed name on the workshop CD.[1] After these presentations, the participants reviewed the habitat table (see Appendix B) and developed population reference levels. When that was completed, the concepts related to thresholds and the use of a risk ranking matrix was discussed, but final decisions were not made.

On day 2 the meeting opened with a review of day 1, especially the resources at risk matrix, the risk evaluation process, and the risk ranking matrix. The difficulties in estimating the time of recovery and the proportion of the resource affected were of particular concern for many participants. Ultimately, however, a risk ranking matrix was developed and

[1] NOAA presentations not available on the CD may be obtained by contacting Ms. Ruth Yender, NOAA Scientific Support Coordinator for RRT X at ruth.yender@noaa.gov or by phone at 206-526-6329.

accepted. The session closed with an overview of what constituted natural recovery, or the no response scenario. The afternoon session began with a presentation by Dr. Alan Mearns of NOAA HazMat on the trajectory associated with the surface oil slick (see "Surface Trajectory" on the workshop CD). The participants were then divided into three focus groups for consideration of the natural recovery scenario. After approximately two hours, the participants reconvened for a presentation on on-water mechanical recovery by Jeff Kainz of Clean Sound Cooperative (see "On-Water Mechanical Recovery" on the workshop CD). This presentation generated considerable discussion, with a number of participants questioning the equipment efficiencies and recovery percentages proposed. The last half of the afternoon was spent having the focus groups continue their risk ranking for both natural recovery and on-water mechanical recovery.

Day 3 began with the focus groups continuing their discussions for the first two response options. Ultimately, one of the three groups was able to complete the natural recovery scoring, and a portion of on-water mechanical recovery. The other two groups completed most of the scoring for natural recovery, but nothing else. There was concern about the scoring differences among the groups regarding cultural/biological resources. It should be noted that each group had a tribal representative. At mid-morning a decision was made to go ahead and have the presentations on the dispersant option, in order to have an overview of that response option relative to on-water mechanical recovery. Presentations were made on the basic concepts of dispersants and issues of water column toxicity by Dr. Jim Clark of ExxonMobil Research and Engineering (electronic version not available for inclusion on the workshop CD), and on the trajectory analysis for the use of dispersants by Dr. Alan Mearns of NOAA HazMat. These presentations generated significant discussion, especially the trajectory analysis, where a number of participants questioned the efficacy assumptions used in the analysis. Ultimately, the participants decided to defer all discussion of dispersants until further information could be obtained concerning the NAS report. Decisions about the validity of the trajectory analysis for use in the workshop were also postponed.

The second workshop was facilitated by staff from USCG District 13 and MSO Puget Sound. The meeting began with a presentation on PAH toxicity by Dr. John Incardona, NOAA (see "Oil Toxicity Concepts" on the workshop CD). This was followed by Mr Al Allen's presentation entitled, "Use of on-water in-situ burning." This was followed by a presentation by Damien Bailey of NOAA HazMat on "Shoreline Mechanical Recovery." When those discussions were complete, the three focus groups reconvened to continue the risk ranking. At the end of the two days, one group had completed the risk ranking for natural recovery, on-water mechanical recovery, ISB and shoreline recovery, one group had completed scoring natural recovery, on-water mechanical recovery and ISB, and the third group had completed natural recovery and on-water mechanical recovery. No group scored dispersants. At the end of the meeting participants discussed how to handle the issue of dispersants for a considerable period of time, and ultimately decided to schedule a third meeting, to be held after the NAS report (NRC, 2005) was released.

In between the second and third workshops, the Steering Committee decided to omit any further use of the risk ranking matrix, and instead focus on a shorter, educational meeting to explain the results of the NAS report (NRC, 2005), to review the protocols for dispersant use in coastal waters of Washington, and to discuss integrated oil spill response planning. These issues were addressed in a series of presentations:

- Results and accomplishments to date – Matthew P. Bernard, USCG D13
- Current dispersant approval process in Washington state – Dr. Dick Logan, WA DOE
- NRC Report Overview "Oil Spill Dispersants: Efficacy and Effects" – Dr. Jacqui Michel, Research Planning, Inc.
- Optimized systems approach to spill response – Al Allen, Spiltec

The first three of these presentations are included on the workshop CD. An electronic version of the presentation by Mr. Allen is not available for inclusion on the workshop CD. At the end of the one day session, a list of recommendations was developed for consideration by RRT X. Participants were allowed to review this list after the last meeting and to submit additional recommendations. These recommendations were reviewed by the Steering Committee for inclusion in the report. The final recommendations after the Steering Committee review are presented in Section 5.2.

3.0 Exercise Scenario and Basic Analytical Information

3.1 Exercise Scenario

As part of the workshops planning process the Steering Committee worked with NOAA HazMat to develop an exercise scenario. The goal was to develop a realistic scenario (described below) which would threaten sensitive resources and allow for considerations of all response options of interest.

During the afternoon of Thursday, June 2, 2005, the oil tanker *T/V Northwest Star* lost power while inbound to the Strait of Juan de Fuca. A response tug, called at the onset of power loss, was unable to stop the ship from drifting toward Cape Flattery, Washington. At 0000 hours on June 3, the tanker grounded on Duncan Rock, resulting in a small gash in the hull and a release of about 200 barrels (bbls) (8400 gallons) of Alaska North Slope crude oil. Additional tugs and emergency response vessels departed from Port Angeles, arriving on scene at 0400. But the oil drifted ashore to Mukkaw Bay and Shi Shi beach before daylight (0530). The emergency response teams began securing the tanker for tow, but cautioned that additional spillage was possible during the next 24 hours.

Throughout Friday, June 3, crews attempted to further secure the vessel in preparation for towing off the rocks. Meanwhile, open water response vessels arrived on scene while the Joint Command at Neah Bay evaluated alternative future response options.

Early Saturday morning, June 4, 2005, an effort was made to pull the vessel off Duncan Rock. At 0400 hours a second hold was ripped open releasing oil over a period of five hours. The leak was secured at 0900 and the vessel was taken in tow to a port of refuge. However, by this time about 5000 bbls (210,000 gallons) of Alaska North Slope crude oil had been released off Cape Flattery.

North and northwest winds ranging from 5 to 20 knots, and southwesterly surface currents, transported the oil to the south, threatening the nearshore coast and shorelines south of Shi Shi beach. The Command responded with its chosen alternatives.

The properties of the Alaska North Slope crude oil in this scenario are as follows (Environment Canada, 1999):

- API = 26.8
- Pour Point = 17º F
- Density = 0.9037 g/cc at 0º C
- Viscosity = 42.4 cSt at 38º C
- Adhesion = 0.28 g/m^2

The weather forecast for June 4-7, 2005 was clear to partly cloudy; Lows in the mid 50's, highs in the mid-60's; Winds 5 to 15 knots,; N to NW, peaking to 25; Seas 3 to 5 feet. The average wind speed was 15 knots (range 5-25). The surface water temperature was 15º C, and the salinity was 32. The sediment load was < 5 g/m^3. Currents were 0.5 – 1.5 knots to the S, SE.

3.2 Geographic Area of Concern

The general area of concern was the outer coastline of northern Washington, along with the offshore islands and a series of coastal estuaries. The estuaries of concern were the Waatch, the Sooes, the Ozette, the Quillayute, the Kalaloch, the Hoh, the Queets, the Raft and the Quinault. Participants agreed to consider resources as either "Local" (restricted to the Washington coastal area or genetically distinct), "Regional" (found throughout British Columbia, Washington and Oregon), or "North Pacific" when they were evaluating impacts.

3.3 Resources of Concern

Participants reviewed the draft resource table developed by the Assessment Planning Committee as the template for risk evaluation matrix and agreed to use it with minor modifications. The final version of this table is presented in Appendix B. As is the case in each ERA workshop, the participants developed a list of habitats and subhabitats which they felt included the resources which would need to be evaluated. For each subhabitat they examined impacts to a list of resource groups, each of which was either a taxonomic or ecological grouping. Normally, participants develop a list of example organisms for each of the resource groups, and review the list to eliminate resource groups which are not relevant to the analysis. In this case, the example organisms were identified by the Assessment Steering Committee and reviewed and modified by Mr. Barry Troutman of WA DFW.

3.4 Conceptual Model

During discussions about the general analytical process, the participants agreed that developing a detailed model was not necessary for their purposes. They were presented the list of seven hazards developed initially in the San Francisco Bay workshop (Pond et al., 2000), and used in all subsequent workshops, and it was suggested that these be considered for each of the proposed response options (these hazards are air pollution, aqueous exposure, physical trauma, oiling/smothering, thermal, waste and indirect). They agreed that the response options to be considered would be natural recovery (no response), on-water mechanical recovery, on-water ISB, dispersant application, and if time was available, shoreline protection.

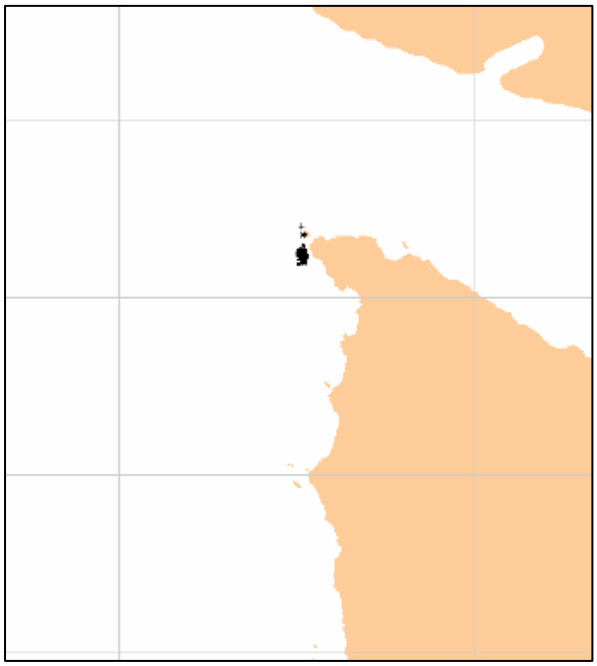
3.5 Modeling Results

The NOAA HazMat Modeling Group used the basic information in the scenario to develop a surface trajectory and a dispersed oil trajectory analysis using GNOME for the detailed risk assessment portion of the workshop. Only the surface trajectory is discussed in the report. Basic weathering information was calculated using the ADIOS II program. Mass balance estimates are presented in Table 3.1. Selected snapshots from the surface oil trajectory modeling results are shown in Figures 3.1 and 3.2.

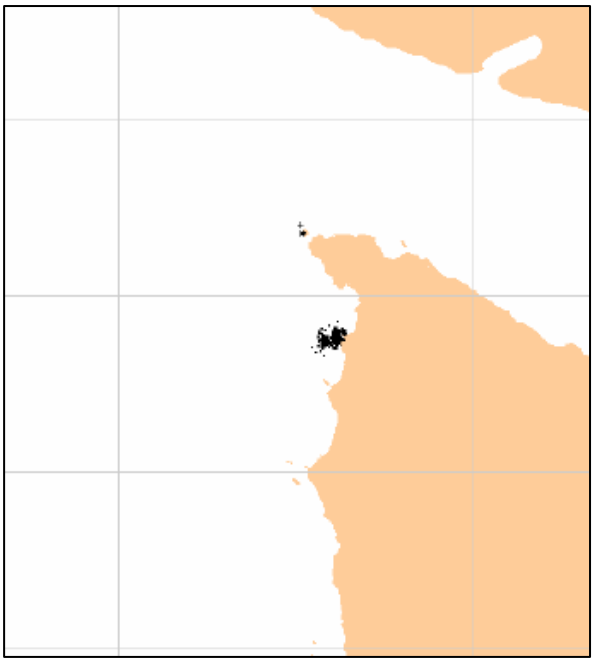
Table 3.1 Oil Budget (in bbs) for the Surface Slick (No Recovery or Dispersant Use) in the Cape Flattery Scenario.

Predicted Fate	Time Since Initial Release (Hours)							
	3	**6**	**24**	**33**	**36**	**57**	**72**	**96**
Released	200	200	200	4950	5200	5200	5200	5200
Evaporated	52	63	70	624	940	1227	1328	1377
Dispersed	7	7	7	30	64	215	257	259
Beached	8	8	121	119	118	254	1661	3511
Off Map	0	0	0	0	0	0	0	0
Floating	134	122	2	4177	4079	3505	1995	54

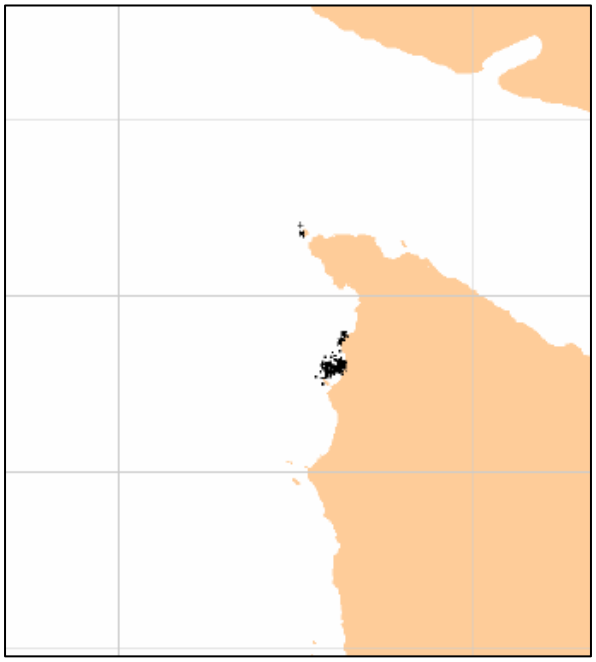
Under prevailing winds the oil moves rapidly to the southeast and within eight hours oil is stranding along the outer coast. Within 6 hours, most of the initial release is on the shore. The second, larger release at 24 hours follows the same general path (Figure 3.2) but moves further down the coast. By the end of 48 hours, stranded oil is found along much of the north coast, and by 96 hours only a trace of floating oil remains, with the rest being evaporated, naturally dispersed, or stranded on the shoreline.



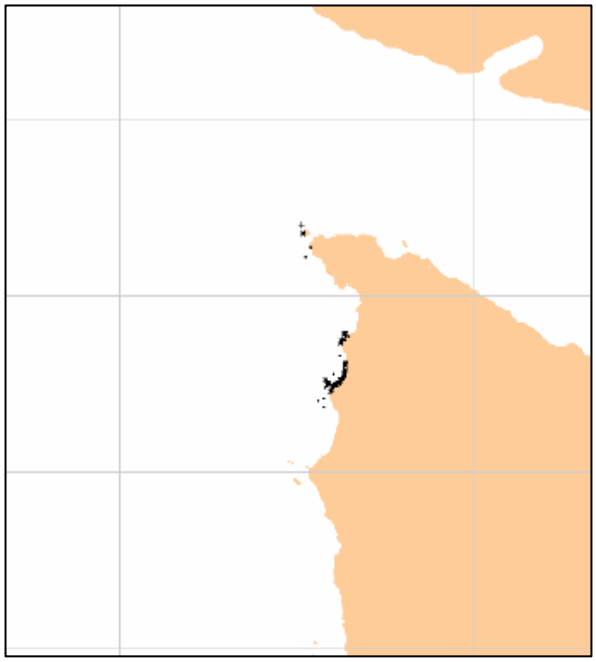
A: 3 Hours



B: 8 Hours

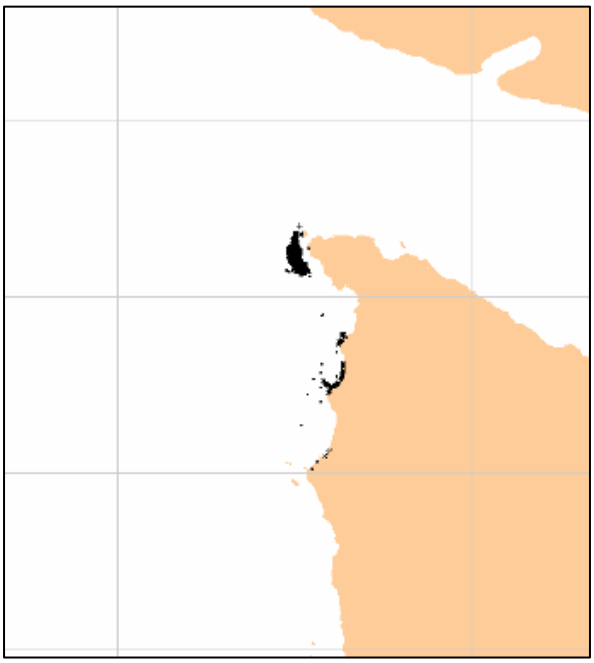


C: 10 Hours

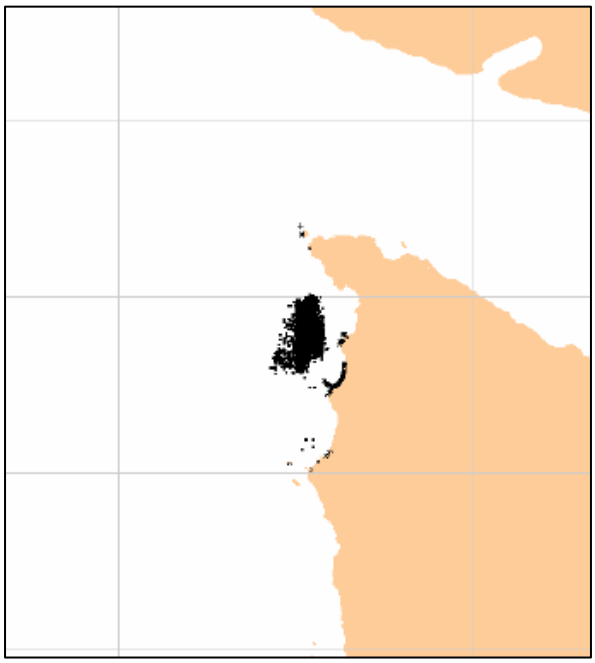


D: 12 Hours

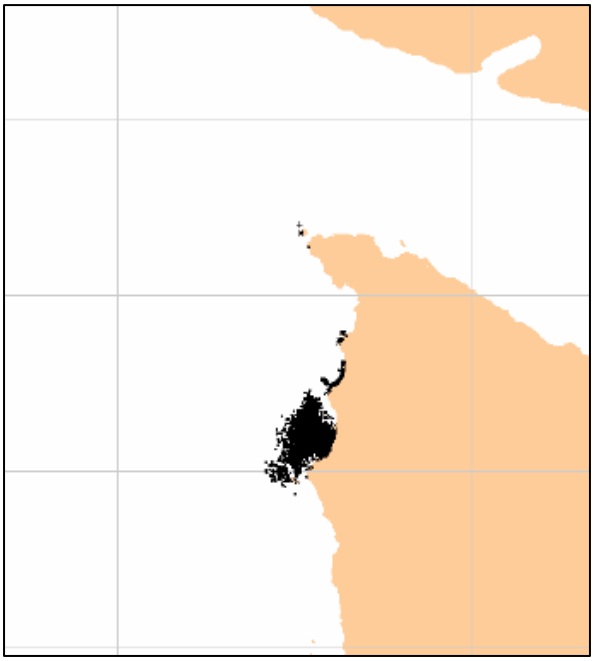
Figure 3.1 *Results from the NOAA scenario modeling for the Cape Flattery surface oil slick trajectory showing the initial 200 barrel release.*



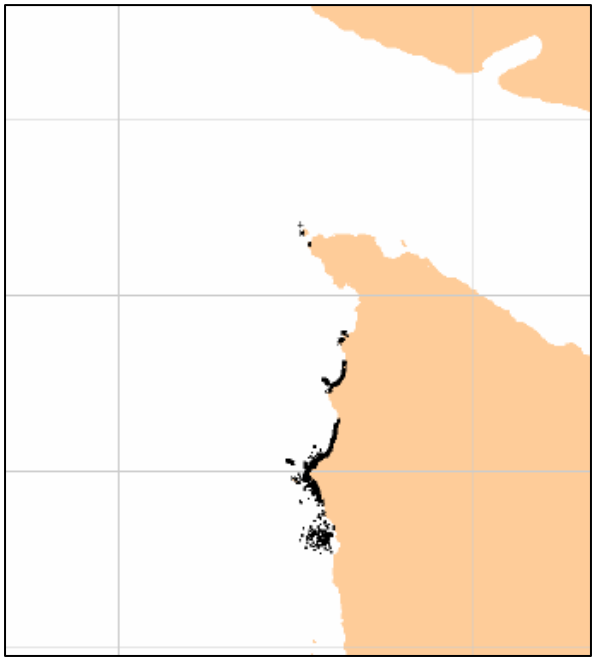
A: 31 Hours



B: 38 Hours



C: 48 Hours



D: 54 Hours

Figure 3.2 *Results from the NOAA scenario modeling for the Cape Flattery surface oil slick trajectory showing the results for the 5000 barrel release occurring between hours 28 and 33 on day 2.*

4.0 The Results of the Risk Analysis Process

At the conclusion of the workshop, the participants made a decision not to include any of the risk ranking analysis in the workshop proceedings. While they felt that the process had been informative, they were concerned that the results would be subject to misinterpretation or misuse if they were released at this time. It is the intent of the sponsors to continue the process through appropriate working groups associated with RRT X, using the information generated at these workshops as a starting point.

5.0 Summary Risk Analysis Results and Lessons Learned

This section contains comments and summary conclusions developed by some or all of the workshop participants.

5.1 General Comments by Focus Group 1 on the Workshop Process

At the end of the second workshop, Focus Group 1 prepared a series of recommendations which they wished to have considered by the workshop organizers. Two members of the group, Dr. Alan Mearns and Mr. David Sawicki, were not present. These recommendations were not reviewed by the entire workshop. However, they represent a series of comments that this group considered important enough to be included in this report.

Recommendations around ERA process:

- Process needs to be based on specific, clear goals.
- Participants need to see results of other successful planning efforts.
- Participants need to have clear understanding of how the results of this process will be used.
- Presenters need to focus on informing participants relative to the ERA process.
- Process needs to focus on actual ecological risks. Other considerations need to be dealt with separately (i.e., economic, legal, technological feasibility, social factors).

Recommendations around workshop:

- Participants need clear direction re: scope, objectives, products, audience, and use prior to participation to process.
- Participants need to know how products will be used.
- Participants need all available information before workshops.
- Personnel involved in ERA workshops need to be involved in spill response.
- Presenters need to focus on informing participants relative to the ERA process.

Recommendations on technical aspects:

- Group 1 felt that the matrix does not capture the idea that some response activity may be worse than natural recovery (i.e., hot water flushing, high pressure washing).

- Information is not available to capture relatively small reductions in impact or grossly comparable strategies (i.e. ISB and skimming).
- Information is not available on long term recovery of various impacted habitats and species.
- There is not enough resolution in matrix to capture nuances of change.
- Needs to be clearer understanding of efficiencies of various response tools.

5.2 Recommendations for RRT Consideration

At the end of the third meeting, a list of recommendations was developed for consideration by RRT X. Participants were allowed to review this list after the meeting and to submit additional recommendations. These recommendations were reviewed by the Steering Committee for inclusion in the report. The final recommendations after the Steering Committee review are presented below.

- Develop workgroups to focus on specific geographic areas or tasks.
- Several recommendations came out of the second meeting:
  - Conduct a comprehensive Sea State Analysis for the outer coast to assist with evaluation of the frequency of conditions [or percent of time, perhaps by month?] when different response technologies could be effectively employed. This goes to the question of how much of time is skimming possible, conditions favorable for dispersant use, etc.
  - Modeling each response technology at 25% efficacy, a level that is within the realistic effective range of both mechanical, burn and dispersants [this was a recommendation to help finish the resource risk evaluations so the groups could compare "oranges to oranges", or a reasonable comparison of benefits and risks of different response technologies. It's not necessary unless groups are to continue with the risk evaluations].
  - Compare spill response equipment we currently have available to a realistic outer coast "wish list" that might provide a high combined efficacy.
  - Conduct a Vessel of Opportunity study for the outer coast– what fishing vessels could be included [similar to one recently completed for the San Juan/eastern Straits area]
  - Is the airport facility in Victoria sufficient and available as a base of operations for some of our response technologies, specifically landing a DC-3 plane for dispersant application?
- Re-evaluate the dispersant pre-approval checklist and compare the checklist from Northwest Area Contingency Plan (NWACP) with those from CA, Alaska, Canada, and other areas.

- Needs to be a clear roadmap for dispersant use. Should be able to be used in an expedited manner for case by case issues. Use the existing EIS, and make the zone definitions in the existing document more readily accessible (perhaps by providing improved maps) so that decision makers can more easily and quickly identify pre-approved and case-by-case dispersant zones.
- Develop a formal recognition process for tribal government participation in the planning process.
- Re-evaluate the basis for the pre-approval zones for dispersant use; consider basing them on something other than depth contours.
- Conduct an analysis of all oil types transported through the Straits including fuel on larger vessels; define volumes that are or are not dispersible to assist evaluation of the utility of staging equipment for dispersant use in response.
- Design and fund a cold water dispersant efficacy tank test, using temperatures representative of outer coast waters and oil and oil products that constitute the majority of product that moves through the Straits and other portions of the state.
- Evaluate feasibility of in-situ burning in comparison to dispersant application, based on average sea state conditions, water temperatures, availability of staged equipment, time delay to bring in appropriate equipment, etc.
- Request an explanation from USCG as to why a 25% increase in mechanical equipment is not expected to yield benefit to the environment, as is indicated in draft USCG rule language for the preferred alternative.
- Finalize approval for SMART protocols and update NWACP to reflect this, as well as a clear definition of the RRT's role in a dispersant use decision.
- Abandon and discourage any efforts to seek an expansion of pre-approval zones within three miles of shore in the state at this time.
- As technical/scientific experts for WA DFW trust resources, we (the WA DFW participants) do not envision that we could make a technical recommendation to WA DFW management and policy makers to support expansion of pre-approval zones in the state. While we recognize that dispersants may be an important response tool, each spill will need to be evaluated from a fish and wildlife perspective to determine if the application is appropriate. There is just not enough scientific information on fate and effects of the oil and dispersants under different conditions to warrant pre-approval. The temporal and spatial distributions of key fish and wildlife species are too variable to pre-determine environmental benefits and tradeoffs of dispersant use.
- Support and fund the recommendations in the NAS report on "Oil Spill Dispersants: Efficacy and Effects". Many of the technical issues raised in this report point to the fact that there is simply not enough information to make effective, technically sound recommendations/decisions regarding the potential benefits or adverse impacts associated with dispersant use.

- Promote research toward determining the fate and transport of dispersants and dispersed oil. Define the physical dilution process (ocean hydraulics) and be able to track the dispersed oil to an endpoint. Determine the biological effects (including sediment impacts and phytoplankton impacts) of various concentrations of dispersants and dispersed oil on sensitive, cultural, economically important, and ESA species.
- The WA Coast ERA process was very challenging to conduct/participate in. The RRT asked participating agencies to commit to attending and participating in the entire process. DNR and other state agencies made that commitment; we even came with our sleeves rolled up ready to get to work. The RRT should respect that commitment by concluding the work with a final message to the participants and their agencies. The message should include a description of the intended and actual process and describe the outcome. Enough energy was spent in support of the process to justify this feedback. Without feedback such as this, it will be challenging for the RRT to get agency participation in the future.
- Contract with a major university to conduct a similar ERA process (exclude policy type decisions such as species v. species, and focus on the effects on single species and habitats (degree of effect, type of effect, etc). They would gather the detailed information from agency representatives, literature, industry, etc and conduct similar species/habitat effects assessments that were conducted at the workshops. Ideally, they would have the time for extensive information gathering in order to ensure that exposure information, species distribution information, biological effects information is all based on most current findings (something that was missing during our workshops). This study could either be conducted after some of the needed scientific studies are completed or could result in a specific list of scientific study needs for the northwest.
- Update the NWACP in an active manner. Rather than relying on non-RRT agencies/public to provide updates to the plan, the RRT should seek out updated information, meeting with appropriate agencies to get information/data needed to update the plan. One example is the various designations and authorities for marine reserves, preserves, sanctuaries, etc. The NWACP should include a reference to all of the protected areas and the purpose for which they are protected.
- Ensure that the NWACP includes specific information on response actions in relation to Canadian waters.
- Update the NWACP to reflect that Washington State has pre-approved regions for the use of dispersants.
- Foster development of a dispersant use policy providing clear guidance to responders regarding go/no go criteria.
- Streamline the decision-making process to fit the narrow “window of opportunity” for dispersant use.
- Continue spill planning based on oil encounter rate, skimming efficiencies, and dispersant effectiveness.

6.0 References

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Appendix A

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Appendix B

Resource Table

Region	Habitat	Subhabitat	Resource Category	Example Organisms
Air			Birds	Bald eagles, peregrine falcons, seabirds, gulls alcids
			Mammals	cetaceans, pinnepeds, people
Offshore Island	Supratidal		Birds	nesting/roosting seabirds, eagles, peregrine falcon, shore birds
			Mammals	pinnepeds
	Intertidal		Birds	black oystercatcher, pigeon guillemot
			Mammals	harbor seals, Steller sea lion, sea otter
			Adult shellfish/other invertebrates	goeduck, sea cucumbers, crabs (Cancer), ghost shrimp, razor and hardshell clams, Nereis, blue mussel
			Kelp or other macroalgae	rockweed, bull kelp, giant kelp
			Seagrass	eelgrass
Mainland Coast	Coastal Estuary		Birds	herons, waterfowl
			Mammals	harbor seals, river otter
			Fish	salmon, herring, sandlance, surf smelt, English sole
			Adult shellfish/other invertebrates	goeduck, sea cucumbers, crabs (Cancer), ghost shrimp, razor and hardshell clams, Nereis, blue mussel
			Kelp or other macroalgae	rockweed, bull kelp, giant kelp
			Seagrass	eelgrass
			Zooplankton and larval fish	salmon larvae, copepods
	Terrestrial		Birds	bald eagles, peregrine falcons, shorebirds, crows, ravens
			Mammals	racoon, coyote, black bear
	Intertidal	Mudflat	Birds	gulls, wading birds, shorebirds, waterfowl, Western sandpiper
			Mammals	racoon, river otter
			Fish	sculpins, flatfish, topsmelt
			Adult shellfish/other invertebrates	goeduck, sea cucumbers, fiddler crabs, ghost shrimp, clams, Nereis
		Sandy beach	Birds	marbled murrelets, gulls, plovers
			Mammals	racoon, coyote, river otter
			Fish	serf perch, surf smelt
			Adult shellfish/other invertebrates	sand crabs, crabs, razor clams, amphipods
		Gravel or cobble beach	Birds	gulls, pelicans, shorebirds, alcids, common murres,
			Mammals	seals, sea lions
			Fish	tidepool fish
			Adult shellfish/other invertebrates	sea urchins, starfish,
			Kelp or other macroalgae	rockweed
		Rock platform	Birds	gulls, pelicans, shorebirds, alcids, common murres,
			Mammals	seals, sea lions
			Fish	tidepool fish
			Adult shellfish/other invertebrates	urchins, starfish, mussels, gooseneck barnacles
			Kelp or other macroalgae	bull kelp, giant kelp, rockweed

Region	Habitat	Subhabitat	Resource Category	Example Organisms
Marine Environment	Subtidal	Shallow softbottom (<20m)	Birds	diving waterfowl, grebes, loons, alcids
			Mammals	pinnipeds, sea otters
			Fish	demersal fish, flatfish, sharks
			Adult shellfish/other invertebrates	dungeness crabs, herring and hardshell clams
			Kelp or other macroalgae	
			Seagrass	eelgrass
		Shallow hardbotom (<20m)	Birds	diving waterfowl, grebes, loons, alcids
			Mammals	pinnipeds, sea otters
			Fish	rockfish
			Adult shellfish/other invertebrates	anemones, sea stars, abalone, sea urchins
			Kelp or other macroalgae	bull kelp, giant kelp
			Seagrass	
		Deep softbottom (>20m)	Birds	diving waterfowl, grebes, loons, alcids
			Mammals	grey whales, pinnipeds, sea otters
			Fish	demersal fish, flatfish, sharks
			Adult shellfish/other invertebrates	crabs, razor clams
		Deep hardbotom (>20m)	Birds	diving waterfowl, grebes, loons, alcids
			Mammals	grey whales, pinnipeds, sea otters
			Fish	demersal fish, flatfish, sharks
			Adult shellfish/other invertebrates	red urchins, crabs
	Water Column	Shallow (<20m)	Birds	loons, grebes, black oyster catcher, common murres
			Mammals	harbor porpoise, sea otter, harbor seal
			Fish	rockfish, salmon, lingcod
			Adult shellfish/other invertebrates	squid
			Zooplankton and larval fish (discuss phytoplankton)	copepods, demersal fish larvae, jellyfish, sea urchin larvae, crustacean larvae, bivalve larvae
		Deep (>20m)	Birds	
			Mammals	Orca, grey whale, humpback whale
			Fish	rockfish, salmon, lingcod
			Adult shellfish/other invertebrates	squid
			Zooplankton and larval fish	copepods, demersal fish larvae, jellyfish, sea urchin larvae, crustacean larvae, bivalve larvae
	Water Surface		Birds	tufted puffin, Cassin's auklet, storm petrel, shearwater, loons, grebes, common murres
			Mammals	northern fur seal, sea otters, Orca
			Kelp or other macroalgae	bull kelp, giant kelp
			Zooplankton and larval fish	copepods, demersal fish larvae, jellyfish, sea urchin larvae, crustacean larvae, bivalve larvae