

PLACE OF REFUGE (POR) & COURSE OF ACTION (COA):
RISK-BASED DECISION SUPPORT TOOL FOR A VESSEL NEEDING ASSISTANCE



Stafford Reid
EnviroEmerg Consulting,
Duncan, BC

ENVIROEMERG.CA

TOPICS



- PREFACE
- BACKGROUND
- STRATEGIC DECISIONS
- SITUATIONAL-SPECIFIC & STATIC INFORMATION
- SUBJECT MATTER EXPERTS & LOCAL KNOWLEDGE
- APPLICATION

PREFACE

This *Place of Refuge (POR) & Course of Action (COA) Risk-Based Decision Support Tool* provides a level of rigour that helps to quickly and methodically review and capture key vessel management and impact mitigation considerations for each place of refuge or another course of action to determine the best overall recommendation. The latter is based on the lowest consequences and risks to the vessel, crew, responders, public, ecology, culture and commerce of a coastal area under threat.

The tool is done in a collaborative, equitable and transparent way. It uses situational information, checklists, and ecological/cultural/commercial information gathered before and during a marine vessel incident. The goal is not to make the marine vessel incident worse by recognizing the relative consequences and risks to coastal resources and their users. This includes the practical application of mitigation measures to reduce risk.



BACKGROUND

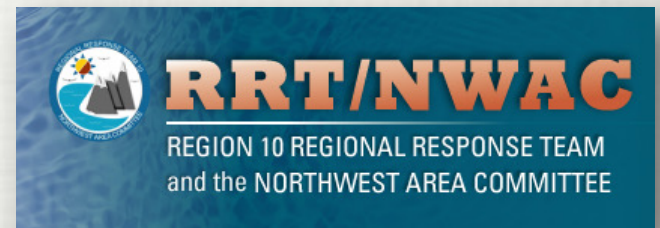
A place of refuge (POR) risk-based decision tool was developed by the US Coast Guard in collaboration with the States of California* and Washington**, and their shipping industry. California's coastal Area Contingency Planning Committees began the process to develop place of refuge data-gathering and decision-making tools in July 2006. It is part of the Washington State's Northwest Area and USCG's Region 10 contingency plans. Their aid is a Microsoft Excel spreadsheet. All are similar in design, purpose, structure, content, and application.

The US recognized that an aid is needed to manage the comprehensive and diverse information to make a decision that is: risk-based, structured, supported, and transparent.

This Place of Refuge (POR) & Course of Action (COA) Risk-Based Decision Support Tool is built on the US model and enhanced with ranks, weights, and is more user-friendly.

* In California referred to as: *Place of Refuge Risk Assessment Job Aid* (POR Job Aid). Refer to: *COMMANDANT INSTRUCTION 16451.9 on U.S. COAST GUARD PLACES OF REFUGE POLICY*

** In Washington referred to as: *Place of Refuge Decision Tool*. Refer to Washington Northwest Contingency Plan, Section 9410.



BACKGROUND

Changes Made from US's Decision-Aid to Pacific Region's Decision Support Tool

Changes made from the US's decision aid and that for This *Place of Refuge (POR) & Course of Action (COA) Risk-Based Decision Support Tool* includes:

IN FORMAT:

- Provides an introduction about the origin and topic of places of refuge;
- Identifies where data inputs are to be entered (green), and parts that undertake calculations (orange);
- Provides a scenario/incident section to capture information about: Vessel Master's request for a place of refuge, the vessel, sea conditions, *etc.* (used for an exercise or incident);
- Provides informational support on how to use the aid ("pop-up" information boxes and text boxes).

IN STRUCTURE:

- Simplified descriptions of rankings for clarity and ease of application;
- Added information on weightings, as well as new weightings, to allow user to determine which factors are the most important and relevant for a decision;
- Included averaging of number of factors considered within each section to balance the number of factors being consider (*e.g.* not askew the decision because one section address more factors than another)
- Includes weighting for the most critical interventions such as towing, salvage, fire-fighting, spill response, *etc.*

BACKGROUND

Some Terminology within the Decision Support Tool

- **Place of Refuge (POR):** A physical place to direct a vessel needing assistance such as a cove, bay, harbour, or lee of an island.
- **Course of Action (COA):** Other options for directing a vessel needing assistance such as to repair in place, go further off shore, or beach.
- **Ranking:** A numerically entered value to provide relative importance of a decision factor across of all POR/COA being considered, such as suitability of vessel's distance/difficulty to transit, anchoring, natural confinement of pollution, logistics, ecological/cultural exposures, safety, *etc.* (horizontal row in spreadsheet).
- **Weighting:** A numerically entered value to identify which decision factors are relatively the most important to consider (vertical column in spreadsheet)
- **Averaging:** A single numerical values that takes into consideration the number of factors in each section of the spreadsheet so as to balance (i.e., not askew) the final decision calculations; and
- **Score:** A numerically derived number that calculates the relative risks and consequences based on rankings, weightings, and averaging of all the POR/COA decision factors.

STRATEGIC RISK-BASED DECISIONS

There is a need to evaluate both the practicalities of managing a vessel needing assistance, as well as potential consequences to the environment whenever a “course of action” (COA) or “place of refuge” (POR) decision is required. This includes determining if a vessel should:

- Remain in the same position for repairs/services;
- Travel out to sea under its own power or tug services;
- Beach on a soft-sediment shore; or
- Go to a place of refuge such as a bay, cove, lee of an island, harbour (there can be multiple POR options).

Criteria for what “COAs” or “PORs” to consider and compare is situational specific. Choices should also be options that the public or an agencies/First Nation’s executive might also raise.

**EACH “COA”OR “POR” HAS TO BE ADDRESSED,
CONSIDERED, COMPARED, AND WEIGHTED.**

**A RECOMMENDATION REQUIRES A QUANTIFIABLE, AND
TRANSPARENT DECISION-MAKING PROCESS AND
RECORD.**

A ship requiring assistance due to loss of propulsion or steering, actual or imminent structural failure (hull breach) or fire damage may require a place of refuge. A place of refuge is:

“... a place where a ship in need of assistance can take action to enable it to stabilize its condition and reduce the hazards to navigation, and to protect human life and the environment.”

This refuge must have adequate water depth for lightering (remove cargo or fuels) or repairs to protect the marine environment. It may entail a ship entering a designated harbour, an undesignated protected water (a cove or bay) or beaching to make ship repairs, to reduce the threat of pollution or both.

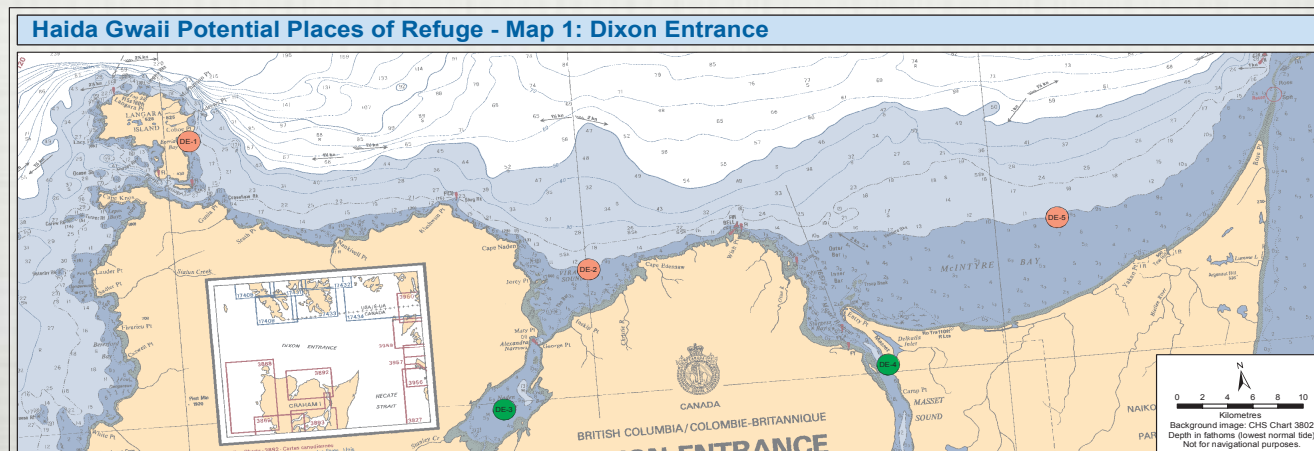
Other decisions include holding the vessel at station, sending it further off the coast, beaching it on soft-sediment shores. These decisions are a critical response action as the outcome – whether denied or approved – can markedly affect the coastal community’s welfare, the environment, and the response cost.

The decision needs to be expeditiously made whilst ensuring that the choice is both pragmatic to the ship master and equitable to those coastal stakeholders that benefit from the decision or that may incur an impact.

SITUATIONAL-SPECIFIC INFORMATION FOR A RISK-BASED DECISION

The POR/COA risk-based decision support tool relies on situational-specific inputs such as:

- Sea and weather conditions – both current and forecasted,
- Type and size of the vessel,
- Status of the vessel (degree and nature of structural failure, whether still under own power/steerage, being towed, on fire, sinking, etc.),
- Its location (distances nearshore or offshore),
- On-board threat mitigation measures and equipment (pumps, firefighting)
- Drift rate and direction and point of land contact,
- Safety and health condition of those on board, of responders, and of communities,
- Cargo type (container, oil, chemical, bulk, passenger),
- Availability of emergency towing capability,
- Availability of fire fighting,
- Coastal wildlife presence, vulnerability and sensitivity,
- Current coastal activities shipping, fishing, harvesting, and more.



STATIC-SPECIFIC INFORMATION FOR A RISK-BASED DECISION

The *This Place of Refuge (POR) & Course of Action (COA) Risk-Based Decision Support Tool* also relies on social, cultural, ecological, and commercial resources, supporting logistics, land-uses assessments such as:

- Coastal ecological resources that are vulnerable and sensitivity to the cargo loss, the vessel's bunker fuels, and the wreckage itself;
- Commercial activities and people that are at risk of health or harmful exposures;
- First Nation's subsistence and culture harvesting exposures;
- Access and egress for salvage and oil spill services and other logistics by land and sea; and
- Adequate water depth to accommodate the ship anchoring or suitable docking facilities

A LARGE NUMBER OF FACTORS TO CONSIDERED. GENERALLY IDENTIFIED IN CHECK LISTS

OPERATIONAL GUIDELINE for Environmental Emergencies

Step 5

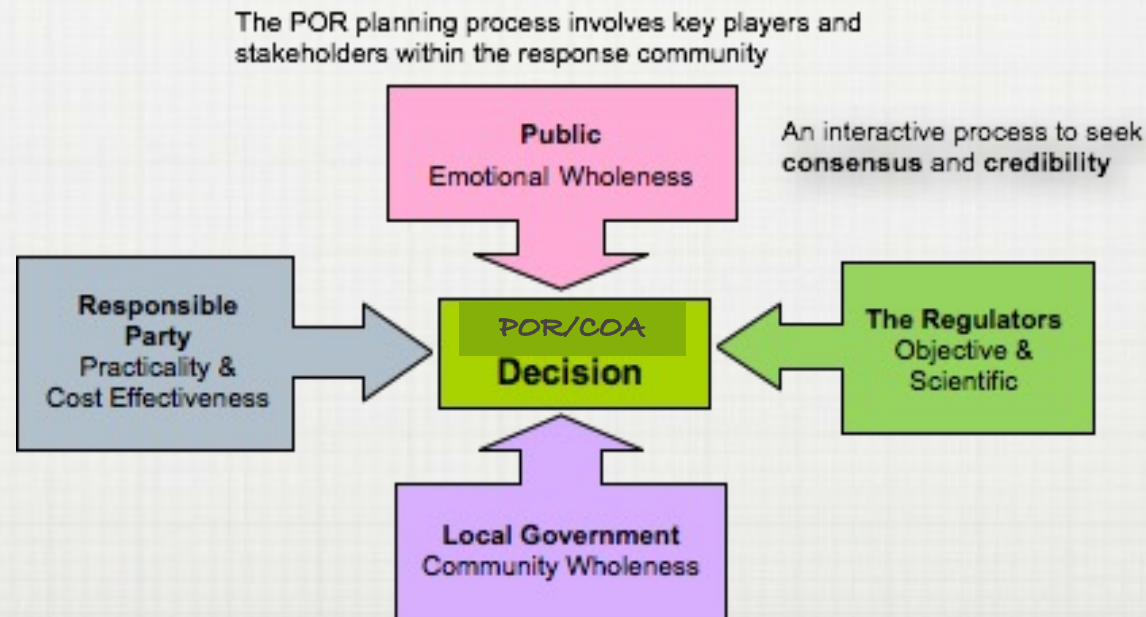
To protect environmental, historic, and cultural resources, Unified Command with its technical specialists should determine the presence of, and proximity to the following for any potential refuge locations:

- resources at risk such as threatened or endangered species, seasonal breeding locations, or designated critical habitat
- essential fish habitat
- mariculture /aquaculture facilities
- other priority sensitive areas, including cultural and historic properties
- other resources, lands and/or waters with special designations
- offshore fisheries
- nearshore fisheries
- subsistence use patterns and treaties
- recreation/tourism information
- spill trajectories

THIS COASTAL WATER AND LAND USE INFORMATION IS GATHERED IN ADVANCE AS PART OF A STAKEHOLDER/COLLABORATIVE EFFORT FOR REGIONALLY-BASED POR PLANNING

BALANCING ENVIRONMENTAL VALUES IN A RISK-BASED DECISION

Environmental emergency preparedness and response are about identifying and balancing social, cultural, ecological, and commercial values. It is also about not making the situation worse – reducing risk. This applies to both pro-active POR/COA preparedness and reactive vessel casualty incident management - in so far that the master and crew are not under distress (*i.e.*, not a search and rescue mission).



NO ONE JURISIDICION, AGENCY, OR COMPANY OWNS ALL THE COASTAL LAND AND WATER USE RESOURCE-USE VALUES. ESSENTIAL ONE HAS TO FOSTER A "SOCIAL CONTRACT" BEFORE AND DURING AN ENVIRONMENTAL EMERGENCY. RESPECT AND TRUST ARE FOSTERED BY CONSULTATION AND COLLABORATION IN PREPAREDNESS AND – DURING REPOSE - UNDER THE INCIDENT COMMAND SYSTEM AND THE UNIFIED COMMAND PROTOCOL THEREIN.

SUBJECT MATTER EXPERTS AND LOCAL KNOWLEDGE INPUTS

Information sourced, analyzed, and applied in a POR/COA decision can be extremely complex and onerous for anyone person or agency to manage. A decision requires subject matter experts supported by local knowledge to address the operational practicalities of managing the vessel needing assistance (*e.g.*, towing, salvage, firefighting, transit route/distance), as well as potential consequences to a region's social, cultural, ecological and commercial values. These people should be approved and empowered to make risk-based and value-based decisions.



A POR/COA RISK-BASED DECISION REQUIRES THE CORRECT PARTICIPANTS ARE IN CONTACT WITH EACH OTHER AND HAVE SITUATIONAL AWARENESS (I.E., A COMMON OPERATIONAL PICTURE). THIS ARRANGEMENT MAY BE EITHER BY CONFERENCE CALLS OR WITHIN AN INCIDENT COMMAND POST

APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

IMPORTANT

Completing the *Place of Refuge (POR) & Course of Action (COA) Risk-Based Decision Support Tool* is undertaken after all participants have full situational awareness (sea conditions, status of vessel, *etc.*), a complete understanding of critical interventions (e.g., towing, salvage, *etc.*), and exposures to responders, community and ecologies/resources (air quality, ecological impacts, *etc.*)

The purpose of the tool is to validate facts and assumptions and make them transparent, comparable and supportable.

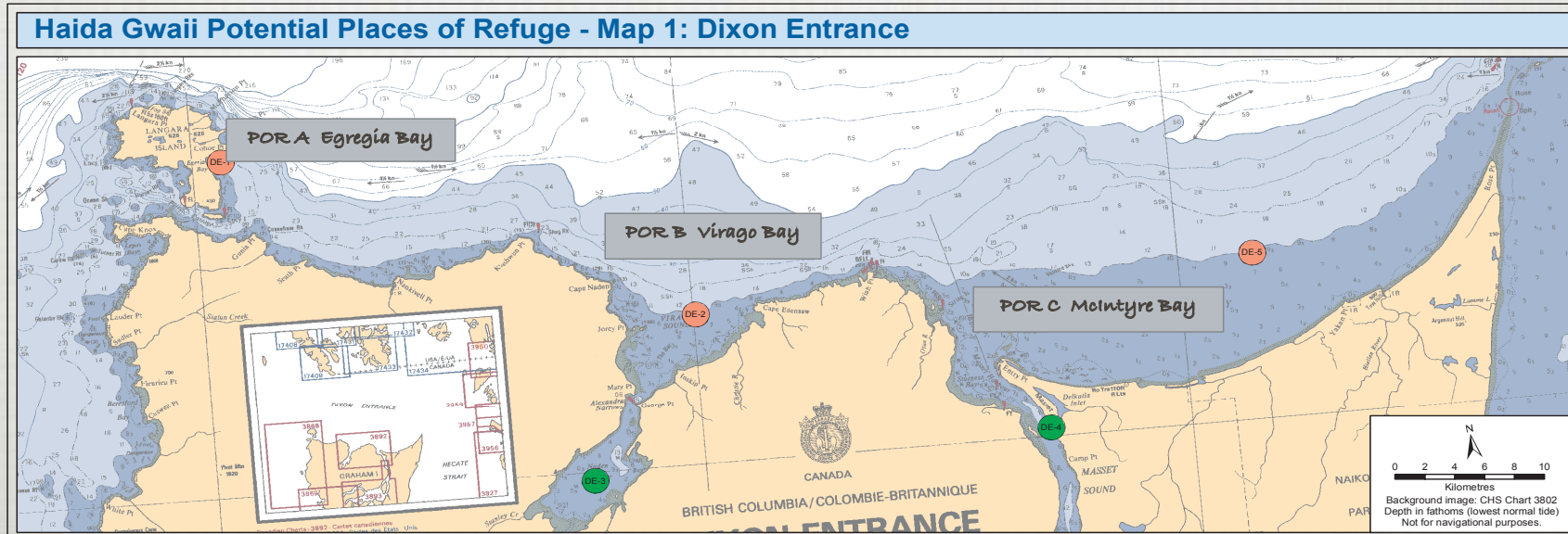
APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

Scenario

The following scenario provides an example of the application of the POR/COA Risk-based Decision Support Tool



Freight vessel carrying vehicles experiences hull structural failure – a crack in the hull. There is a potential loss of Bunker fuel. Ships' Master requested a Place of Refuge in order to assess damages and to undertake repairs.



APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

Step 1: Risk Analysis and Probability Determination

To evaluate the likelihood of achieving the requirements for: Part 1 - a vessel needing assistance; and Part 2 - the requirements to mitigate the consequences of a casualty (e.g., spill, cargo loss, wreckage); for each Place of Refuge (POR) and Course of Action (COA) rank the listed factors as either:

- 1 = Ideal
- 2 = Moderate
- 3 = Poor, or
- 4 = Unsuitable

RANK ARE BASED ON: SITUATIONAL AWARENESS; EXISTING AND FORECASTED SEA/VESSEL CONDITIONS; EXPERT OPINION/LOCAL KNOWLEDGE; KNOWN ATTRIBUTES OF A PLACE OF REFUGE, AND EMERGENCY SUPPORT SERVICES AVAILABILITY/CAPABILITY.
RANK CHOICE IS PREDICATED ON WHAT IS REQUIRED TO PROTECT/MANAGE THE VESSEL AND TO MITIGATE IMPACTS.

WEIGHTING

Weighting provides an opportunity to identify particular variables that are of greater or lesser importance given the nature of the incident. Weighting ensures that those aspects of greatest importance are reflected in the total score. For example, the importance of off-vessel firefighting capability may be a critical variable due to potential for total loss of vessel and resulting pollution.

Weightings:

- 2 = Minor Importance
- 4 = Major Importance
- 8 = Critical Importance

INPUTS

Vessel Requirements & POR/COA Suitability	POR A	POR B	POR C	Repair In Place	Go Offshore	Beaching	Weighting
PART 1 - VESSEL REQUIREMENTS							
RESCUE TOWING (Availability, Performance, and Timeline)							
TRANSIT DIFFICULTY (In Command or In Tow)	1	1	1				2
DISTANCE TO REFUGE VS. URGENCY (Deteriorating or Escalating Situation)	1	2	3				8
ANCHORING/STABILIZING (Seabed and Swing/Tug Services)	2	1	1				4
SHELTER CONDITIONS (Currents and Winds)	1	1	3				4
OTHER (Specify)							
OTHER (Specify)							
OTHER (Specify)							
OTHER (Specify)							
PART 2 - POR AND COA SUITABILITY FOR REPAIR/COASTAL IMPACT MITIGATION							
NATURAL CONFINEMENT OF WATER POLLUTION	3	3	3				2
LOGISTICS (Staging & Access by Land, Water and Air)	2	2	1				4
OFF-VESSEL FIREFIGHTING							
SALVAGE (Hull Patching, Lightering)	3	2	1				4
SPILL RESPONSE (Fuel, Cargo)	3	1	1				4
SECURITY	1	1	2				2
COMMUNICATIONS	2	2	1				2
OTHER (Specify) Proximity to Prince Rupert	3	2	1				2
OTHER (Specify)							
OTHER (Specify)							
OTHER (Specify)							

CALCULATION AND INITIAL WEIGHTED SCORES

Weighted Score for Each POR and COA							
Vessel Requirements & POR/COA Suitability	POR A	POR B	POR C	Repair In Place	Go Offshore	Beaching	
PART 1 - VESSEL REQUIREMENTS							
RESCUE TOWING (Availability, Performance, and Timeline)	0	0	0	0	0	0	0
TRANSIT DIFFICULTY (In Command or In Tow)	2	2	2	0	0	0	0
DISTANCE TO REFUGE VS. URGENCY (Deteriorating or Escalating Situation)	8	16	24	0	0	0	0
ANCHORING/STABILIZING (Seabed and Swing)	8	4	4	0	0	0	0
SHELTER CONDITIONS (Currents and Winds)	4	4	12	0	0	0	0
OTHER (Specify)	0	0	0	0	0	0	0
OTHER (Specify)	0	0	0	0	0	0	0
OTHER (Specify)	0	0	0	0	0	0	0
OTHER (Specify)	0	0	0	0	0	0	0
PART 2 - POR AND COA SUITABILITY FOR REPAIR/COASTAL IMPACT MITIGATION							
NATURAL CONFINEMENT OF WATER POLLUTION	6	6	6	0	0	0	0
LOGISTICS (Staging & Access by Land, Water and Air)	8	8	4	0	0	0	0
OFF-VESSEL FIREFIGHTING	0	0	0	0	0	0	0
SALVAGE (Hull Patching, Lightering)	12	8	4	0	0	0	0
SPILL RESPONSE (Fuel, Cargo)	12	4	4	0	0	0	0
SECURITY	2	2	4	0	0	0	0
COMMUNICATIONS	4	4	2	0	0	0	0
OTHER (Specify)	6	4	2	0	0	0	0
OTHER (Specify)	0	0	0	0	0	0	0
OTHER (Specify)	0	0	0	0	0	0	0
OTHER (Specify)	0	0	0	0	0	0	0
TOTAL WEIGHTED SCORE	72	62	68	0	0	0	0

The lower score; the more ideal



APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

Step 1: Risk Analysis and Probability Determination Continued...

PROBABILITY OF A POR/COA ACHIEVING RESPONSE OBJECTIVES

The probability table (far right) is completed based on the common situational and operational picture fostered by collaboratively completing the vessel requirements and POR/COA suitability table (above) using situational information, expert opinion and local knowledge.

The lower the probability of the situation escalating, the better the POR/COA.

A probability score can be slightly adjusted for a particular POR/COA whereby it could - or conversely could not - effectively manage the vessel and mitigate consequences. For example, rating 0.5 changed to 0.4 in the case where a POA/COA is slightly more probable (likely) to improve the situation.

Likelihood of Situation Escalating

Under existing and expected conditions (e.g., vessel integrity, sea conditions, mitigation measures, etc.) with a given POR or a COA (e.g., beach, repair in place, etc.) the situation will escalate (become worse) with:

Highly Probable... A 90% or greater certainty
 Probable A 75% certainty or greater
 Equally Probable .. A 50% certainty or greater
 Unlikely A 25% certainty or less
 Improbable A 5% certainty or less

THE LOWER THE SCORE, THE BETTER THE POR/COA

POR/COA OPTIONS	Probability Score of Situation Escalating
Place of Refuge A	0.15
Place of Refuge B	0.1
Place of Refuge C	0.15
Repair in Place	
Go Offshore	
Beaching	

15% probability (likelihood) of making the situation worse

IMPORTANT: The probability scores are retained throughout the risk calculation, but the POR/COA options might be modified by health and safety concerns, ecological, historical, cultural resource impacts, and economic activity interruptions.

APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

Step 2: Human Health and Safety

Human Health and Safety Considerations Ranking:

- 4. No Concerns** (e.g., No expected threat to human health and safety)
- 8. Minor Concerns** (e.g., Potential for minor injuries and/or noxious (chronic) exposures to contaminated air/water/land)
- 16. Significant Concerns** (e.g., Potential for mortalities, serious injuries, hazardous (acute) exposures to contaminated air/water/land)

WEIGHTING OF HUMAN HEALTH AND SAFETY BY GROUP TYPE

Every person is of equal importance whether they are a community resident, a responder, or crew member. However, each group can have different mitigation measures and options to protect their health and safety. The weighting score reflects the level of protection/options available, such as a community having the ability to shelter in place (i.e., stay indoors) and/or evacuate for adverse air quality, crew and responders having haz/mat personnel protective equipment to manage the vessel and its cargo. Weighting scores for mitigation of threats to human health and safety are:

- 8 Low Mitigation** (e.g., No or few health and safety measures/options available)
- 4 Medium Mitigation** (e.g., Marginal health and safety measures/options that available)
- 2 High Mitigation** (e.g., Adequate health and safety measures/options readily available)

INPUTS

GROUP TYPE	Consequence Score for each POR and COA						WEIGHT
	POR A	POR B	POR C	Repair In Place	Go Offshore	Beaching	
General Population	4	4	8				4
Response Personnel	4	4	4				4
Vessel Crew	4	4	4				4
TOTAL # GROUP TYPES CONSIDERED (default is 3)	3						

CALCULATION AND INITIAL WEIGHTED SCORES

GROUP TYPE	Weighted Score for Each POR and COA					
	POR A	POR B	POR C	Repair in Place	Go Offshore	Beaching
General Population	16	16	32	0	0	0
Response Personnel	16	16	16	0	0	0
Vessel Crew	16	16	16	0	0	0
Weighted and Averaged Total (The lower the score, the safer the situation with mitigation availability)	16	16	21	0	0	0

The lower the score, the safer the situation with mitigation availability



APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

Step 3: Ecological and Cultural Values

Ecological and cultural value rankings:

2 No Impact (e.g., No exposures from cargo/fuel loss, debris/wreckage, fire, or beaching). For "oil sensitivity" - if no risk of a heavy oil entering the environment.

4 Minimal Impact (e.g., Low resource vulnerability and sensitivity, local-scale (<10 km), short duration consequence (day/week), no significant impacts on populations, good resource remediation and restoration potential). For "oil sensitivity" - if the dominant sensitivity score is very low or low.

8 Moderate Impact (e.g., Moderate resource vulnerability and sensitivity, regional-scale (<50 km), moderate duration consequences (weeks/month), minor impact on populations (e.g., consider population size and its recovery, remediation and/or recruitment potential). For "oil sensitivity" - If the dominant sensitivity score is moderate.

16 Serious Impact (e.g., High resource vulnerability and sensitivity, regional/provincial scale (>50 km), long-term (months/year) duration consequence, significant impacts on populations (e.g., consider population size and its recovery remediation and/or recruitment potential.) For "oil sensitivity" - If the dominant sensitivity score is high or very high.

Ecological and Cultural Values	Raw Consequence Rankings for each POR/COA						WEIGHT
	POR A	POR B	POR C	Repair in Place	Go Offshore	Beaching	
Ecological Values							
Listed Species of Conservation Concern	8	4	4				16
Birds (non-listed)	8	4	8				8
Marine/coastal mammals (non-listed)	8	4	4				8
Fish and invertebrates (non-listed)	8	8	8				8
Marine/coastal plants (non-listed)	8	8	4				8
Other important natural resources considerations	4	4	8				8
Other (specify)							
BC Shorezone Sensitivity Mapping (Bunker C/Heavy Oil)	16	8	4				8
BC Shorezone Sensitivity Mapping (Diesel/Light Oil)							
TOTAL # ecological values considered (default is 8)	7						
Cultural Values							
Culturally Important Areas (non-harvest):	8	8	8				8
Culturally Important Areas (harvest):	16	8	16				16
Designated Archaeological / Historical Site							
Undesignated Archaeological / Historical Site							
Other (specify)							
Other (specify)							
TOTAL # cultural values (default is 3)	2						

WEIGHTING ECOLOGICAL AND CULTURAL VALUES

Weightings:

16 High Importance
8 Moderate Importance
4 Low Importance
2 No Importance

APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

Step 3: Ecological and Cultural Values Continued...

Weighted Consequence for Each COA						STEP 3 of 4: Ecological and Cultural Values	
POR A	POR B	POR C	Repair in Place	Go Offshore	Beaching		
Ecological Values						<p>The protection of natural, resources and cultural values are important to coastal community's well-being and livelihood. These resources can also have national and international significance (e.g., presence of designated species at risk or important cultural sites). If harmed or damaged, they may not be replaceable through natural (ecological) recruitment, or by restoration and remediation efforts. Unlike a vessel, natural, historical and cultural resources are not insured once lost - often only prevention and mitigation measures are paid for from vessel casualty/spill compensation regimes.</p> <p>The weighted scores for natural, historical, and cultural resources can support or deny a POR/COA recommendation.</p>	
128	64	64	0	0	0		
64	32	64	0	0	0		
64	32	32	0	0	0		
64	64	64	0	0	0		
64	64	32	0	0	0		
32	32	64	0	0	0		
0	0	0	0	0	0		
128	64	32	0	0	0		
0	0	0	0	0	0		
544	352	352	0	0	0	TOTAL WEIGHTED SCORES (Ecological Values)	
78	50	50	0	0	0	TOTAL AVERAGED WEIGHTED SCORES (Ecological Values)	
Cultural Values							
64	64	64	0	0	0		
256	128	256	0	0	0		
0	0	0	0	0	0		
0	0	0	0	0	0		
0	0	0	0	0	0		
0	0	0	0	0	0		
0	0	0	0	0	0		
320	192	320	0	0	0		TOTAL WEIGHTED SCORES (Cultural Values)
160	96	160	0	0	0		TOTAL AVERAGED WEIGHTED SCORES (Cultural Values)
WEIGHTED AND AVERAGED TOTAL SCORES FOR ECOLOGICAL AND CULTURAL VALUES							
119	73	105					

The lower the score, the more ecologically and culturally preferred



APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

Step 4: Social and Economic Values

Social and economic value rankings:

- 2 No Impact** (e.g., No exposures from cargo/fuel loss, debris/wreckage, fire, or beaching)
- 4 Minimal Impact** (e.g., Low vulnerability and sensitivity, local scale (< 10 km), short duration consequence (day/week), good resource remediation and restoration potential)
- 8 Moderate Impact** (e.g., Moderate vulnerability and sensitivity, regional scale (< 50 km), moderate duration consequences (weeks/month), marginal resource remediation and restoration potential)
- 16 Serious Impact** (e.g., High vulnerability and sensitivity, regional/provincial scale (> 50km), long-term (months/year) duration consequence, no remediation and restoration potential)

WEIGHTING OF SOCIAL AND ECONOMIC VALUES

Weighting is based on the relative importance beginning from a local (community), regional and then to provincial/international level. Weighting scores:

- 8 High Importance**
- 4 Moderate Importance**
- 2 Low or No Importance**

Social and Economic Impacts - raw score	POR A	POR B	POR C	Repair in Place	Go Offshore	Beaching	WEIGHT
Maritime commerce and shipping	2	2	2				2
Commercial fishing and aquaculture	4	4	8				8
Recreational fishing and marine tourism	8	4	4				8
Other (specify)							
Other (specify)							
TOTAL # Social and Economic Impact Categories (default is 3)	3						

APPLICATION OF THE RISK-BASED DECISION SUPPORT TOOL

Step 4: Social and Economic Values Continued...

Economic Impacts - weighted score	POR A	POR B	POR C	Repair in Place	Go Offshore	Beaching
Maritime commerce and shipping	4	4	4	0	0	0
Commercial fishing and aquaculture	32	32	64	0	0	0
Recreational fishing and marine tourism	64	32	32	0	0	0
Other (specify)	0	0	0	0	0	0
Other (specify)	0	0	0	0	0	0
WEIGHTED AND AVERAGED TOTAL	33	23	33	0	0	0

The lower the score, the better the social and economic consequences

APPLICATION OF RISK-BASED DECISION: SUMMARY OF COMBINED SCORES

Summary

TABLE 1 - Consequence Scores: shows the modeled probability (likelihood) for each Place of Refuge (POR) option, as well as Course of Action (COA), and then the relative level of consequences related to health and safety concerns, natural, historical and cultural resource impacts, and economic activity intrusions.

The lower the score, the lower the consequences

15% probability
(likelihood) of making
the situation worse

POR A Egregia Bay

POR B Virago Bay

POR C McIntyre Bay

TABLE 1	Consequence Scores			
	Probability Score	Health and Safety	Ecological and Cultural	Socio-Econ Impacts
Place of Refuge A	0.15	16	119	33
Place of Refuge B	0.1	16	73	23
Place of Refuge C	0.15	21	105	33
Repair in Place	0	0	0	0
Go Offshore	0	0	0	0
Beaching	0	0	0	0

10% probability
(likelihood) of making
the situation worse

APPLICATION OF RISK-BASED DECISION: SUMMARY OF COMBINED SCORES

Summary Continued...

TABLE 2 - Risk by Consequence Type: shows the modeled total risk for each Place of Refuge (POR) option, as well as Course of Action (COA) for each consequence type.

The lower the score, the lower the risk

TABLE 2		Risk by Consequence Type				
	Probability Score	Health and Safety	Ecological and Cultural	Socio-Econ Impacts	Total Risk	
POR A Egregia Bay	Place of Refuge A	0.15	2	18	5	25
POR B Virago Bay	Place of Refuge B	0.1	2	7	2	11
POR C McIntyre Bay	Place of Refuge C	0.15	3	16	5	24
	Repair in Place	0	0	0	0	0
	Go Offshore	0	0	0	0	0
	Beaching	0	0	0	0	0

Most preferred recommendation based on lowest risk score*

THE SUMMARY IS PROVIDED TO COMMAND WITH A RECOMMENDATION AND INCLUDES SUPPORTING ATTACHMENTS/DOCUMENTATIONS AND A SIGN-OFF/ENDORSEMENT BY CONTRIBUTORS.

* Decision makers must consider each category individually for consequences and risks, not just focus on the lowest score, and then be able to ascertain the main “drivers” – e.g., safety, ecological, commercial or other factors considered – to support a recommendation.