Marine Mammal Oil Spill Response Protocol

Prepared For

Western Canada Marine Response Corporation

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Preface

This Marine Mammal Oil Spill Response Plan (MMOSRP) has been developed to integrate into the Western Canada Marine Response Corporation (WCMRC) wildlife response protocols for an oil spill response on the British Columbia (BC) coast. The intent of this MMOSRP is to build preparedness capacity on the BC coast by defining a standard for marine mammal response that uses Incident Command System to drive process.

This MMOSRP articulates the marine mammal species of BC and important or sensitive areas, marine mammal response objectives, strategies and tactics, response closure and next steps. Within this framework, details for a Rapid Response Network are defined to provide initial marine mammal reconnaissance and assessment as this is a critical component of an effective wildlife response.

An integrated wildlife response involving oil spill response professionals, wildlife professionals, local rescue organizations, environmental groups and government agencies is key to a successful oiled wildlife response (OWS 2014). This MMOSRP defines how all of these groups can work together in order to achieve a cohesive, coordinated and maximally effective response for marine mammals in BC.

Since BC is bordered by Washington and Alaska, there may be cases where international cooperation and permitting are required for the marine mammal response, particularly if a spill becomes trans-boundary or if oiled animals cross the international border between Canada and the United States. In the United States, marine mammals fall under the jurisdiction of the National Oceanic and Atmospheric Administration (NOAA). In this case, the response would fall under the Canada-US Joint Marine Pollution Contingency Plan (GOC 2018). In addition, British Columbia belongs to the Pacific States/British Columbia Task Force on Oil Spills (http://www.oilspilltaskforce.org/), the province could be called upon to participate in an incident that has or could result in an oil spill harming the environmental resources of another members' jurisdiction or one that threatens another jurisdiction including: Alaska, Washington, Oregon, California, and Hawaii (BCMOE 2007). In these events, this MMOSRP can also provide guidance for marine mammal response strategies and resources.

In the United States, the first comprehensive set of oil spill response guidelines were formalized in 2006 (Johnson and Ziccardi, 2006). The *Macondo 252/Deepwater Horizon* Spill in 2010 was the first significant oil spill to utilize these guidelines as the blueprint for how to organize the response to oiled marine mammals. From this incident, a revised document was prepared based on lessons learned and other relevant sources of information (Ziccardi et al 2015). This MMOSRP integrates response protocols and best practices learned from other areas, such as the Deepwater Horizon Incident, while incorporating BCs unique ecology, species assemblage and operating environment.

As it has been demonstrated that the most effective wildlife plans are those which ensure key stakeholder groups are consulted and play a role (IPIECA 2014), this MMOSRP was drafted and shared with a broad spectrum of stakeholders early in its development through an interactive workshop. The workshop was held at the WCMRC facility in Vancouver, with Sea View Marine Sciences. Participants included representatives from Fisheries and Oceans Canada, the Vancouver Aquarium/Ocean Wise, Marine Mammal Rescue, Oiled Wildlife Society, Port of Vancouver, Porpoise Conservation Society, Focus Wildlife, Eagle Wing Tours, Wild 4 Whales Foundation, and the BC Animal Health Centre.

This MMOSRP was developed as a contribution to the capacity building efforts for oil spill response on the BC coast and to provide a foundation for the coordination and communication related to marine mammals during a response. Due to the complex nature of oil spill responses in Canadian waters, an effective wildlife response is both multi-faceted and inter-disciplinary. A response would include the Canadian Coast Guard (CCG) - the lead federal agency of Canada's Marine Oil Spill Preparedness Response Regime (DFO 2009), Fisheries and Oceans Canada (the federal agency responsible for marine mammals and ocean contamination), the BC Ministry of the Environment (lead provincial coordinating agency for marine oil spills in BC), Environment and Climate Change Canada (ECCC), Transport Canada (TC), First Nations, WCMRC, and marine mammal rehabilitation experts, veterinarians and marine mammal observation professionals.

As it has been found that there is no direct correlation between the amount of oil spilled and the number of wildlife casualties (IPIECA 2014), this MMOSRP was developed as a guiding document for marine mammals and marine mammal related resources in the province without relating to the size of a spill. The MMOSRP overarching goal is that in the event of an oil spill on Canada's west coast, marine mammal response can be implemented such that negative effects to marine mammals are minimized and the needs and mandates of each of the participating groups can be met. This MMOSRP is intended to provide a framework for response protocols, field techniques, and communication structure.

This MMOSRP is not intended as a reference for recovery and rehabilitation of marine mammals, as this requires the professional care provided at designated facilities by marine mammal rehabilitation experts and veterinarians. These resources are however identified in the MMOSRP.

This MMOSRP is a baseline and living document that will be subject to revisions as new information becomes available through exercises, spill responses and best practices from academia and other accredited resources.

Intended Audience

The MMOSRP is to be used by those who could be involved in a marine mammal or oil spill response on the BC coast. This could include, but is not limited to the following:

- Private industry
- First Nations
- Response organizations
- Wildlife rescue and rehabilitators
- Government regulators – ECCC, TC, CCG, BCMOE, Local Governments
- Independent contractors and professionals
- Non-Governmental Organizations

Regulatory Authority, Legislation and Spill Reporting Government Contacts

In Canada, marine mammals and marine turtles are included in the definition of fish in the federal *Fisheries Act*. Marine mammals are specifically protected under the *Marine Mammal Regulations* of the *Fisheries Act*. In addition, some species are also protected under the *Species At Risk Act* (SARA). These legislative documents protect marine mammals from disturbance, injury or mortality, as well as protecting the habitat of those which are listed under SARA.

In British Columbia environmental emergency prevention, preparedness and response is legislated both provincially and federally. The pertinent provincial legislation is the BC Environmental Management Act (BC Government 2018). As of October 30, 2017, the Division 2.1 Spill Preparedness, Response and Recovery of the *Environmental Management Act* came into force with three new regulations: (1) Spill Preparedness, Response and Recovery Regulation; (2) Spill Reporting Regulation; and, (3) Spill Contingency Planning Regulation (BC Government 2018b).

The pertinent federal legislation that pertains to spills in the marine environment includes: the Canada Shipping Act (CSA), the Marine Liability Act, Fisheries Act, Migratory Birds Convention Act, Canadian Environmental Protection Act, Transportation of Dangerous Goods Act, and the Canada Oil and Gas Operations Act (BC Government 2018c). In Canada, marine mammals are under the regulatory oversight of Fisheries and Oceans Canada (DFO).

In BC, there are 25 species of marine mammals ranging from the common harbour seal (*Phoca vitulina*) to the rarely observed Stejneger's beaked whale (*Mesoplodon stejnegeri*) that occupy a range of niches from the coastal inshore waters, to the deep waters west of the continental shelf. DFO has a formalized Marine Mammal Response Program in BC, with trained federal personnel and public volunteers across the province that can assist if marine mammals are in distress. This program recognizes that marine mammals can be affected by a wide range of human activities including:

- fishing activities,
- marine traffic,
- noise,
- coastal development, and
- pollution (DFO 2018).

The Pacific Region Marine Mammal Contacts which include the Marine Mammal Response Program of BC are in Table 1.

Table 1. DFO Pacific Region Marine Mammal Contact Names, Positions and Phone Numbers.

Name	Position	Contact
Paul Cottrell	Marine Mammals Coordinator, Pacific Region DFO Marine Mammal Response Program	1-604-666-9965
Annely Greene	Marine Mammal Program Manager DFO	1-604- 666-0071
Patricia DeMille	North Coast / Haida Gwaii Area Contact	1-250-627-3085
Stefan Beckman	Victoria Area Contact	1- 250-363-3252
Carlos Paramio	Campbell River Area Contact	1- 250-850-5708
Paul Preston	West Coast Vancouver Island Area Contact	1- 250-720-8941
Ken Green	Vancouver / Lower Mainland Area Contact	1- 604-664-9251

DFO maintains the current list of marine mammal program and area contacts at: http://www.dfo-mpo.gc.ca/fm-gp/mammals-mammiferes/contacts-eng.html.

Spill Reporting Contacts

The BC provincial government provides access to mobile phone applications (apps) for reporting of spills. Links to these apps are provided at: https://www2.gov.bc.ca/gov/content/environment/air-land-water/spills-environmental-emergencies/report-a-spill.

In BC, Spills or other Environmental Emergencies can be reported to: 1-800-663-3456

Marine spills in international waters can be reported to:

1-800-OILS-911 (1-800-6457-911)

In addition, the federal government provides a number of contacts for reporting an oil spill in British Columbia. All pollution, or threats of pollution in the Marine Environment must be reported.

The federal reporting number is 1-800-889-8852 or contact any Coast Guard Marine Communications and Traffic Service (MCTS) at:

- **Comox MCTS: 250-339-3613**
- **Prince Rupert MCTS: 250-627-3074**
- **Vancouver MCTS: 604-666-6011**
- **Victoria MCTS: 604-363-6611**
- **Marine Channel 16 VHF.**

When calling in a Spill Report, you will be asked for following information:

- Your name
- Telephone number
- Location of the spill
- Quantity of the spill
- Type of product spilled
- The on scene weather (CCG 2018).

Introduction to Spill Response on the West Coast of Canada

As previously alluded to, spill response on the west coast of Canada consists of a complex legislated relationship between government, industry, First Nations and a Response Organization, such as WCMRC. The following sections are intended to introduce WCMRC and provide the background spill response knowledge necessary to use, interpret and implement the MMOSRP.

Western Canada Marine Response Corporation (WCMRC) Background

WCMRC is the only designated Response Organization (RO) on the west coast of Canada. It is designated and regulated by Transport Canada under the Canada Shipping Act, 2001 (CSA, 2001) – Response Organization and Oil Handling Facilities Regulations. WCMRC is certified to the highest recognized standard, with the ability to handle a 10 000+ tonne spill.

The CSA (2001) mandates that all tankers over 150 gross tons, vessels other than tankers over 400 gross tons and oil handing facilities loading/unloading product have a membership with a designated RO. As of the time of writing, WCMRC is the only federally certified response organization on the BC coast and therefore provides province-wide spill response services. As a result WCMRC has response personnel and resources on 24/7 stand-by in strategic locations along the BC coast (Figure 1).

WCMRC started as a small co-op in 1976 servicing only the Burrard Inlet. It has since grown to be where it is today, having responded to over 750 spill incidents and supported internationally recognized responses such as the Exxon Valdez and the BP Deepwater Horizon incident.

WCMRC Geographic Area of Response (GAR)

WCMRC's Geographic Area of Response (GAR) includes navigable in-land waters and coastal waters of BC extending out to the Exclusive Economic Zone (EEZ), 200 nautical miles offshore. The GAR includes four response areas: the Designated Port, Primary Area of Response (PAR), Enhanced Area of Response (ERA) and the ambiguous area Inside the GAR, but Outside the PAR/ERA (Figure 2). These areas are explained in detail below.

- **Designated Port:** The Port of Vancouver, due to the large volume of product handled, high traffic density and small navigation corridors, is deemed as a site of considerable risk and therefore a designated port under the CSA. As a result, WCMRC has a dedicated equipment package for the Port of Vancouver, which under no circumstances, unless authorized by TC, will be re-directed to another part of the coast or project. WCMRC is required to have equipment deployed and on scene within 6-12 hours following an incident in this area.
- **Primary Area of Response (PAR):** This is the area outside of the designated port, but with traffic that is in transit to the designated port. The CCG requires WCMRC to be able to mobilize response assets to the area within a designated amount of time. WMCRC is required to have equipment deployed and on scene within 18-72 hours.
- **Enhanced Area of Response (ERA):** Marine areas not covered under the above two designations, but still with a higher risk of oil spills due to traffic convergence and volume of shipping were identified as ERAs. WCMRC is required to have equipment deployed and on scene within 18-72 hours.

- **Inside GAR, Outside PAR/ERA:** In this area WCMRC is still required to respond, however the response times increase to include travel time. In this area WCMRC is required to have equipment deployed and on scene within 18-72 hours, plus travel time.

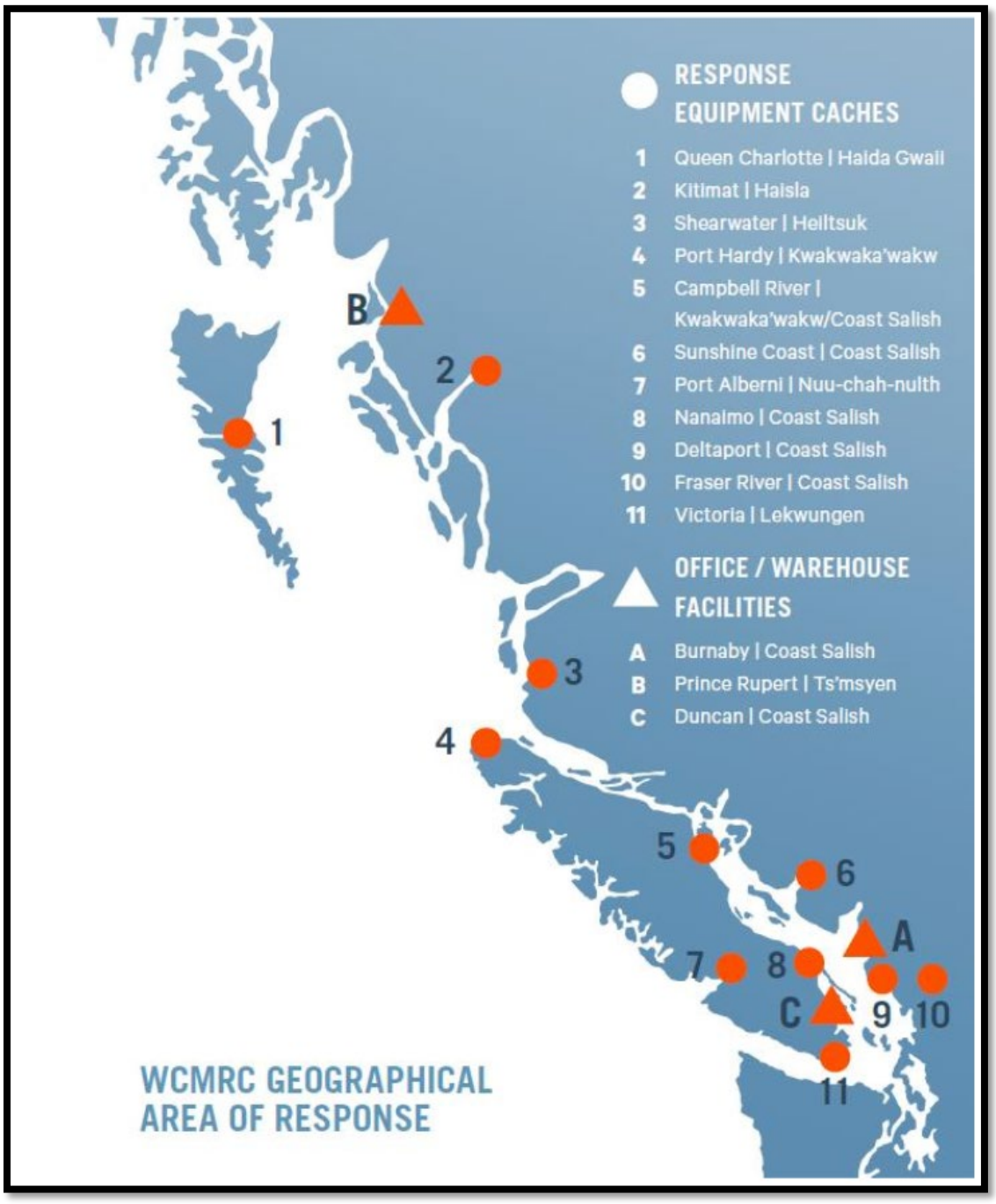

Figure 1. WCMRCs Geographic Area of Response (GAR) and response bases and equipment

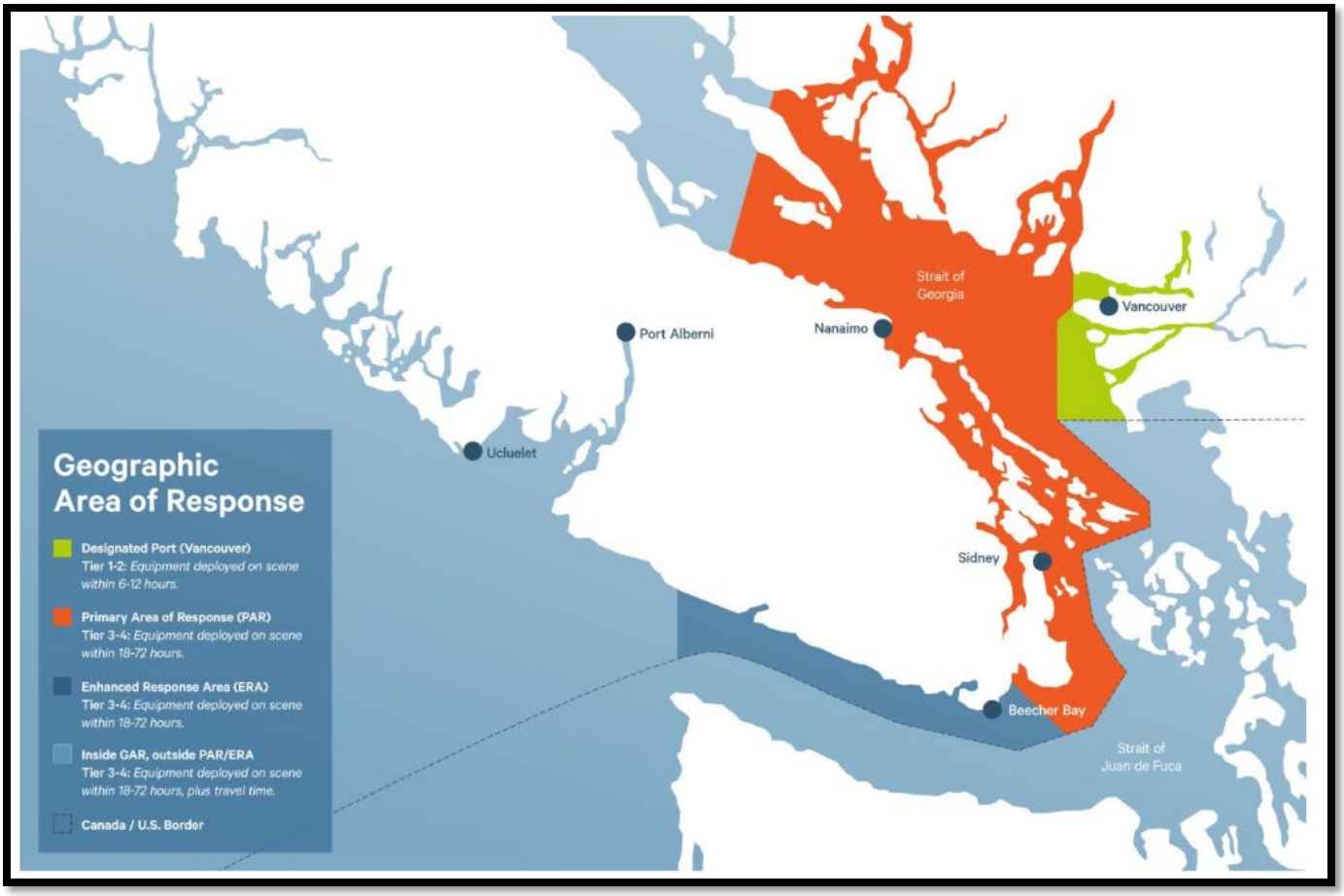

Figure 2. WCMRCs response zones within the GAR. All area outside of the GAR and not pictured here fall in-to the Inside GAR and Outside PAR and ERA zones.

Roles and Responsibilities

The Polluter Pays Model

In accordance with the CSA (2001), the Responsible Party, defined in legislation and herein as *the Polluter*, is required to clean up all product spilled, and within reason return the environment to its previous state. The polluter is obligated to report an incident to the appropriate government officials and take command of clean-up activities. The first step typically, is that the polluter notifies the CCG and then activates WCMRC to respond.

The CCG, WCMRC, and the polluter then scale up the response according to the size of the incident and align objectives, personnel and resources using the Incident Command System (see **Incident Command System** below).

Typically the CCG acts in an advisory and monitoring role although is capable of responding to smaller spills if required. Through its Environmental Response Program, the CCG ensures ship sourced spills of oil and other pollutants are cleaned by: (a) monitoring clean-up efforts by polluters, and (b) managing clean-up efforts when polluters are unknown, unwilling or unable to respond to a marine pollution incident.

In addition to CCG, there are a number of other government agencies involved during a spill response. Each of these groups are explained below.

Transport Canada (TC)

Transport Canada is the lead agency responsible for regulating the National Oil Spill Preparedness and Response Regime. This consists of developing and enforcing regulations written in the *Canada Shipping Act* (CSA, 2001) and the *Marine Liabilities Act* (S.C. 2001. c.6) that pertain to Oil Handling Facilities and Response Organizations. TC ensures that WCMRC's response plan is up-to-date and that WCMRC is adequately prepared to respond to an incident up to 10,000 tonnes.

Fisheries and Oceans Canada (DFO)

The Department of Fisheries and Oceans (DFO) is the lead regulatory agency responsible for protecting aquatic resources and marine mammals in Canada. DFO is mandated by the *Fisheries Act* (1985), which includes the *Marine Mammal Regulations* (MMR). DFO offers scientific support to the incident federal monitoring officer (CCG in their oversight role) as well as issues permits to allow wildlife rehabilitators to capture, clean and release oiled marine mammals. The *Marine Mammal Regulations* (MMR) specifically state, that individuals are strictly prohibited from disturbing marine mammals, except when the individual or organization is authorized to do so by license or aboriginal authority. As of the time of writing, the Marine Mammal Coordinator in the Pacific Region is Paul Cottrell (Table 1).

Environment and Climate Change Canada (ECCC)

Similar to DFO, ECCC provides scientific support to the response through the science table, the NEEC (National Environmental Emergencies Center) and the Environment Unit. The primary role of NEEC is to provide unique technical and scientific environmental advice and assistance to the lead agency in the event of an environmental emergency, such as an oil spill. Additionally, the ECCC helps to identify the environmental protection priorities and provide advice on ways to reduce the pollution's impact on the environment. This can include weather forecasts, location of wildlife and sensitive ecosystems, and expertise on spill countermeasures and remediation options.

Incident Command System (ICS)

How each of the aforementioned groups coordinates during a response is defined by the ICS. The ICS is a systematic tool and standardized approach to establish command, control and coordination during an emergency response. It provides a common hierarchy within which responders from multiple agencies can seamlessly integrate to achieve a common set of objectives. The ICS is scalable, increasing and decreasing in size to meet the incidents complexity and needs. Each of the ICS positions has pre-defined roles, responsibilities and reporting expectations. A typical response ICS org chart is presented in Figure 3. In addition to outlining roles, responsibilities and reports, it also has a very clearly defined span of control. This means that supervisors are never overburdened and only ever have between 3 – 7 direct reports. When this is exceeded a new supervisory position is added, and when it is not met the supervisory position is collapsed. This is how the structure expands and contracts to meet the incidents needs.

In ICS, response personnel are grouped into five sections. The first is Command and Command Staff. This would be the group that is ultimately in charge of the response and responsible for setting the response objectives. In Canada, opposed to having one Incident Commander from the Polluter, there is typically a Unified Command group with representatives from Government – the ECCC and BC MoE, First Nations and the Polluter. Underneath the Command Team (Unified Command) there is the Command Staff. This is where the Information Officer, Safety Officer and Liaison would sit. They would report directly to the Command Staff.

The next major ICS groups are Finance, Logistics, Planning and Operations (Figure 3). Finance is responsible for managing all financial aspects of the response. They will calculate the daily burn rate, send and receive invoices as well as manage spill response personnel's time to ensure they're properly compensated for their work. Finance typically consists of individuals with a strong accounting and administrative background.

The Logistics Section is responsible for ensuring that personnel and equipment are properly procured and managed. In addition to resource/asset management they also ensure that everyone in the response is adequately outfitted for their job duty, fed and housed. Logistics is ultimately the backbone of the operation providing the essential items that responders require to do their job.

The Planning Section is most notably recognized for their ability to maintain the response schedule, as well as complete the daily Incident Action Plan (IAP). The IAP is created each day, signed off by Unified Command and used to carry out the next day's response activities. In ICS once the response evolves out of the emergency, triage phase and into the planned phase, the response is always working one day ahead of operations. The plan is created each day and is used to drive the activities of the following operational period. This is known most commonly as the planning cycle (Figure 4).

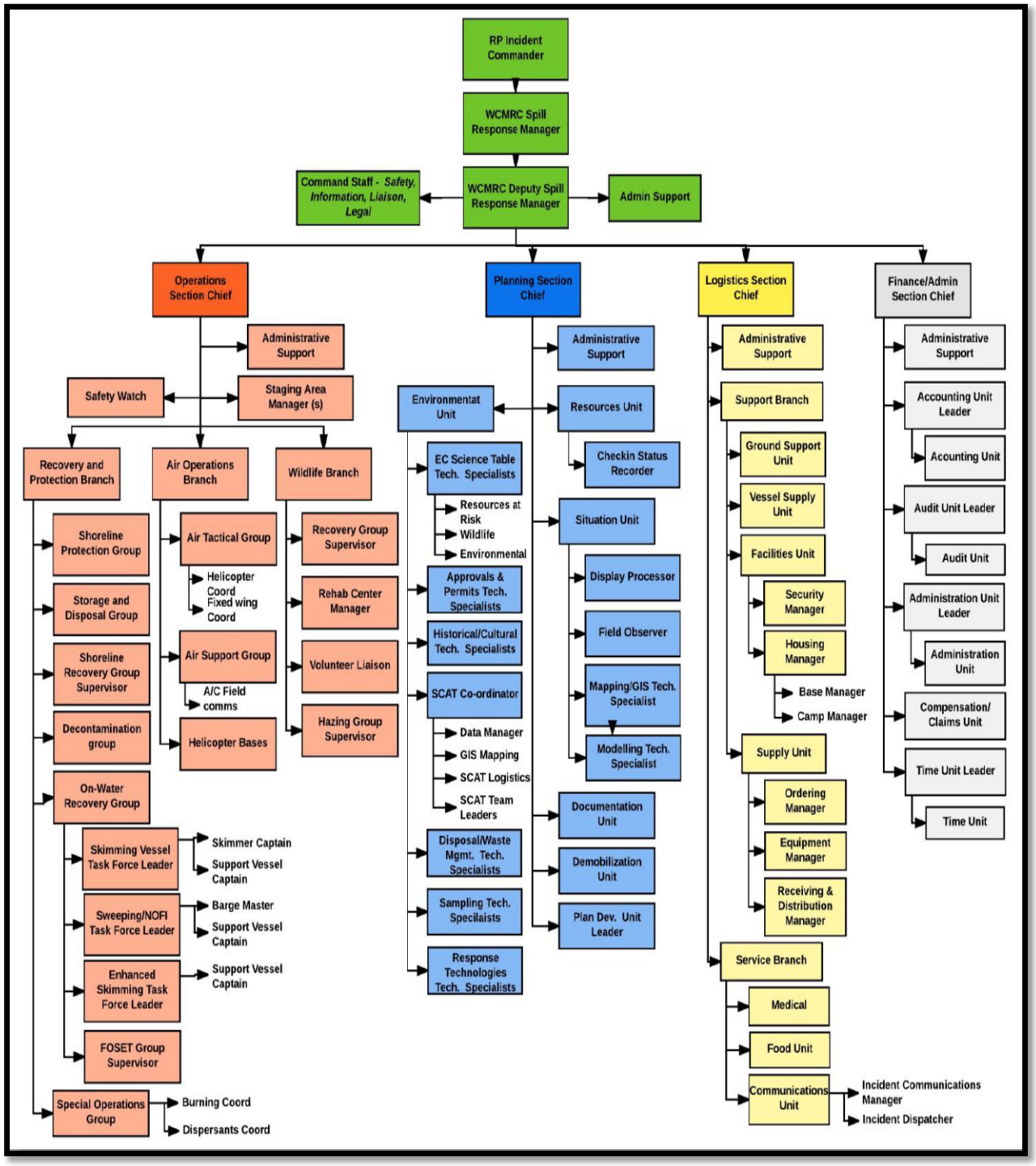

Figure 3. Example of an ICS structure.

At the beginning of the operational period (typically on a 12 or 24 hour cycle), there is a Command Meeting. This is where objectives are set for the next operational period. After this first meeting there is a Command and General Staff Meeting where these objectives are explained to the rest of the spill response staff. With the command objectives in hand, Planning and Operations will determine the tactics that will achieve the objectives set by the Unified Command.

Following this meeting there will be an official Planning Meeting. During this time the Incident Action Plan (IAP), developed throughout the operational period, is reviewed and accepted by all of the section heads (ex. Logistics Section Chief, Finance Section Chief, Operations Section Chief, Planning Section Chief). Once the final IAP has been accepted by each of the Section Chiefs it is presented to Unified Command for final sign off. Once signed off the plan is then passed to Operations, who are briefed on what their work assignments are for the next day.

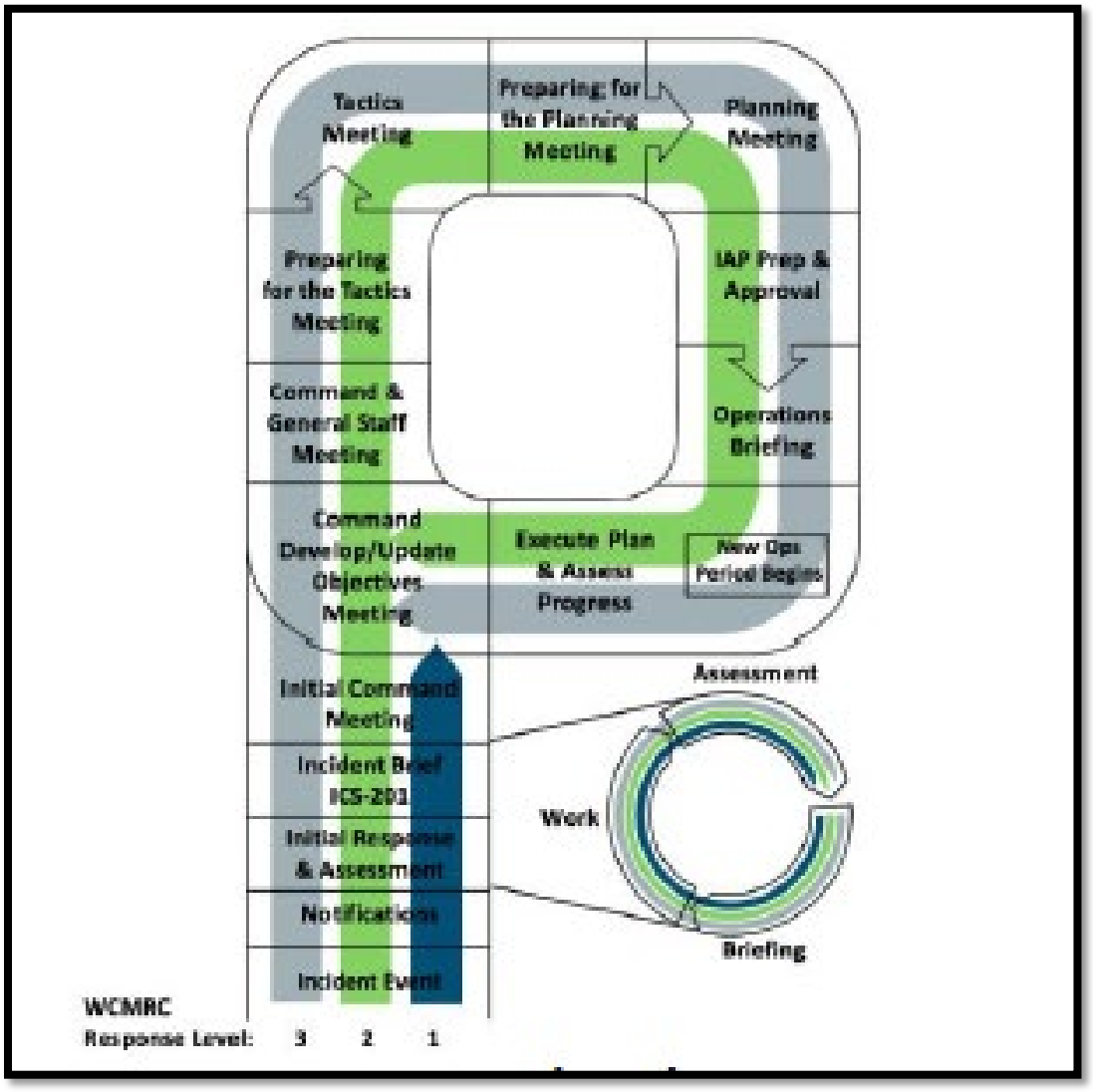

Figure 4. Illustration of WCMRC spill response planning cycle.

In addition to developing the final IAP, the Planning Section also includes the Environment Unit and Situation Unit. The Situation Unit tracks what is happening during the day, while the rest of the Incident Command Staff is looking forward to the next operational period. The Environment Unit is responsible for waste management and permitting, sampling, shoreline clean-up assessment, determining sites of resources at risk, scientific support, technical advice, as well as setting environmental response priorities.

The final group is the Operations Section. Operations is responsible for implementing the tactics outlined in the IAP. Operations is typically broken up into the Recovery and Protection Branch, the Air Operations Branch and the Wildlife Branch. The Recovery and Protection Branch would be responsible for (although not limited to) shoreline protection, on-water recovery, decontamination, waste disposal and storage. The Air Operations Branch provides aerial support for added response visibility. Lastly, the Wildlife Branch is responsible for the capture, rehabilitation, recovery, release, and hazing. Oil spill response as it relates to marine mammals would be under the Wildlife Branch.

Wildlife Branch

The Wildlife Branch, underneath the Operations Section is typically lead by a Wildlife Branch Director. The director is responsible for overseeing the tactical delivery of the wildlife portion of the IAP. The qualifications of this individual will vary for each response. Typically however, it is an individual who is intimately familiar with ICS as well as the regulatory climate of the operating area. In British Columbia, this could be a representative from Canadian Wildlife Service (CWS), DFO, or ECCC, or could be a contractor who has a great working relationship with each of the above mentioned environmental government agencies.

The wildlife branch is guided is via the IAP which is signed off by Unified Command. The IAP will define the wildlife branch organizational structure, operation guidelines, contain permits, species lists, hazing approvals, and capture approvals, etc. This portion of the plan is developed is through collaboration with Wildlife Planning experts in the Planning, Environment Unit and tactical experts in the Operations Wildlife Branch. Daily situation updates received from the field will help to inform the next days' wildlife response activities. Some of the tactical elements included a Wildlife Response Plan, relevant to marine mammals are outlined in this MMOSRP. These include: pre-emptive capture of wildlife, hazing, post oiling capture, stabilization, cleaning, rehabilitation, and release. Where each of these services take place will depend on the response operating environment and accessibility.

A typical organization structure for a wildlife branch can be seen in Figure 5. This is a commonly accepted type of structure, however will vary depending on the needs and complexity of the response. Some positions will collapse, while others may split in order to maintain appropriate span of control.

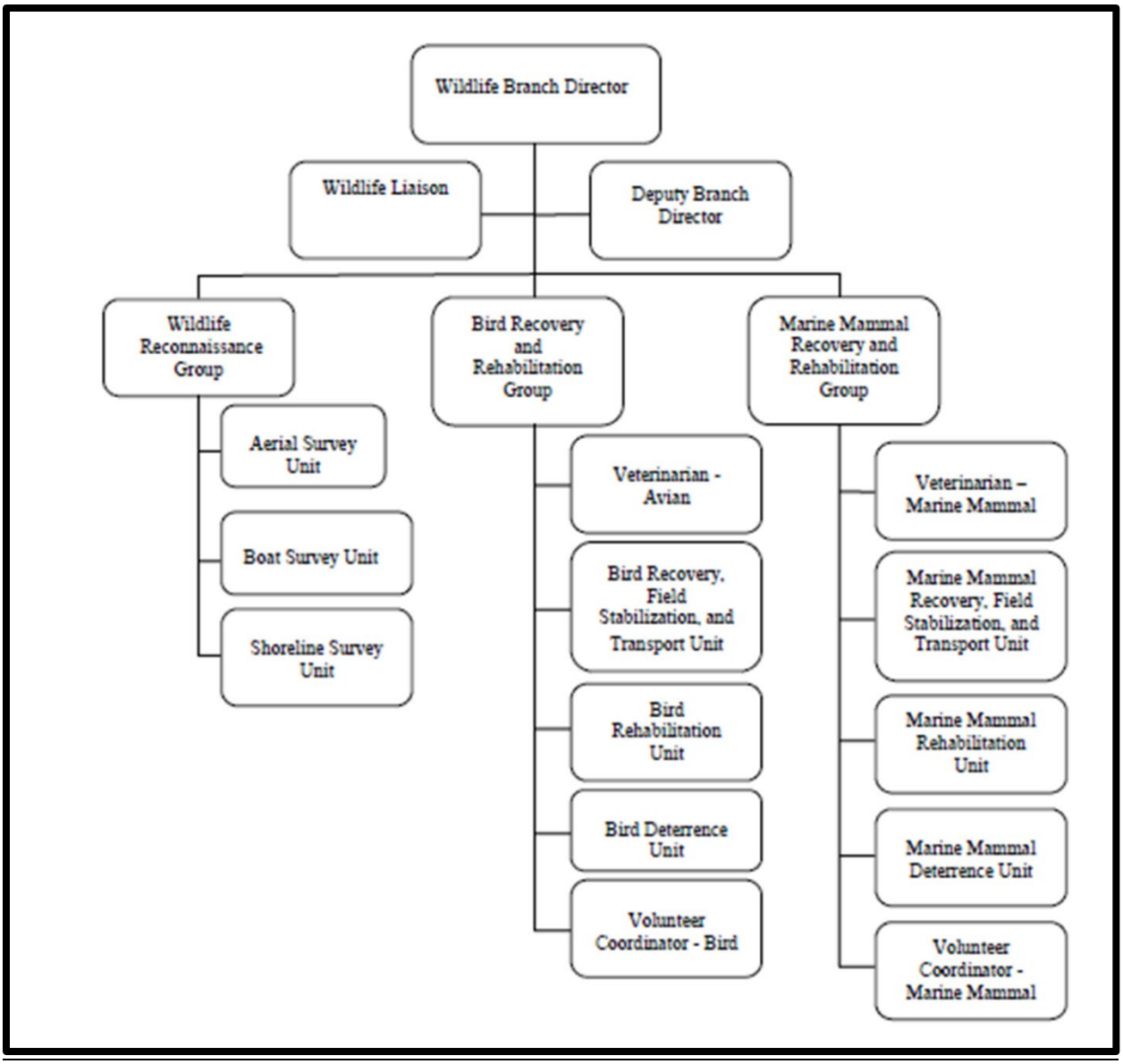

Figure 5. Standard Wildlife Branch Organization Chart.

RESPONSE INITIATION

For a response to be initiated, WCMRC must receive a signed authority to commence work from either the Polluter or the CCG. As written into the Canada Shipping Act (CSA 2001), it is the responsibility of the Polluter to have a membership with an RO on the coast who will respond in a timely manner if an incident were to occur. In order for this to happen, it is critical that the Polluter activate WCMRC immediately after an incident. After WCMRC is activated they then notify, assess and mobilize to the casualty site as quickly as possible.

External spill notifications are the responsibility of the Polluter and therefore WCMRC is not required to make any calls outside of its own organization, except to its contractors and Mutual Aid Partners. As a courtesy, WCMRC will call TC at the outset of each incident.

A high level overview of the notification procedure WCMRC follows is presented in Figure 6. WCMRCs 24/7 Emergency Call Line is the first to receive a call. This is then passed to the Duty Officer. Once the Duty Officer (DO) is notified of the incident they will call the Polluter back to ascertain the incident specifics. After this initial incident information is collected, notifications are made to senior management. Depending on the nature of the incident the DO will then either pass the response command off to a senior WCMRC staff member or begin to mobilize personnel to the site to begin response.

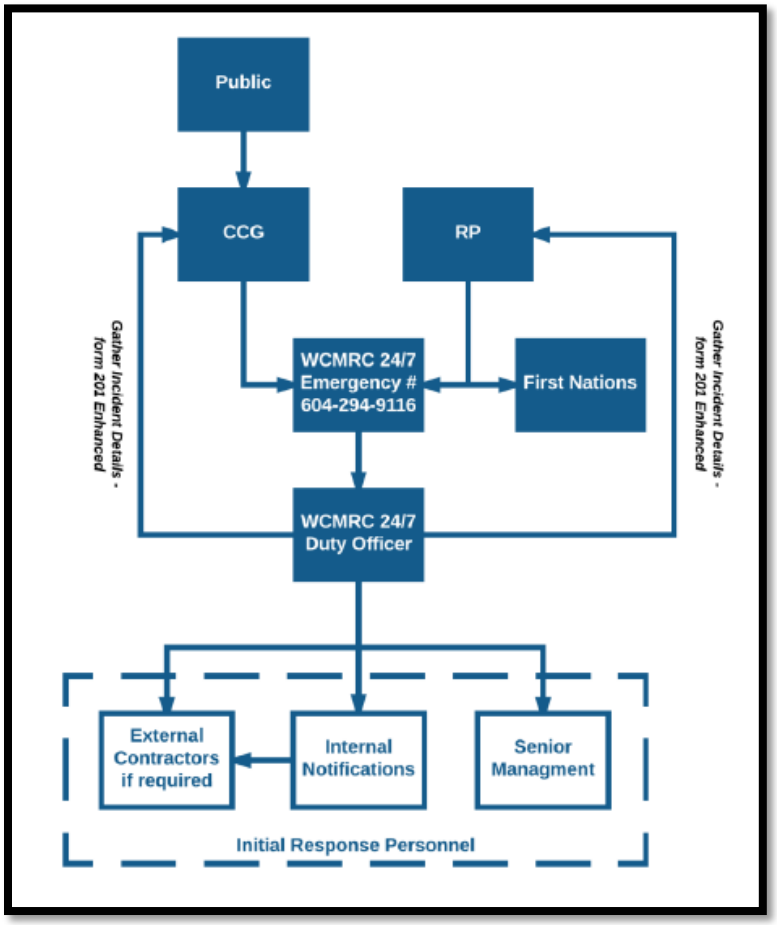

Figure 6. WCMRC Notification Illustration.

Incident Assessment and Mobilization

After the initial call is received and notifications are made the spill is assessed to determine its complexity and consequently the size of response required to remediate the situation. Additional information about this process can be found in WCMRCs Oil Spill Response Plan (WCMRC, 2016). A high level overview is portrayed in Figure 7.

In short, the WCMRC Duty Officer collects as much information as possible, it then assesses the incident information and initiates oil spill modeling based on proposed volumes of product spilled. This will then outline the potential impact extent. Ultimately this information will be used to begin the allocation and mobilization phase of the response, where personnel and assets are mobilized depending on the size of the spill.

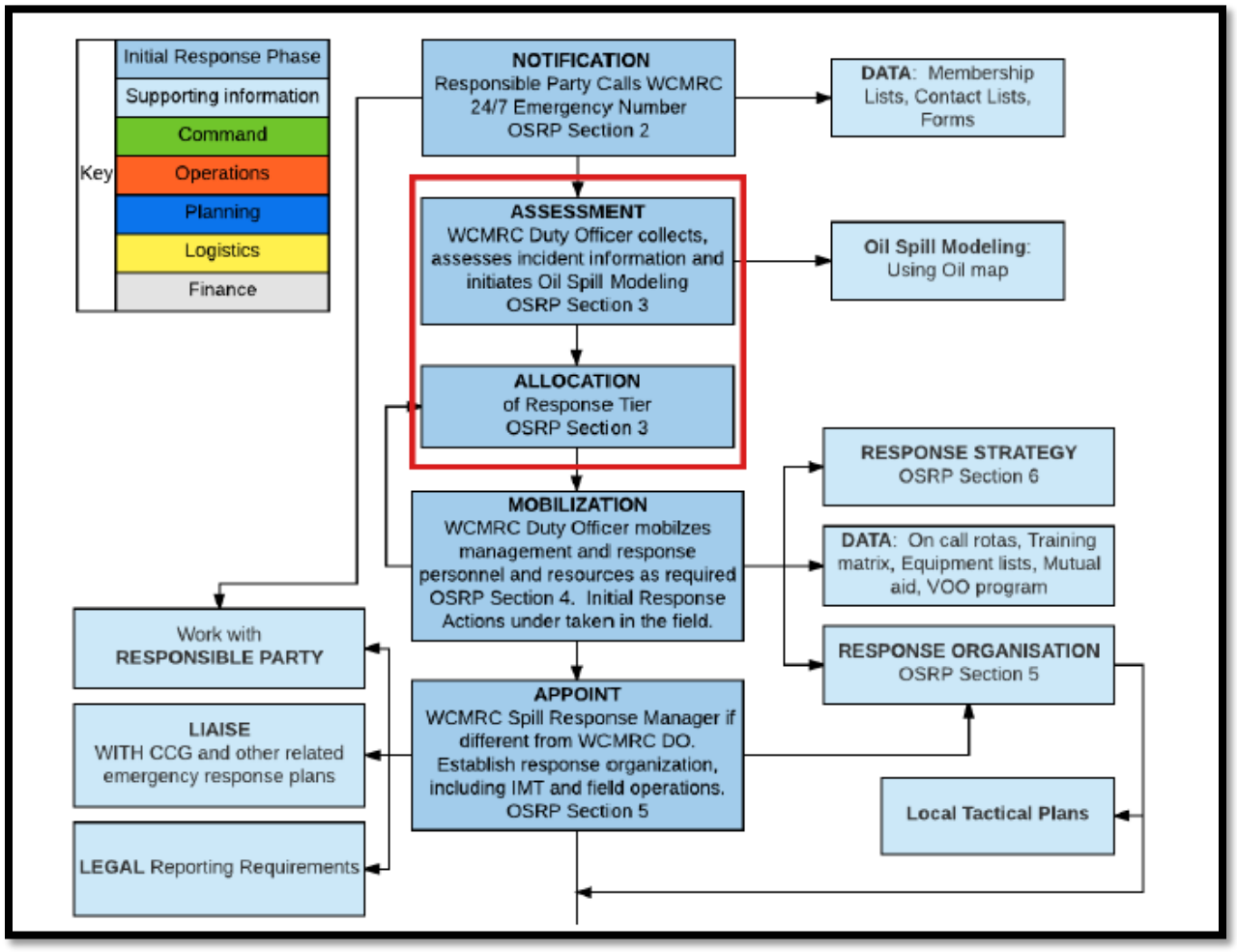

Figure 7. WCMRC Overview of Spill Response Structure.

The next phase of the response is Mobilization, which begins shortly after the Polluter calls. An overview of the process can be seen in Figure 8.

The first phase is the initial mobilization of personnel for an on-scene site assessment, this is followed by aligning response Strategies and Objectives to combat the spill. Once these objectives are set further resources are mobilized to meet the incident objectives. The next section to mobilize is the Logistics Section. This is responsible for managing the movement of personnel and assets to the site, as well as to plan staging areas, location of the Incident Command Post and housing/basic amenities for responders. The next step is to establish the Incident Management Team who will continue to set the response objectives for each operational period. Lastly, the initial incident briefing occurs where incoming personnel are briefed on what has happened to date, define their roles, priorities and communicate any incident objectives/strategies that have already been established.

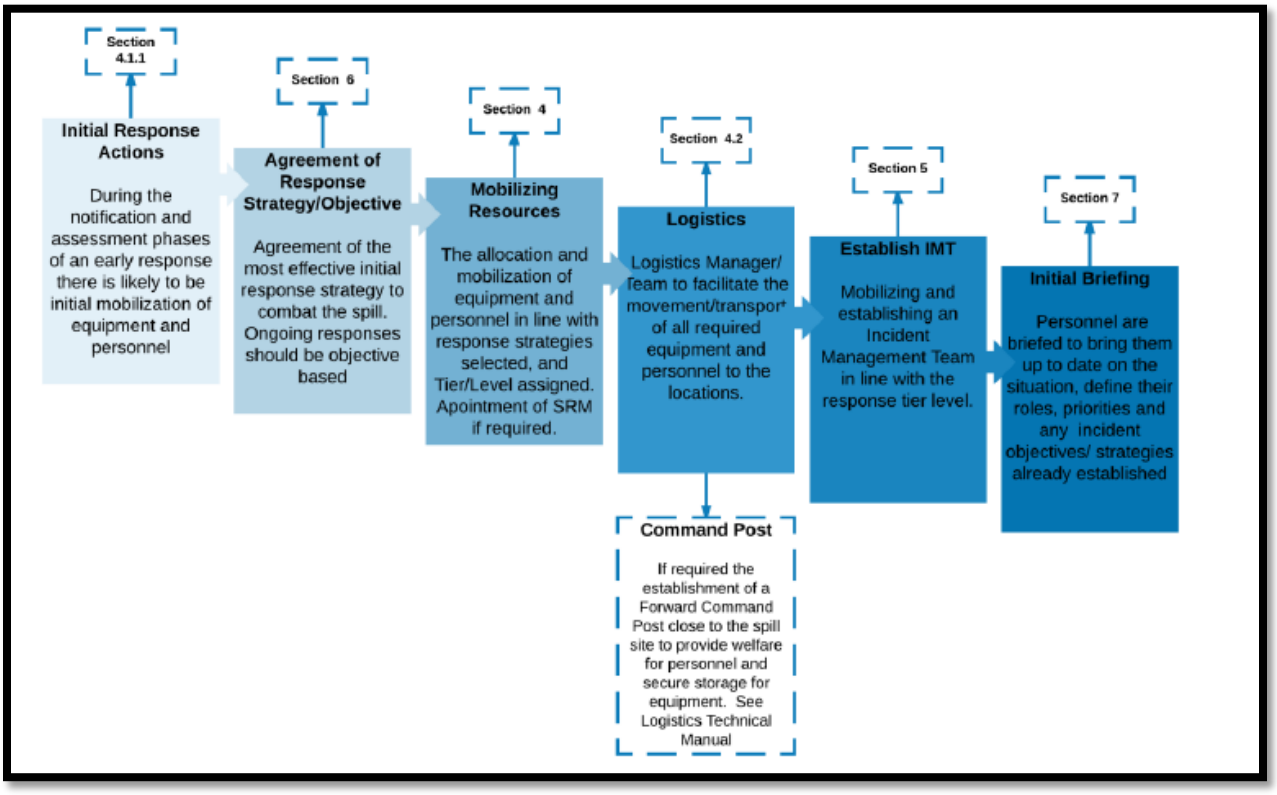

Figure 8. Overview of WCMRC Spill Mobilization Structure.

Spill Response Techniques

WCMRC uses a variety of techniques to respond to oil spills depending on the nature of the incident and operating environment. These consist of un-sheltered water tactics, sheltered water tactics and shoreline protection. Simply put, techniques generally consist of concentrating product using oil spill boom towed by vessels and skimming it up using skimmers appropriate for the product type.

WCMRC typically responds using the three-step triage approach. These steps are:

1) Contain at the source;

2) Skim on water;

3) Protect sensitive resources.

To contain at the source, oil spill boom is typically placed around the casualty. This is used to stop product from spreading out from the casualty. Skimmers are then used to skim the product off of the water and into temporary storage which is transported for disposal. Before skimming the product it is usually concentrated using J-Sweeps or U-Sweeps. A J-Sweep uses one vessel, a piece of boom and a drogue, which hold the boom off from the towing vessel in a "J" configuration (Figure 9). Whereas the U-Sweep technique uses two vessels attached to the end of the boom which tow the boom in a "U" configuration (Figure 10). Both techniques are used to concentrate the product in order to skim it off of the water using brush or disk skimmers, depending on the product density.

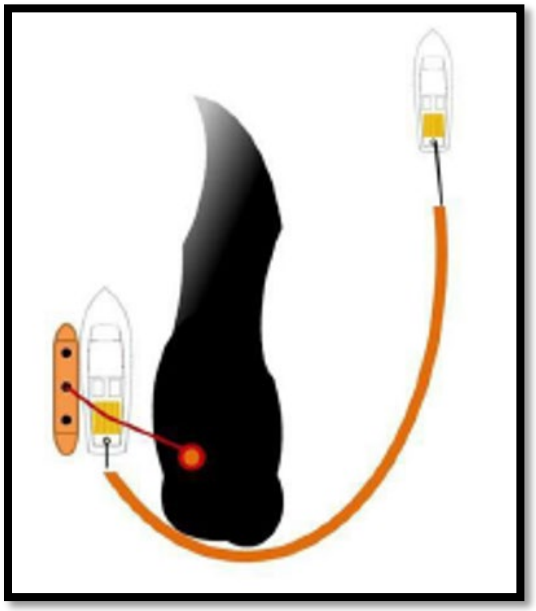

Figure 9. J-Sweep Illustration.

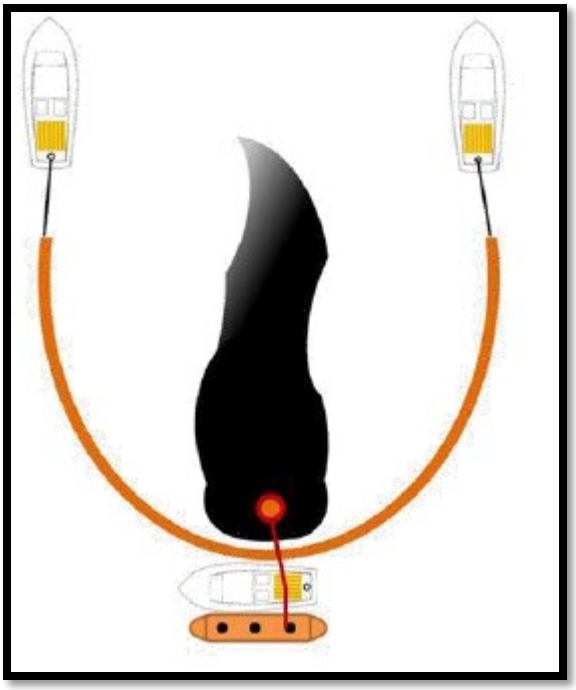

Figure 10. U-Sweep Illustration.

The last general tactic that is used is protecting sensitive resources by sweeping product away from the sensitive areas or by using boom to cordon off segments of shoreline with high biological, cultural or socio-economic value. There are two general types of shoreline protection booming: exclusion booming (Figure 11) and deflection booming (Figure 12). Exclusion booming entails the boom being run across the shoreline and secured at to the shore on both sides. This excludes the entire length of shoreline. While deflection booming secures one end of the boom to the shoreline, with the other end extending out into the current and is used to deflect the product away from the shoreline of concern.

These tactics are implemented to control and remove the product from the marine environment, which provides habitat to a diversity of marine wildlife ranging from plankton to porpoises. Notwithstanding the importance of the different tropic levels and taxa, as the name implies the MMOSRP pertains only to the marine mammals of western Canada.

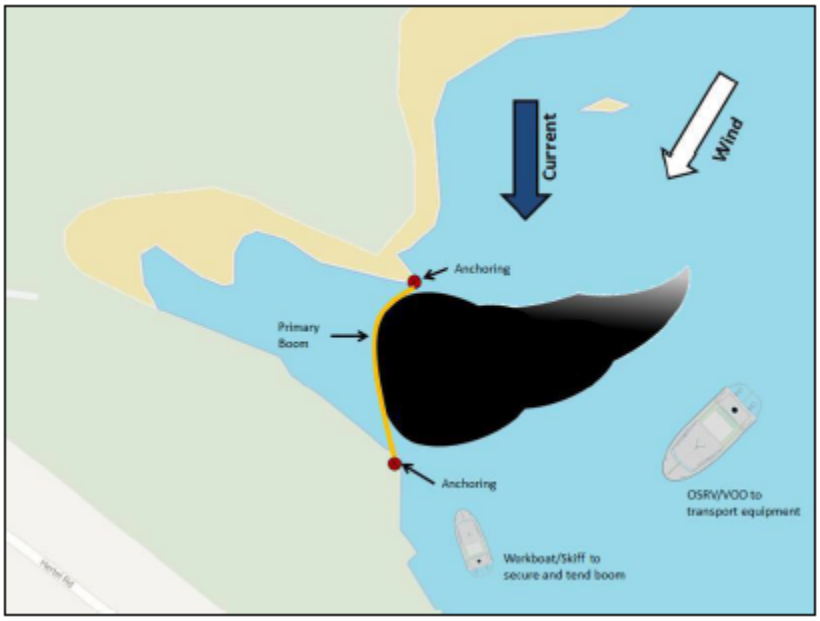

Figure 11. Exclusion Booming Illustration.

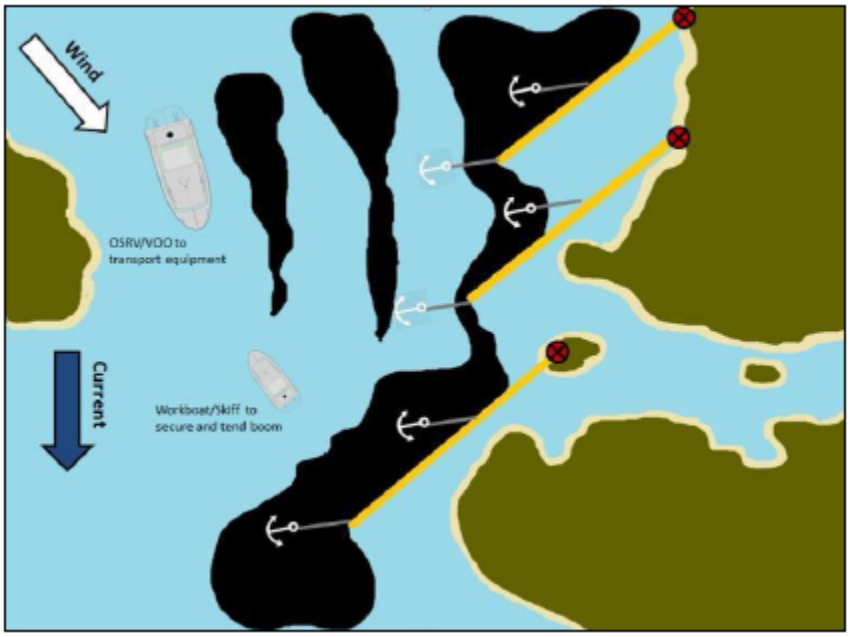

Figure 12. Deflection Booming Illustration.

Overview of Marine Mammal Species in British Columbia

British Columbia has an incredible diversity of marine mammals, with 25% of the globally known existing species having been recorded in BC waters (Ford 2014). These species can be found in all the marine ecosystems from the coastal fjords to west of the continental shelf. Some species, such as the harbour seal are reliably present throughout the coastal waters, while others such as the North Pacific Right and Sei whales remain elusively rare with infrequent sightings.

The marine mammals of the western Canada also exhibit temporal differences with some species present year-round, and others present only seasonally. Ford (2014) classifies the 25 marine mammal species that regularly occur (or did occur) in BC waters into the 12 Ecosections as defined by the BC Ministry of the Environment (MOE 2018).

For the purpose of this MMOSRP, and to align with the GAR, the Ecosections have been grouped into eight areas to define the marine mammal distributions where species are considered to be regularly present (based on Ford 2014). While Ford (2014) also includes areas where these species were historically considered to be regularly present, this has not been included for this MMOSRP but this should be re-evaluated and amended as the distributions and populations of marine mammals change over time.

The eight areas of marine mammal distributions are grouped as follows:

- Coastal South Vancouver Island (VI) = Juan de Fuca Strait and Strait of Georgia Ecosections
- West Coast Vancouver Island (VI) = Vancouver Island Shelf Ecosection
- Coastal North Vancouver Island (VI) = Johnstone Strait and Queen Charlotte Strait Ecosections
- Central Coast = Queen Charlotte Sound Ecosection
- North Coast = Hecate Strait and Dixon Entrance Ecosection
- North Coast Fjords = North Coast Fjords Ecosection
- Offshore = Continental Slope, Transitional Pacific and Subarctic Pacific Ecosections
- All Areas = Found in all 12 Ecosections

The risk to marine mammals from an oil spill must be addressed on a species-by-species basis along with their federal SARA conservation statuses, distribution (Table 2), residency in BC, and candidacy for cleaning and/or rehabilitation (Table 3).

Table 2. Marine Mammals of British Columbia, Conservation Statuses, and Habitat Preferences.

Species	**SARA Status**	**Habitat Preferences***
North Pacific Right Whale	Endangered	Offshore
Grey Whale	Special Concern	Offshore West Coast VI Coastal South Coast VI Central Coast North Coast
Common Minke Whale	Not Applicable	All
Sei Whale	Endangered	Offshore
Blue Whale	Endangered	Offshore
Fin Whale	Threatened	Offshore West Coast VI Central Coast North Coast
Humpback Whale	Special Concern	All
Sperm Whale	None	Offshore Central Coast
Baird's Beaked Whale	None	Offshore Central Coast
Hubb's Beaked Whale	None	Offshore? Central Coast?

Species	SARA Status	Habitat Preferences*
Stejneger's Beaked Whale	None	Offshore? Central Coast?
Cuvier's Beaked Whale	None	Offshore West Coast VI Central Coast?
Short-finned Pilot Whale	None	Offshore
Risso's Dolphin	None	Offshore West Coast VI North Coast
Pacific White-sided Dolphin	None	All
Northern Right Whale Dolphin	None	Offshore
Killer Whale	Endangered – Southern Resident Threatened – Northeast Pacific Transient Threatened - Northeast Pacific northern resident Threatened - Northeast Pacific offshore	All
Harbour Porpoise	Special Concern	All except Offshore
Dall's Porpoise	None	All
Northern Fur Seal	None	All except Coastal North VI

Species	SARA Status	Habitat Preferences*
Steller Sea Lion	Special Concern	All
California Sea Lion	None	Offshore West Coast VI Coastal South VI Coastal North VI
Northern Elephant Seal	None	All except Coastal North Vancouver Island
Harbour Seal	None	All except Offshore
Sea Otter	Special Concern	West Coast VI, Coastal North Vancouver Island, Central Coast, North Coast, North Coast Fjords

*Adapted from Ford (2014)
"?" indicates uncertainty as identified in Ford (2014)

In addition to the regularly occurring marine mammal species, there are six other species that are rare visitors to BC waters. These include:

- Pygmy Sperm whale (No SARA status) – stranded animals only, not seen alive in BC waters (Ford 2014).
- Dwarf sperm whale (No SARA status) – only a single record from BC – a live stranding near Tofino (Ford 2014).
- Long-beaked common dolphin (No SARA status) – only a few sightings in BC (Ford 2014).
- Short-beaked common dolphin (No SARA status) – stranded animals only, not seen alive in BC waters (Ford 2014).
- False killer whale (No SARA status) – few sightings of stranded and live animals in BC (Ford 2014).
- Striped dolphin (No SARA status) – only stranded animals or skeletal remains found in BC (Ford 2014).

While it is possible that these species may be encountered during an oil spill response, it is considered that the probability of occurrence is extremely low. Therefore, these species will not be further addressed in the MMOSRP. Of the regularly occurring 25 species, 48% (n=12) are migratory (Table 3). In general terms, the migratory whales are present in the spring through to the fall, whereas the migratory pinnipeds

tend be present in the winter and spring months. Nearly a quarter of the species (n=6) have uncertain residency patterns in BC, and just over a quarter (n=7) are present year round (Table 3). Only the dolphins, porpoises, pinnipeds and sea otters are considered as candidates for cleaning and rehabilitation (Table 3) based on their size, previous accounts of captivity and examples in the literature. However, candidacy for cleaning and rehabilitation does not confer any measure of success, and each case would have to be assessed by Fisheries and Oceans Canada and qualified marine mammal rehabilitators and veterinarians (see **Tertiary Response**).

Table 3. Marine Mammal Species, Residency and Candidacy for Cleaning and/or Rehabilitation.

Species	**Residency**	**Candidacy for Cleaning and/or Rehabilitation**
North Pacific Right Whale	Migratory	No
Grey Whale	Migratory	No
Common Minke Whale	Migratory	No
Sei Whale	Migratory	No
Blue Whale	Migratory - can occur throughout the year	No
Fin Whale	Migratory	No
Humpback Whale	Migratory - can occur throughout the year	No
Sperm Whale	Migratory	No
Baird's Beaked Whale	Migratory	No
Hubb's Beaked Whale	Uncertain – no confirmed sightings of living animals in BC (Ford 2014)	No
Stejneger's Beaked Whale	Uncertain – only one likely sighting of live animal in BC (Ford 2014)	No

Species	Residency	Candidacy for Cleaning and/or Rehabilitation
Cuvier's Beaked Whale	Uncertain – only five sightings of live animals in BC (Ford 2014)	No
Short-finned Pilot Whale	Uncertain – few live sightings in BC (Ford 2014	No
Risso's Dolphin	Uncertain – most sightings in the summer, but recorded in much of the year (Ford 2014)	Possible
Pacific White-sided Dolphin	Year-round	Possible
Northern Right Whale Dolphin	Uncertain – possibly limited to the summer months in BC (Ford 2014)	Unlikely
Killer Whale	Year-round	Possible
Harbour Porpoise	Year-round	Possible
Dall's Porpoise	Year-round	Possible
Northern Fur Seal	Migratory	Possible
Steller Sea Lion	Year-round	Possible
California Sea Lion	Migratory	Possible
Northern Elephant Seal	Migratory	Possible
Harbour Seal	Year-round	Possible
Sea Otter	Year-round	Possible

Sensitive and Important areas for Marine Mammals in BC

It is beyond the scope of this MMOSRP to define the fine-scale distributions and important habitats for the 25 marine mammal species occurring throughout BC waters. However, there are a number of sites or areas in BC that are recognized as important to different species of marine mammals (Table 4). Figure 13 provides an illustration of many of the sites listed as important for marine mammals. In addition to these coastal sites, the waters westward from the entrance of Barkley Sound to La Perouse Bank have been recently been identified as Habitat of Special Importance for southern resident killer whales (DFO 2017).

Table 4 is not intended to be exhaustive, as the areas important to marine mammals differ based on the scale of evaluation. However, it is intended to serve as a basis for rapid evaluation of important or sensitive sites, and to provide a guide for local considerations in an oil spill response. Table 4 was compiled based on local knowledge (A. Hall, C. Hall), Management Plans, Recovery Strategies for SARA listed species, reports, theses and web searches. However, other important, but unidentified areas likely exist, particularly for those species which are not SARA listed, have not yet been studied sufficiently to identify important areas or critical habitat, and for those which remain offshore and elusive. Table 4 should be updated as new information comes to light about the habitats used by the different marine mammal species of BC.

Table 4. Recognised important sites and areas for marine mammals in BC.

Location	Species
Race Rocks Ecological Reserve	Harbour seal Steller sea lion California sea lion Northern elephant seal Killer whales – southern resident and transient Harbour porpoise Dall's porpoise
Southern Resident Killer Whale Critical Habitat (Juan de Fuca Strait, Haro Strait, Boundary Pass, Gulf Islands, southern Georgia Strait) (DFO 2011, DFO 2009b, Hall 2011)	Southern resident killer whales Transient (Bigg's) killer whales Humpback whales Grey whales Harbour porpoise Dall's porpoise Harbour seals
Northern Resident Killer Whale Critical Habitat (southeastern Queen Charlotte Strait to Johnstone Strait including Telegraph Cove and the Robson Bight (Michael Bigg) Ecological Reserve (DFO 2011))	Northern resident killer whales Transient (Bigg's) killer whales Humpback whales Grey whales Minke whales Pacific white-sided dolphins Harbour porpoise Dall's porpoise Harbour seals

Location	Species
Humpback whale Critical Habitat Langara Island, southeast Moresby Island, Gil Island and southwest Vancouver Island (including Barkley Sound) (DFO 2013, DFO 2009)	Humpback whale Transient (Bigg's) killer whales Offshore killer whales Grey whales Minke whales Harbour porpoise Dall's porpoise Harbour seal Sea Otters
Clayoquot Sound	Transient (Bigg's) killer whales Humpback whales Grey whales Minke whales Harbour porpoise Dall's porpoise Harbour seals Sea Otters
Broughton Archipelago	Northern resident killer whales Transient (Bigg's) killer whales Humpback whales Grey whales Minke whales Pacific white-sided dolphins Harbour porpoise Dall's porpoise Steller sea lions Harbour seal Sea otters
Prince Rupert/Port Edward	Northern resident killer whales Transient (Bigg's) killer whales Humpback whales Grey whales Harbour porpoise Steller sea lions Harbour seals
West Coast Vancouver Island Cape Scott to Cape Sutil Shelter Bay to Cape Caution Skidegate Inlet east coast of South Moresby Island Calvert Island Dundas, Aristazabal and Porcher Islands McMullin Group (DFO 2010)	Grey whales
Shelf break boundary of Queen Charlotte Sound Hecate Strait Dixon Entrance (Gregr et al 2006)	Fin whales Northern resident killer whales

Location	Species
Gwaii Haanas National Park Reserve, National Marine Conservation Area Reserve, and Haida Heritage Site (PCA 2016)	Blue whale Fin whales Sei whales Humpback whales Killer whales (northern resident, transient (Bigg's), offshore) North Pacific right whales grey whales harbour porpoise Steller sea lion sea otters
Pacific Rim National Park Reserve of Canada in Barkley Sound (Long Beach Unit and Broken Islands Group) (PCA 2017) Southwestern Vancouver Island	Humpback whales Killer whales (northern resident, Southern resident, transient (Bigg's), offshore) grey whales harbour porpoise Steller sea lion sea otters
Gulf Islands National Park Reserve of Canada (PCA 2017b)	Killer whales (southern resident, transient (Bigg's)) Harbour porpoise Steller sea lion
Pacific waters within 3 nm (5.56 km) of the nearest shoreline (DFO 2013b)	Transient (Bigg's) killer whales
Scott Islands Triangle Island Small islets off Beresford and Sartine Islands Cape St. James Kerouard Islands off Banks Island North Danger Rocks (DFO 2010b)	Steller sea lions – breeding areas
West coast Vancouver Island from Vargas Island north to Hope Island (nearshore – usually within 2 km of shore, depths to 40 m (SORT 2007))	Sea otters

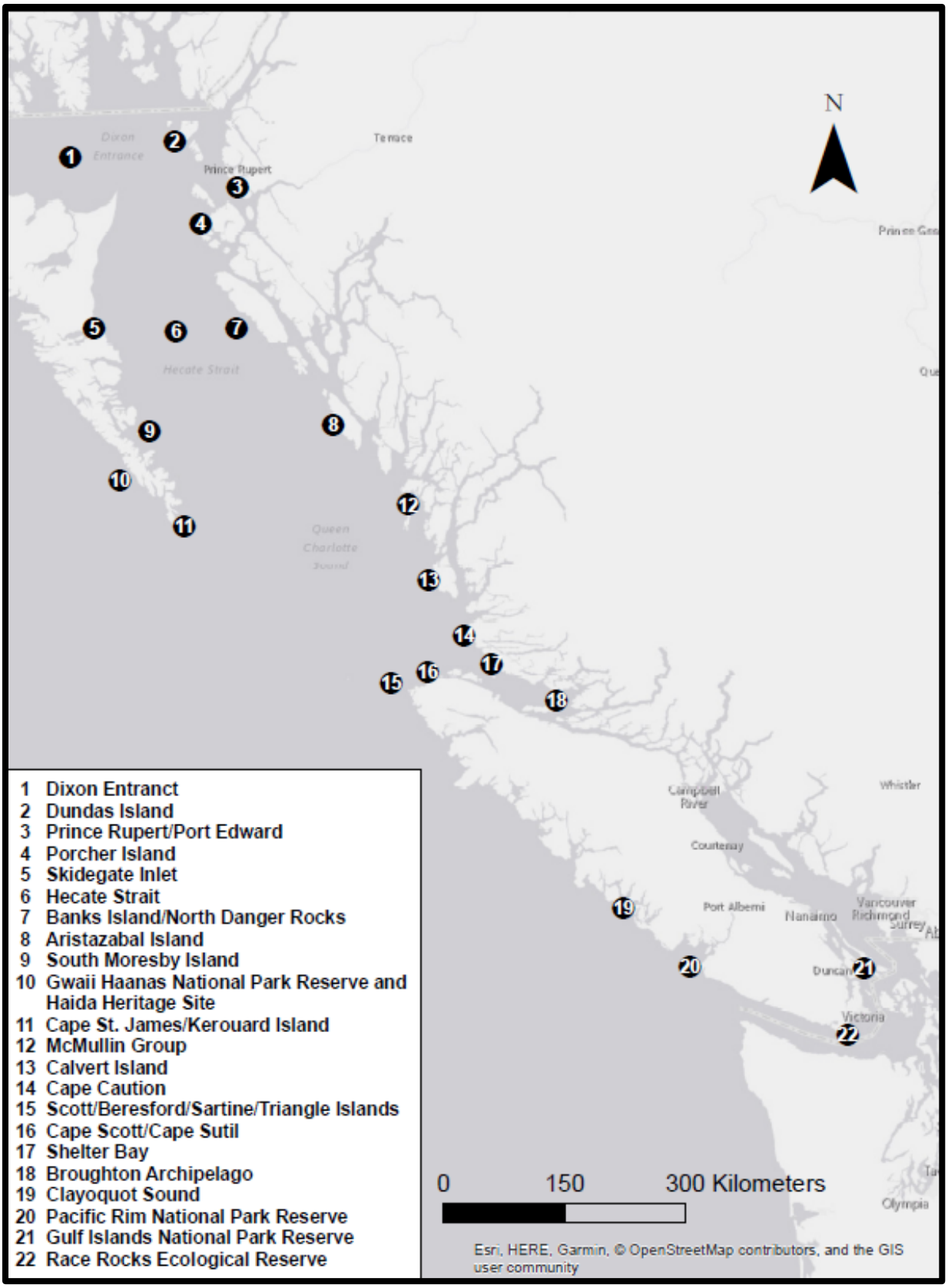

Figure 13. Map of Important Sites and Areas for Marine Mammals in BC.

Priority Species

All marine mammals are protected under Canadian law (see **Legal Framework**), with less than half of the species found in BC waters possibly considered as candidates for capture and rehabilitation (Table 3). Of the species that are considered candidates for capture and rehabilitation (Table 3), only the killer whales, harbour porpoise, Steller sea lion and sea otters have a SARA status (Table 2). All except killer whales are listed as *Special Concern* (Table 2). In addition to the SARA status, the proximity of the oil spill to known haul-outs for pinnipeds and areas of the west coast of Vancouver Island that are identified as important for sea otters should be taken into account and considered in the evaluation of priorities. Marine mammals with fur should be considered a priority due to the negative effects of oil on the animals' ability to thermoregulate (see **Impacts of Oil on Marine Mammals**).

Jarvela Rosenberger et al (2017) developed a conceptual framework to evaluate the impacts of potential oil exposure and applied it to 21 marine mammal species in BC waters, with vulnerability assessed at the species-specific (individual) and population levels. These levels were assessed separately and combined. Jarvela Rosenberger et al (2017) found that while all marine mammals have an inherent risk to oil spill exposure because of their existence at the air-ocean surface interface, northern resident, southern resident and transient (Bigg's) killer whales, sea otters, and Steller sea lions had the highest combined (individual and population levels) risk. At the species-specific level, baleen whales, harbour porpoise and sea otters were deemed to have the highest risk (Jarvela Rosenberger et al. 2017). While at the population level, all marine mammal species, except the sperm whale, northern elephant seal, and the California sea lion, were found to have high likelihood of suffering population-level effects. The sperm whale, northern elephant seal and California sea lion were found to have a moderate risk for population level effects (Jarvela Rosenberger et al. 2017).

Hannah et al (2017) also developed a framework for the evaluation of the effects of ship-based oil on a variety of marine biota. They had similar results to Jarvela Rosenberger et al. (2017) with sea otters, baleen whales (e.g. grey whales), and toothed whales (e.g. resident killer whales) with the highest risk for oil vulnerability.

Although the risk to marine mammals will vary based upon a number of factors including size of spill, location of spill, product, proximity to marine mammal species, season, weather conditions, and the time required to enact the marine mammal component of the wildlife response,

- **the marine mammal priority species will likely include:**
  - **Killer whales – northern resident, southern resident, and transient (Bigg's)**
  - **Sea otters**
  - **Steller sea lions**
  - **Harbour porpoise**

The identification of priority species does not exclude the risks associated to the other marine mammal species. According to the Oiled Wildlife Society of BC, determining the priority of affected treatment is based on whether a species is protected by provincial or federal legislation, including species at risk legislation, and the cumulative loss will adversely affect a wildlife population (OWS 2014).

Legal Framework

Marine mammals and sea turtles are included in the definition of fish in the Fisheries Act (DFO 2006). This Act prohibits causing serious harm to fish, unless authorized by the Minister of Fisheries and Oceans Canada (DFO 2018). Activities such as hazing, catching oiled marine mammals, transporting live marine mammals, transporting deceased marine mammals, rehabilitating or cleaning marine mammals, and releasing rehabilitated or cleaned marine mammals authorization from the Minister of Fisheries will be required.

This will require contact with the Marine Mammal Coordinator for the Pacific Region of DFO:

Paul Cottrell (1- 604-666-9965)

or the Marine Mammal Program Manager for the Pacific Region of DFO:

Annely Greene (1- 604-666-0071).

Relevant sections of the legislation include:

- Section 52 of the *Fishery (General) Regulations* which provides authority for the issuance of licenses for experimental, scientific, educational or public display purposes,
- Section 57 of the *Fishery (General) Regulations* which provides authority for the transplantation of marine mammals including capture and captive placement,
- Section 7 of the *Marine Mammal Regulations* prohibits disturbance of marine mammals except when fishing for marine mammals under the authority of a license (DFO 2018b),
- Section 15 of the *Marine Mammal Regulations* covers the transportation of live or deceased marine mammals,
- Sections 32 and 33 of the *Species At Risk Act* which prohibits the killing, harming, harassing and possession of species listed as extirpated, endangered or threatened and the protection of their critical habitat. Licenses are required for any activity that may harm, harass or kill a listed species where:

  (a) The activity is scientific research relating to the conservation of the species and conducted by qualified persons;

  (b) The activity benefits the species or is required to enhance its chance of survival in the wild; or

  (c) Affecting the species is incidental to the carrying out of the activity.
- Section 83 of the *Species At Risk Act* which allows for exemptions if an activity is deemed necessary for the protection of public safety, health, including animal and plant health, or national security; and that the purposes of SARA are respected to the greatest extent possible.

Canada has pledged to protect these species and ecological diversity in accordance with *United Nations Convention on Biological Diversity* (1992), and under the *National Accord for the Protection of Species at Risk* (1996).

Fisheries Act licences for marine mammals in the Pacific Region are issued through the Scientific Licences – Coastal Pacific Region. The application form is available at: http://www.pac.dfo-mpo.gc.ca/fm-gp/licence-permis/sci/licence-sci-permis-eng.pdf.

DFO Pacific Region is also responsible for issuing the SARA permit.

DFO Pacific Region contacts for scientific license are as follows:

1. **South Coast Area Scientific Licences: 1-250-756-7270**
2. **Fraser River Area Scientific Licences: 1-604-666-7575**
3. **North Coast Area Scientific Licences: 1-250-627-3499**

If the oil spill response is to occur within a Marine Protected Area (MPA), the *Oceans Act* will be relevant, as certain activities may be limited within the MPA to mitigate disturbance to marine animals or their habitat. Similarly, if a response is required within a national park, Parks Canada.

If the wildlife response requires transport of marine mammals across an international boundary, the Convention on the International Trade of Endangered Species (CITES) will apply.

Impacts of Oil on Marine Mammals

The impacts to marine mammals from oil can have both lethal and sub-lethal effects. Awareness of the impacts to marine mammals – including cetaceans - from oil spills is growing. The highly publicized spills of the Exxon Valdez (1989) and the Deepwater Horizon (2010) have resulted in the known deaths and long-term health consequences leading to population declines in many species of cetaceans, pinnipeds and otters. Among those reported as killed or seriously impacted are killer whales, sea otters, harbour seals, and bottlenose dolphins (*Tursiops truncatus*) (Jarvela Rosenberger et al. 2017, Ott 2005).

After the Deepwater Horizon event, the immediate and short-term effects to marine mammals were evaluated over a five year period quantifying the exposures, injuries and mortalities with the ranges of 31 stocks of cetaceans in the Gulf of Mexico affected (Takeshita et al. 2017). Recovery from the long-term population level effects resulting from the Deepwater Horizon oil spill, has been determined to require decades to recover for most of the affected marine mammal species (DWH NRDAT 2016).

Closer to the BC coast, recovery from the Exxon Valdez spill for killer whales has not occurred with two killer whale populations in Alaska being significantly affected. One experienced a population depression, while the other has lost of all potentially reproducing individuals, leaving the group functionally extinct (Matkin et al. 2008, 2012). Spills do not have to be as extensive as these two examples to have potentially damaging effects to marine mammals, and for some marine mammals in BC – such as the *Endangered* Southern Resident Killer Whales, the loss of as few as one reproductively capable female could have long-term consequences at the population level due to the small population size, and limited number of reproductively active females. Other marine mammals that rely on fur for insulation, such as sea otters, are highly susceptible to the effects of becoming oiled (McQuillan 2011).

Jarvela Rosenberger et al. (2017) identified oil exposure pathways as direct contact, adhesion, inhalation, direct ingestion and ingestion through contaminated prey. Oil exposure can impact marine mammals in a variety of ways including respiratory impacts, skin or mucous membranes (e.g. eyes and mouths) irritations, internal bleeding impaired wound healing, chemical burns, infections, acute or chronic toxicity, ability to feed – particularly for baleen whales and benthic feeders, the inability to thermoregulate leading to hypothermia or hyperthermia, exhaustion, dehydration, or starvation.

Animals that become unable to maintain body temperature and buoyancy may drown, while others may seek the relative safety of the shore (IPIECA 2014). This habitat shift can have effects on the animals' ability to forage effectively and communication with conspecifics. Furred marine mammals, including pinnipeds and sea otters risk ingesting the oil during grooming, and the oil can impair their ability to swim.

Inhalation of toxic substances can lead to respiratory irritation, inflammation, emphysema, or pneumonia (NOAA 2018). Ingestion of oil, either through direct ingestion or through contaminated prey, can lead to acute and chronic health problems including gastrointestinal distress, vomiting, maldigestion, ulcers, bleeding, diarrhea, anemia, liver dysfunction, endocrine dysfunction, kidney dysfunction, impaired brain function, immune suppression, damaged lungs, reproductive impairment or failure, or reduced neonatal or juvenile survival, or death (IPIECA 2014, Takeshita et al. 2017, NOAA 2018, IPIECA 2017).

Other impacts to marine mammals from oil spills could include loss of prey resources, habitat loss, and habitat quality decline. The long-term consequences of these indirect effects are difficult to quantify but could have serious consequences at the species or population levels. The serious nature of the effects to marine mammals from oil exposure validates the need for this MMOSRP and qualified personnel involved in the marine mammal response.

Marine Mammal Response Team Overview and Qualifications

The Marine Mammal Response Team should be composed of a core group of marine mammal professionals and support personnel having experience with BC marine mammals and marine operations.

The qualifications of the marine mammal professionals should include:

- Experience with oil spill wildlife response,
- Marine Mammal Observers (MMOs) with experience in the identification of species, behaviours, group sizes, habitats, and be capable of the collection of scientific data following established protocols,
- Meet all the necessary qualifications for permit requirements for marine mammal response for observation approach distances (this may need to be issued if oiled marine mammals are suspected),
- Experience in the observation of wild marine mammals in adverse working conditions,
- Experience or training in the capture, treatment, and care and rehabilitation oiled wildlife,
- Experience conducting wildlife-related response activities within the Incident Command System structure,
- Ability to be accountable for the required daily data reporting and billing for invoices,
- Have existing professional relationships with oil spill response and wildlife rehabilitation centres,
- Ability to develop professional relationships with other key organizations that are assets to spill response,
- Ability to quickly mobilize to conduct marine mammal field assessments and reconnaissance,
- Be able to quickly communicate with veterinarians, Marine Mammal Rescue or other rehabilitation centres as required,
- Have oil spill training (e.g. Basic Marine Oil Spill Safety Training Course).

The marine mammal professionals are not expected to each have each of these qualifications but rather that the composition of individuals meets these criteria. The Marine Mammal Response Team will require a Marine Mammal Lead to coordinate the activities and information flow during a response.

In addition to the marine mammal professionals, the Marine Mammal Response Team would have additional members that provide marine support including vessel captains and deckhands.

The qualifications of the support team members should include:

- Experienced in BC marine waters,
- Captains license or vessel operators equivalent,
- Marine Emergency Duties certification (not necessary for deckhands),
- Current Occupational First Aid (or equivalent) certification (not necessary for deckhands),

- Maintain an annual liability insurance policy for no less than $2,000,000.00,
- WorkSafe BC insurance for the region of response operations,
- Ability to be accountable for financial reporting and billing.

As with the marine mammal professional's component of the Marine Mammal Response Team, it is not expected that each individual of the marine support component would have each of these qualifications but the team as a whole would meet these criteria.

Marine Mammal Response Team and ICS

The Marine Mammal Response Team will fit within the ICS organizational structure of the Wildlife Branch as part of the Recovery Group Reconnaissance Strike Team as illustrated in Figure 14, and will participate in surveillance and behaviour observations of marine mammals. The Marine Mammal Response Team lead will communicate with WCMRC, DFO and other individuals within the ICS structure as required.

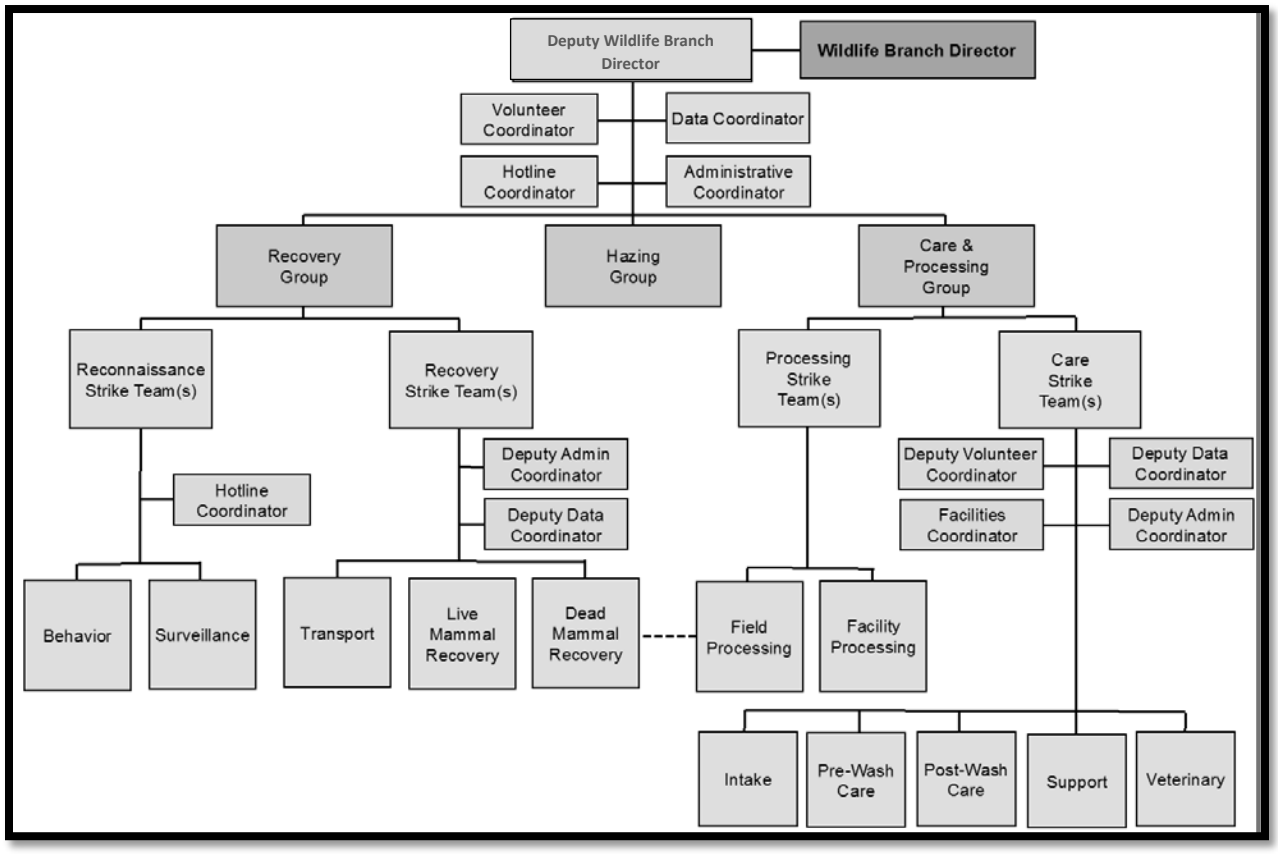

Figure 14. Example of Marine Mammal Organization under the Wildlife Branch (from Ziccardi et al (2015)).

Required Approvals and Permits

As defined in the **Legal Framework** section, federal approvals and permits will be required for activities related to marine mammals that contravene the *Fisheries Act* or the *Species At Risk Act*. These can be obtained by contacting the Marine Mammal Coordinator or Program Manager of DFO Pacific Region or the regional offices.

Marine Mammal Coordinator for the Pacific Region of DFO:

Paul Cottrell (1- 604-666-9965)

Marine Mammal Program Manager for the Pacific Region of DFO:

Annely Greene (1- 604-666-0071).

Section 2 - Marine Mammal Response Objectives

There are five objectives to the Marine Mammal Response that serve as the foundation of the MMOSRP. Objectives 1 and 2 are based on strategies that aim at either preventing oil from reaching marine mammals, or preventing the marine mammals from reaching the oil. Objective 3 is based on safely rehabilitating oiled marine mammals, and releasing back into the wild. While objectives 4 and 5 are based on environmental monitoring during and after the response.

Objectives

1. Prevent harm to marine mammals through on-the-water rapid response assessment/surveillance and exclusion booming.
2. Prevent harm to marine mammals by actively deterring or hazing.
3. Safely rehabilitate animals that have been impacted. Capture, clean, rehabilitate, release.
4. Safely retrieve deceased, oil marine mammals for veterinary necropsy and toxicological analyses to be used for monitoring, reporting and scientific advancement.
5. Monitor the environment to ensure adequate recovery.

Section 3 - Marine Mammal Response Strategies and Tactics

Wildlife response options for marine mammals remain limited, primarily due to the practicality and effectiveness of capturing and handling large animals for treatment (SBVEDP 2014). The primary goal is to avoid having contact between the animals and the contaminated area. The secondary goal is to enact a wildlife response that involves capture, cleaning, rehabilitation and release. This is only an option for the smaller marine mammals of BC. However, all marine mammal response tactics are based upon immediate implementation of a data collection strategy.

Oil spill preparedness has been developed in other regions according to a tiered approach. Typically three tiers are used:

- Tier 1: Spills that only have a local impact and require only local resources,
- Tier 2: Spills that have regional or national significance, and require resources from a larger area or across that nation, and
- Tier 3: Spills that have international significance, and require resources from multiple countries (Ziccardi et al 2015).

The organizational structure depends on the Tier of the response. A Tier 3 response would be the most elaborate, but for lesser responses, certain aspects may still be required. However, if marine mammals are potentially affected by a spill, then sections within the Marine Mammal Response Team would be activated. The initial response for marine mammals would include the activation of the Rapid Response for reconnaissance and reporting.

Primary Response –Rapid Response Network

The Rapid Response Network would be part of the overall Marine Mammal Team and would be mobilized for immediate marine mammal reconnaissance and assessment. This network is made up of marine mammal professionals and marine support and can be mobilized throughout BC waters. However, emphasis was placed on southern BC because this area has been identified as one of four areas in Canada that were ranked as having the highest risk of oil spills due to increased shipping traffic coupled with severity of potential impacts to living resources and sensitive habitat (Marty and Potter 2014). The Rapid Response Network could be activated on WCMRC vessels of opportunity, as well as independent contractor vessels. The suitable contractors for the Rapid Response Network are identified in Table 5.

Table 5. Rapid Response Network Resources.

Name	Resources	Location	Contact
Sea View Marine Sciences	Professional Marine Mammal Observers Vessels and Captains Hydrophones Remote Operated Vehicle Live animal capture, handling, oiled wildlife response, stranded marine mammals, live marine mammal rescue. Marine Mammal Lead	Southern Vancouver Island	Capt. Chris Hall 1-250-514-7103 Dr. Anna Hall 1-250-727-5709
Adam's Fishing Charters	Charter vessel	Victoria	1-250-370-2326
Anthony Beal	Charter vessel	Sooke	1-250-920-6476
Foghorn Fishing Charters	Charter vessel	Victoria	1-250-658-1848

Name	Resources	Location	Contact
Bill Sergeant	Charter vessel	Southern Vancouver Island	1-250-661-1948
John Lum	Charter vessel	Sooke	1-250-889-4032
Pacific Whale Watch Association	Charter vessels and marine mammal observers	Southern British Columbia and Northwestern Washington	Brett Soberg 1-250-213-7669
Harbour Air	Charter Sea Planes	Throughout BC coast	1-800-665-0212
Oiled Wildlife Society of BC	Small stockpile of equipment, including personal protective gear, medical supplies, husbandry supplies, feeding supplies, and caging and washing equipment.	Throughout BC	1-778-300-5401
Porpoise Conservation Society	Marine Mammal Observers	Lower Mainland and southern Vancouver Island	1-604-6296112

Other Potential Resources

1. DFO Science
2. Canadian Marine Animal Response Alliance - National
3. The Whale Interpretive Centre – Telegraph Cove
4. Marine Mammal Research Unit of University of British Columbia – Vancouver
5. University of Victoria - Victoria
6. Royal Roads University - Colwood
7. Bamfield Marine Station - Bamfield
8. Alaska Clean Seas - Alaska
9. International Fund for Animal Welfare - International
10. Strawberry Isle Marine Research Society - Tofino
11. OrcaLab – Hanson Island
12. Parks Canada - Victoria
13. Oceans Network Canada - Victoria
14. Cetacean Research Lab Vancouver Aquarium – Vancouver
15. Marine Research and Education Society – Northeast Vancouver Island

Marine Mammal Surveillance, Assessment and Reconnaissance

Marine mammal surveillance, assessment and reconnaissance (SAR) is required because the spatial and temporal variations in species distributions can vary over short (hourly) and long (seasonal) timeframes. As such, it is necessary to deploy rapid, real-time visual SAR surveys for marine mammals potentially at risk. Depending on the nature of the spill and the potential for species at risk, the SAR may be conducted via aircraft, vessel, and/or terrestrial methods (SBVEDP 2015). The marine mammal response initiating with field SAR activities will begin immediately, as appropriate, upon notification of a spill event and may continue as the incident progresses.

Initial Response Phase (IRP)

The Initial Response Phase starts with the initial notification to WCMRC that a spill has occurred, and ends at the beginning of the ICS Planning or Operational Phase. This phase covers the responder's first critical hours that may be spent at an operational cleanup site, aboard a response vessel, at a staging area, or in the Incident Command Post (ICP). This phase may be as short in duration as a few hours, or as long as 72 hours depending on the location and nature of the spill. The goal of the Incident Command (IC) is to shorten the Initial Response Phase and enter the Planning/Operational Phase as soon as possible.

Initial Response Phase for Marine Mammals (IRP-MM)

Wildlife response requires assessment of the vulnerable species within the geographic limits of a spill (OWS 2014). The Initial Response Phase for Marine Mammals (IRP-MM) will be conducted by the marine mammal lead and will require the acquisition of local data relevant to the spill location for notification to the Rapid Response Network. The marine mammal lead will be selected through the available resources, but can be coordinated through Sea View Marine Sciences (Table 5).

The marine mammal lead will conduct the following:

1. Arrange a contract with RP for a marine mammal response.

2. Review the location of the spill with WCMRC.

3. Identify relevant nautical charts.

4. Coordinate with Logistics to obtain information on: coastal facilities including marinas, fuel docks, marine supply, marine mechanics, hotels, and travel.

5. Identify sources of local marine mammal knowledge including wildlife tour operators, natural history groups, researchers, and First Nations.

6. Review WCMRC spill trajectory models, existing sensitivity maps, and information from the on-scene commander.

7. Review the local marine geography and oceanography.

8. Obtain the current weather conditions and forecast.

9. Communicate with WCMRC for the spill product identity and Material Safety Data Sheets.

10. Identify risk factors for marine mammals and response personnel.

11. Identify marine mammal species that could be present.

12. Identify marine mammal species immediately at risk.

13. Identify existing maps for marine mammal distribution, or relevant local knowledge.

14. Identify any safety training required for marine mammal response.

15. Provide any relevant safety training to responders.

16. Request immediate data response from the British Columbia Cetacean Sightings Network (BCCSN) for cetaceans within 10 km of the spill site for the previous 24, 48 and 72 hours.

17. Request immediate data response from the Pacific Whale Watch Association (PWWA) for real-time data of cetaceans and other marine mammals within 10 km of the spill site within the previous 24, 48 and 72 hours for spills within the GAR and the ERA of southern Vancouver Island.

18. Estimate the expected size of the marine mammal response (low, medium, high),

19. Complete the Spill Notification Record – Marine Mammals (Appendix 1).

Completion of the IRP-MM will occur when the Spill Notification Record – Marine Mammals is complete. Upon completion of the IRP-MM, the Operational Phase for Marine Mammals (OP-MM) will commence.

Operational Phase for Marine Mammals (OP-MM)

The Operational Phase for Marine Mammals (OP-MM) will be conducted by the marine mammal lead and will require the planning, operations and mobilization of the Rapid Response Network. The marine mammal lead will conduct the following:

1. Identify the geographically relevant members of the Rapid Response Network.
2. Identify other key marine mammal personnel or resources in the vicinity of the spill location.
3. Contact the identified Rapid Response Network members.
4. Determine whether aerial and/or vessel support required for marine mammal response.
5. Assemble the Rapid Response Network Team (RRNT).
6. Assign duties within the RRNT including: vessel captains, Primary Marine Mammal Observers (MMOs), and data recorders.
7. Provide the Spill Notification Record – Marine Mammals to the assembled Rapid Response Network Team.
8. Update spill site location and spill site buffer zone location.
9. Identify the relevant wildlife facilities.
10. Identify the immediate marine mammal response priorities.
11. Review 1-11 with Rapid Response Network Team.
12. Determine whether immediate assessment is required or possible (due to weather conditions, location of spill, or approaching inclement weather) or whether RRNT is on standby, and review with RRNT.
13. Determine appropriate assessment and reconnaissance protocols.
14. Mobilize RRNT or maintain standby status.
15. Relay information to Communications Team for press release.
16. Maintain communications with RO regarding RRNT mobilization status.

Operational Phase for Marine Mammals Field Assessment (OP-MM-FASS)

If the RRNT is held on standby status, the OP-MM will be continually reviewed and updated as required. If the RRNT is mobilized, the OP-MM will advance into the Operational Phase for Marine Mammals Field Assessment (OP-MM-FASS) stage. The OP-MM-FASS will be conducted by the marine mammal lead and the RRNT, and will proceed as follows:

1. The marine mammal lead will assign the RRNT for reconnaissance of the immediate oil spill site and/or a buffer zone.
2. The RRNT will commence the field assessment with aerial and/or vessel reconnaissance as determined in the OP-MM at the spill site and buffer zone(s).
3. Conduct beach or shoreline surveys for stranded marine mammals if terrain and access allows.
4. Marine mammal observations will be immediately relayed to the marine mammal lead.
5. The RRNT will complete the Rapid Response Network Field Assessment Record (RRNT-FAR) (Appendix 2).
6. Liaise with DFO for permitted personnel and additions of other qualified responders to permits to collect deceased marine mammals upon finding, and to report live potentially contaminated marine mammals.
    a. **Marine Mammal Coordinator for the Pacific Region of DFO: Paul Cottrell (1- 604-666-9965)**
    b. **Marine Mammal Program Manager for the Pacific Region of DFO: Annely Greene (1-604-666-0071)**.
7. **Contact: BC Marine Mammal Response Network (Observe, Record, Report): 1-800-465-4336.**
8. Maintain communication with Communications Team for press release updates.
9. Maintain communication with RO.
10. Conduct regular weather conditions and forecast checks, and update RRNT as required.

Except in obvious cases of oiled marine mammals, the role of professional MMOs on the RRNT will be to advise as to the presence and documentation of marine mammal species to federal authorities and marine mammal rehabilitation facilities for the final decision making process of whether or not live collection is feasible.

Secondary Response – Life Saving Displacement: Deterrence or Hazing

Life saving displacement through deterrence or hazing may be required to keep healthy, unoiled marine mammals away from contaminated areas. This is a standard practice with other types of wildlife, particularly birds (OWS 2014), and can include the use of deterrents or through pre-emptive capture. The latter is more difficult for marine mammals than it is for other wildlife taxa. Hazing often involves the use of auditory or visual stimuli that can be used to prevent animals from entering an area or herding the animals away from the contaminated areas.

Options for implementing hazing programs should be considered and assessed by oil spill response and marine mammal professionals, with regulatory agencies during early stages and as the wildlife response process proceeds (OWS 2014). Deterrence or hazing programs require strategic planning and appropriate regulatory authorization, permits and oversight (OWS 2014).

Deterrent or hazing activities for marine mammals can include the presence of vessels as well as deployment of sound propagating equipment either on vessels or potentially in the water. Any proposed deterrent strategies or actions will be conducted in consultation and coordination with the DFO and will be guided by site-specific and species-specific factors present at the time of the incident (SBVEDP 2015). Any required notifications, permits and/or approvals, if not already in place, will be sought prior to implementation of deterrent and preemptive capture strategies (SBVEDP 2015). Any and all personnel deploying and utilizing deterrent equipment will be properly trained in the use of the deterrent equipment, and will use appropriate personal protective equipment (PPE) and other safety precautions.

Options for marine mammal hazing include:

- Oikomi pipes - reverberant metal pipes that have been used and reported as effective but limited to small areas, and could be dangerous in rough sea conditions (NOAA 2007, Ziccardi et al 2015).
- Mid-frequency sonar - when the *USS Shoup* was using mid-frequency sonar (source level approximately 235 dB (exact level is classified) and frequency 2.6-3.3 kHz over 1-2 second signals emitted every 28 seconds (US Navy, Pacific Fleet, 2004)) in Haro Strait, J-pod (southern resident killer whales) avoided the noise at 22 km distance, but this technology has significant risks associated with it (NOAA 2007).
- Seal control devices - small explosive devices that are readily available, inexpensive and effective for up to 1 mile, but can pose risk of injury to people and to wildlife, as well as risks near volatile substances (NOAA 2007, Ziccardi et al. 2015). Were used during live whale captures in Washington and British Columbia, and were effective (NOAA 2007).
- Acoustic Harassment Devices (AHDs) – are devices that can cause pain. Have worked at keeping killer whales away from fish pens (Morton and Symonds 2002), and Olesiuk et al. (2002) found that they kept 95% of harbor porpoises out for a range of about 3 km. Not found to work with pinnipeds (NOAA 2007).
- Killer whale calls – the use as deterrents or attractants is uncertain (NOAA 2007, Ziccardi et al 2015).
- Acoustic Deterrent Devices (ADDs or net pingers) – have been shown to be effective with some odontocetes on fishing gear, but habitiuation can occur (Ziccardi et al 2015).

- Aircraft - May be very effective initially and can be quickly mobilized to also provide reconnaissance but there may be safety issues, expensive and there is little control of animal movements with possible habituation (Ziccardi et al 2015).

Other options that have been deemed less effective or with uncertain efficacy are available. These include: bubble curtains, strobe lights, fire hoses, booms, lines on the water, vessel traffic, gunshots, cracker shells (smaller, safer versions of seal bombs) and fishing nets (NOAA 2007, Ziccardi et al 2015).

Hazing to deter marine mammals would be conducted under the guidance and permission of DFO. Any hazing would be coordinated by the DFO Marine Mammal Coordinator.

This will require contact with the Marine Mammal Coordinator for the Pacific Region of DFO: Paul Cottrell (1- 604-666-9965) or the Marine Mammal Program Manager for the Pacific Region of DFO: Annely Greene (1- 604-666-0071).

Tertiary Response - Marine Mammal Capture, Cleaning, Transportation and Rehabilitation

A marine mammal response may require the implementation of capture for oiled or otherwise affected individuals. These animals may become disabled or weak to a point where capture is possible and can then be transported to the Marine Mammal Rescue (MMR) in Vancouver where medical care can administered by a trained rehabilitation and veterinary team.

Capture, retrieval and transport of oiled marine mammals will be dependent on several conditions:

- Environmental and weather conditions
- Time of year
- Species impacted
- Location of affected marine mammal(s)
- Ability to transport to MMR
- Consideration of animal welfare for the capture, transport and treatment

Marine mammal capture, cleaning, transportation and rehabilitation would be conducted under the guidance and permission of DFO.

This will require contact with the Marine Mammal Coordinator for the Pacific Region of DFO: Paul Cottrell (1- 604-666-9965) or the Marine Mammal Program Manager for the Pacific Region of DFO: Annely Greene (1- 604-666-0071).

Protocols for Capture, Cleaning, Rehabilitation and Release.

There are no specific protocols developed in BC for marine mammal capture, cleaning, rehabilitation and release during an oil spill response, with the exception of sea otters (Blight 2004). However a number of other protocols do exist that can be adapted for the BC coast. These include:

- Pinniped and Cetacean Oil Spill Response Guidelines (Ziccardi et al 2015)
- Marine Mammal Oil Spill Response Guidelines (Johnson and Ziccardi 2006)
- Protocols for the care of oil-affected marine mammals (Johnson et al 2003)

In the event that marine mammals are exposed to oil within the GAR, and are determined to be candidates for capture, cleaning and rehabilitation, the DFO will have to provide the authority to commence the capture operations because DFO maintains the federal authority over all marine mammals. As this is a federal responsibility, with internal procedures not available at the time of writing, this is beyond the scope of this MMOSRP.

This will require contact with the Marine Mammal Coordinator for the Pacific Region of DFO: Paul Cottrell (1- 604-666-9965) or the Marine Mammal Program Manager for the Pacific Region of DFO: Annely Greene (1- 604-666-0071).

While the capture of oiled marine mammals will be under the direction of the DFO, initial observations would be from the Rapid Response Network. Data will be collected and communications will occur as outlined in **Marine Mammal Surveillance, Assessment and Reconnaissance**. Records of the oiled marine mammals and the communications relayed will be tracked on the Oiled Marine Mammals Data Record (Appendix 3). There are few permanent facilities for the cleaning and rehabilitation of oiled marine mammals in British Columbia (Table 6). Only the Marine Mammal Rescue Centre at the Vancouver Aquarium is dedicated to the care of marine mammals. However, other centres may be useful for supplies, personnel or for holding oiled marine mammals before transport to the Marine Mammal Rescue Centre. Due to the limited capacity for marine mammal rescue and rehabilitation on the BC coast, it may be required to implement temporary or mobile facilities and resources.

Table 6. Wildlife Rehabilitation Facilities in BC.

Vancouver Aquarium Marine Mammal Rescue Centre	**Marine Mammal Rescue and Rehabilitation**	**Vancouver**	**1-604-258-7325**
Wild ARC	**Wildlife Rehabilitation Centre**	**Southern Vancouver Island**	**1-250-478-9453**
Wildlife Rescue Association of British Columbia	**Wildlife Rehabilitation Centre**	**Lower Mainland**	**Contact**
Island Wildlife Natural Care Centre	**Marine Mammal Rescue and Rehabilitation**	**Salt Spring Island**	**1-250-537-0777**

Mobile Facilities/Resources

If the marine mammal response is to occur outside the PAR or the designated Port of Vancouver, and therefore the distance to the Marine Mammal Rescue Centre (MMRC) of the Vancouver Aquarium is increased, it may be preferable to consider additional options for mobile facilities or resources. At a minimum, three scenarios could arise:

1. If the incident occurs in a remote portion of the BC coast, and there is access to a major airport, the oiled wildlife may have to travel by air to the Vancouver International Airport or via seaplane or helicopter to Burrard Inlet.

2. If the incident occurs in a remote portion of the BC coast, and there is no access to a major airport, the oiled wildlife may have to travel by regional airline to the Vancouver International Airport or via seaplane or helicopter to Burrard Inlet.

3. If the incident occurs in a remote portion of the BC coast, and there is no airport, the oiled wildlife may have to travel by seaplane or helicopter to Vancouver Harbour – if the scale of the marine mammal response can be managed by this logistical contingency. If the scale of the marine mammal response exceeds the capacity of this logistical contingency, a temporary or mobile facility may be required. A temporary camp can be created with a wide range of functional mobile units, including water reservoirs, generators, canteens, etc., where operational staff and equipment can be brought in and supported for several weeks at a time (IPIECA 2014). Considerations would include the mobilization and construction time, the weather conditions, proximity to the spill (e.g. is the spill remote but coastal, or is the spill remote and offshore?), whether the temporary facility will be sufficient to handle the marine mammal response and whether there are enough personnel, water, resource space, animal food or available budget to ensure the optimal use of resources. The welfare of the oiled marine mammals must be at the forefront of this decision making process.

In these scenarios, implementing a temporary Wildlife Care Centre and field Stabilization Facility(s) according to ICS principles, wildlife response plan, and best-practices may be required (OWS 2014). As marine mammals are under the authority of the DFO, this would require implementation by the federal government.

This will require contact with the Marine Mammal Coordinator for the Pacific Region of DFO: Paul Cottrell (1- 604-666-9965) or the Marine Mammal Program Manager for the Pacific Region of DFO: Annely Greene (1- 604-666-0071).

Euthanasia and Deceased Marine Mammals

Euthanasia

In some cases, euthanasia of marine mammals may be required. This will be determined by the Marine Mammals Coordinator of Fisheries and Oceans Canada. As of the time of writing in May 2018, this position is held by Mr. Paul Cottrell. His contact phone number is: 1-604-666-9965. The federal website for updates to the position and personnel: http://www.dfo-mpo.gc.ca/fm-gp/mammals-mammiferes/contacts-eng.html.

IPIECA (2017) and Ziccardi et al (2015) provides details, criteria and protocols for the euthanasia of wildlife. However, this would likely be conducted by the experienced team at the Marine Mammal Rescue Centre at the Vancouver Aquarium.

Deceased Marine Mammals

An important component of oil spill response is the collection of data on all dead wildlife affected by a spill (OWS 2014). Accurate record keeping of dead animals aids in potentially holding a RP liable for wildlife damages and determining which species to focus on for restoration and monitoring (OWS 2014).

The prompt removal of dead oiled wildlife from the environment can be critical to minimize the secondary effects such as poisoning and oiling of predators and scavengers (SBVEDP 2015). All deceased marine mammals are to be reported to DFO, and with permission collected by experienced personnel. It may not be evident in the field whether the animal died due to oil exposure or other causes. As such, all carcasses will be collected. Any collected dead wildlife will be documented and held with the appropriate chain of custody until disposal is approved by the appropriate regulatory authorities.

The collection and postmortem examination of deceased marine mammals is a critical part of the response for a number of reasons including:

- evaluation of the size of the oil spill,
- evaluation of the environmental and biological impacts
- improved understanding of the effects of oil on marine mammals,
- provide evidence required for cost recovery and prosecution,
- prevention of contamination moving through the marine food webs,
- assist in removing the oil from the environment, and to
- remove the potential hazards associated with decomposing carcasses (IPIECA 2017).

This aspect would again be conducted under the guidance and permitting of the DFO. The deceased marine mammals would be necropsied by an experienced and professional team.

This will require contact with the Marine Mammal Coordinator for the Pacific Region of DFO: Paul Cottrell (1- 604-666-9965) or the Marine Mammal Program Manager for the Pacific Region of DFO: Annely Greene (1- 604-666-0071).

Personal Protection

Wild animals can carry a number of diseases and infections (viral, fungal, bacterial and pathogenic) that are considered zoonotic – that is they can be transmitted to humans. During any wildlife response, it is imperative that the responders protect themselves by avoiding contact the blood or other bodily fluids of any marine mammal or other affected wild animal. This includes both living and dead animals. Injuries can occur from bites, scratches or zoonotic diseases. There are also inherent risks in conducting marine or shoreline fieldwork that include the weather, tides, currents, remote working locations, rocky shorelines, working on boats, fatigue, cold water survival, hypothermia, and other wildlife including (but not limited to) bears, cougars, and wolves.

Always wear gloves and/or any other protective clothing as directed. Always replace torn or worn gloves or other protective items. Contact a physician if anyone is bitten by a marine mammal or if there is any concern due to inadvertent contact with an animal's bodily fluids (DFO 2006).

- Always wear protective gloves (neoprene or nitrile).
- Wash any exposed areas of skin thoroughly with anti-bacterial soap as soon as possible.

It is also critical that responders maintain safety while working in the marine environment. This includes the use of:

- Closed toe, non-slip, waterproof footwear
- Personal Floatation Devices (PFDs)
- Effective raingear
- Sunscreen
- Sunglasses
- Full eye protection, i.e., goggles, safety glasses, or face shield
- Oil resistant rain gear or oil protective clothing (coated Tyvek, Saranex, etc.) if working with oiled animals
- Weather appropriate clothing
- Hard hat
- Eye protection
- Respirator
- Personal gear for rugged terrain if conducting shoreline surveys
- Safety vest or other reflective clothing
- Ear protection (muff or ear plug type) if using pyrotechnic devices or operating machinery

Marine mammal oil spill response kits

- Field guides
- Binoculars
- Rain gear
- Data sheets
- VHF Radio
- First Aid Kit
- Plastic or metal clipboard
- Copy of permits
- Protective Gloves (nitrile or plastic)
- Camera
- Flashlights
- Emergency food and water
- Safety glasses

All marine mammal responders have the right to a safe working environment.

If the environment for work is unsafe – Stop Work Immediately.

Report the Problem. Fix the Problem. Return to Work Only When Safe.

Record Keeping

All documents generated during the oiled-wildlife response, including carcass chain-of-custody and sample collection records must be delivered to the documentation unit for final post-incident compilation and record keeping (OWS 2014). Records of all marine mammal response actions will be maintained inclusive of any observed marine mammals, oiled marine mammals, captured or attempted captures. These data will also include a record of the communications of data to DFO with recommendations or suggestions from the Rapid Response Network. Records will be maintained on a daily basis, with a summary report provided at the closure of the response. The timeline for this will depend on the scale of the response.

Section 4 – Response Closure of Wildlife Response and Sign-Off

The duration of wildlife response activities is correlated with the severity and magnitude of the spill, and the level of impact (or potential impact) on species and habitats (SBVEDP 2015). The field assessment for marine mammals will continue until such time that the spill is contained, and the risk to marine mammals is deemed negligible. Some of the factors involved in closing the spill response are:

- Response team safety,
- Trajectory of oil spill in relation to concentrations of marine mammals,
- Number of new animals oiled per day,
- Quantity, toxicity, and rate of weathering of oil,
- Logistical or capacity constraints in holding and/or treating additional animals,
- Whether response effort poses any unreasonable risks (e.g., disease) to healthy wild populations of marine mammals,
- Capacity of existing facilities to keep rehabilitated animals that are unfit for release into the wild,
- Projected cost of continuing response efforts, combined with funding availability, and
- Public concern (Blight 2004).

The decision to terminate the wildlife response will be made by Unified Command, other involved regulatory agencies and stakeholders. At this time, the Marine Mammal Oil Spill Response Field Summary Report (Appendix 4) will be completed.

The marine mammal lead will reconvene all members of the RRNT and review the field operations and procedures for marine mammal oil spill response debrief and lessons learned. The success of the marine mammal response will be checked against the following:

1. Are there improvements to the IRP-MM to expedite this phase?
2. Are there any improvements to the OP-MM that would expedite this phase?
3. Were the efforts to protect marine mammals from reaching the oil successful? If not, what went wrong and what could have been improved?
4. Were there any barriers or roadblocks encountered that prevented or hampered the efforts to protect marine mammals from being oiled?
5. Are there any improvements that could be made to increase the welfare status of oiled marine mammals?
6. How can the capture and transport of oiled marine mammals be improved or expedited?
7. What improvements if any are required for cleaning or rehabilitation facilities?
8. Were local resources effectively integrated into the response actions?
9. How can the local response capacity and integration of local communities be improved for increased oil spill preparedness and response efforts?
10. Is long-term monitoring to be conducted? If so, is a plan in place and who are the contacts?

The key strengths and weaknesses will be identified, areas for improvement with specific recommendations will be reviewed and integrated into this MMOSRP.

Long-term Marine Mammal Monitoring

The need for long term-monitoring of marine mammal populations affected and potentially affected by an oil spill is well exemplified by the integrated evaluation implemented after the Deepwater Horizon spill in the Gulf of Mexico. The work of Takeshita et al (2017) serves as a guide for integrated cetacean monitoring including:

Oceanic species

- Research cruises evaluating distribution, exposures, demographics and prey availabilities
- Remote biopsies
- Tagging
- Passive acoustic monitoring

Coastal species

- Aerial surveys evaluating distribution and abundance
- Prey availability

Bay, sound, and estuary species

- Longitudinal photo-identification (ID)
    - Survival
    - Abundance
    - Remote biopsies
- Capture-release
    - Health assessment
    - Satellite tagging
- Stranding investigations

Section 5 - Next Steps and Needs

The development of this MMOSRP led to the identification of a number of gaps that provide guidance for the next steps in oil spill preparedness planning. These include:

1. Consolidation and integration of existing resources for the development of an oiled wildlife response network in BC including regulatory agencies, rehabilitation centres, marine professionals, oil spill response organizations (i.e. WCMRC), and oiled wildlife specialists into a British Columbia Marine Wildlife Response Team.
2. Assemble oil spill response kits for marine mammals.
3. Identify oil spill response training required for marine mammals and other marine wildlife (see Zicardi et al 2015).
4. Development of species specific response plans that include assessment, capture protocols, and rehabilitation guidance.
5. Evaluation of the existing wildlife rehabilitation centres for response capacities for marine mammals, marine birds and other wildlife.
6. Ensure BC has adequate trained personnel, resources and facilities to successfully respond to an oiled wildlife incident.
7. Develop a network of professional on-call wildlife first responders that are stationed throughout the BC coast.
8. Identification of an oiled wildlife response organization with rapid mobilization capacity.
9. Identification of oiled wildlife training for marine professionals.
10. Delivering oiled wildlife training for marine professionals prior to a spill event.
11. Development of a species awareness mobile application for industrial professionals.
12. Identification and securing of dedicated oiled wildlife response funding.
13. Identifying the personnel and government agencies that would be integrated into the Wildlife Branch during an incident response.
14. Formal adoption of ICS into wildlife response and identification of specific key personnel, companies and regulatory agencies.
15. Identify and resolve gaps in equipment required for a wildlife response.

Appendix 1 – Spill Notification Record – Marine Mammals

Name of person completing SNR – MM: _____

Date: _____

Contract Arranged: **Yes** **No**

If no, explain:

_____

_____
_____
_____
_____
_____

Complete the Spill Notification Record – Marine Mammals Table

Task	Data
Relevant Nautical Charts	
Logistics Contacted?	
Spill Location	
Marine Mammal Information Sources	
Marine Mammal Species of Concern	
Current Weather Conditions	
Current Marine Forecast for Region	

Spill Product Identity	
MSDS obtained (Yes or No)	
Risk Factors for Marine Mammals	
Risk Factors for Personnel	
Any Marine Mammals in Immediate Risk? If Yes, identify.	
Any relevant maps or information of relevant marine mammal distributions?	
Any safety training required for marine mammal personnel? If yes, identify.	
Date of safety training provided.	
BCCSN data request results.	
PWWA real-time data results.	
Estimated scale of marine mammal response: low, medium, high.	

Appendix 2 – Rapid Response Network Field Assessment Data Record

Data form completed by: _____

Contact Number: _____

Date: _____

Vessel On: _____

Field Team Members: _____

Area Covered and Observation Techniques:

Species Sightings Summary

Species	Location (GPS Coordinates) and Time of Sighting	Sea State Beaufort Scale	Group Size	Behaviour – include whether moving toward the spill location	Evidence of Oiling

Species	Location (GPS Coordinates) and Time of Sighting	Sea State Beaufort Scale	Group Size	Behaviour – include whether moving toward the spill location	Evidence of Oiling

Species	Location (GPS Coordinates) and Time of Sighting	Sea State Beaufort Scale	Group Size	Behaviour – include whether moving toward the spill location	Evidence of Oiling

Species	Location (GPS Coordinates) and Time of Sighting	Sea State Beaufort Scale	Group Size	Behaviour – include whether moving toward the spill location	Evidence of Oiling

Appendix 3 - Oiled Marine Mammals Data Record

Oil Spill Name: _____

Name of Person Completing Data Record: _____

Contact Number: _____

Marine Mammal Species Oiled: _____

_____

_____

Location of Oiled Marine Mammals: _____

_____

_____

Name of Marine Mammal Observer Who Documented: _____

Time of Sighting: _____

Vessel Name or Other Platform: _____

Describe Details of Observation:

Time Marine Mammal Lead Contacted: _____

Appendix 4 - Marine Mammal Oil Spill Response Field Summary Report

Date: _____

Name of Person Completing Field Summary Report: _____

Contact Number: _____

Name of Person Submitted to: _____

Contact Number: _____

Complete All Sections Below

Name of Spill

Date(s) of Field Effort

Names and Contacts of Field Personnel Including Contractors

Field Effort

Include personnel, vessels, effort in hours and nautical miles, area of field effort, weather conditions, sea conditions, and hours of operation per day.

Summarize Marine Mammal Observations

Include: species, observer, location, time of sighting, group size, behaviour, evidence of oiling, encounters with spill product, sea state at the time of sighting and details of information relay for oiled animals.

Safety Concerns or Other Additional Details

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