WCMRC
Western Canada Marine Response Corporation

MARINE RESPONSE PLAN

Revision: 1

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ABBREVIATIONS

AOBD	Air Operations Branch Director
BC	British Columbia
C&R	Containment and recovery
CCG	Canadian Coast Guard
EOC	Emergency Operations Centre
EU	Environment Unit
GAR	Geographical Area of Responsibility
GNC	Global Naming Convention
GRN	Global Response Network
IAP	Incident Action Plan
IC	Incident Commander
ICP	Incident Command Post
ICS	Incident Command System
IMP	Incident Management Plan
IMT	Incident Management Team
MRP	Marine Response Plan
NEBA	Net Environmental Benefit Analysis
OSRP	Oil Spill Response Plan
OWS	On-water Supervisor
ppm	Parts per million
RO	Response Organization
RP	Responsible Parties
SCAT	Shoreline Cleanup Assessment Technique
SIMA	Spill impact mitigation assessment
SRM	Spill Response Manager
SRP(s)	Strategic Response Plan(s)
TC	Transport Canada
TFL	Task Force Leader
UC	Unified Command
uSCAT	Underwater Shoreline Cleanup Assessment Technique
WCMRC	Western Canada Marine Response Corporation

STRATEGIC DOCUMENT CONNECTIVITY

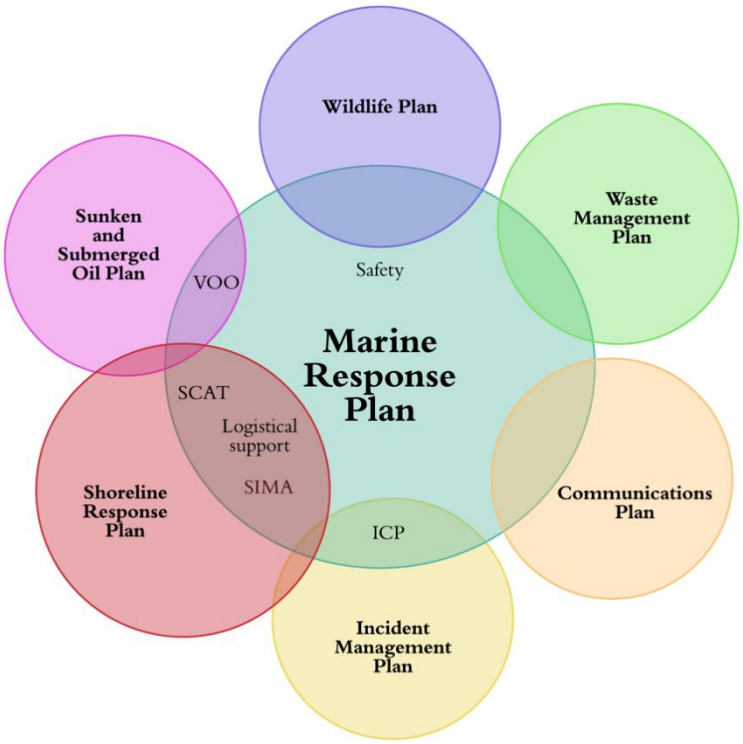

Figure 1 – Representation of the connections between strategic plans and their association to the central plan

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1. INTRODUCTION

This plan is one of multiple Strategic Response Plans (SRPs) which Western Canada Marine Response Corporation (WCMRC) has developed to support its operations, namely:

- Marine Response Plan
- Shoreline Response Plan
- Waste Management Plan
- Wildlife Response Plan
- Sunken & Submerged Oil Plan
- Communications Plan
- Surveillance Plan
- Alternative Countermeasures Plan
- Convergent Volunteer Plan
- Decontamination Plan
- Coastal Response Program
- Vessel of Opportunity Program
- Staging Area Program
- Tier 5 Operational Response Plan.

These plans cover all major areas of response operations and aim to support WCMRC in identifying:

- The appropriate incident management structure and response organization for the applicable response strategy
- The likely resource requirements
- The likely logistical and support requirements.

As illustrated in Figure 2, all SRPs listed above are underpinned by the principles and response methodology outlined in the WCMRC Incident Management Plan (IMP) and wider response fundamentals outlined in the WCMRC Oil Spill Response Plan (OSRP).

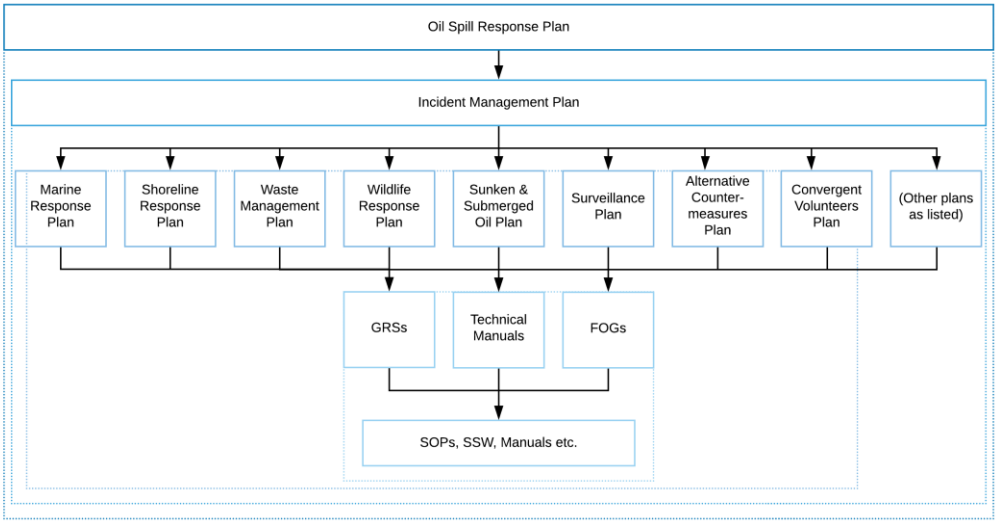


Figure 2 – WCMRC response documentation framework and hierarchical plan linkage

There is also a technical manual in place which assists with implementing the tactics associated with the strategies outlined in each SRP. The WCRMC technical manual describes the following tactics which are relevant to this SRP and are used by WCMRC to enact the measures outlined in this plan:

- Safety Tactics
- Unsheltered Water Tactics
- Sheltered Water Tactics
- Surveillance Tactics
- Waste Management Tactics
- Logistics and Planning Tactics
- Alternative Response Tactics (including in-situ burning and dispersant application – tactics not currently undertaken by WCMRC)

Additional tactics contained within the technical manual which may be referred to in support of marine response operations are:

- Shoreline Tactics
- Sensitive Area Protection Tactics
- Wildlife Tactics
- Inland Tactics

1.1 PURPOSE

The purpose of this Marine Response Plan (MRP) is to demonstrate that WCMRC use a combination of industry best practice, specialist equipment and guidance documentation to consider the most effectible means of responding to the 'oil on water' aspects of a spill incident.

In order to evidence adherence to the RO Planning Standards, RO Regulations and industry best-practice, this MRP describes the rationale and methodology WCMRC will use when choosing strategies, tactics and resources to respond to a spill, based on the circumstances, environment and conditions at the time of the incident.

All response operations conducted by WCMRC will place an emphasis on safety, which remains the highest priority throughout the duration of an incident.

All strategies, tactics and resources deployed in response to a spill incident will be done so with the sole purpose of mitigating the impact of any spill on the environment, taking into account the net environmental benefit of intervention and the justifiable limit at which to cease operations.

1.2 USE

This plan should be used by WCMRC personnel to, as effectively as possible, establish and enact marine response strategies as appropriate to the requirements of the incident.

This plan provides clear guidance on choosing functions for a response organization structure specific to the requirements of marine response to an oil spill incident, based on the principles outlined in the IMP.

This plan is an operational document and as such acts as a guide to establishing marine response activities in the 24-48 hours which follow initial notification of an incident, particularly when escalating to a Level 2/3 response (see Section 3). This plan does not cover specific tasks and arrangements required during the marine response operations nor does it cover operations as they move into the 'project phase' as sites become established for long term recovery.

This SRP is applicable to all WCMRC response personnel at strategic level and above is shared internally as 'required reading'. This ensures all response personnel are aware of the procedures and guidance which have been put in place to ensure any response is conducted in accordance with that described in the OSRP.

1.3 BACKGROUND

As a Response Organization (RO), WCMRC are called upon by organizations who, in the event of an oil spill incident, require specialist pollution response support and expertise. 'Oil spill response' is a complex and multifaceted discipline which requires careful planning, assessment and execution in an attempt to respond in the most efficient way possible to a variable and challenging scenario.

WCMRC's operational oil spill response priorities are:

1. **Contain** (the pollutant to minimize its impact)
2. **Recover** (as much of the pollutant as feasibly possible)
3. **Store** (the recovered pollutant safely prior to responsible disposal)
4. **Protect** (people, the environment and property from the pollutant)

These priorities frame all aspects of WCMRC's strategic decision making with regards to oil spill response. All SRPs and the response principles herein have been developed in accordance with these overarching priorities.

A large portion of WCMRC's geographical area of response (GAR) is made up of open, unsheltered water extending up to 200 nautical miles offshore. The Designated Port (Vancouver) and Primary Area of Response (Strait of Georgia) covered by WCMRC demonstrates the importance of a robust and efficient MRP and operational capability.

This being the case, it is clear that marine response to 'on water' or 'at sea' pollution response incidents is a fundamental function of WCMRC and as such this is well exercised and practised by the organization in peace-time. Continual improvement is achieved in this area as a result of training, exercising, drills and implementing the lessons learnt from each session.

Because marine response is an integral part of WCMRC'S response capability, the organization holds a large amount of specialist 'containment and mechanical recovery' equipment (substantially in excess of statutory requirements) which is maintained and operated at the highest standards. This equipment can be immediately mobilised and dispatched across the

GAR as required to support various locations dependant on the requirements of that area at the time.

Whilst containment and recovery (C&R) remains the primary marine response capability of WCRMC, this plan acknowledges other marine response strategies which may form part of an Incident Management Team's (IMT) Incident Action Plan (IAP) should a net environment benefit analysis (NEBA) / spill impact mitigation assessment (SIMA) deem them appropriate, pending governmental recommendation and approval by Unified Command (UC) and/or Canadian Coast Guard (CCG).

2. ESTABLISHING THE RESPONSE

2.1 MARINE RESPONSE PROCESS

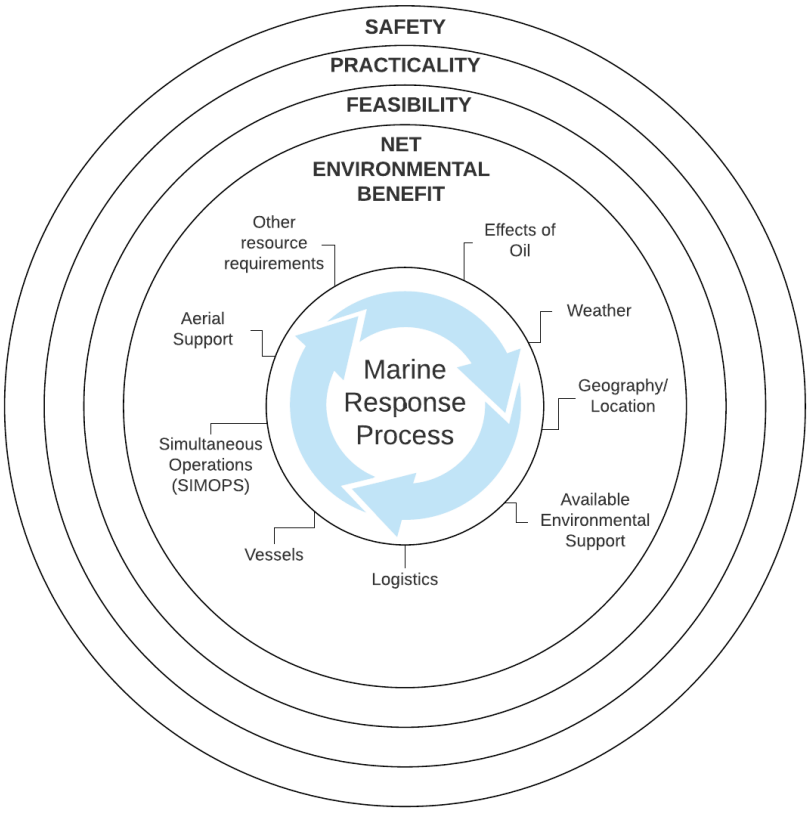


Figure 3 – Representation of cyclical marine response process and overarching considerations

Figure 3 illustrates WCMRC's process for considering marine response operations and the overriding factors which influence decision making at subsequent stages of the process:

- **Safety:** The safety of responders, the public and anyone impacted by the spill and/or marine response operations will always be WCMRC's primary concern.
- **Practicality and feasibility:** The initial circumstances of the spill and how a proportional response can be applied in reality, considering resource availability, the scale of the incident and any influencing factors (see Section 2.1.1 'Limitations & Constraints').
- **Net environmental benefit:** Analysis and comparison of the impact of response operations against the impact of the spill.

Within these overriding considerations is the operational process WCRMC follows when conducting marine response operations. Much like every other response process adopted by WCMRC, the Marine Response Process is cyclical and begins with information gathering (planning) followed by deployment of resources and the assessment of progress against the IMT's objectives.

2.1.1 LIMITATIONS & CONSTRAINTS

It is of critical importance to consider the limitations and constraints at an early stage in the marine response process. Limitations and constraints must frame and inform considerations at every stage – they are major influencing factors.

There are 'macro' limitations and constraints which apply to the wider response effort (as outlined in the WCRMC Incident Management Plan) but each part of the response will have their own issues to navigate. These 'micro' limitations and constraints apply to a particular response operation. It is important to distinguish this difference and understand how particular factors apply to individual Sections and to the response as a whole.

WCMRC may face limitations and constraints that will impact their ability to respond efficiently to an incident. It is important that these are considered at the earliest stages of marine response in order inform operational considerations and to mitigate any foreseeable issues.

Table 1 provides examples of the different types of limitations and constraints to consider when planning marine response operations.

Table 1 – Limitations and constraints considered during the marine response process

Limitations and Constraints	
Regulatory	▸ Government/Agency regulatory requirements ▸ Permits or registration may be needed for site access ▸ Regulatory approval may be required for techniques other than manual recovery
Environment	▸ Accessibility of location (see 'Logistics') ▸ Site security requirements ▸ *Seasonal variation of conditions ▸ *Tidal conditions ▸ *Extreme/adverse weather ▸ *Available daylight hours for safe operation ▸ Size of geographical area covered ▸ Weathering complications of substance spilled
Equipment	▸ Availability of properly scaled equipment for mobilisation to remote locations ▸ Equipment mobilization and deployment time ▸ Containment boom must be suitable for location and operating conditions[1] ▸ Recovery skimmer device must be suitable for oil type, environmental conditions and oil storage capacity ▸ Encounter rate of skimmer ▸ Temporary storage capability ▸ Accessibility of communications equipment suitable for remote locations ▸ Maintenance and repair of equipment
Safety	▸ Prolonged environmental exposure ▸ Availability of PPE ▸ Fate and effects of the substance spilled ▸ Responder fatigue and overall health ▸ Associated 'Environment' factors (*)
Logistics	▸ Availability of suitably equipped vessels ▸ Aerial surveillance support and transit time ▸ Requirement for adequate equipment storage and waste disposal facilities[2] ▸ Vessel personnel and crew rotations ▸ Vessel management, fuelling, available storage and transit time ▸ Responder food/drinks, welfare services, transportation to and from the response site and safety provisions.

[1] The operational limit for effective boom deployment and oil spill containment has been determined to be Beaufort Scale Wind Force 4 as detailed in Section 4.3.2.1.

[2] Vast areas of the British Columbia (BC) coastline are remote and have limited or no connectivity to principal shoreline or city infrastructure. Operating in such areas presents significant logistical challenges and is likely to increase the complexity (and thus the resource requirements) of an incident. Aspects of the response which rely on a large 'supply chain' of resources, such as equipment staging and waste processing, are likely to be most heavily influenced by the location of the operations, given their required transport and connection needs.

2.1.2 MARINE AREAS

RO Regulations and Planning Standards define the potential operating environments expected to be encountered in marine response as shown in Table 2.

Table 2 – RO Regulations and Planning Standards Defined Operating Environments

Operating Environments	
Shoreline	The intertidal zone between the extreme low tide and maximum high tide, including the backs shore areas affected by storm conditions.
Sheltered	Areas where on-water oil recovery operations can be carried out effectively with minimal disruption from environmental conditions.
Unsheltered	Areas where on-water oil recovery operations are normally affected by environmental conditions.

These same standards require WCMRC to maintain the capability to conduct response operations across all three operating environments simultaneously (as demonstrated and evidenced in the OSRP). As such, the maintenance of this capability must be considered throughout the marine response planning process to ensure that resource relocation/redeployment is not to the detriment of another operating environment.

For information on how these definitions influence equipment selection, see Section 4.3.2.1.

2.2 MARINE RESPONSE PRINCIPLES

Table 3 outlines the principles of marine response adopted by WCMRC in accordance with the overarching response priorities outlined in Section 1.3. These principles apply throughout the life of an incident and can be used as a checklist in the Initial Response Phase or as an aid to developing objectives in the Planning Cycle.

Table 3 – Principles of marine response operations

Build appropriate Organizational structure	
Select most appropriate tactics for each defined marine environment	
Contain pollution close as close to the source as possible	
Develop a robust surveillance and monitoring program	
Conduct marine response operations safely and responsibly	
Minimize secondary contamination	
Minimize and manage oily waste	
Consider net environmental benefit and operational limitations	

3. RESPONSE STRUCTURE

3.1 SCALE OF RESPONSE

In the initial stages of a response, WCMRC will use the methodology outlined in the IMP to assess the requirements of the incident and select the appropriate response level based on incident complexity and Polluter requirement.

Generally speaking, for small scale and less complex incidents a core 'Level 1' response organization (Figure 4) will be required, comprising predominantly of 'essential' response personnel who support on-water (or 'on-scene') operations. This 'essential' IMT will act as support to the On-Water Supervisor (who manages the response at tactical level) and manage all aspects of the strategic response as required.

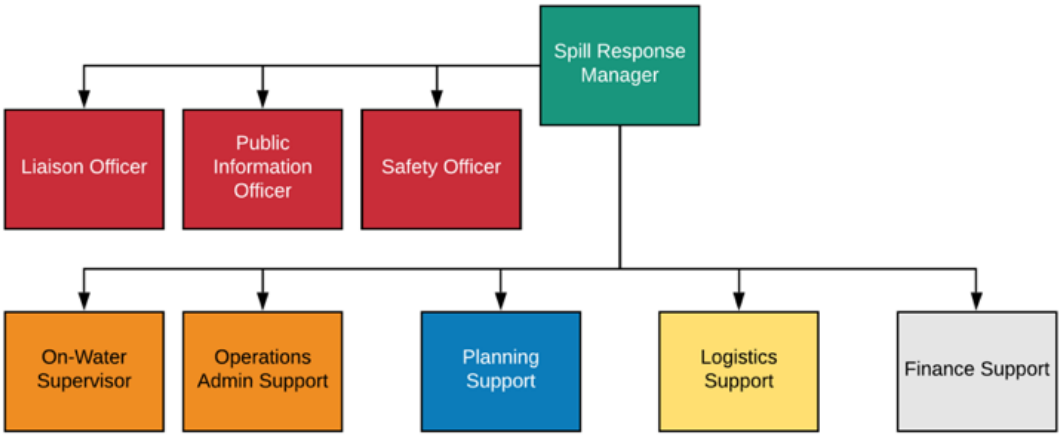
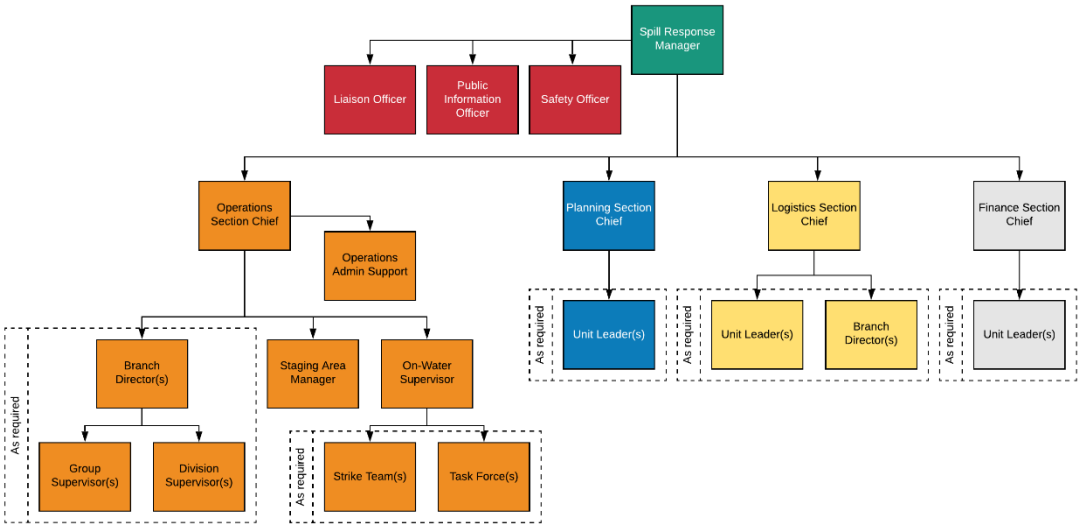


Figure 4 – Recommended Initial IMT Organization: Essential Response ('Level 1')

For larger and more complex incidents, an 'enhanced' or 'expanded' response organization (Figure 5) is likely to be required. Given the additional complexity factors, Polluter requirements and/or limitations and constraints which impact the required scale of response, IMS functions specific to the nature of the incident will be required. It is within these 'enhanced' and 'expanded' response organizations that functions specific to marine response will be established.



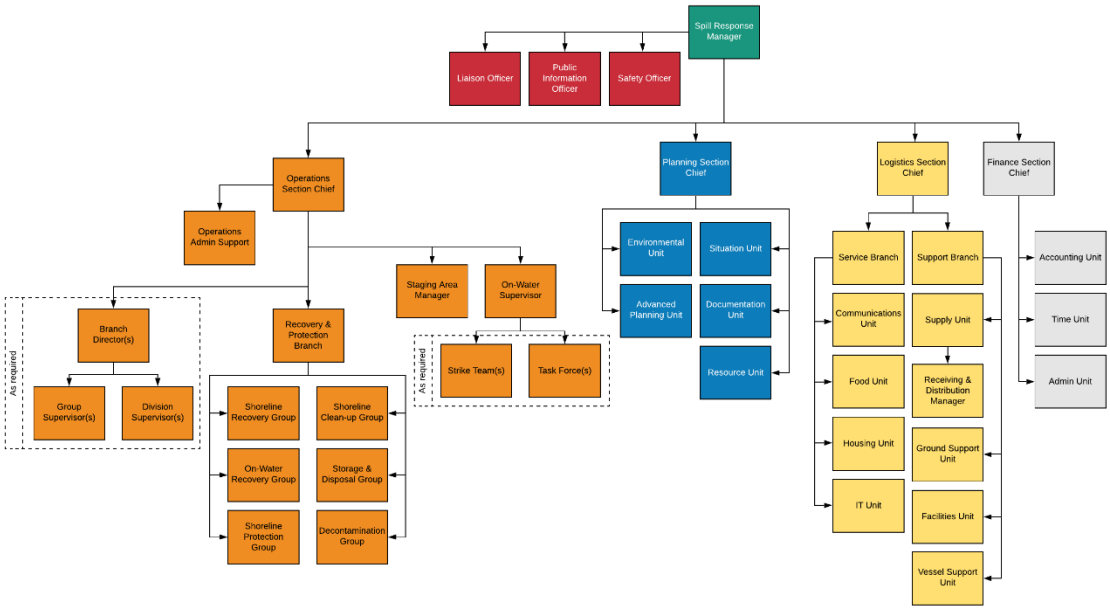


Figure 5 – Recommended Initial IMT Organizations: Enhanced Response ('Level 2') and Expanded Response ('Level 3')

3.2 IMT FUNCTIONS FOR MARINE RESPONSE

The Incident Command System (ICS) Functions outlined in Table 4 are key to conducting successful marine response operations and are therefore likely to be required as part of an enhanced or expanded response organization.

In particular, on-water Branch Directors and/or Group Supervisors have the critical role of overseeing the establishment of key response locations, based on information from aerial surveillance and SCAT/uSCAT teams (via the Environment Unit).

Complete job aids and checklists for all IMT functions listed in Table 4 are contained within tactical plans and supporting documentation (e.g., 'handbooks') as part of the WCMRC document hierarchy outlined in Section 1.

Marine response operations are under the control of the Operations Sections Chief based in the Incident Command Post (ICP) as part of the IMT. Task Forces are dispatched to the scene of the spill ('the field') and provided with a safety and operational briefing based on their marine response assignment. Each Task Force is managed by a Task Force Leader (TFL) and all subsequent commands from the Operations Section to the Task Force are via the TFL, who provides feedback on conditions in the field, safety concerns and operational information. The Operations Section Chief then updates to the Spill Response Manager and/or Incident Commander on the progress and effectiveness of the chosen tactics, thus informing the choice of strategies for the following operational periods.

Table 4 – Key IMT functions for Marine Response

Position/Section	Marine Response Role
Initial Response Phase	
On-Water Supervisor	**Responsible for managing the on-scene response to a pollution incident and directing the tactical response both on water and in the field.** **The OWS is the most 'senior' on-scene function in the response organization and reports directly to the Operations Section Chief or their deputy at the ICP (or Emergency Operations Centre [EOC])**
Operations Section	
Site Safety Assistant	Ensure that all appropriate actions are taken to protect the health and safety of on scene response personnel
Staging Area Manager	Manage staging areas for equipment to be used for marine response (and other strategies i.e., shoreline cleanup)
Operations/Environment Unit (OPS/EU) Liaison	Act as a liaison between the Operations Section and Environment Unit to ensure effective lines of communication
Air Operations Branch Director (AOBD)	Responsible for ensuring that adequate aerial surveillance is mobilised to assess the extent and severity of oiling and thereafter effectively support on-water recovery operations
Recovery & Protection Branch Director	Oversee and implement the protection, containment and cleanup activities established in the IAP
Unsheltered Water Recovery Group	Supervise tactical response operations within the unsheltered water operating environment
Sheltered Water Recovery Group	Supervise tactical response operations within the sheltered water operating environment

Position/Section	Marine Response Role
Shoreline Protection/Recovery Group	Responsible for the deployment of containment, deflection, and adsorbent/absorbent materials in designated locations
Task Force(s)	Location specific resources (of different kinds and types) with common communications and leader, carrying out assignments in a safe fashion and in a manner consistent with directions received from the Group Supervisor
Planning Section	
Environment Unit	Assessment of environmental implications of response options/strategies
Environment Unit Leader	Determines the need (or potential need) to implement and subsequently monitor marine response strategies
SCAT Coordinator	Ensure SCAT/uSCAT surveys are conducted in appropriate locations and a timely manner followed by assessment of the information provided
Resources Unit	Maintaining the status of all assigned tactical resources and personnel
Situation Unit	Ensure all spill information is recorded to facilitate spill decision making
Technical Specialists	Provide specialist advice as required, such as: ▸ Resources at Risk and Wildlife ▸ Permitting/Compliance ▸ Historical/Cultural Resources
Logistics Section	
Service Branch	Management of all service activities (e.g., communications, food, medical provision etc.)
Supply Unit	Ensure distribution of all supplies for the incident and maintaining an inventory
Faculties Unit	Ensure set-up, maintenance and demobilization of incident facilities
Vessel Support Unit	Responsible for implementing the Vessel Routing Plan for the incident and coordinating transportation on the water and between shore resources
Ground Support Unit	Repair of primary tactical equipment, vehicles, mobile ground support equipment and fuelling services; transportation of personnel, supplies, food and equipment in support of incident operations
Finance Section	
Accounting Unit	Ensure all costs recorded

3.2.1 MARINE RESPONSE DURING THE INITIAL RESPONSE PHASE

The majority of incidents which WCMRC respond to will undoubtedly be dealt with during the Initial Response Phase and without the requirement to enter into the Planning Cycle and therefore mobilise an enhanced or expanded response as outlined in Section 3.1.

In recognition of this, WCMRC response personnel are adequately trained to take direct action to recover easily manageable amounts of spilled oil. This action, based on established tactical and site-specific procedures, will only be taken in circumstances where the recovery can be done safely and where an obvious net environmental benefit exists.

The ICS Functions listed in Table 4 (with the exception of 'On-Water Supervisor') are therefore unlikely to be required in the majority of instances and will only be mobilised in circumstances where the spill exceeds the current scale of response, as per the methodology outlined in the WCMRC IMP.

3.2.2 SCALING-UP MARINE RESPONSE

The main indicators of the requirement to expand or enhance ('scale-up') marine response operations are as follows:

- **Exceeding immediate response capability** (i.e., an obvious requirement for equipment, personnel and/or specialisms beyond the capability/capacity of existing marine response resources)
- **Change in the circumstances of the incident** (i.e., the situation, complexity and potential for escalation[3])
- **Exceeding a manageable span of control** (i.e., one person begins to supervise beyond their effective capacity or more than is seven resources[4])

3.2.2.1 SPAN OF CONTROL & ORGANIZATION LEVELS

Span of control is a vital principle for creating, expanding or reducing the response organization to reflect the scale and needs of the incident.

Span of Control means the number of resources that are managed by one person. The WCMRC ICS Field Operations Guide states that "Span of control can range from 3 to 7 resources reporting to one person, but a 5 to 1 ratio is considered optimal".
This principle ensures that all functions are effectively supervised and managers are not overloaded. If any span of control within the response organization has, or is likely to, exceed the optimal (5) or maximum (7), the response organization must be increased in size and/or rearranged into manageable hierarchical units as follows:

- **Branches:** Created under Sections with functional responsibility for major incident operations
- **Divisions:** Created under Branches and used to divide an incident into geographical areas of operation
- **Groups:** Created under Sections or Divisions and used to divide the incident into functional areas of operation
- **Task Forces:** Different resources grouped together to carry out a task under a Group
- **Strike Teams:** Single resources of the same kind and type grouped together to carry out a task under a Group
- **Single Resources:** Individual person or a piece of equipment under a Group

[3] Specific guidance on incident assessment is contained within the WCMRC Incident Management Plan.
[4] Based on ICS Concepts & Principles as declared in the WMCRC OSRP under Section 8.14 Incident Command System Overview.

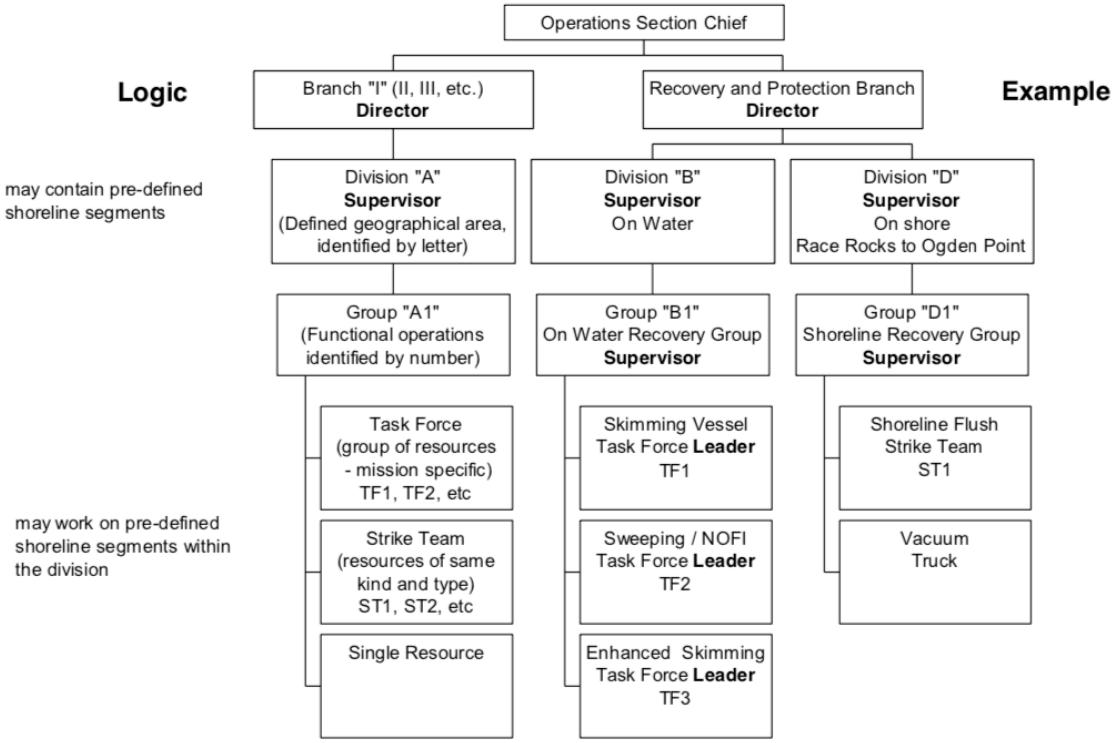


Figure 6 – Chart illustrating the relationship between the different organizational levels and how they can be used to manage span of control.

Further guidance on managing the span of control using pre-designated organizational levels can be found in the WCMRC Field Operations Guides.

3.3 EXAMPLE ORGANIZATION INCLUDING MARINE RESPONSE

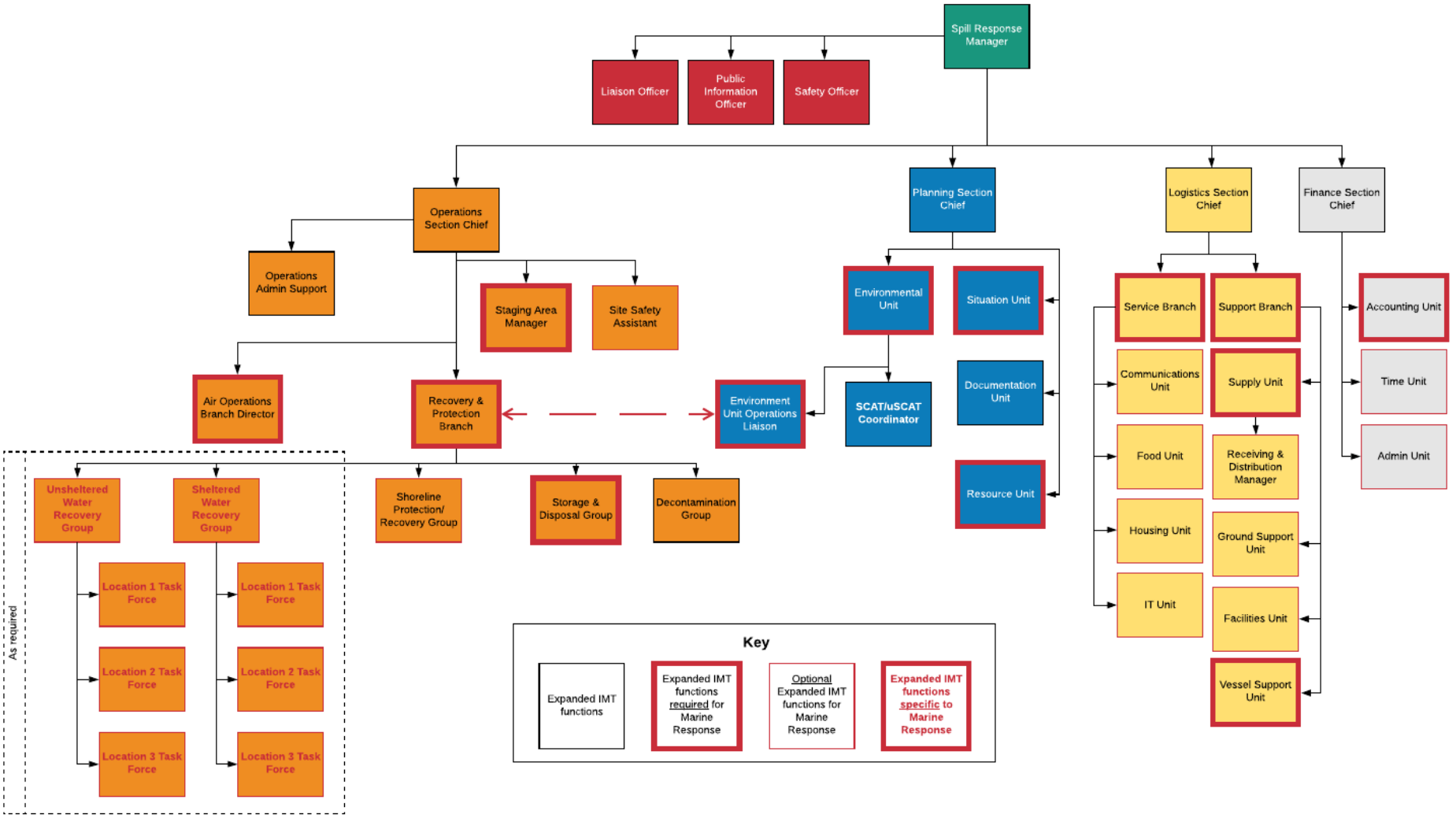


Figure 7 – Expanded IMT response organization showing functions required to carry out marine response operations

4. RESPONSE STRATEGIES

When planning marine response operations, WCMRC will determine the most appropriate strategies, tactics and equipment to be used based on the circumstances of the spill at the time (e.g., current and forecasted weather conditions).

WCMRC will use various tools and decision making aids (e.g., plans) to assess the situation and determine which strategies and tactics:

- Are appropriate for the circumstances of the spill and the resources available
- Can be safely implemented
- Have largest degree of net environmental benefit throughout the life of the response (see Section 4.1)

4.1 CHOOSING A STRATEGY

In order to determine which strategies should be adopted, the Polluter, supported by WCMRC, will be asked to conduct a 'Net Environmental Benefit Analysis' (NEBA) using the 'Spill Impact Mitigation Assessment' (SIMA) process[5].

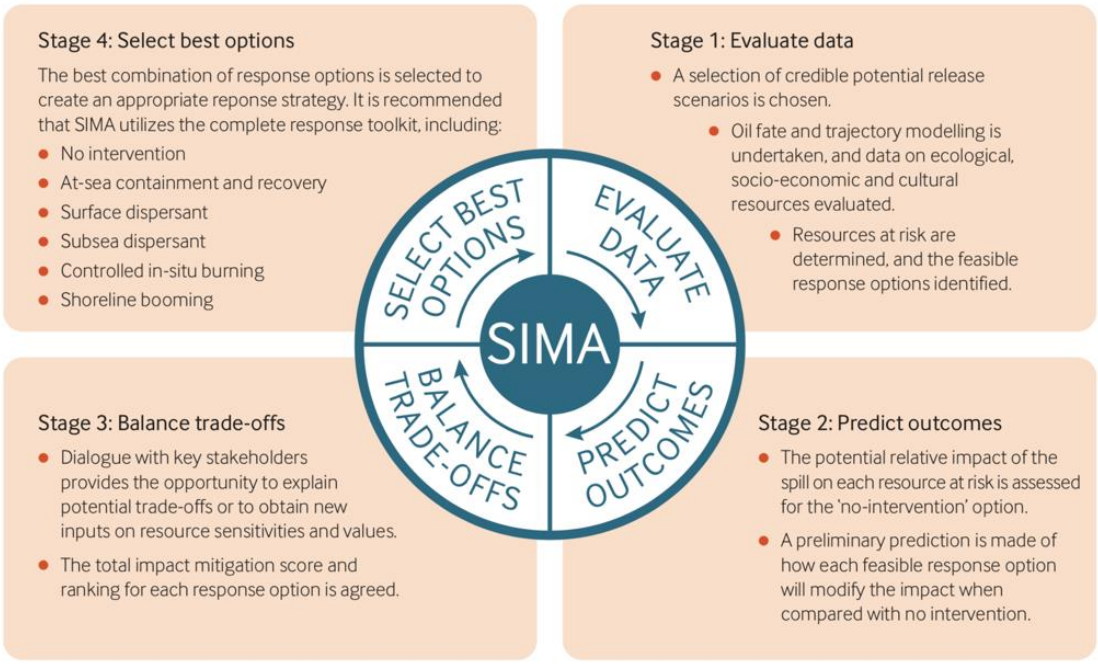


Figure 8 - Summary of SIMA process as depicted in IPIECA, IOGP and API guidelines

As illustrated by Figure 8, the SIMA process provides a means of establishing which of the available strategies:

- **Are likely to be effective** based on the circumstances of the spill
- **Have the greatest net-benefit to the environment**
- **Can be justified as the best possible option** based on a recognised decision model

[5] Based on lessons learned from using a net environmental benefit analysis, the SIMA process has been developed by the International Petroleum Industry Environmental Conservation Association (IPIECA), the International Association of Oil & Gas Producers (IOGP) and the American Petroleum Institute (API) as an established means of facilitating "the selection of the most appropriate response options to effectively combat an oil spill".

This process ultimately informs the strategies chosen for oil spill response and thus informs the tactical assignments. In the early stages of response planning, it is important to begin the SIMA process to ensure that the chosen strategy or strategies for marine response is appropriate for the longevity of the spill.

4.2 PRINCIPLE STRATEGIES

In the initial stages of a response WCMRC will promote good source control and effective surveillance and monitoring as principal response strategies which continue for the life of the spill (where applicable) and support other implemented countermeasures. That is to say that, wherever possible, identifying and isolating the source of a spill should take priority and at all times during the response an effective surveillance and monitoring plan should be in place to complement and direct other strategies such as containment and recovery.

4.2.1 SOURCE CONTROL

One of the first considerations of WCMRC will be the potential to contain an oil spill at source (e.g., a grounded vessel). At source containment is clearly a favourable option for marine response wherever possible as the impact of any spill will ultimately be limited to a smaller area than it would be otherwise. Source control may be considered as:

- Limiting the amount of the pollutant contained within the source and/or restricting the rate of flow from the source (e.g., removing fuel oil from grounded vessel via a safe and controlled means)
- Enacting measures to completely contain the spilled oil to an area very close to the source (e.g., complete or partial encirclement of grounded vessel using containment boom).

The circumstances of the spill and local conditions will determine whether source control is possible, safe and appropriate. Encirclement for example, whether complete or partial, requires a negligible current to be effective.

4.2.2 SURVEILLANCE & MONITORING

The importance and value of information provided to the IMT by way of surveillance and monitoring strategies cannot be understated. The information gleaned from various methods of observation and feedback (e.g., overflights) is fundamental to:

- Determining the **actual** circumstances of the incident
- Providing the IMT with a good level of situational awareness
- Assessing the effectiveness of other strategies
- Support the implementation of tactical assignments

In simpler terms, a robust surveillance and monitoring strategy is the single most effective means of obtaining good quality information available to the IMT.

More information concerning surveillance and monitoring is contained within the WCMRC Surveillance Plan.

4.3 PRIMARY STRATEGY (CONTAINMENT AND RECOVERY)

C&R is the practice and application of methods to control, direct and collect free-flowing oil from the surface of the water by means of mechanical equipment. C&R requires a significant 'on-water' response and is often supported by aerial resources to locate oil slicks and direct vessels from the air.

Any C&R response must be deployed in an effective arrangement specific to the circumstances of the incident. The sea state and weather conditions must be calm enough for the response to function well and for the response personnel to operate any equipment with minimal health and safety risk (up to and including a Beaufort Force 4 only [see Section 4.3.2]).

4.3.1 OPERATING ENVIRONMENT

In the event of an incident, WCMRC will determine the operating environment in line with the requirements of the RO Regulations and Planning Standards as outlined in Section 2.1.2.

4.3.1.1 SHORELINE RESPONSE

WCMRC's strategy for shoreline response are covered by a separate Shoreline Response Plan.

Initial shoreline assessments will be conducted by Shoreline Cleanup Assessment Technique (SCAT) teams that operate under the Environmental Unit Leader as part of the IMT. Based on feedback from the SCAT team(s), the Operations Section Chief begins the mobilisation of shoreline cleanup response resources. A Shoreline Division Supervisor is assigned to manage the response and arrange logistical support. Shoreline Task Force Leaders are be responsible for implementation of the shoreline cleanup assignments.

If, however, the immediate capability of first-responder marine crews can be safely utilized to good effect during the intervening period between spill discovery and enacting the Shoreline Response Plan, first-responder marine crews will conduct removal of bulk oil from shorelines or areas where it is trapped against the shore to prevent remobilization.

4.3.1.2 SHELTERED WATER RESPONSE

The strategy used for sheltered water response is the deployment of personnel, vessels and mechanical equipment to contain, collect and recover oil from a sheltered water environment with the objective of protecting areas of environmental, social and cultural sensitivity.

The Environment Unit will work with the Polluter to establish the likely location, direction, scale and properties of the spilled oil. The Operations Section will determine the most appropriate tactics to mitigate the effects of the spill based on the findings of the Environment Unit and circumstances of the response (location, weather, resources availability etc.). Once the most suitable tactics have been established, assignments will be written, and Task Forces briefed on the means of implementing them. The Task Forces will then deploy the necessary equipment and begin recovery operations.

The tactics typically used to enact this strategy are:

- The use of boom sweep systems in a 'U' and/or 'J' or 'V' module configurations (see Section 4.3.2.3.1)
- The use of Current Buster systems (see Section 4.3.2.3.2)
- Shoreline protection by exclusion and diversion/entrapment booming

Work Boats and/or power skiffs will be assigned to support the deployment of these tactics if the weather conditions and the capabilities of the vessel meet the requirements of the task.

4.3.1.3 UNSHELTERED WATER RESPONSE

Any response activity conducted, usually in open water, in conditions of Beaufort Scale 3 to 4 (as explained in Section 4.3.2.1 and illustrated by Table 6) shall be considered an 'un-sheltered water response'.

The strategy and objective of unsheltered water response is largely the same as that of sheltered water response but focuses predominantly on the deployment of resources to contain and recover oil in open water using an 'advancing sweep' method/system as outlined in Section 4.3.2.3. The resource requirements for unsheltered water response are also similar to that of a sheltered water response, but support from additional vessels (see Section 5.5) is likely to be required.

The tactics deployed to enact the unsheltered water response strategy are pre-designated by means of Task Force assignment (as outlined in the WCMRC Technical Manual) as follows:

- Primary Response Vessel Task Force: Deployment of a collection boom (sweep) system in conjunction with a shipboard or portable a skimming system ('J' configuration).
- Response Barge Task Force: Deployment of a tugboat towing a barge equipped with a skimmer and Current Buster and/or boom sweep system maintained by supporting vessels.

Both of these tactics can be used in conjunction with vessels towing boom in a gated 'U' configuration to enhance encounter rates.

It should be noted that offshore containment recovery tactics, in any case but especially in the case of large offshore spills in unsheltered water, are very likely to be enhanced through the use of aerial surveillance which will be used to direct on-water operations to the area(s) with the highest concentration of oil.

4.3.2 BOOMS AND SKIMMERS

WCMRC maintains an extensive inventory of equipment to conduct mechanical containment and recovery operations, namely booms (to collect and direct oil), skimmers (to 'lift' oil from the surface of the water) and vessels (to deploy the equipment).

4.3.2.1 OFFSHORE BOOMS & SELECTION METHODOLOGY

WCMRC maintains an extensive inventory of oil spill booms as listed in the WCMRC OSRP.

Tactical manuals and decision making aids are in place to support WCMRC operational personnel with the selection of equipment based on the circumstances of an incident. In order to ensure compliance with RO Regulations and Planning Standards, however, WMCRC have further classified the defined operating environments as outlined in Section 2.1.2.

WCMRC have quantified the defined marine conditions associated with each operating environment and thus determined the recommended equipment specifications for each. In order to do this, WCMRC compared RO Regulations and Planning Standards information against three sources of comparable data:

- ASTM International voluntary consensus technical standards[6]
- The requirements of the Oil Pollution Act of 1990 (OPA 90)
- The WCMRC Global Naming Convention (GNC) used classify oils pill response equipment

As a result of this comparison, WCMRC have been able to identify appropriate boom properties for each of the operating environments based on their defined conditions, as illustrated by Table 6.

This comparison also provides a means of defining an operational limit for on-water operations associated with marine response. Using the methodology described in this section to establish the criteria of each operating environment, **WCRMC have determined that conditions of Beaufort Scale 4 (as defined by Table 5) represent the maximum operational limit for effective offshore containment and mechanical recovery of free-flowing oil**. In conditions which exceed Beaufort Scale 4, it is the position of WCMRC to recommend alternative strategies.

[6] Standard F625 – 94 (Reapproved 2006) 'Standard Practice for Classifying Water Bodies for Spill Control Systems' and Standard F1523 – 94 (Reapproved 2001) 'Selection of Booms in Accordance With Water Body Classifications')

Table 5 – Definition of Sea States and Beaufort Scale

Beaufort Scale	Wind Speed (kt)	Maximum Wave Height (m)	Sea State	Appearance
1	1-3	0.1	0	Calm – small ripples, without foam crests
2	4-6	0.3	1	Small wavelets, do not break
3	7-10	1.0	2	Large wavelets, beginning to break
4	11–16	1.5	3	Small waves, frequent foam crests
5	17-21	2.5	4	Large waves, many foam crests
6	22-27	4.0	5	Large waves, some spray, foam crests everywhere

Table 6 – Quantitative comparison of operating environment criteria and required equipment specification

Categorization Methodology				Operating Environment Criteria				Boom Properties		
RO Planning Standards	ASTM F625, F1523	OPA 90	Global Naming Convention	**Beaufort Scale**	Sea State	Significant Wave Height (m)	Wind Speed (kt)	Boom Height (“)	Boom Height (mm)	Buoyancy/ Weight Ratio
Shoreline	Calm Water	Rivers & Canals	Boom-B-3	**0-1**	0-2	<=0.3	0-3	>=6, <24	>=150, <600	3:1
Sheltered	Protected Water	Inland/Great Lakes	Boom-B-2	**2-3**	2-3	<=1	4-10	>=18, <42	>=460, <1040	4:1
Unsheltered	Open Water	Ocean	Boom-B-1	**3-4**	2-4	<=2	7-16	>36	>900	8:1

4.3.2.2 SKIMMERS & RECOVERY CAPABILITY

WCMRC has access to a multitude different types of skimmer to account for different scenarios and pollutants as listed in the WCMRC OSRP.

Transport Canada (TC) guidelines for on-water recovery stipulate that WCMRC must maintain skimmer resources capable of meeting the WCMRC recovery capability over a 10-day operational period. WCMRC maintains a skimmer inventory for on-water recovery of a 10,000-tonne spill in either the Primary Area of Response (PAR) or Enhanced Response Area (ERA) during this timeframe and therefore meets this standard. To ensure realistic estimates, the recovery equipment used to calculate adherence to this planning standard has been de-rated to 20% of its nameplate capacity.

See the WCMRC OSRP for further information regarding WCMRC's recovery capability and compliance to TC guidelines.

4.3.2.3 TACTICS: SWEEP SYSTEMS

The principle of vessel drawn sweep systems is to use booms to collect and concentrate oil into an apex and thereafter recover the collected oil from the surface of the water using skimmers. The sweep systems used by WCMRC for marine response may combine conventional boom configurations with Current Busters and leader vessels for enhanced oil concentration and recovery.

4.3.2.3.1 BOOM CONFIGURATIONS

The boom configurations used by WCMRC as sweep systems are as follows:

- 'U' boom system (or 'gated U boom' system): Vessels towing containment boom in a U-shaped configuration concentrating spilled oil at the apex. By leaving an opening secured by chain ('gate') at the apex of the boom this configuration can be used by leader vessels to enhance oil concentration for a following sweep system.

- 'J' boom system: Two vessels towing containment boom in a J-shaped configuration to allow a skimmer to be deployed into the apex of the boom from the rear towing vessel. Recovered oil is then directed to a primary storage device such as a floating bladder.

- 'V' boom system: Similar is nature to a 'U' boom system but with the requirement a dedicated skimming vessel positioned at the apex.

These sweep systems and boom configurations are covered in more detail in the WCMRC Technical Manual.

4.3.2.3.2 CURRENT BUSTER

The Current Buster system can be used successfully to work both large pools and/or windrows/streamers of oil. The benefit of this system over regular containment boom is that it can be towed over four times faster and cover a much larger area. It is more manoeuvrable when operating without the recovery system/barge attached. Once the collection bag is full then the recovery vessel would come alongside to pump out the collection bag. WCMRC maintains five current busters. These sweep systems are regarded as the most efficient systems available. They have a unique ability to collect and concentrate oil in waters exposed to current as well as when towing the system at high speeds in open water.

The WCMRC OSRP and Technical Manual contains further information on the use and deployment of Current Busters.

4.3.2.4 SHUTTLE & PRIMARY STORAGE

Oil recovered from the surface of the water will be transported to temporary storage by means of 'shuttling' from the point of initial recovery (i.e., skimmer vessel) to the primary storage facility (i.e., large barge). Shuttling will be conducted using bladders or small barges.

Good practice is to operate three shuttles simultaneously, one offloading skimmers, a second in transit and a third offloading to primary storage. The on-water primary storage barge will be located as close as possible/practical to the recovery operation to facilitate efficient shuttle transit.

Shuttling may also be used to transfer oil from primary storage to secondary storage (or permanent storage where possible). Vacuum trucks will be used to evacuate the bladders and to transfer oil to on-shore facilities.

WCMRC maintains an in-house storage capability which is sufficient in meeting the primary storage requirements of CCG. To meet secondary storage requirements, WCMRC has identified service providers which can be contracted to provide single-hulled barges to support WCMRC with additional secondary storage resources.

In any oil spill scenario, the management of recovered oil and waste is a critical factor in ensuring the success of marine response operations. This being the case, shuttling methods and the chain of primary, secondary and permanent storage must be considered from the outset.

Refer to the WCMRC OSRP and Waste Management Plan for more information concerning the storage of recovered waste.

4.3.3 VESSELS

WCMRC maintains a dedicated fleet of specialized spill response vessels. These vessels are strategically located around British Columbia on the South Coast, Vancouver Island and North Coast.

The vessels range in size and purpose but are capable of deploying oil spill response equipment efficiently and safely. The types of vessel immediately available to WCMRC are:

- Response barges and mini barges
- Skimming vessels
- Boom boats and skiffs
- Logistics and work boats
- Landing craft

Refer to the WCMRC OSRP for a detailed inventory of WCMRC's retained vessel capability.

4.4 SECONDARY STRATEGIES

The two alternative response strategies identified by WCMRC are dispersant application (by either aircraft or vessel) and in-situ burning.

These strategies are currently not undertaken by WCMRC but it is acknowledged that situations may arise where strategies other than containment and mechanical recovery are appropriate as either primary or complimentary response operations. Indeed, in other parts of the world, dispersant application and in-situ burning are commonplace.

WCMRC has the ability to mobilise the specialist resources required to deploy these alternative strategies through the Global Response Network (GRN).

4.4.1 DISPERSANT APPLICATION

Oil dispersants are a mixture of emulsifiers and solvents which have been proved to expedite the breaking down of oil in water into minuscule droplets[7]. This allows the oil to be naturally processed more easily by means of wave action, dilution to very low concentrations and microbial biodegradation.

Following the application of dispersing agents, the concentration of oil droplets in the water can be reduced to as little as ~10 ppm (parts per million) in minutes, ~1 pmm in hours and <1 part per billion after a day. This high rate of dilution can have a significant impact on the capability of a spill to impact wildlife, shorelines and other ecological and economic concerns.

Dispersant application is a widely adopted response strategy globally and is often subject to stringent government oversight. Although there is no formal mechanism in place to request and approve dispersant use in Canada, it is likely that any proposed use will be subject to a rigorous government approval process and their use will only be approved where there is a clear net benefit to the environment in the context of an oil spill. If therefore a SIMA analysis recommends dispersant application as a viable response strategy and UC deems it to be appropriate, an exemption from the current restrictions will be sought and support from GRN partners may be requested by WCMRC.

Although the use of dispersant is widely considered to be a 'secondary' strategy in Canada, their use under exercise conditions has been 'approved' by environmental authorities previously. This may indicate a change in how dispersant is being regarded by authorities and further evidences the requirement for their use to be examined on a case-by-case basis.

These strategies and the associated tactics are covered in more detail in a separate Alternative Response Measures Plan (ARMP).

[7] More information on how dispersant works can be found on the International Tanker Owners Pollution Federation Ltd (ITOPF) website here.

5. RESPONSE SUPPORT

The success of any response relies heavily on the effective participation of all stakeholders. All Organizations, like WCRMC, have their own distinct duties, obligations and responsibilities which they are expected to discharge to the best of their ability in a time of need.

Where Section 3.2 outlines the **managerial** requirement for marine response, this section provides guidance on the **logistical** requirements of marine response operations in the Initial Response Phase and/or the first (and possibly following) operational period of the Planning Cycle.

5.1 RESOURCE REQUIREMENT

All marine response operations require a large number of resources which often operate simultaneously and thus need to be managed carefully at both a strategic and tactical level.

The tracking and management of resources is a fundamental aspect of the IMT and requires clear communication between key functions in the Operations Section (e.g., Staging Area Manager) and Planning Section (e.g., Resources Unit Leader). Good oversight of resource location, assignment and status will allow for effective and timely deployment of resources and aid in establishing the resource requirements of the incident (potentially influencing the scale of the response).

It is impossible to provide an exhaustive list of the resource requirements for marine response operations, however, there are certain resources which the IMT are likely to request as part of developing the tactics for marine response. These recommended resource requirements are listed in the WCMRC Technical Manual to provide guidance on the resource requirement of the various tactics used in unsheltered and sheltered waters.

5.2 AERIAL SUPPORT

Aerial support is a critical supporting element of marine response. Aerial observation is invaluable when attempting to locate and determine the scale of oil on the surface of the water. When observed from the air, the 'leading edge' of slick can be identified and on-water resources guided to the required location.

Aerial surveillance by helicopter is best used for surveillance over sheltered waters where the advantage of agility outweighs the endurance and range requirements of the aircraft. Over unsheltered waters, there is less need for rapid changes in flying speed, direction and altitude, thus the speed and range of a fixed wing aircraft is more beneficial. Aerostats tethered to vessels or land bases can also be used to continuously monitor a slick or response operation. In addition, drones are increasingly being used to monitor an oil spill in a specific location, this is fast and effective, although can only be used in line of sight for short time periods. Remote sensing equipment mounted in aircraft or aerostats can also be used to monitor, detect and identify sources of pollution.

In the event of marine response resources being mobilised, WCMRC or UC may (based on the location and scale of the incident) recommend the mobilisation of aerial support which will be managed by the Air Operations Branch within the Operations Section of the IMT.

Aerial surveillance support and resources would be mobilised by the Polluter through existing service agreements and/or via the Canadian Coast Guard who may activate aerial surveillance assets in the form of Transport Canada's National Aerial Surveillance Program (NASP) aircraft, or a CCG helicopter.

More detail regarding on oil spill surveillance operations is contained within the WCMRC Surveillance Plan.

5.3 CANADIAN COAST GUARD

In the event of an incident, the WCMRC Spill Response Manager (SRM) will communicate directly with the Canadian Coast Guard (CCG) Duty Officer or Incident Commander, should CCG have assumed command of the response where the Polluter is unknown. In these circumstances, CCG will also fulfill the regulatory requirements of the Polluter. CCG will be part of UC in any case, as either the Polluter or Federal Incident Commander.

Regardless of whether CCG has assumed command, representatives from CCG will typically fulfill roles throughout the IMT. The roles are likely to provide support to the Operations Section, Planning Section and Logistics Section and offer collaboration on development of plans, strategies and tactics related to containment, recovery, temporary storage and disposal of oil. As part of UC, CCG will also review and approve any formal Waste Management Plans developed by the IMT.

CCG has access to vessels which can perform containment and recovery operations in both sheltered and unsheltered waters. CCG can also provide resources to support marine response operations, including the provision of the NASP aircraft as outlined in Section 5.2.

5.4 SUPPORT FOR SCAT/USCAT

Shoreline Cleanup Assessment Technique (SCAT) surveys are a regular part of the oil spill response operation. Surveys continue throughout the response to verify shoreline oiling, clean-up effectiveness, and eventually, to conduct final evaluations of shorelines to ensure they meet clean-up endpoints.

Underwater Seabed Cleanup Assessment Technique (uSCAT) is a process which applies the principles and practices of traditional shoreline SCAT, specific to the requirements of sunken and submerged oil (SSO).

WCMRC may be required to provide marine and logistical support for SCAT/uSCAT and shoreline clean-up operations.

Further information on SCAT and uSCAT is available in the WCMRC Shoreline Response Plan and SSO Plan respectively.

5.5 VESSEL OF OPPORTUNITY

As outlined in the WCMRC OSRP, the Vessel of Opportunity (VOO) Program objective is to provide WCMRC's operations team with a reliable and trained pool of vessels and crew that are maintained in response ready status, therefore capable to support if available.

A VOO is a vessel whose crew have been trained by WCMRC to respond to marine oil spills. A number of vessels have been on boarded into the WCMRC VOO Program and are thus available to mobilize as resources in the event of shoreline response.

VOO participants may be activated to fulfill a number of different roles in a response depending on the capabilities of the vessel and the crew. These roles are likely to be, but not limited to, the following:

- Containment support and recovery operations ('skimming')
- Current Buster deployment and sweep operations
- Towing, offloading, shuttling and temporary storage operations
- Site-specific response strategies and shoreline protection booming
- Support Roles
    - Command & Control vessel
    - Safety/air Monitoring vessel
    - Crew boat/water Taxi
    - Logistics support

The mobilization of VOO as part of an incident response is the responsibility of the Logistics Section, supported by the appropriate Contract Supervisor as required.

Further information on the VOO Program and a list of vessels can be found within the WCMRC OSRP and VOO Program plan.

5.6 SAFETY

Marine response operations vary in size and scope; however, safety at these sites is critical to success. WCMRC will ensure that all safety procedures are followed, or where appropriate, develop site specific process to ensure the safety of responders.

WCMRC will:

- Develop site specific health and safety plans, including the requirement for 'tailgate' or 'toolbox' safety briefings
- Introduce appropriate safety measures
- Ensure safety watch personnel are present and enforce a safety program
- Ensure first aid personnel are available to all marine response teams and dedicated first aid stations are established

5.7 TRAINING

Prior to assignment, **all** personnel involved in marine response will be adequately trained to a level which allows them to conduct their assignment safely. WCMRC will, if required, establish on-site training facilities to ensure they are complying with this requirement.

More information regarding the training of response personnel is contained within the WCMRC Training Program.

5.8 INCIDENT COMMAND POST

The marine response will, at all times, be supported by the IMT from the Incident Command Post (ICP). Functions specific to marine response will be incorporated into the IMT as required (see Section 3.2). These functions will provide strategic guidance to marine response personnel and feedback to the IMT on the effectiveness of the response.

As outlined in Section 3, in the initial stages of a response or in the event of a small-scale incident, marine response is likely to be managed and coordinated by on-scene personnel or 'first responders'. As an incident progresses and/or escalates and moves into the Planning Cycle, the IMT will take over coordination of marine response and direct all activities by means of the Incident Acton Plan (IAP) and associated work assignments based on the planning information available to them (e.g., oil spill modelling, satellite imagery etc.).

The same principle applies to the mobilisation and management of all resources associated with marine response. In the initial stages if an incident, pre-existing and readily available resources are likely to be deployed and managed by on-scene personnel. Should the requirement for resources extend beyond the immediate capability, consideration should be given handing coordination of marine response over to the IMT at the ICP. This is because the requirement for additional resources often indicates a requirement to expand the current scale of response. Resource requirement, procurement and logistics management will thereafter be managed by the ICP (possibly via a Staging Area) and on-site management of resources will remain the responsibility of on-scene personnel.

During any response, regardless of scale or complexity, the importance of communication between 'the field' (or 'on-water' in the case of marine response) and the ICP cannot be overstated. Effective and regular communication will facilitate efficient enactment of the IAP and provide the insight required to review and adapt plans for subsequent operational periods, thus directly contributing to the success of response efforts.

Details of how WCMRC implement effective communication networks are contained within the WCMRC Communications Plan.

DOCUMENT HISTORY

REVISION NO.	REVISION DATE	DESCRIPTION OF CHANGE	DOCUMENT OWNER
1.0	30th November 2020	Initial Version	RRT

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