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ASOCIACION REGIONAL DE EMPRESAS DE PETROLEO
Y GAS NATURAL EN LATINOAMERICA Y EL CARIBE

GUIDELINES FOR OIL SPILL MANAGEMENT AND CONTINGENCY PLANNING

Canadian International
Development Agency

Environmental Services
Association of Alberta

ARPEL

GUIDELINES FOR OIL SPILL MANAGEMENT AND CONTINGENCY PLANNING

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OIL SPILL MANAGEMENT AND CONTINGENCY PLANNING GUIDELINES

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1.0 Introduction

The risk of oil spills in Latin America is significant. In a region of the world with 500 million inhabitants, the production and refining of crude and condensate are increasing every year. Tanker traffic alone accounts for the equivalent of 4000 shipments a year in proximity to coastlines and river systems.

It is an objective for each ARPEL Member Company to prepare oil spill contingency plans. This includes the preparation of a regional approach to planning which would allow more effective action to combat marine oil spills.

These guidelines have been developed to assist with reaching this objective. The guideline information can be equally applied to all types of oil facilities and transportation systems, both onshore and offshore. However, the actual applicability of the guidelines' information to government requirements must be considered.

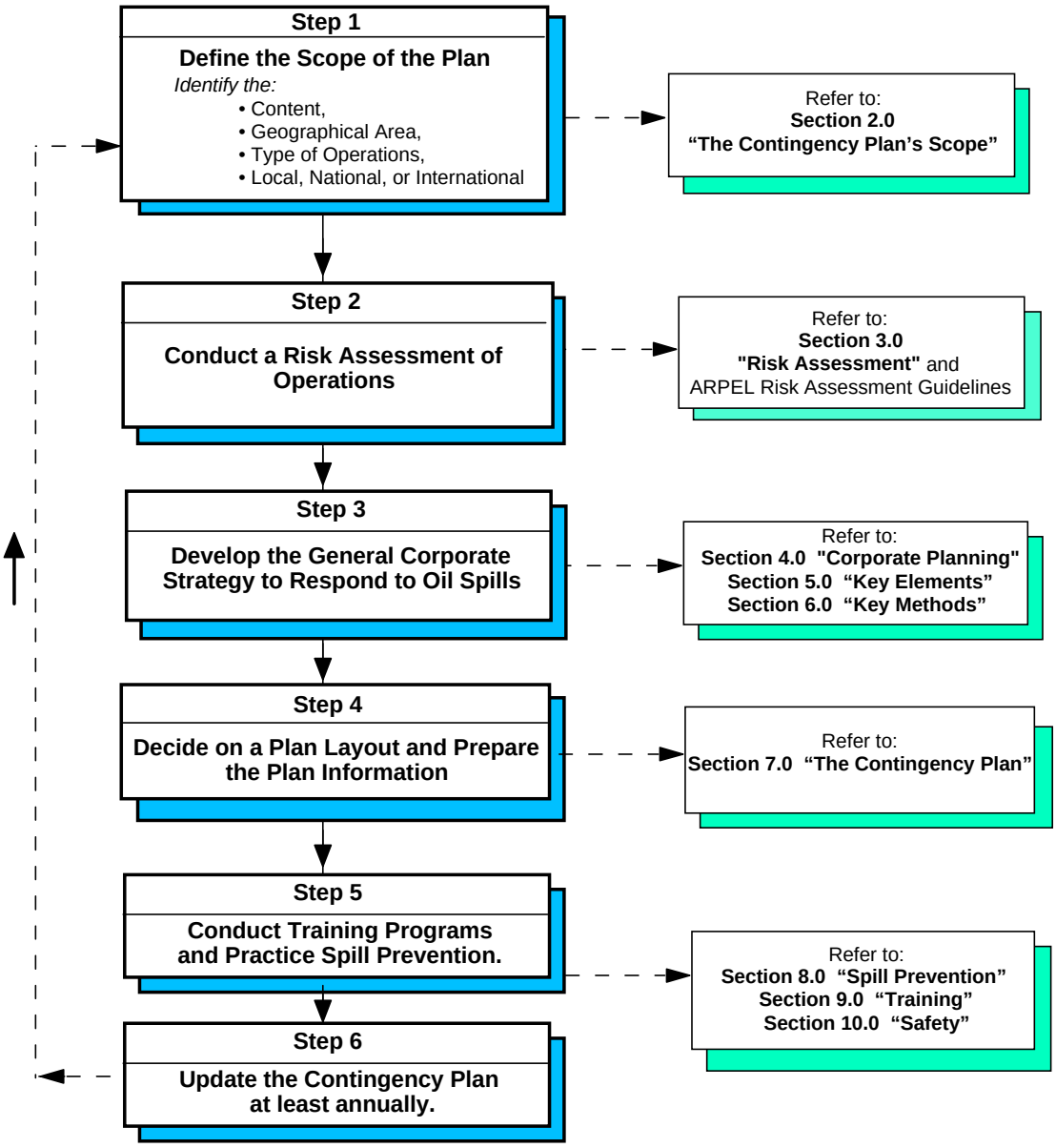
- ✓ For small spills, which can be handled locally by the individual ARPEL Member Company, these guidelines will assist with the development of each Companies' contingency plans to address local spills.
- ✓ For larger spills, that are beyond the local Company capability or affect a larger area, a compatible and cooperative response will be required. This may occur with another ARPEL Member Company or with various governments. Although international agreements may be in place, these guidelines can also serve as a common basis for all Companies to develop recognizable and consistent contingency plans.

Careful and detailed planning is therefore necessary with any of these emergency operations. To be most effective, local, national or regional contingency plans should follow a similar layout. The layout should be common although each Plan may vary in its length. The content may also vary with the size of the geographical or operational area and the degree of risk.

Figure 1-1 identifies how to use this document.

- ✓ If there are no plans in place then the guidelines can be used to ensure that all necessary components are considered.
- ✓ If a Company already has effective plans in place, then the guideline information may provide suggestions for the future upgrading of the plans.

Figure 1-1
How to Use the ARPEL
"Oil Spill Management and Contingency Planning Guidelines"



2.0 The Contingency Plan's Scope

There are many different types of oil spill contingency plans. They vary depending on their geographical coverage, type of operation, and the administrator of the plan (i.e. Company or government). These guidelines provide a suggested framework from which the various different types of plans can be developed. However these guidelines focus on the Company (National) and Company (Operations) types of plans (See Table 2-1).

A contingency plan may also be written to address other types of emergencies besides oil spills. This may include fire, explosion, gas release, transportation accidents, and natural disasters.

Regardless of the subject or type of plan, the relationship to other contin-gency plans, in particular national plans, must be identified in the plan.

Table 2-1
Types of Oil Spill Contingency Plans

Type of Plan	Scope	Type of Operations
Joint International	• Generally administrative and addresses the overall responsibilities for oil spills affecting multi-national resources. • Developed between national governments, international or national petroleum companies, and international associations.	• Marine Tanker Transportation Routes • Pipelines Crossing Major River Systems
Company International	• Administrative guidelines for notification methods and government contacts. • References other Company plans.	• Company Marine Tankers • Company Pipeline, Rail or Trucking Routes
Government National	• Government methods for coordinating government departments, manpower, and industries for response.	• Major industrial disasters of which oil spills may only be one component.
Company (National)	• Administrative organization of Company response methods. • Identifies Response Teams and structure. • For Companies with limited operations, may also address other types of emergencies. • Refers to other plans for specific Company operations.	• Domestic tanker operations (coastal or river). Ship board plans. • Major transmission pipelines.
Company (Operations)	• Regional plans which specifically address individual or area operations. • Personnel are specifically identified.	• Specific geographical operations which may include gathering pipelines, production facilities, bulk or service stations, drilling operations, and ship board plans.

3.0 Risk Assessment

All Companies should conduct a risk assessment of their operations to identify:

- all possible sources of spills (including chronic leaks),
- potential size of discharges,
- spill response methods,
- time to initiate an active spill response, and
- protection / cleanup priorities.

This information can be prepared in a table and included in an appendix to the Plan. An example of such a risk assessment table is on the following pages. A Company should review and, if necessary, revise its risk assessment at least annually.

There should be no restrictions on the consideration of the type and size of spills. Suggested spill types are (but should not be limited to):

- tanker accident offshore,
- tanker off-loading operations,
- pipelines,
- pipeline pumping stations,
- each storage tank,
- storm drain systems at refineries and marine and distribution terminals,
- failure of refinery and distribution terminal oily water separators,
- miscellaneous facility piping,
- miscellaneous barrels around the refinery and distribution terminals,
- miscellaneous process vessels in the refinery and distribution terminals, and
- spills during truck loading and transportation.

Depending on the scope of the plan, the risk assessment can be translated into spill scenarios which will form the basis for ensuring that prevention methods, the contingency plans, and the designated response levels are adequate. These Levels (or Tiers) will vary between companies and plans, however the examples below define three possible levels:

- Level 1, Minor Local Spills, 0 to 100 bbls. (< 16 m^3)
- Level 2, Medium Spills, 100 to 5000 bbls. (16 m^3 to 795 m^3).
- Level 3, Major National Spills, over 5000 bbls. (> 795 m^3)

The environmental damage that can occur from small spills, particularly onshore spills from pipelines and storage tanks must also not be overlooked. If a pipeline spill occurred into a river system, extensive environmental damage can occur which may affect the local ecosystem for a number of years.

Small spills and leaks onto the ground at facilities such as refineries must also be addressed in any prevention plans and training programs. The environmental damage that can occur from small spills should never be under estimated. In the right circumstances, 1 litre of spilled hydrocarbon could cause 1,000,000 litres of groundwater toxic.

Table 3-1
Example of an Oil Spill Risk Assessment Table for Typical Petroleum Operations
(Potential Spill Volumes are only given as examples.)

Spill Source (Scenario)	Potential Spill Volume	Consequence Impact	Prevention and Response Strategies
Offshore Tanker Spill - Collision	> 150,000 m^3	Extreme local impacts to mangroves, coral platforms, beaches and all biological resources.	Low possibility of offshore recovery operations. Minimal potential application of dispersants and in-situ burning of oil in the water. Possible use of booming and skimming operations nearshore to protect mangrove, coral, and lagoon areas. Extensive shoreline cleanup required using acceptable methods.
Tanker Spill during Transfer Operations at Marine Terminal	> 1000 m^3	Minimal impact if confined to the terminal area. Safety concerns are high due to possible concentrations of products around the dock and the proximity of the other nearby port operations.	Immediate deployment of boom, small skimmers and bay cleaner. Deflection and suppression methods for reducing flammable vapours. Prevention: Upgrade tanker inspection criteria, operation checklists, and communications during loading / unloading procedures. Consult with IMO / ITOPF for latest criteria.
Tank and Dike Failure at Marine Terminal	> 4500 m^3	Discharge into ditches and ocean waters. Oiling of local shorelines and possible severe impact. Also other beaches if spill is not contained in terminal area.	Improve tank dike and pipeline corridor containment capabilities. Initial booming attempts at terminal drainage channels to ocean waters. Washing of drainage channels and recovery of product using sorbents and skimmers. Shoreline cleanup may be required using acceptable methods. Extreme safety concerns for large volumes of product.
Small Vessel Leak at a Distribution Terminal	> 65 m^3	Confined to tank area unless improper or absence of ditching and dikes then possible local impact to Company property. If not contained by storm runoff system, may contaminate off-site areas including water bodies.	Facility operations may be affected during cleanup. Cleanup using pumps, sorbents, skimmers. Ensure adequate storage capacity and integrity of diking systems.

Example of an Oil Spill Risk Assessment Table for Typical Petroleum Operations
(Continued)

Spill Source (Scenario)	Potential Spill Volume	Environmental Impact	Prevention and Response Strategies
Large Tank Leak at a Distribution Terminal	2700 m^3	Confined to dike area if dike holds. Instantaneous break can breach or destroy dike. Regular inspection of dikes and tanks may prevent leaks.	Facility operations may be affected during cleanup. Improve dike maintenance and ensure dike drain valves remain closed when not manned. Avoid the use of bolted, old and poorly welded tanks.
Fuel and Product Bulk Storage Tanks at a Distribution Terminal	160 m^3 (Annual use: 5000 tonnes diesel, 300 tonnes gasoline.)	Confined to dike area if dike holds. Instantaneous break can breach or destroy dike. Regular inspection should detect slow leaks.	Facility operations can continue during cleanup. Improve maintenance and ensure proper equipment usage and type. Improve dike maintenance and ensure dike drain valves remain closed when not manned. Avoid the use of bolted, old and poorly welded tanks.
Misc. Small Spills (pipeline pigging traps, drips)	< 1 m^3 (Can occur at any type of facility.)	Can significantly degrade long term ground condition.	Can be avoided with proper maintenance and housekeeping practices.
Pipeline - Main	Existing 6" no-automatic shutdown valves on lines: 5 km @ 17.7 m^3/km = 88 m^3	Extreme local impact - extensive area may be contaminated including waterbodies and downstream water users. Site can be at any location on pipeline. Remote location may restrict response access activities and increase environmental impact.	Operations will be restricted or totally shutdown. Boom containment in most rivers may be possible with make-shift booms. In small watercourses, boom containment may be possible but very dependent on response time. Collection using trenches and pumps. Burning operations may be possible in some locations. Improve pipeline leak detection, manned inspection schedules, maintenance and ensure proper equipment usage and type. Regularly review spill response potential and control point locations for critical areas.
Truck Rollover	< 10 m^3	May or may not be contained to immediate ditch. Highly probable that may enter at least a small watercourse.	Unable to predict location. Improve driver training standards, notification procedures and hauling requirements. Possible placement of truck response spill kits at key locations.

4.0 Corporate Planning

This section reviews the issues and ultimately the decisions that must be made by a petroleum Company on how it expects to administer the development and implementation of the contingency plan and how an emergency response is to be handled.

Company - Government Relations

The oil spill responsibilities of government departments and Company personnel may be similar or different in title and description. It is therefore essential that the responsibilities be clearly defined and previously agreed to with the applicable government departments.

This may also be applicable to international organizations that may be responsible for administering law where country jurisdictions do not apply (i.e. offshore waters).

- ❒ Illustrate the different responsibilities on a chart and include the chart in the contingency plan. The chart should also indicate when the various individuals or agencies would become involved in a spill response. References should be made, where required and if applicable, to a National Spill Response Plan.

- ❒ Conduct face-to-face meetings and joint training programs, on a pre-spill basis. This will facilitate discussions of response options and decision-making during actual emergency situations.

- ❒ Invite government personnel to communication / notification and equipment exercises. Exercises should be held at least on an annual basis.

- ❒ Involve government agencies through either notices of Company intentions or invitations to participate in oil spill research, investigations, the development of response measures, and facility developments. As the need arises, the Company should continue to take an active role in promoting a coordinated effort by the Company and government to address oil spill concerns.

Company - Other Industries

Reference other industrial operations which are in the same geographical area as the Company's in the applicable contingency plan.

- ❒ Include the notification procedures, spill response responsibilities, and the effect that the other industrial operations may have on the Company's spill response.
- ❒ Consider the close proximity of other operations, the predominant wind directions, the potential for spilling flammable products, and possible ignition sources from both the Company operations and those of the other industrial operators.
- ❒ Develop evacuation routes for land based operations.
- ❒ Review the plan with the other industrial operator to ensure that their concerns are addressed.

Written Procedures

Specific written procedures should be prepared for any operations where hydrocarbon spillage is possible.

- ❒ Develop mandatory checklists for ALL operations where spills could occur (e.g. during oil transfers).
- ❒ Post single page laminated action guides in key locations.

Customs and Immigration Requirements

Equipment and manpower imported for spill cleanup operations will require special clearance from national customs and immigration departments.

- ❒ As part of the pre-planning process, arrange a set procedure between the Company and the authorities to eliminate problems due to time delays during a spill response operation.
- ❒ Obtain a written confirmation of the agreed procedures from the government authority.
- ❒ Ensure that the procedure will also expedite the return of the equipment to the countries of origin.

Government and Company Requirements

- ❒ Ensure that procedures which may require review and approval by either a government department, port authorities, or by a specific Company requirement are identified in the Plan. These procedures would identify the government notification or operational requirements. Examples include the Company's procedure for dispersant application and burning operations during spill cleanup.
- ❒ Prepare for alternate response strategies for spills caused by terrorism or other suspicious causes. Cleanup response to spills caused by acts of terrorism will often take secondary urgency to the actual government investigations. In some situations, spill response and cleanup may not be allowed until an investigation is complete.

Financial Expenditures

The authority and limitation for financial expenditures must be identified before a spill event. These are further defined by the size or extent of the oil spill or emergency. The authority for expenditures is usually assigned to the senior Company employee who is either at the spill site or command centre.

- ❒ Ensure that financial expenditures and limitations are discussed within the Company as part of the pre-spill process.
- ❒ Establish proper documentation procedures to ensure that adequate written information is available for financial auditing and payment purposes.
- ❒ Identify financial responsibilities in the Duties and Responsibilities section of the Plan for the senior Company representative at the spill site. For large spills, a Financial Advisor would be appointed to work in close cooperation with the person responsible for procurement.
- ❒ Consider using computer documentation for spill expenditures.
- ❒ Arrange pre-spill contractual arrangements with companies who may be required for supplying equipment or manpower during a spill response. This will ensure that the contractors manpower and equipment capabilities, and their requirement to respond are known and agreed to prior to a spill event. Specific financial agreements should be identified in the contracts.

Cost Recovery from Other Industrial Spills

Occasionally a Company may be involved in a spill cleanup that is the result of a non-Company operation, either within the petroleum industry or from another industrial source. Procedures must therefore be determined to recover the Company's costs. Examples of such spills are:

- tankers and trucks used to transport Company products,
- tankers in transit off a country's coast, and
- other industry operators within the country or the Company's operational areas.

❒ Consider the potential liability for costs, legal and other problems when developing these procedures.

❒ Consult with the International Maritime Organization (IMO) in London and the International Tanker Owners Pollution Federation (ITOPF) for further information on this subject.

5.0 Key Elements of a Contingency Plan

The following list identifies key elements of oil spill contingency plans. By following the suggestions contained in this guideline, the majority of the following elements should be addressed.

1. *The plan must reflect the views of senior management.*
   Keep senior management informed and ensure that they approve the contingency plan contents. This will help to avoid possible delays during a spill response.
2. *The plan must be concise and easily read and used.*
   Ensure that the plan does not become an oversized intimidating document that is put "on the shelf". Only include the necessary reference information. Refer to other Company documents which contain the larger quantity of reference information (e.g. spill equipment maintenance manuals).
3. *The plan should address all potential types of spills, regardless of size or location.*
   Do not overlook the prevention and response to small spills from storage tanks, tank trucks, valves and transfer lines. As mentioned in the section on risk assessment, the chronic environmental damage can still be severe from small spills.
4. *For major spills, primarily offshore, the plan must provide detailed response information.*
   Assume that "it could happen to us" and thoroughly analyze all aspects of spill response.
5. *The plan information should be developed in accordance with government standards.*
   Conduct pre-spill discussion and review meetings to familiarize government personnel with the plan. This may avoid serious conflicts and delays which can occur during an actual spill response. Government representatives should also be present at all plan communication and equipment exercises.
6. *The contact names and phone / fax / cellular / radio contact numbers must be current.*
   Efforts must be made to ensure that the contact information is kept up to date. If this information is kept to one or two of the plan pages, then it can be easily updated and distributed for insertion into everybody's copy of the plan.

7. *The plan should include adequate and realistic spill prevention, response, and cleanup information.*
   Identify some prevention practices. A contingency plan provides the opportunity to formulate a sound prevention program based on the risk assessments that were conducted during the planning process.

   Ensure that the identified response procedures reflect methods which are practical and available to the Company. Response procedures may be limited due to logistics, finance, or climatic conditions. Unrealistic expectations are sometimes identified for the use of dispersants, in-situ burning, and recovery equipment in unfavourable sea states.

   Subsequent cleanup steps such as transfer, storage and disposal must also be identified.

8. *The plan must provide responders with adequate information on the fate of oil in the environment.*
   Summarize hydrocarbon behaviour and environmental information in the plan.

9. *The Plan should include adequate information on locations and facilities.*
   Include maps, facility plot plans, production and storage capacities, oil types and properties, historical wind, sea, and other climatic conditions.

   As an example, for tankers this would include the number of tanks, capacities, loading procedures, pumps, etc.

10. *The plan must address safety considerations.*
    Identify safety procedures in the action section of a plan. A separate appendix on safety may also be included.

11. *The plan must refer to other Company plans.*
    The relationship to other Company plans either site specific plans or other types of emergency plans (fire, accident, gas release etc.) should be identified, preferably on a graphic map.

6.0 Key Methods to Use a Contingency Plan

The following list identifies methods that can be used to increase the usefulness and personnel knowledge of a contingency plan.

1. *The plan must be easy to read and follow.*
   Include charts, graphics and tables wherever possible. A plan has to be referred to in a high stress emergency situation. It must be clear and concise.

2. *The plan must be used in training exercises.*
   Review the plan in all training sessions. This provides an excellent opportunity to familiarize personnel with a Company's emergency and oil spill response procedures.

   The more that a plan is used, the more familiar its users become with its contents and where to find information.

3. *The notification methods that are identified in the plan must be tested.*
   Exercise the plan to ensure that the notification methods and organizational structures are functional.

4. *Employees must be aware of the plan and its importance.*
   Ensure that all necessary employees know that the plan exists, where it is located, who administers it, and how to activate it. Employees with specific responsibilities should receive a copy. Condensed versions or single page notification procedures should be posted.

5. *The plan information should be shared with any contractors who are identified in the plan.*
   Include all equipment and response contractors in any exercises. The contractors will then be prepared to provide response assistance, and will be given incentive to keep their equipment in proper operating condition.

6. *The plan must be reviewed and updated after a spill incident.*
   Conduct a “post mortem” review of the spill response to provide practical suggestions for improving the plan, prevention methods, and training programs.

7. *The plan must address long term spill cleanups.*
   A spill response which may continue for weeks or months can have serious administration, financial, manpower, re-training, and logistical problems for a company. Discuss these considerations in the plan or in training sessions with the response personnel who may be managing a spill.

7.0 The Contingency Plan

This section identifies the primary components of an oil spill contingency plan.

The information can be revised as necessary to suit individual corporate needs. In particular, the information requirements should be organized and formatted to make the data readily accessible in a logical sequence which is applicable to the operations.

Table 7-1 suggests a table of contents for a spill contingency plan. There are four primary sections followed by an Appendix of additional information.

Additional information, such as environmental resources and training programs may have to be referenced in the plan but do not necessarily have to be included in the plan.

Table 7-1
Example of a Table of Contents for an Oil Spill Contingency Plan

Preface	Section 1.0 Introduction	Section 2.0 Action Plan	Section 3.0 Responsibilities	Appendices
• Distribution • Plan Updates • Table of Contents • Glossary of Terms	• Purpose • Scope • Corporate Environmental Policy • Facility Information	• Action Guide (Chart) • Notification Chart & Procedures • Reporting Requirements • Activation of Small, Medium, and Major Spills • Incident Report Form	• Organization Chart • Response Team • Government • Personnel Responsibilities - Initial Action Responsibilities - Response Responsibilities	• Inventory of Spill Equipment • Properties of Company Products • Company Facility Descriptions & Plot Plans • Spill Response & Cleanup Strategies • Environmental Data (summary) • Training Requirements • Contact Numbers

Format

Contingency Plans have to be referenced during emergency situations which usually involve high emotions and stress. They must be concise, practical, well organized, and easy to understand.

- ❒ Follow a standard format for all plans. This includes Company plans that are used for different geographical areas and facility / operation types. If practical, National Plans should follow the same format. A standard format allows the plan to be easily understood and remembered by personnel. It also allows personnel who are already familiar with the plan for their area of operation, to be able to quickly assist in an emergency response for another operational area.

- ❒ Keep the Plan's size to a minimum. Use coloured tabs to clearly separate and identify sections.

- ❒ Maximize the use of tables, charts, checklists, and graphics instead of narrative text.

- ❒ Use instructional text rather than descriptive narratives.

- ❒ Include footers on each page with the Plan's production or revision date and the page number.

- ❒ Start each section and important sub-sections on a new page so that the information can be quickly located.

- ❒ Number <u>all</u> pages.

- ❒ Use a word processing format for all Plan information. Minimize, if not eliminate, the use of photocopied information.

- ❒ Use single page laminated summary sheets to identify action items, notification priorities and contact numbers. Post these summary sheets in key offices near telephones (control rooms and transfer points in refineries, pipeline operations, and terminals). The summary sheets do not replace the requirement for the more detailed plan; however, they do continually reinforce to personnel the spill prevention and emergency response procedures.

Figure 7-1

Example of using a map to illustrate the geographic zones that a contingency plan covers.

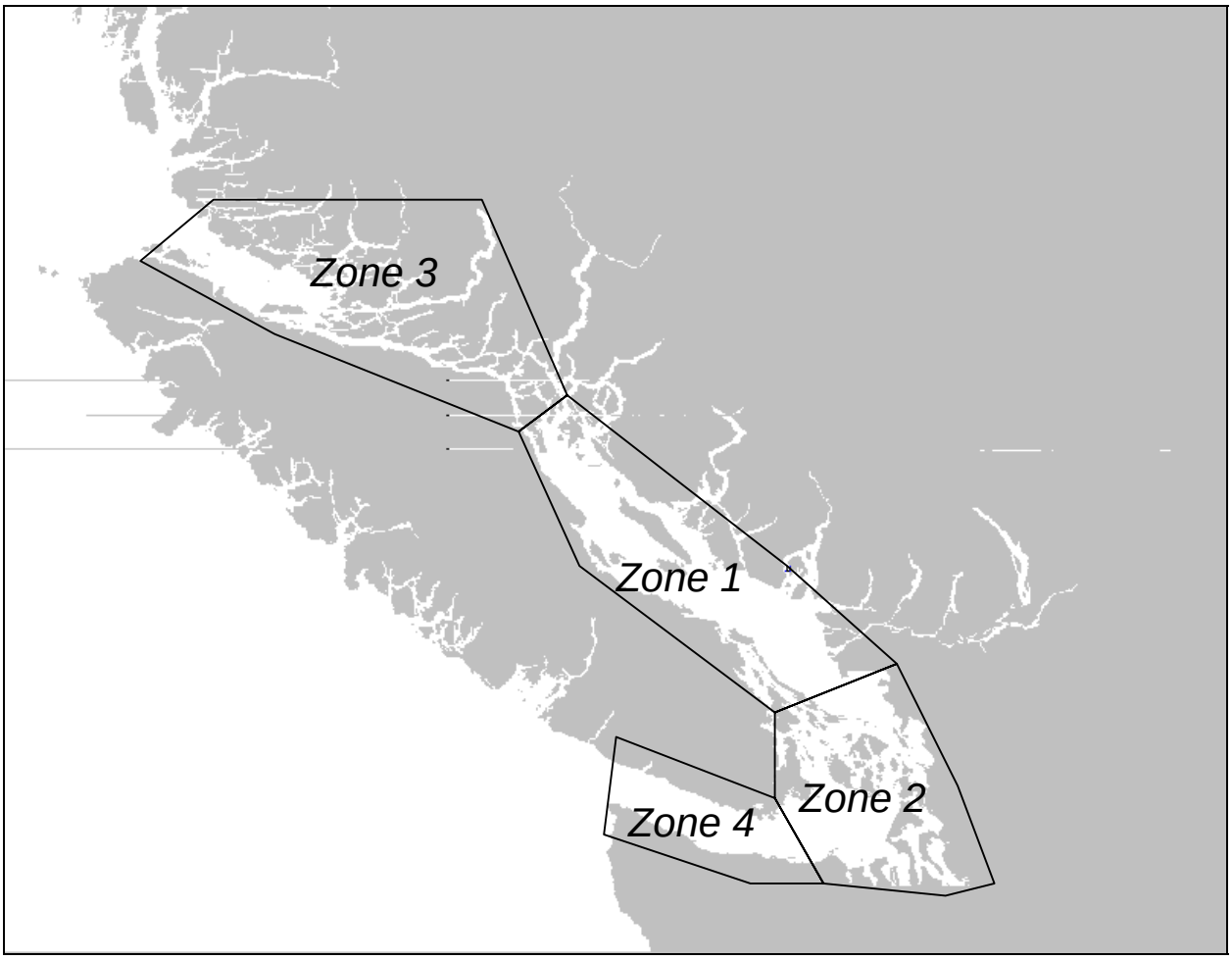


Figure 7-2

Example of a Corporate Environmental Policy that utilizes a page format that makes the information easy to read and understand.

CORPORATE ENVIRONMENTAL POLICY

The Company is committed to the corporate policy of excellence in environmental management which will safeguard the environment and the health and safety of its employees, customers and the public:

1 *The Company will comply with all applicable environmental laws and will develop and implement practicable measures to protect environmental quality and human health.*

2 *The Company will manage its operations to prevent any adverse events and minimize potential hazards that may affect its employees, the public and the environment.*

3 *In the event of an incident, the Company will implement effective control measures and notify all concerned parties.*

4 *Company operations will be subject to internal audits respecting environmental performance, and a corporate status report will be presented annually to the Board of Directors.*

5 *All managers and supervisors are responsible for ensuring their operations and employees comply with this policy.*

Preface

Distribution

- ❒ Include a distribution list at the front of the Plan.
- ❒ Provide a specific number for each of the Plan copies, the name of the individual who received that copy, job title, and location. Include both Company and non-Company recipients on the distribution list.
- ❒ Assign a specific individual to distribute the Plan and to ensure that all future update pages are inserted in all Plan copies.
- ❒ Ensure that sufficient copies of the Plan are distributed. Only those individuals who would be involved in an oil spill should receive a copy.

Table 7-2
Example of a Distribution List

Plan Copy Number	Name	Title	Location
1		Environmental Manager	Company Head Office
2		Marine Operations Manager	Company Field Office
3		Ministry of the Environment	Government Office
4		National Defence	Government Office
etc.			

Plan Updates

- ❒ Avoid frequent plan updates.
- ❒ Try to limit updates to changes of the reporting requirements or personnel contact names and phone numbers. To reduce the number of updates, only include the personnel names in an Appendix; elsewhere refer to the personnel by their position title and not their actual name.
- ❒ Try to make technical changes at the same time as personnel updates.
- ❒ Consider what updates may be required following a review of spill events, spill exercises, and notification / communication exercises.

Table of Contents

- ❒ Include a table of contents with titles that adequately define what each section addresses and the relevant page numbers.
- ❒ Alternatively, a descriptive table of contents can be used. Example: “If you need information on response equipment, see Section ??”.

Glossary of Terms

- ❒ Define acronyms, abbreviations, and technical terms that are used throughout the Plan.
- ❒ Include a conversion table of metric, British or American units (i.e. barrels, gallons, litres, tonnes).
- ❒ The glossary can also be placed in an Appendix.

Table 7-3
Example of a Plan "Glossary"
(Not complete - modify for specific Company or Plan needs)

Term	Definition or Description
Dispersants	Specially formulated agents that are sprayed at low dosages on slicks to enhance its natural mixing and biodegradation in surface waters.
Emergency	An unexpected, unplanned event that could or does result in serious injury, loss of life, property damage, or environmental damage.
Flash Point	The lowest temperature at which the vapours above a volatile liquid form a combustible mixture with air.
In-Situ Burning	A controlled ignition of oil, other hydrocarbon products, and oil spill debris at the site of the spill. For offshore spills the burning of the floating oil may occur with or without fire-resistant booms.
Level 1 Spills	Accidental discharges occurring at or near a facility as a result of routine operations. Impacts are low and in-house response capability is adequate. [0 to 100 bbls. (< 16 m^3)].
Level 2 Spills	Medium-sized spills occurring in the vicinity of a facility as a result of a non-routine event. Significant impacts are possible and external (regional) support for adequate spill response is required. [100 to 5000 bbls. (16 m^3 to 795 m^3)].
Level 3 Spills	Large spills occurring either near or remote from a facility as a result of a non-routine event, and requiring substantial resources and support from national or worldwide spill co-operatives to mitigate effects perceived to be wide-reaching, i.e., of national or international significance. [over 5000 bbls. (> 795 m^3)].
Mechanical Removal	Booms, skimmers and storage devices are used to deflect, exclude and / or contain slicks and to ultimately recover, store and dispose of the oil.
OSR	Oil Spill Response
PVC	Polyvinyl Chloride
Sea Conditions	Calm water: Significant Wave Height <1 ft (0.3 m); Wind Speed 4-6 knots (2-3 m/s) Protected Water: <3 ft (1 m); 11-16 knots (6-8 m/s) Open Water: <6 ft (2 m); 17-21 knots (8-10 m/s)
Solubility	The quantity of a substance which can be dissolved in another substance (usually water) at a given temperature.
Specific Gravity	The ratio of the density of a substance to the density of a reference substance. For liquids or solids, it is the ratio of the density (@ 20°C) to the density of water.
SPM	Single point mooring buoy.
Vapour Density	The density of a gas or vapour relative to air.
Viscosity	A measure of the resistance to flow that a liquid offers when it is subjected to shear stress; higher values indicate thicker, slower-moving materials. For example, gasoline has a lower viscosity than diesel.
Viscosity Ranges	Low: 150-200 cSt; Code I; light oils that readily flow Medium: 1500 - 2000 cSt; Code II; slowly flowing fluids High: >17,000 cSt; Code III-IV; semi-solid to solid materials

Table 7-4
Example of a Plan "List of Units"

(Not complete - modify for specific Company or Plan needs. Conversions should also be included.)

Units	Term
bbls (bbl)	*barrels*
cm	*centimetres*
cSt	*centistokes*
ft^3/ft	*cubic feet per foot*
gal/hr	*(US) gallons per hour*
gal/acre	*(US) gallons per acre*
gpm	*(US) gallons per minute*
hrs	*hours*
in.	*inches*
kg/m	*kilograms per metre*
kg	*kilograms*
Km/hr	*kilometres per hour*
knots (kts)	*nautical miles per hour*
L	*litres*
L/hr	*litres per hour*
L/hectare	*litres per hectare*
lbs/ft	*pounds per foot*
m	*metres*
m/s	*metres per second*
m^3/hr	*cubic metres per hour*
m^3/m	*cubic metres per metre*
mm	*millimetres*
NM^2/hr	*square nautical miles per hour*
^oC	*degrees Celsius*
^oF	*degrees Fahrenheit*

Section 1.0 Introduction

❒ Briefly summarize the purpose and scope of the Plan in terms of the:

- facilities it addresses,
- geographical location of the Company responsibilities,
- types of oil,
- magnitudes of possible spills,
- response capability,
- water bodies and other resources that will be protected.

Purpose (Example)

• "The purpose of this spill contingency plan is to identify the responsibilities of Company employees and the general response strategies that may be followed in the event of a hydrocarbon spill occurring at the (*name of facility*) marine terminal and refinery".

Scope (Example)

• "This plan addresses the containment and recovery of gasoline, jet fuel, kerosene, diesel, gas-oil, marine diesel and crude oil spills which may occur at the (*name of facility*) marine terminal and refinery from the point of vessel mooring to product exit from the terminal and refinery either via pipeline, tanker or truck."

Facility Information

❒ Include specific information on the types of Company operations and facilities which are covered by the Plan.

❒ Present the information in a table, or preferably a map or schematic. A map of the country could identify the various operating areas, facilities and pipelines. The area of interest for the specific plan can be highlighted. References to the other Company plans are then easily visible. The latitude and longitude for the major facilities should be included.

Table 7-5
Example of a Plan "Facility Information Table"
(for a Marine Tanker Terminal)

Weather	
Precipitation	**Wind**
Annual 3,000 mm Wettest Month November Driest Month July	• Typically 10 - 20 knots from the south east (onshore) during the day / reversing in the evening. • Winds may exceed 80 knots during winter storms (normally from the NW).

Marine Conditions		
Currents	**Tides**	**Waves**
• Generally 0.25 - 0.5 knots (influenced by tide)	• High Tide 2.2 m • Low Tide 0.0 m	• Generally less than 40 cm near the jetty - higher in the bay.

Transfer Operations	
Oil Tankers	**Tank Farm**
Maximum Size 120,000 DWT (berth 1) 80,000 DWT (berths 2 & 3) 40,000 DWT (berth 4)	Number of Tanks 58 Volumes 2,000 - 25,000 tonnes Transfer Rate 200 tonnes / hour
Frequency 12 tankers / week Oils Handled Crude & refined products	Oily Ballast Reception Tank 35 (4,500 tonnes)

Corporate Environmental Policy

Oil spill prevention and response procedures will not always have a predicted outcome. However an established and dedicated corporate environmental policy will provide guidance with decision making especially when there are unforeseen circumstances and conflicting options.

- ❒ Include, as the first element of the plan, a Corporate Environmental Policy which is dated and signed by the senior management of the Company.
- ❒ The Corporate Environmental Policy should commit the Company to an environmental protection program that specifically addresses the prevention and mitigation of spills.
- ❒ A sample corporate spill policy follows. An alternate one was previously illustrated in the Format section. This example policy should be revised to suit the Company's specific requirements. Additional comments and suggestions for developing a specific Company spill policy can be obtained from the ARPEL Code of Environmental Conduct (and from ARPEL Code of Environmental Practices).

Figure 7-3
Example of a Corporate Spill Policy
(see Figure 7-2 for an alternate example of a Corporate Policy)

Company Corporate Spill Policy

Company activities interact both with ecosystems as well as the self-sustaining development for the nation. The Company commits itself to conducting its activities with a priority to safeguard the health and safety of its employees, the public, and the environment. The Company will ensure timely response to spills with the development of adequate emergency plans and procedures, personnel training, and as a minimum, compliance with the prevailing legal requirements.

The Company will develop adequate environmental protection programs by working cooperatively with government authorities and specialized organizations.

This contingency plan addresses oil spills which may occur from (name the Company operations here) and is effective (from what date). The plan will be periodically revised as required.

Section 2.0 - Action Plan

Action Guide (Chart)

An "Action Guide" is a checklist of spill response duties which a spill responder can immediately and quickly use.

- ❒ Provide a brief action guide which briefly identifies the "what needs to be done" information for the initial response to a spill.

Figure 7-4
Example of a Spill Action Guide

SPILL ACTION GUIDE
for a Marine Terminal

In the event of discovering an oil spill, the following initial steps should be taken:

- ❑ *Identify the spill source, type, volume and location.*
- ❑ *If possible shut-in the spill source. Notify other marine facilities in the area, if necessary.*
- ❑ *Remove all ignition sources.*
- ❑ *Notify the Company Terminal Port immediately. Use the Company Spill Report Form to ensure all necessary information is recorded.*
- ❑ *Attempt to initially contain the spill to prevent further movement.*
- ❑ *Make all notifications without delay.* (Some contact numbers could be inserted here.)
- ❑ *Anyone who is notified must notify the next position identified on the notification chart. If a position cannot be contacted, continue through to the next contact.*
- ❑ *During response and cleanup operations keep accurate written records of all events. Include response progress and time / dates of notifications made and received.*

Notification Chart and Procedures

A notification chart identifies the names, positions, and telephone numbers of persons who must be alerted when a spill occurs. The order in which they must be contacted is usually dictated by the flow of the notification chart.

- A brief narrative of the notification system should be included to clarify the chart. Example:

  > "All Company terminal personnel are responsible for reporting spills to the Marine Terminal Control Centre."

- Ensure that the notification chart does not represent the Company's organization structure. It is meant to identify who is to be contacted and in what sequence. A proper notification chart will assist with the mobilization of resources (equipment and manpower) to respond to a spill.

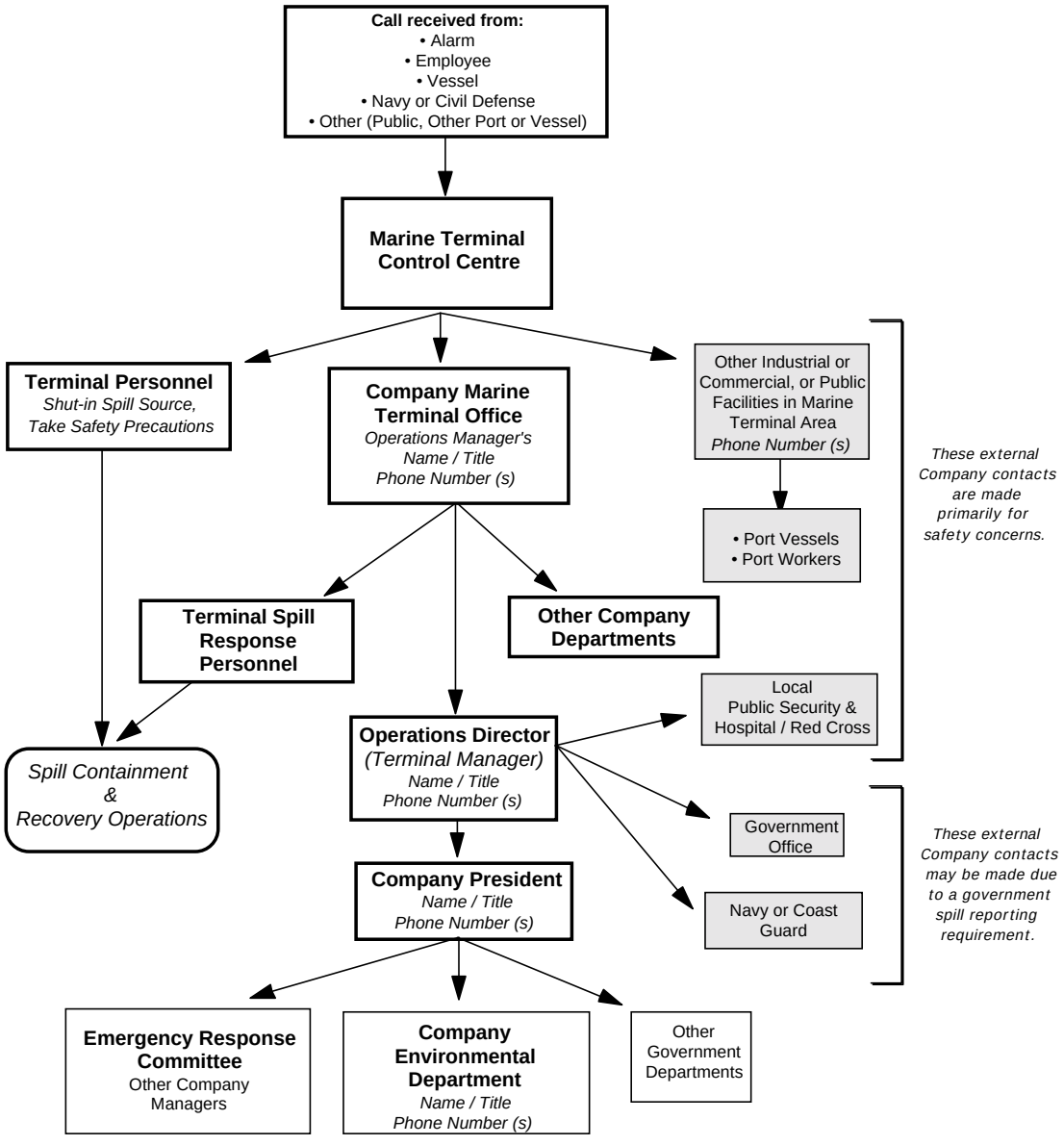
  Once all contacts have been made, the communication structure may return to the typical Company organization structure (i.e. response workers report to their manager who reports to his manager etc.).

- Avoid the use of abbreviations unless the abbreviations are regularly used in the Company.

- If practical, identify the person responsible for enacting other plans (i.e. Company, National, or Government plans).

A sample draft notification chart appears on the following page.

Figure 7-5
Example of a Spill Notification Chart for a Company Marine Terminal



Reporting Requirements

Reporting requirements indicate who within the Company and the government requires notification that a spill has occurred. The reporting requirements may vary depending on the volume or location of the oil spill and are usually designated by "Levels" or "Tiers".

- ❒ Clearly indicate the reporting Levels. A notification chart may be required for each level; if so, the chart must indicate for what level of spill the chart applies.

- ❒ All spills, regardless of size, entering waterways or otherwise posing a potential public concern should be reported.

Table 7-6
Example of Spill Reporting Requirements

Spill Level	Volume	Notification	Spill Plan
Level 1, Minor Local Spills	0 to 100 bbls. (0 to 16 m^3)	Company	Company
Level 2, Medium Spills	100 to 5000 bbls. (16 m^3 to 795 m^3)	Company and Government	Company and National Government Plan
Level 3, Major National Spills	over 5000 bbls. (over 795 m^3)	Company and Government	Company and National Government Plan

Incident Report Form

A standard Company Spill Report Form should be used to assist with the alerting process. This ensures that an appropriate response is expedited, particularly for a major spill.

The report form is an integral part of spill response and should be used to report spills of any magnitude. However, spill reports should be considered to be status reports that are subject to updating as the spill response progresses. Proper documentation procedures ensure the adequate recording of information during a tense emergency situation. Information on the form can also be used for assessing spill prevention techniques.

An additional page can be used to record the following:

- additional information,
- a drawing of the spill site,
- precautionary information on the products,
- prepared statements for calling emergency response personnel or residents who may have to be evacuated.

Example: "This is Company calling from Location. Our telephone number is Number. We have received (or confirmed) a report of an oil spill at Location. Company personnel are proceeding to the site. We request your immediate assistance to secure the area and protect the public".

A sample spill report form follows on the next page.

INITIAL SPILL REPORT FORM

Use Letter Code for Radio / Phone Transmission

A SPILL DATE AND TIME	Date and Time Spill Occurred	Date and Time First Observed	Report # & Date
B ENVIRONMENT CONDITIONS	Air Temperature	Wind Speed / Direction	Forecast
C SPILL LOCATION	Location	Latitude	Longitude
D SPILL TYPE AND VOLUME	☐ Oil ☐ Produced Water ☐ Chemical ☐ Other Volume (m^3)		
E SPILL SOURCE	☐ Well ☐ Pipeline ☐ Tank ☐ Other		
F SPILL CAUSE			
G SPILL STATUS	☐ Terminated ☐ Continuing		
H SPILL SITE DESCRIPTION AND AREA	(Forest, brush, muskeg, slope, watercourses) Área (m^2)		
I SPILL CONTROL MEASURES	Is the spill contained? If yes, how? ☐ Yes ☐ No		
J ACTION TAKEN			
K ACTION PROPOSED			
L RECOMMENDATIONS AND/OR REMARKS			
M REPORTED TO:	Name. Title, Location	Date and Time	

Reported to: _____ _____ _____

Name Position Signature

Section 3.0 - Responsibilities

This section of the Contingency Plan identifies “who does what”.

This section identifies the personnel roles and responsibilities and also provides an organization structure (i.e. chart). Although this section does identify the notifications that the various individuals may be required to make, it does not identify the notification process. The notification process is clearly “action” oriented and initiates the spill response. Once the notification process is complete, the designated Company response organization structure takes over.

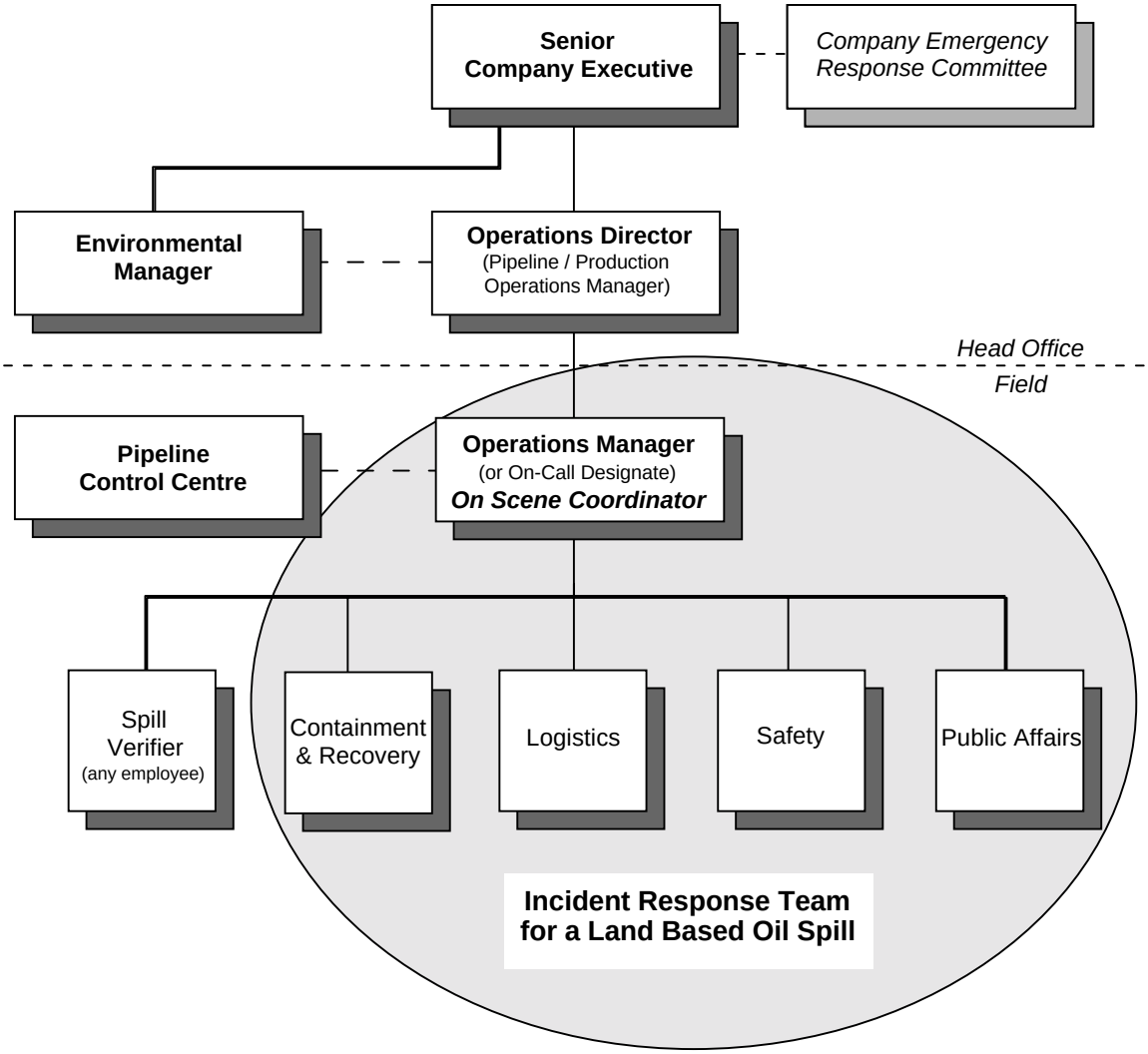
Organization Chart

The organization chart clearly identifies those individuals (positions) who will be involved in a spill response. It may also include administration positions responsible for the documentation and financial aspects. Sometimes it may be necessary to include two or more charts (i.e. the local plan, and one for the National Plan etc.).

Decide which of the personnel positions identified in the Organization Chart and the Duties and Responsibilities in the following section apply to the particular operations. Adjustments can then be made to the suggested information.

- ❒ Consider what non-Company manpower requirements may be required for spills that are:
    - large,
    - require a lengthy time for cleanup, or
    - are outside the Company’s geographical area of operation.

Figure 7-6
Example of an
Organization Chart for a Pipeline Company



- All boxes identify positions which may have spill responsibilities (see Duties and Responsibilities).
- Shaded area is an example of an "Incident Response Team" for a minor spill (see Incident Command Systems, Section 11.0).

Response Team

A response team is a dedicated group of individuals within the Company who takes an active role in the response and cleanup of spills. The team would include spill equipment personnel and Company environmental specialists.

- ❒ Clearly identify the response team members, names, and positions within both the Company and the Response Team.

Table 7-7
Example of Spill Response Team
(Contents of table are examples only.)

Name	Response Team Position	Company Position	Response Team Duties
John Smith	Cleanup Supervisor	Production Manager	Coordinate spill response equipment and manpower.

Duties and Responsibilities

The duties and responsibilities must be detailed for all personnel positions that appear in the notification and organization charts. For some types of operations it may be beneficial to identify the duties and responsibilities for each of the three designated levels of spills.

- ❒ Consider using a table to identify the duties and responsibilities of each individual. The position of the person within the response team is indicated along with his or her company position in the table heading. The responsibilities for both the initial action or notification period and the response / cleanup period are identified.

Table 7-8
Example of a Duties and Responsibilities Table

Name	Company Position	Notification Responsibilities	Response / Cleanup Responsibilities
John Smith	Production Manager	Contact Vice-President Production	Coordinate spill response equipment and manpower.

- ❒ Identify the level of spill that the individual may be involved in.
- ❒ Identify the Company position (or individual) who will be responsible for assuming the role of the On Scene Coordinator. The method for appointing an On Scene Coordinator should be previously discussed within the Company.
- ❒ Consider only including the Company position name in this section. Actual personnel names should only be identified in the Appendix for Contact names. This will reduce the number of required Plan revisions due to personnel changes.
- ❒ List the positions in the order in which they may be involved in a spill (i.e. from the positions who will be conducting the response to the Company president), followed by non-core Company personnel.

Various position titles of Company Response Team members are suggested on the following pages with some limited examples of their responsibilities. The responsibilities must be further reviewed and expanded depending on the specific Company needs. Regardless of the position titles used by a Company, the following duties should be covered by some position. The results of training exercises will determine if the assignment of the duties is correct or if it needs to be modified. See also Section 11.0 “Incident Command Systems”.

First Company Person who receives Notification of a Spill

Any field office Company employee, public witness or telephone answering service.

Notification Responsibilities:

- ❒ Records information on the Company Spill Report Form.
- ❒ If it is an onshore spill, gives caller (assumed to be public) general safety precautions and any other specific instructions. *Company may wish to put this information on the reverse of the Spill Report Form.*
- ❒ If a pipeline spill, contacts the Company Pipeline Control Centre.
- ❒ If an offshore spill or marine terminal operation, contacts the Company Marine Terminal Control Centre.
- ❒ If a production facility spill, contacts the Operations Manager or if after hours, the on-call designate to arrange for verification of the spill.

Company Control Centre

A Company Control Centre may exist for pipeline, marine terminals, and some production operations.

A Company Control Centre might receive the initial spill notification through an alarm, a Company employee, a contract employee or vessel, the public, or police.

Notification Responsibilities:

- ❒ Records information on the Company Spill Report Form.
- ❒ Gives caller (if public or police) general safety precautions and any other specific instructions.
- ❒ Takes appropriate operational action (i.e. shutting in lines).
- ❒ Notifies the Operations Manager or if after hours, the on-call designate, to arrange for verification of the spill. *Verification may be required for onshore spills. It might also be indicated by a control panel.*
- ❒ Upon verification, notifies the appropriate government authorities and, if required, emergency response personnel.
- ❒ Arrange for maintenance and cleanup crews.

Spill Verifier (Initial Responder)

The Spill Verifier is either an employee or Company representative who has either discovered the spill, or who has been dispatched to verify the location and the extent of the spill. *Verification may be required for some onshore spills (i.e. pipelines) and onshore production facilities.*

The spill verifier is the ***Initial On Scene Coordinator***.

Notification Responsibilities:

- ❒ Receives call from the Operations Manager, a control centre, or the on-call designate and proceeds to scene of spill.
- ❒ Observes safety personal protection measures.
- ❒ Assesses the situation and maintains contact with the Operations Manager or a Company Control Centre.

<u>If a spill is verified:</u>

- ❒ Provides assistance to any injured people, prevents further injuries, and advises public (who may be at the site) of dangers.
- ❒ Takes any possible operational steps to reduce the risk and loss (i.e. shutting in the source, containing the spill, securing the facility).
- ❒ Stays at the spill site until relieved by Company personnel. Maintains radio or phone contact.
- ❒ Meets and advises any emergency response personnel *(onshore spills).*
- ❒ Meets and advises initial media.

<u>If the spill can not be located:</u>

- ❒ Notifies the Operations Manager (or Control Centre) and stays at the scene until further advised. Maintains radio contact.

<u>If there is no spill or the problem has been rectified by the Verifier:</u>

- ❒ Informs the Operations Manager (or Company Control Centre).

Operations Manager (or On-Call Designate)

The term "Operations Manager" is used here to designate the senior Company employee for the particular operations area. The Operations Manager may possibly assume the role of the ***On Scene Coordinator*** during the spill response, containment, and cleanup.

Notification Responsibilities:

- ❒ Receives call from a Company employee (or a Company Control Centre).
- ❒ Records information on the Company Spill Report Form.
- ❒ Calls the nearest available employee to have the spill verified. For pipelines and offshore spills, this may require arranging for air patrol.
- ❒ Maintains regular contact with the verifier.
- ❒ If required after verification, notifies emergency response personnel.
- ❒ Assembles the spill response team and arranges for appropriate spill response equipment and manpower. Assumes the overall responsibility for the response operations.
- ❒ Notifies his Manager in head office (e.g. Marine Operations, Terminal Manager, or Production / Operations Manager).
- ❒ If spill can not be verified, consults with the original caller, emergency response personnel, Company Control Centre, and the verifier.
- ❒ Ensures that the next-of-kin of injured and fatalities have been properly notified. *The Company should have a policy addressing next-of-kin notification for employees, contractors and others.*

Response / Cleanup Responsibilities:

- ❒ Assumes the overall responsibility for the response operations.
- ❒ Ensures that site security, crowd control, and public evacuation measures are in place.
- ❒ Assumes the responsibilities of the Public Affairs Coordinator if one has not been appointed (see Public Affairs Coordinator).
- ❒ Arranges for ground and air surveillance if required.

- ❒ Ensures a “historian" is appointed to accurately document all spill response activities. This includes photographs, videos and analytical sampling. This position is in addition to the requirements for each person to keep a log of their activities. The "historian" ensures that provision is made for necessary on-site cost and recovery accounting and a chronological record keeping of spill control events.

- ❒ Based on the magnitude of the spill, arranges for specialist assistance (e.g. spill consultants, purchasing, accounting, maintenance, communications), and provision of additional response equipment.

- ❒ Regularly advises the Operations Director (i.e. production, refinery, terminal) on the status of response operations.

Technical Assistant (to the On-Scene Coordinator)

The responsibilities of this position may be performed by the On-Scene Coordinator or by any of the other Response Team or other technical support personnel. However, with a spill of large volume and / or which requires extensive cleanup, the On Scene Coordinator may require a Technical Assistant.

Response / Cleanup Responsibilities:

- ❒ Dispatches response crews as required.
- ❒ Assists with ensuring that Management is regularly informed of spill response activities.
- ❒ Advises on the health, safety and security precautions to be taken at the spill site.
- ❒ Coordinates the provision of additional response equipment from Company and other sources.
- ❒ Provides back-up assistance to the On Scene Coordinator.

Cleanup Supervisor (Response Team)

If the spill is of significant size, a Cleanup Supervisor may be required to coordinate the spill response activities. The Cleanup Supervisor would manage the Response Team. Otherwise, these responsibilities may be fulfilled by the On Scene Coordinator. Although spill response information may be available in a reference manual, the supervisor's ability to improvise and innovate will be key to the success and efficiency of the spill response.

For marine spills it is recommended that there be a Marine Cleanup Supervisor and a Shoreline Cleanup Supervisor.

Response / Cleanup Responsibilities:

- ❒ Oversees the operations of the Response Team members.
- ❒ Implements the cleanup strategies.
- ❒ Regularly communicates with the On Scene Coordinator.
- ❒ Advises the On Scene Coordinator of changes in response strategies.
- ❒ Assigns individual supervisors to offshore, terminal, and shoreline cleanup operations. These supervisors manage the acquisition of men and equipment and the containment and cleanup operation (e.g. boom and skimmer captains).
- ❒ Mobilizes sufficient men and equipment to the appropriate land (designated control points) or water based recovery locations.
- ❒ Ensures the efficient movement of equipment and supplies.
- ❒ Directs the actual spill recovery including the acquisition of equipment, deployment and operation. Oversees the acquisition and / or contracting of Company spill equipment, government (e.g. Navy, Coast Guard) equipment, and other contractor personnel and equipment.
- ❒ Oversees access and site preparation.
- ❒ Arranges for disposal of recovered material.

Response Team Members

Response / Cleanup Responsibilities:

- ❒ Deploy and operate booms, skimmers and other cleanup equipment.
- ❒ Report to the Cleanup Supervisor.

Logistics Coordinator

(possibly a member of the Response Team)

If the spill is of significant size, a Logistics Coordinator may be required to coordinate communications and equipment movements. Otherwise, these responsibilities may be fulfilled by the On Scene Coordinator.

Response / Cleanup Responsibilities:

- ❒ Ensures for the efficient movement of equipment and supplies.
- ❒ Activates a mobile command centre and ensures that the operational needs of the centre are satisfied (i.e. supplies and equipment). Ensures that a written record is maintained of all communications.
- ❒ Acquires and ensures the proper function of all communications equipment (i.e. relays, walkie-talkies, mobile radios, telephones, fax machines, and satellite systems). This includes the use of dedicated telephone lines and radio frequencies.
- ❒ Ensures that adequate direction signs to the spill site and / or control points are installed.

Safety Coordinator

(possibly a member of the Response Team)

This position may be the Company safety specialist. Depending on the size of the spill, the responsibilities could be assumed by other field personnel such as a field foreman.

Response / Cleanup Responsibilities:

- ❒ Ensures that the spill location and initial containment site are inspected and determined to be safe for workers, (e.g. H_2S and explosive meter monitoring).
- ❒ Advises the On Scene Coordinator of any special safety requirements at the spill site and the selected control points. (e.g. fire-fighting, first aid, No Smoking signs, prohibited equipment).
- ❒ Assesses the required level for standby emergency services, (i.e. first aid personnel, first aid room, ambulance).
- ❒ Ensures that all work is conducted in a safe manner.
- ❒ Ensures that all accidents are properly documented.

Operations Director

(Marine, Terminal, Refinery, or Production Operations)

The term "Operations Director" is used here to designate the person to whom the Operations Manager reports. This person may be located in a Company field office or in the Company head office.

Notification Responsibilities:

- ❒ Receives call from the Operations Manager.
- ❒ Notifies the appropriate government authorities. This may include the Police / Army, Hospital / Red Cross, and the Navy / Coast Guard.
- ❒ Notifies the Company Safety and Environmental Departments. Alternatively, these duties may be performed by the Company President.
- ❒ Contacts the Company President (or other designated Company Executive) and keeps him or her informed of spill response.
- ❒ Oversees the administration department for Transportation, Storage, Procurement and Finance, Technical Services (Engineering & Communications).
- ❒ Maintains regular contact with the Operations Manager and the Senior Company Executive as required. *(The point of contact with the Senior Company Executive must be established within each Company).*

Response / Cleanup Responsibilities:

- ❒ Keeps the Senior Company Executive (Vice President, Production) informed on the spill response activities and the resumption of operations.
- ❒ Maintains contact on regular basis (e.g. daily, every four hours, etc.) with the Operations Manager.

Environmental Manager

"Environmental Manager" refers to either the regional office person who is responsible for the corporate administration of environmental affairs or the Company environmental manager in head office. For some companies this may be an environmental coordinator who is positioned in a field location.

Notification Responsibilities:

- ❒ Receives call from the Marine Operations, Terminal or Production Operations Manager.
- ❒ Confirms mandatory regulatory agency notification has been completed.

Response / Cleanup Responsibilities:

- ❒ Confirms and discusses, as required, the spill response procedures with the Operations Manager or the Cleanup Supervisor.
- ❒ Provides technical environmental expertise as required to the field operations. This may include regulations, and environmental resources and impacts (birds, fish, shellfish, mammals, vegetation, soils / sediment, and seasonal variations).
- ❒ Ensures that the needs of the government environment agencies are being met either through the environment department or directly from the Operations Manager.
- ❒ In conjunction with the Operations Manager, coordinates the acquisition of additional environmental monitoring and / or remediation services.
- ❒ Monitors the effectiveness of the spill response.
- ❒ At the conclusion of the spill response, ensures that all reports and post-mortem reviews are conducted and documented. Ensures that recommendations for changes to the contingency plan are implemented.
- ❒ Coordinates support with other environmental advisors.
- ❒ Responsible for the updating and distribution of the contingency plan.

Environmental Advisors

Response / Cleanup Responsibilities:

- ❒ Advise on the possible environmental impact of the spilled oil, cleanup methods and environmental regulations.
- ❒ Provide assistance to the Environmental Manager.

Public Affairs Coordinator

If the spill is of significant size, a Public Affairs Coordinator may be required to serve as the on-site contact for the public and the media. Otherwise, these responsibilities may be fulfilled by the On Scene Coordinator. Regardless, the person who fulfils these responsibilities must have training in media communication techniques.

Response / Cleanup Responsibilities:

- ❒ Ensures that the media and the public do not interfere with the activities of the spill response personnel.
- ❒ Ensures that all information about the spill is consistent and is originating from the proper Company source.
- ❒ Coordinates the content of all information with the head office Public Affairs Manager, or the senior manager with public affairs responsibilities.
- ❒ At the direction of the On Scene Coordinator, conducts interviews or arranges tours for regulatory personnel, media and the public as requested.
- ❒ Prepares press releases.

Senior Company Executive

"Senior Company Executive" may include the positions of President and Vice-Presidents of Corporate Affairs, Insurance, Law, Production, etc.

Notification Responsibilities:

- ❒ Receives call from the Operations Director or other Company source.
- ❒ If required, activates the Company Emergency Response Committee and / or keeps other Company department managers informed.
- ❒ Confirms mandatory regulatory agency notification has been completed.
- ❒ Oversees public relations and government liaison.

Response / Cleanup Responsibilities:

- ❒ Ensures that there is adequate and regular communication maintained between the Company and the public, government officials, and shareholders.
- ❒ Takes responsibility to ensure that Company resources and administrative functions are adequately dedicated to the response operation.

Company Emergency Response Committee

A Company Emergency Response Committee is a pre-established group of individuals who have the corporate authority to make significant decisions which directly affect the well being of the Company.

The Committee has various corporate responsibilities including engineering, financial, legal, human resources, environment, safety, and executive. The Committee meets on a pre-arranged schedule that is based on the emergency. In addition to oil spills, the Committee is responsible for all other types of emergencies.

Notification Responsibilities:

- ❒ Receives call from the Senior Company Executive (if not previously notified due to their individual job responsibilities).

Response / Cleanup Responsibilities:

- ❒ As required, makes collective corporate decisions based on information supplied from Company response personnel.

Other Support Positions

Other duties and responsibilities may be required from a number of individuals within the Company and through contract personnel. These include:

Technical Services

- ❒ Provide engineering and communication services for response operations as requested.
- ❒ Repair and maintain equipment for use during the spill response.

Legal Advisor

- ❒ Advises on insurance and liability concerns (possible member of the Company Emergency Response Committee).

Maritime Information Advisor

- ❒ Provide data relating to the tanker cargo, ownership, and vessel information.

Finance and Procurement Advisor

- ❒ Arrange for the procurement and / or purchase of equipment, logistics, materials and manpower as required.
- ❒ Maintains records of all financial transactions relating to the spill response.

Historian

The "historian" ensures that provision is made for necessary on-site cost and recovery accounting and a chronological record keeping of spill control events. This position is in addition to the requirements for each person to keep a record of their own activities.

- ❒ Maintains photographic, video, and written documentation of all spill response activities.
- ❒ Ensures that adequate analytical sampling is performed as necessary.
- ❒ For small spills, may also be responsible for the general duties of the Financial and Procurement Advisor.

Government Responsibilities

There must be a clear understanding of the government responsibilities in a spill incident. This will help to avoid serious delays, managerial problems, and ineffective response procedures.

- ❒ Clearly identify the relationship and responsibilities of the various government departments and the Company in an oil spill response.
- ❒ Ensure that the responsibilities have been previously agreed to by the government departments and the Company.
- ❒ Identify when and for what type of spills a government department may take control of the response operations. Ensure that this is clearly indicated in the plan.

Relevant government responsibilities may include the following:

Regulatory Environmental Agency

- ❒ Defines the priority areas for protection and cleanup.
- ❒ Recommends methods of containment, control, cleanup and disposal.
- ❒ Regulates and advises on the use of dispersants.
- ❒ Arranges or provides weather forecasts, current, wind and tide information for spill tracking and spill trajectory modelling.
- ❒ Balances environmental trade-offs to achieve the greatest net environmental benefit.
- ❒ Advises the OSC on environmentally acceptable methods of spill containment, control, cleanup and disposal.
- ❒ Provides environmental information for inclusion in situation reports prepared by the OSC.
- ❒ Advises and informs senior regional and headquarters personnel as the situation dictates.

Coast Guard or Navy

- Monitors the countermeasures operations and assumes command and control if the polluter is unable or unwilling to provide an adequate response.

  In the event that the CG assumes command and control on behalf of the government, the polluter remains liable for all reasonable costs incurred by the CG, and all costs incurred by resource agencies supporting the CG's response, subject to established limitation of liability principles.

- Implements regional alerting procedures to ensure that the appropriate agencies are notified and a determination made as to whether Coast Guard may have the lead agency status with respect to this incident.

Appendices

The plan Appendices generally contain summaries of reference information.

As a Company requires concise action-oriented plans, detailed support information should be placed in separate reference manuals. This especially applies to the considerable quantity of reference information which is generated during the contingency planning process.

Appendix 1.0 Inventory of Spill Equipment

❒ List the Company spill equipment in a table identifying the:

- storage location,
- type [i.e. transportation, communications, safety, containment (booms), removal (skimmers), dispersants, storage containers, transfer (pumps), and ancillaries (shovels, rakes etc.)].
- quantity,
- model and serial number.

Table 7-9
Example of a Spill Equipment Table

Storage Location	Type of Equipment	Quantity	Model / Serial Number
Marine Warehouse	Transrec Skimmer	1	6542S57GH

❒ List equipment that would be available from other agencies and cooperatives in a similar format.

❒ Consider including guidelines on the use and care of equipment.

❒ The ARPEL “Oil Spill Expert and Equipment Database” should be referenced for information on oil spill personnel and equipment inventories or ARPEL members.

Appendix 2.0 Properties & Behaviour of Company Products

- ❒ Include summary information table that identifies, for each Company product, the physical / chemical properties most relevant to spills, safety aspects, primary response considerations and first aid:

    - viscosity,
    - flash point,
    - specific gravity etc.

- ❒ Consider including, or make available through another reference publication, Material Safety Data Sheets (MSDSs) for the products that Company handles. Caution is given that MSDSs are often confusing, inconsistent and sometimes even contain errors.

- ❒ For marine shipments, indicate in a brief section (table and or map) the probable behaviour of spilled oil at various points enroute, taking into account variations in meteorological and sea conditions according to time of day and season.

Table 7-10
Example of a Plan's Summary of Oil Properties & Behaviour for an Offshore Marine Facility

(Modify for specific Company or Plan needs)

<table>
<tr><td colspan="2">Forecasting the fate and behaviour of slicks requires specific knowledge of the oil spilled and the environment into which it has entered. The properties of spilled petroleum products affect the selection of applicable countermeasures. These properties begin to change as soon as a spill occurs primarily due to the processes of:
Spreading
Drifting
Weathering Factors such as Evaporation & Emulsification
Dispersion
Other processes that affect spilled oil include:
Sedimentation
Interaction with debris</td></tr>
<tr><td>Spreading</td><td>When spilled on water, oil spreads at a rate that depends on its volume, surface tension, and viscosity as well as water and air temperature, wind velocity, sea conditions and currents:
Large volumes of oil spread more quickly since gravity is the main force causing initial spreading.
Higher viscosity oils tend to spread less rapidly. Since temperature affects viscosity, oil spilled into cold water will spread at a slower rate.
Wind, waves and current cause spilled oil to mix and drift. Wave action can quickly cause the formation of water-in-oil emulsions. Emulsified oil has an increased viscosity and, therefore, a reduced spreading rate. However, once oil becomes emulsified, the resulting oil/water mixture has a much larger volume than the original spill.
Generally, oil spilled on water can spread quickly; however, this spreading does not usually occur uniformly. Furthermore, higher viscosity oils, such as Bunker C and emulsified crude, can assume slicks of various shapes and sizes that often are transported by ocean or wind-driven currents or other forces. When slicks accumulate in long lines due to the wind (windrows) or at the edge or mixing boundary of a tidal current (tidal rip), this can facilitate both containment and recovery operations</td></tr>
<tr><td>Drifting</td><td>Oil slicks drift with surface currents. These surface currents are driven by the combined effects of currents and winds. The effects of wind-driven currents (approximately 3-4% of the wind velocity) and residual / tidal currents are additive and simple trajectory models can sometimes be useful in forecasting slick movement. A key source of help during spill response is local knowledge (i.e., mariners, fishermen and nearby residents).

Computer models can be applied to project the movement of spilled oil and identify areas, amenities and biological resources having a higher probability of undergoing impacts. The priority areas will require the application of countermeasures and protection in the event of a spill.</td></tr>
</table>

Table 7-10 *(Continued)*

Weathering	Three major processes which contribute to weathering are evaporation, emulsification and dispersion. Dissolution, oxidation, sedimentation and biodegradation also occur over time but to a much lesser extent. The rate of weathering depends on site conditions and the type of product spilled.
Evaporation	The rate of oil evaporation increases as a slick spreads and its exposed surface area increases. Warm temperatures and high winds also increase the evaporation rate. Lighter components in crude and refined oils evaporate more rapidly than heavier fractions so that slick volume diminishes (generally 10 - 40%) although the reduction in volume due to evaporation is usually more than offset by emulsification -- see below. Bunker C loses far less volume (5%) when spilled than gasoline (90 - 99%) which rapidly diminishes to a very thin, unrecoverable residue.
Emulsification (water-in-oil)	The natural mixing energy of waves causes water droplets to combine with spilled oil to form water-in-oil emulsions known as "chocolate mousse". Crude oil emulsions containing 20 - 80% water by volume are common. This mixing of oil and water increases the volume and viscosity of oily liquid that must be dealt with, hindering all oil removal options. In contrast with "dispersions", weathering processes slow down when water-in-oil emulsions are formed due to the decreased oil surface area that is available for chemical or biological reactions. Emulsions can be very stable and can persist for many months following a spill.
Dispersion (oil-in-water)	Waves and turbulence cause oil droplets to disperse in water to form oil-in-water dispersions. Weathering processes can be accelerated if oil-in-water dispersions are formed due to the increased surface area of the oil. However, as the oil is dispersed into the water, evaporation is also inhibited. Dispersion also prevents emulsification.
Other Weathering Processes	Dissolution, oxidation and biodegradation are other weathering processes that occur. They are not usually considered when selecting countermeasures since their influence on slick properties is so small and/or slow.
Dissolution	Only a small portion of petroleum products mixes into the water column (dissolution). Fuels such as diesel and heating oil are generally insoluble but contain small amounts of compounds that dissolve in water. Oxidation and microbial degradation also produce water soluble compounds as they occur.
Oxidation	Oxidation occurs when hydrocarbons combine with oxygen, and sometimes ultra-violet radiation. Although thin slicks undergo more rapid oxidation, it is still slow relative to other weathering processes, accounting for only about 1% of all weathering losses.
Biodegradation	Bacteria, fungi and yeast oxidize oil by using it as a food source. Biodegradation depends upon the oil composition, temperature, dissolved oxygen and nutrients. The rate increases with temperature generally starting at 32°F (0°C) and peaking at approximately 86°F (30°C). Water-in-oil emulsions do not biodegrade readily because microbes are surrounded by oil rather than by water (which replenishes oxygen and nutrients).

Table 7-10 *(Continued)*

Sedimenta-tion	When oil is spilled in coastal waters with a high sediment load, oil droplets may adhere to suspended sediment particles causing the oil to sink and making it unavailable to most conventional countermeasures options. Some heavy crude oils, emulsions and Bunker C require very little particulate material to sink them since their specific gravity is approximately 1 (i.e., close to water).
Interaction with Debris	Debris can mix with spilled oil and thus hamper response operations. Containment of a spill is affected if floating objects strike and damage booms. Similarly, the flow of oil into skimmers can be restricted by debris.

Appendix 3.0 Company Facility Descriptions and Plot Plans

- ❒ Include any plot plans of Company facilities which may assist in a spill response. This would include the transfer system, tanks or sumps, capacities, type of product contained, access, water and foam or water fire-fighting systems and pipeline routes.

- ❒ On maps include the driving and / or vessel travel times between the various Company and urban centres.

Appendix 4.0 Spill Response and Cleanup Strategies

This appendix would describe applicable response strategies. Details on how to perform the operations should remain in a reference manual or training program.

- ❒ Identify general response strategies followed by specific strategies which are pertinent to the specific Company operations.
- ❒ To assist in deciding on the spill response strategies, develop spill scenarios that consider a range of "worst-credible" accidents leading to spills (See Risk Assessment). Further consider developing practical response strategies which must be identified for each accident type and included in training sessions.
- ❒ Emphasize safety in oil spill response operations. Information from the Company's safety program should be incorporated into this section. Items that can be considered include boat and dock safety, the use of personal protection equipment and clothing, and substance and alcohol abuse.
- ❒ Provide quick reminders for responding to spills that emphasizes safety, quick actions and use of the Company Report Form.
- ❒ De-emphasize the use of sorbents for spills on water. Particulate sorbents and pads are useful for accidental discharges on land. They are much more limited (and expensive) when used for water-borne spills.

Table 7-11
Considerations for Developing Spill Response Strategies
(Modify for specific Company or Plan needs)

Planning & Logistics	Factors that influence the time to mobilize operations and the setting of associated response priorities.
Monitoring Spills	Safety and environmental threats requiring monitoring actions following a spill.
Spills on Land	Containment methods for spills onto land.
Spills on Water	Countermeasures operations for spills into water.
Removal	Techniques for skimming and sorbing oil released onto land or into water.
Transfer	Equipment needed to move collected liquids and solids to interim storage and disposal facilities.
Shoreline Cleanup	Response actions required in dealing with sensitive river bank and shorelines.
Post-Spill Activities	Personnel decontamination, equipment cleaning, and maintenance and debriefing.

Planning & Logistics

The feasibility of containing and recovering a spill will be determined by its location and the rate of the release, spreading, transport and evaporation.

- ❒ Compare these rates with the total time needed to deploy response equipment in order to evaluate whether or not containment, sorbent and skimming operations can be effectively implemented.

- ❒ Consider pre-assembling spill cleanup kits to expedite response and reduce the total deployment time needed, which will include:

    - Equipment and support material procurement time.
    - Personnel mobilization, transit and assembly at spill site time.
    - Actual equipment set-up and deployment time.

- ❒ Determine whether or not a spill has entered a major waterway and whether or not access by land or water to control points is possible so that booms, sorbents and skimmers and vacuum trucks can be deployed. Check maps and consult with personnel familiar with the spill area.

- ❒ Establish priorities to optimize utilization of personnel and gear needed for ALL cleanup phases (containment, removal, storage, transfer and disposal) at selected sites.

- ❒ Allow additional time for adverse weather, flying or driving conditions.

Spills on Land

- ❒ Attempt to contain spills on land as close to the source as possible, if safety allows. Every effort should be made to ensure that a spill does not reach water, where its containment and recovery are much more difficult and the potential environmental impacts are much greater. Containment can be achieved using:

    - A berm or dike around the spill source.
    - A trench or ditch downslope of the spill source.
    - Berms can be constructed from earth or sand bags.

Table 7-12
General Response Strategies for Spills on Land
(Modify for specific Company or Plan needs)

Earth Berm / Trench	If possible, locate the berm/trench sufficiently downslope of the release point to complete its construction before the spill arrives. Dig the trench along a natural drainage contour. It should be approximately 0.5 m deep with a relatively flat bottom. The excavated material can then be combined with other materials to build a berm.
Sand Bag Berm / Trench	Sand bags can be used where available and if the earth is too hard and does not lend itself to excavation or compacting. ***A plastic liner*** can be used to seal the trench and bags and should be anchored with gravel or rocks and be woven between layers of bags.
Size of Spill	Berms surrounding large spills which cover extensive areas will be difficult and time-consuming to build. For small spills, earth berms may generally be more easily deployed than sand bags. In this case, it is important to build the berm as close to the source as possible to minimize the spill's tendency to spread.
Terrain	Steep terrain can make work difficult, particularly with heavy equipment; large flat areas will require longer barriers to contain the spill. Spilled oil will also travel much faster on steep inclines; it will move more slowly and tend to pool on flat ground allowing more time for the construction of barriers.
Soil Type	Oil will soak into loose, coarse, or dry soils while hard-packed soil can create a natural barrier. Soft, wet soil ground can also impede vehicle and machinery access.
Proximity to Water	It is important that every precaution be taken to ensure that a spill does not enter a waterway. If there is any possibility of contamination, a stream or river should be protected with a berm or flume.
Weather	Weather can play an important role in spill response operations, particularly if rainfall is heavy or prolonged. Since most oils float on water, any pooled water that collects in a trench or against a berm will effectively increase the volume of liquid needed to be contained. Water can also significantly increase the tendency of oil to spread thus posing a substantial hindrance to effective cleanup. The threat of excessive runoff and flooding should be considered.
Location	The location of a spill will play an important role in determining the most feasible type of containment barrier. Spills involving tanker trucks will generally occur in areas where there is good road access although a truck can leave the roadway and release its cargo some distance away. In cases of spills resulting from pipeline operations, the spill site may cause considerable logistical problems. Accessibility of both equipment and manpower could be hindered by difficult terrain or dense tree growth. Consideration must also be given to determining areas where a helicopter might initially land as well as one or more designated locations where equipment could be staged for later deployment at strategic locations.

Spills on Water

Containment of spills on water can be difficult because oil quickly spreads. In turbulent water, mixing of the oil into the water column is likely to occur, making its recovery impractical. For these reasons, it is important that if a spill reaches water that containment be attempted as close to the source as possible, and that the spill be prevented from reaching a quickly flowing river. Spills in tributaries should be contained, if possible, before reaching larger rivers where containment and recovery can be difficult and dangerous. Any effort to contain spills on large rivers should be limited to shore-based operations located in areas where the oil might pool in accessible back eddies near the shoreline.

In flowing streams, oil will travel at the same speed as the surface current. On larger rivers or in open seas, slicks will also be transported at 3.0 to 4.0% of the wind speed. This effect, although comparatively small, can be an important factor if the wind is at right angles to the water flow and if the water surface involved is extensive. The wind can force the spill to the sides of a coastal river where flows are slower. Long reaches of a river can become contaminated; however, containment and recovery might be possible.

In smaller streams, the wind will have less impact and the slick speed can be easily estimated by placing a small stick in the middle of the stream and determining the length of time required for it to travel a given distance, typically 10 m. This information can be quickly converted to speed (36 / time (sec) = ***x*** km/h) to determine the estimated travel time to a confluence or other sensitive area.

Note

Whenever a berm or flume in a river is constructed as part of a spill response operation, the impacts of the disturbance must be weighed against the potential impacts of the un-contained spill. Care must be taken to minimize any adverse effects. Local regulatory agency representatives should be consulted in all cases prior to construction unless immediate action is necessary, particularly if fish spawning streams are involved.

Table 7-13
Containment Strategies for Spills on Water
(Modify for specific Company or Plan needs)

General	Determining the best possible strategy for containment will depend on a number of factors: • Speed of slick travel • Location of possible containment sites • Availability of personnel and equipment • Location of sensitive areas • Safety of operations Containing oil spills on water is generally achieved either by using floating booms (in open water) or by constructing a temporary berm and inverted weir (in rivers). In both cases the objective is to build a barrier against which the (normally floating) oil will pool while allowing the underflow of water.
Temporary Berm / Inverted Weir (Rivers)	Barriers can be constructed from earth or rocks although if large rocks are used, plastic sheets or packed mud should be used to ensure that a complete seal is made. Choosing and positioning the pipe is critical to effective operation of the weir. The pipe should be low enough at the inlet end to ensure that an increase of the slick thickness or substantial lowering of the water will not result in a loss of oil through the pipe. Larger pipes that allow greater volume (and slower) flows will minimize the tendency of oil to become entrained in the water at the inlet side. The outlet end of the pipe should be positioned to create a continuous, smooth flow. Underflow of oil (under the pipe) should also be prevented by ensuring that the pipe inlet is not located on loose gravel.
Booms (Open Water)	Booming with conventional spill containment booms can be an effective means of controlling spills on relatively calm, slow-moving waters. Effective containment is usually difficult in streams or rivers where currents exceed 0.7 knots (0.4 m/s). At these speeds, oil becomes entrained in the water flowing under the boom resulting in significant losses. Some improvement can be achieved in waters flowing at 1 - 2 knots (0.5 - 1 m/s) if the boom is deployed at an angle of less than 90^{o} to the direction of flow. Also, booms with high reserve buoyancy, top and bottom tension members and durable fabric work best. Very large booms generally do not provide significant advantages for offshore operations; however, booms should be appropriately sized, particularly if used as part of an oil removal system, e.g. with a Transrec Skimmer. Sorbent booms or socks can also be used to provide a barrier to floating oil. These types of booms should be checked regularly to ensure that they do not become saturated with either water or oil since they will tend to float very low in the water or even sink and release oil downstream. They are generally used on streams or adjacent to shoreline in calm conditions and have limited or no application to large marine spills.

Oil Recovery

When large volumes of oil have been contained either through natural or mechanical containment, it will be necessary to remove or recover the accumulated oil. In rivers, this will generally occur in excavated trenches, adjacent to berms or natural barriers, or in back water areas. Vacuum trucks are ideal at cleanup sites accessible by road and where a large volume of oil has pooled that is generally free of water. The truck must be positioned at a safe distance so that there is no possibility of fire or explosion.

Oleophilic devices, such as disc, drum or brush skimmers, that can selectively recover hydrocarbons in water, are better suited to applications where the oil has formed a distinct layer on top of relatively quiet water than weir or suction devices. These can be deployed from existing vessels if the entire recovery system has been carefully planned including the steps necessary to contain, remove, store and transfer the collected liquid. It is usually less cost-effective to purchase expensive, self-propelled skimmers that are still limited by adverse sea and weather conditions. Multiple packages using smaller components can be assigned to spill duty at various locations.

When using disc, drum and brush skimmers, ensure that small items of debris are periodically removed from scrapers to allow their efficient operation. Weir and suction skimmers require significant liquid storage space to ensure that their operation can be continued. This provides for water pickup and oil/water separation. Belt skimmers are used less frequently than previously although some models are excellent choices for harbours and other more protected waters since they are capable of picking up debris.

Transfer Operations

- ❒ Use pumps to transfer oil recovered by a skimmer to temporary and/or final storage facilities. Pumps can also be used for low-pressure flushing of contaminated shoreline, although this spill response technique should only be carried out under the guidance of an environmental advisor.

  There are a number of factors which should be considered when choosing a pump:

  - Centrifugal ("trash") pumps are capable of moving oil but will emulsify oil and water, resulting in the generation of larger volumes of liquid waste.
  - Peristaltic, diaphragm and other positive displacement type pumps tend to reduce oil/water emulsification.
  - Ensure that pumps and drives selected for transferring highly volatile hydrocarbons are explosion proof.

- ❒ Solid wastes, such as contaminated sediment, used sorbent, spent boom and other debris, will require the use of rakes and shovels for initial pickup and then lined containers, pickup trucks, etc. for their transfer to disposal sites. Care should be taken during such operations to prevent the contamination of soil and water at transfer points.

- ❒ For shoreline and offshore transfer operations, boom all vessels that do not involve the transfer of gasoline and light crude products. For some smaller spills it may be practical and safe to boom off gasoline and light crude spills. This strategy must be further reviewed by the Company versus the consequences of dispersion using water spray.

- ❒ Use fire monitors so that water spray can be used to knock down flammable vapours.

Offshore Response

- ❒ Consider including a brief section on in-situ burning (see below) as a possible response option. The American Marine Fireboom and Helitorch are items that can be used for some situations to effectively remove oil. The limitations of burning should be indicated in this section particularly in reference to its use in the country's coastal waters.

- ❒ Similarly, the potential use and limitations of dispersants should be clearly indicated. Dispersant application operations, for example, should be limited to the amounts and types of petroleum products that can be feasibly moved into the water column. Heavy crude oil, emulsions and weathered oil will not be effectively dispersed using chemicals.

- ❒ Review the location and the amount of dispersant for stockpiling as well as the means of applying dispersants in the waters of the country where the Company operates. The products, areas, and times of the year must be specified on a pre-spill basis.

- ❒ The protection of resources in waters with sufficient flushing action is often viewed to be a situation that is appropriate for the use of dispersants.

- ❒ Identify areas where mechanical recovery operations, for both river and offshore waters may be restricted by the lack of containment and recovery equipment, and / or water conditions (i.e. high current, waves, debris etc.).

Cleaning River Banks and Shorelines

Site restoration, river bank and general "shoreline" cleanup are important spill response steps. Consultation with environmental advisors is critical to ensuring cleanup efforts do not create adverse impacts. General rules for "shoreline" cleanup include:

- ❒ **Minimize** impact to shoreline, particularly vegetated areas, during all phases of spill response. Cleanup can cause more damage to such shorelines than an untreated spill, especially if fish habitat is involved.

- ❒ **Assess** shorelines requiring cleanup in terms of three factors:

    - environmental sensitivity.
    - property, archaeological or other damage.
    - natural cleansing action at the site.

  Lighter oils typically do not adhere to, or washes off, the banks of fast moving rivers and rocky headlands. Little or no cleanup action can be taken. On the other hand, sheltered ponds and marshes can suffer long-term contamination and reduced environmental productivity.

- ❒ **Obtain** approval and instruction prior to conducting cleanup operations.

- ❒ **Be particularly careful if oil has entered marshy areas and wetlands**. Personnel and equipment should NOT be deployed into such areas without explicit approval from environmental authorities. Damage to both upland and water areas may result.

- ❒ **Approach vegetated areas and other sensitive zones from the water side, if cleanup is to be attempted**. Be aware that plant species, benthic organisms, birds, fish and animals can all be adversely affected by cleanup operations.

Burning

In-situ burning is gaining wider acceptance and should be considered by ARPEL members as an option for some spill situations because of the following advantages:

- Large quantities of oil can be removed rapidly and efficiently.

- The amount of oil reaching shoreline can be reduced.
- Burning can sometimes be considered when skimming is not feasible.
- Storage and disposal needs are reduced.

Although oil removal rates can be many times faster than mechanical recovery, burning depends on many factors. The containment of the oil is particularly important to maintain sufficient film thickness. A decision to conduct an in-situ burn should address the following aspects:

- government approvals and permits,
- health and safety of response personnel and the public,
- potential threats to nearby facilities (terminals and marinas),
- public concerns for air quality, disruption of normal activities, etc.,
- environmental impacts to biological resources,
- disposal of soot, burn residue and debris,
- removal of oil by other means such as skimming and dispersants, and
- coordination with other response operations and agencies.

In-situ burning is a highly specialized procedure and should only be carried out by trained personnel.

Since in-situ burning removes and does not recover spilled oil, equipment needed for storage, transfer, separation and disposal often is reduced. Sometimes, however, several cleanup steps must be considered to process burn residue since it can sink and be difficult to recover.

Dispersants

Dispersants are usually applied to slicks to form small droplets of oil that enter into the water column and reduce the amount of oil which might otherwise enter bays, estuaries and shorelines. In this way, dispersants can often eliminate or reduce potential impacts to sensitive habitats such as mangroves, salt marshes, birds, beaches and coastlines of high ecological and/or economic value.

Generally, oils with a viscosity less than 1,000 cSt can be dispersed. Since weathering increases viscosity significantly, dispersants should be applied as early following a spill as possible. At viscosities above 1,000 to 2,000 cSt, dispersants are still effective but higher dosages may be required, depending

on the mixing energy (waves) present. At 10,000 to 20,000 cSt, dispersion becomes very difficult because the dispersant may not penetrate to the oil/water interface where it is needed. Water-based dispersants are generally not effective on highly viscous oil.

- The active agent in dispersants is called a **surfactant**. It reduces the oil-water interfacial tension and promotes the formation of very small oil droplets in water.

- Most dispersants also contain a **solvent** which penetrates the oil and acts as a carrier for the surfactant.

The decision to use dispersants is based on minimizing the environmental impacts of a spill. Dispersants should be used in areas where significant flushing action occurs. Generally, minimum effective dosages are used to minimize possible adverse impacts.

When To Use Dispersants

✓ When oil is moving toward shore in an area with good flushing.

✓ When physical removal methods alone are inadequate.

✓ When weather/sea conditions prevent recovery operations.

✓ When natural dispersion is not fast enough.

When Not To Use Dispersants

✗ In shallow water with poor circulation such as protected bays and inlets.

✗ In fresh water used for water supplies.

✗ In brackish water used for desalination plants or cooling systems.

✗ On highly viscous oil well below its pour point.

✗ Directly above coral reefs.

Dispersant types can be grouped into three general categories:

Water-Based Dispersants	May be diluted with water but are the least effective and are generally not recommended, except for special situations (e.g., low-pressure flushing of shorelines and post-spill cleanup)
Concentrate Dispersants	Most effective when applied in neat form but can be applied in diluted form (with water) if necessary. Typically based on hydroxy-compound solvents such as glycol ethers.
Conventional Solvent- Based Dispersants	Generally contain low concentrations of surfactant active agents (i.e., < 40 - 50%) and are primarily used in undiluted (neat) form. Diluting them with water can reduce their effectiveness.

Specific chemical and physical properties of dispersants are available from manufacturers. They should be consulted to ensure that the dispersants chosen are compatible with environmental conditions and regulations, and are potentially effective when applied to the petroleum products handled at a facility.

Dispersant application equipment can also be divided into three groups (according to the method of application), as follows:

1. Vessel Application Equipment
2. Aerial Application Equipment
3. Shoreline Application Equipment (rarely used).

Disposal

The need for disposal of sometimes large amounts of debris-laden, oily-water mixtures is to be expected in any successful oil spill response operation.

- ❒ Consider all of the available options including open pit burning, landfarming (controlled biodegradation), and transfer to incineration sites.
- ❒ Obtain, if required, pre-approval from government authorities if open pit burning is considered.
- ❒ Plan logistics carefully so that cleanup activities are not halted because collected materials cannot be processed. Disposal operations usually involve the transportation, transfer and storage of both solid and liquid materials.

- Plan disposal options early in the response and contingency planning process. It has often been the case during large spill incidents that disposal is only seriously considered as the cleanup proceeds. This has led to problems in obtaining vessels, vehicles, qualified personnel, disposal facilities and permits.

  These problems can be avoided by pre-planning all options and knowing which ones will not be allowed by regulatory authorities such as road oiling, landfilling and burning in municipal incinerators. Prior agreements with thermal generating stations, asphalt producers, other petroleum corporations, municipalities, government agencies and other organizations can greatly facilitate disposal.

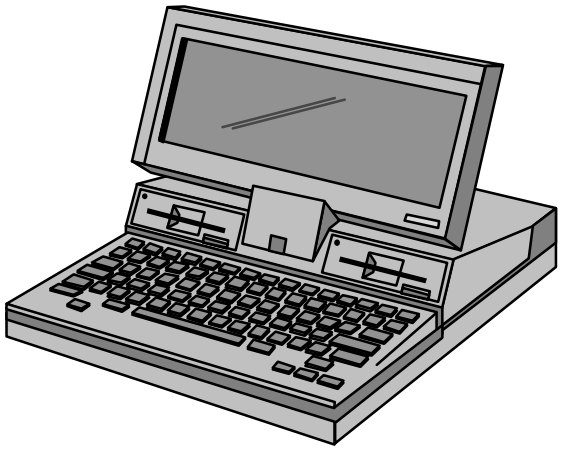
Appendix 5.0 Spill Monitoring

Monitoring at the Spill Site

- ❒ Monitor spills throughout the response to ensure safety and to direct cleanup efforts.
    - Use explosion meters to detect explosive gas concentrations in the atmosphere.
    - Observe and monitor spill movement and behaviour to properly direct response efforts.
    - Be aware and report any and all threats to the safety of people, property and the environment.

- ❒ In fast flowing river systems, be prepared to warn downstream water users if containment and removal are not possible and what precautions to take.

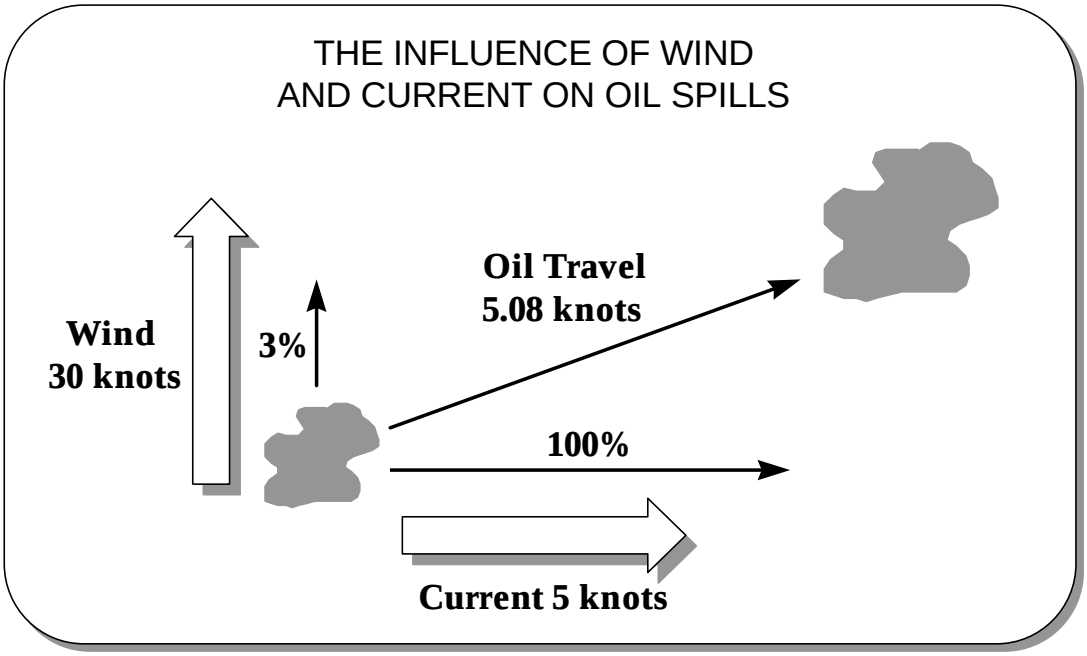
Trajectory Modelling



Computer models can be applied to project the movement of spilled oil and identify areas, amenities and biological resources having a high probability of impacts from spills. The high risk areas identified through modelling will require planning the application of countermeasures in the event of a spill. Although models do not always accurately forecast slick trajectories in an actual emergency, they can be effectively used as a planning tool.

Oil slicks are transported by surface currents which are driven by the combined effects of currents and winds. The effects of wind-driven currents (approximately 3 - 4% of the wind velocity) and ocean currents are additive and simple trajectory models can sometimes be useful in forecasting slick movement. A key source of help during spill response is local knowledge.

If there is any doubt, ask mariners, fishermen and government agencies for their assistance in determining the location and movement of slicks.



Remote Sensing (Offshore Spills)

Remote sensing implies that a device, other than the human eye, is used to detect spills usually from an aerial vantage point (airplane). The current expectation of remote sensing is that it be available as a countermeasures technique that can be used effectively during a spill to facilitate tracking oil slicks. However when planning response strategies it should be noted that:

- ❒ Remote sensing has been used in the past without the success expected of it. Data has to be "interpreted" or "enhanced" after its collection so that the location of spilled oil be determined. Verification may still be necessary. This is not always acceptable since planning the location of response operations for the immediate future is still not possible.

- ❒ Moreover, simply making visual observations from a vessel and confirming the presence of oil could be done more quickly and at a much lower cost.

- ❒ The state-of-the-art of remote sensing is relatively basic, yet involves relatively sophisticated equipment. The most useful piece of equipment today is one of the most inexpensive, i.e., an infrared (IR) camera. The most promising device is the laser fluorosensor. Several other sensors can also be useful in a variety of environmental conditions.

- Optical techniques are most commonly used for remote sensing. Both still and television cameras are used because of their availability and low price. Filters are sometimes added to improve contrast so that identification of oil (versus other phenomena such as kelp and algae) is more accurate. Charge-coupled detectors (CCDs) have largely replaced low-light-level TV (L^3TV) and laser-illuminated (active-gated) television.

- Scanners have also been used to detect oil spills because they are sensors in the visible region of the spectrum. Again, CCDs have replaced these older technologies.

- Infrared sensors are often used because they are economical and provide thickness information although false targets can interfere with readings. Ultraviolet data suffers similarly from interferences but can be used with IR information. Fluorosensors yield the most accurate indication of the presence of oil since few other substances fluoresce at the same wavelength.

- Other technologies that have been used to remotely detect oil slicks include microwave and radar.

Appendix 6.0 Post Spill Activities

Once spill cleanup activities have been completed:

- Personnel should undergo decontamination.
- Used equipment and gear should be cleaned and restored.
- Response operations should be reviewed.
- Spill prevention and response strategies should be discussed.

Personnel Decontamination

Decontamination is essential to minimize health and safety hazards.

- ❒ Clean or dispose of all contaminated items. If used, respirators should be cleaned, checked and recharged. Disposable items (cartridges, gloves, coveralls) must also be properly disposed, replaced and/or stored.
- ❒ Remove all contaminants from any exposed areas of the body (skin, hair, fingernails, etc.) to prevent infection / ingestion.
- ❒ Immediately report any illness / wounds. Replenish first aid kits.
- ❒ Establish and appropriately identify "Clean" and "Dirty" areas.

  Clean areas include vehicles, eating areas, communications and control centres. Every effort should be made following cleanup to avoid contaminating these areas.

  Dirty areas should be designated for the decontamination of cleanup teams. Personnel who have participated in spill cleanup should use decontamination facilities directly after each work exposure and should not enter clean areas until decontaminated.
- ❒ If oiled, clean personal clothing immediately. Exposing leather (shoes, gloves, jackets) to oil should be minimized to avoid damage.
- ❒ Provide facilities with showers, lockers, an area for workers to change into clean clothing, and an area to clean and store soiled rain gear and clothes.

Equipment Cleaning

- ❒ Clean all equipment before it is returned to storage. Contaminated equipment can present handling difficulties if it causes secondary pollution (due to material coming from it and not from the original spill). Manual cleaning can use pressure washer wands, scrub brushes, detergent or degreasers and warm water.

- ❒ Use a containment area to store contaminated wash water. Separators *cannot* be utilized when detergents and degreasers are used since the oil remains suspended in the water and would violate discharge permits specifying hydrocarbon levels in the effluent. Oily wash water can be chemically treated to remove excess oil and grease. Upon approval, the wastewater can be disposed in a municipal wastewater treatment plant.

- ❒ Once cleaned, fully inspect all equipment components such as fittings, fasteners and valves. Perform any repairs or order replacements promptly.

- ❒ Return all equipment and tools to their original storage locations, and take an inventory. Promptly replace any missing, damaged or spent items.

Equipment Maintenance

- ❒ Response equipment from spill kits and depots should be inspected and serviced at regular intervals while in storage and following training exercises and spill use.

- ❒ Pumps and Hoses

    - inspect for damage
    - ensure all fittings are present
    - flush with water
    - check for leaks
    - check and top up oil and other fluid levels
    - rinse pumps with fresh water

- ❒ Electrical and Monitoring Equipment

    - check operation
    - recalibrate
    - check and recharge / replace battery units
    - replace worn cables and ground connectors

- ❒ All Equipment

    - always store equipment clean and dry
    - consult manufacturer's recommended maintenance and storage guidelines to keep warrantees valid
    - keep manufacturer service guides in a designated place
    - check for corrosion/deterioration

Debriefing and Equipment Review

An objective of spill response should be the application of the experience gained to plan future cleanups. This should improve the efficiency with which both personnel and equipment function.

Critical, constructive review should focus on each cleanup phase. This is usually done in debriefing sessions conducted both during and subsequent to cleanup.

- ❒ Identify the response methods which were effectively used.
- ❒ Discuss what worked and what did not work in each operational phase.
- ❒ Specify corrective actions that could be implemented to improve containment, recovery, the application of sorbents, collection and storage of debris and other materials, and transfer operations.
- ❒ Review the disposal options considered and those implemented.
- ❒ Assess and repair even minor damage to all hardware components and apply required maintenance to all items.

Debriefing also affords the opportunity to review the cause and circumstances of an oil spill. The means to prevent future incidents should be discussed at length soon after the event and actions to be taken to prevent similar occurrences. Factors usually considered include:

- environmental circumstances,
- equipment design and malfunctions,
- procedures and checklists,
- human error,
- vandalism, and
- other external influences.

Appendix 7.0 Environmental Sensitivities

This appendix of the plan should contain a summary of the critical environmental sensitivity information, usually displayed in a map format.

For complete information on developing sensitivity maps for areas refer to the ARPEL guideline “Environmental Sensitivity Maps Guideline”.

Environmental sensitivity maps provide an easy to understand graphical representation of:

- information critical to spill planners and responders (e.g. sensitive locations, response / cleanup strategies, spill equipment locations)
- support information on biological, geomorphological and human-use resources, as well as spill response and cleanup methods.

Appendix 8.0 Contact Numbers

- ❒ Organize contacts so that internal Company contacts appear first followed by personnel associated with outside companies and agencies that must be contacted following a spill.

- ❒ Include the first and last names, organization, position, geographical location, phone (office and 24 hour / residence), fax, cellular and/ or radio numbers, and pagers (if applicable).

Table 7-14
Example of a Contacts Table

Name	Organization / Position	Location	Office Phone	Office Fax	Cellular / Radio	Home Phone
John Smith	Production	Moin Terminal	938-2916	938-2917	831-2510	651-6454

Company Contacts in the order of:

- Field, Production, Terminals, Refineries etc.
- Head Office,

External Contacts:

- Fire, Police
- Hospital, Ambulance
- Fishermen
- Other Port Users
- Tanker Owners
- Government Departments
  Local Governments
  Navy / Army

Equipment Cooperatives:

- Clean Caribbean Cooperative (provides spill response to member companies and on call services throughout the Caribbean, Central America, and South America)
- Other Operators

Equipment and Service Contractors / Consultants. Prepare an alphabetical list of manpower and equipment that can be drawn upon in the event of a large-scale spill. Diving / salvage, air transportation (charter), sea transportation, heavy equipment, trucks, accommodation, food, communication. If appropriate, sources from outside the country should be included [IMO, Southampton, ARPEL members, other Central and South American countries, Holland (salvage)].

Appendix 9.0 Control Points

"Control Points" are specific geographical locations, primarily on watercourses, which allow for the staging and deployment of oil spill containment and recovery equipment. Control point selection is critical to provide an effective oil spill response. Although primarily used for spill responses that may involve onshore watercourses (i.e. rivers, creeks), shoreline control points can also be pre-determined for offshore operations.

Each proposed control point should be evaluated for 12 specific parameters. Each parameter is rated a numerical value between 0 and 5. The higher the number, the better the conditions for oil spill containment and recovery operation. A value of 3 indicates average conditions, thus with 12 parameters, a total of 36 points represents a workable control point.

- ❒ Review every control point for individual criteria, as the overall total may not reflect a specific problem with the site (i.e. poor boat launch, water flow patterns). In some cases, the application of a particular criterion, e.g. boat launch, may not be appropriate (N/A) due to the site or congestion of the watercourse, however it still may be a good control point for other reasons.
- ❒ Regularly re-evaluate control points for changes in oil production areas and natural features.

The twelve control point parameters are:

1. General Access

- ❒ Is the site hard to find?
- ❒ Are there entry problems such as gates?
- ❒ Will it be difficult to bring in equipment?
- ❒ What are the overall road conditions?
- ❒ Are the roads narrow, steep or rutted?

2. All Weather Access

- ❒ Are roads available to the site?
- ❒ Are the roads suitable for travelling in adverse weather conditions (i.e. rain, floods, snow)?
- ❒ Is it possible to upgrade the roads in emergency conditions?

3. Work Area Size

- ❒ Is the area adequate for equipment?
- ❒ Is there adequate room for manpower so that the area is safe?

4. Work Area Restrictions

- ❒ Is the site flat and stable?
- ❒ Are there steep side slopes or escarpments which must be worked around?
- ❒ Is there thick grass, brush or trees present which will hamper deployment?
- ❒ Are there fences, power lines, pipelines or gas distribution lines which could present problems?

5. Boat Launch

- ❒ Can a river boat of significant size (3 to 8 metres) be launched into the water?
- ❒ If the stream is too small or shallow to use a boat, mark the evaluation as not applicable.

6. Equipment Storage

- ❒ Can equipment be stored at the site without hampering the movement of equipment and manpower in the work area?
- ❒ Does the equipment have to be transported to the site using small vehicles?

7. Natural Anchors

- ❒ Are there large trees on both shorelines which can be used for cable anchor procedures?
- ❒ Does the river bottom allow for river anchors to be used?
- ❒ Are there bridge piers which can be used as anchors?

8. Water Depth

- ❒ Is there adequate depth for skimming and boat operations?

9. Water Speed

- ❒ Under seasonal conditions, will the current speed allow for normal equipment deployment techniques?
- ❒ Are there rapids upstream or downstream of the work area?
- ❒ Is the current slower along the shoreline?

10. Flow Pattern

- ❒ Does the current pattern provide for oil to be deflected into the work area?
- ❒ Are there whirlpools or rapids present which may hamper oil recovery?
- ❒ Are there back eddies which could be used for oil recovery?

11. Water Hazards

- ❒ Is vegetation (land and water) present which will hamper skimmer and boat operations?
- ❒ Are there large rocks or obstacles (i.e. piers) which could affect safe boat handling?

12. Equipment Deployment

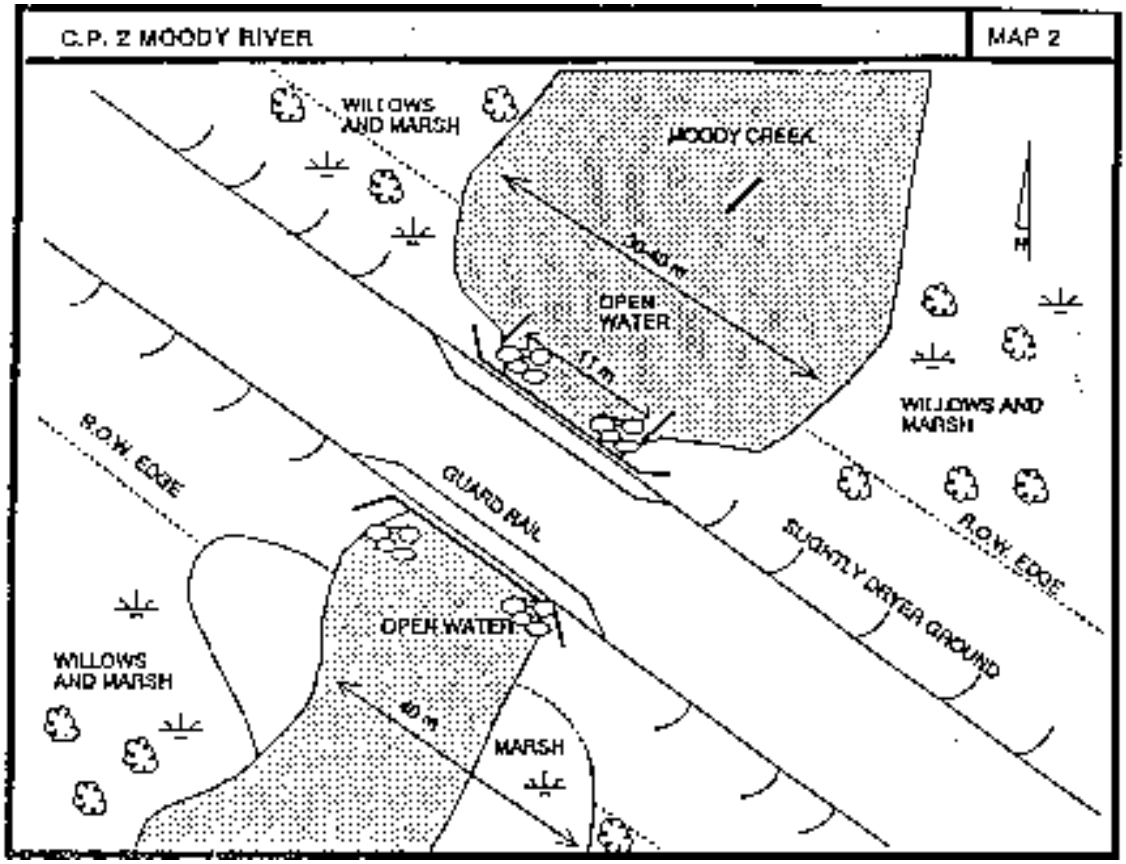
- ❒ Can standard equipment deployment techniques be used?
- ❒ What is the estimated time to deploy equipment at this control point (average 2 to 4 hours)?

Control Point Maps

Control points maps should identify the watercourse, bridges, roads, access trails, vegetation, and all distances. Each map should be supported with information summarizing:

- control point number,
- location,
- upstream / downstream control point numbers,
- nearest spill equipment location,
- access directions to control point and boat launch capabilities,
- landowner names,
- shoreline and bottom characteristics,
- watercourse width, depth, and velocity,
- workspace capabilities,
- site preparation requirements,
- environmental sensitivities.

Figure 7-7
Example of Pipeline Control Point Map



LOCATION: LSD 2-34-113 W5

UPSTREAM C.P.: 21 (23km), 3 (21 km)
DOWNSTREAM C.P.: None

NEAREST OSCAR EQUIP. DEPOT: Co-enerco/Zama Plant (31.2 km)

ACCESS TO CONTROL POINT: Bridge 32.2 km south on main road from Co-enerco Plant.
OWNERSHIP: Public QUALITY OF CONTROL POINT: Fair

BANK CHARACTERISTICS: Marshy, gentle
HYDRAULIC CHARACTERISTICS: Low flow, large, weedy, open water area upstream.
STREAM WIDTH: 12 m STREAM DEPTH: ±1m BED MATERIAL: Organics
ENVIRONMENTAL SENSITIVITY: Waterfowl, aquatic furbearers. Approximately 200 m from Hay Lake, (Wildlife Key Area for waterfowl moulting, staging and production).

WORK SPACE ACCESS/SIZE: Fairty wide, flat road shoulder with moderately steeps edges. Some higher ground adjacent to channel. Working area best on east bank of river.
BOAT LAUNCH: Good though travel inhibited at low water
SITE PREPARATION: None
COMMENTS: Containment best upstream, weeds may interfere with skimmer. Use bridge supports for anchor points during high water.

Appendix 10.0 Evacuation

This section of the contingency plan identifies the Company's procedures for the evacuation of Company personnel, residents and other public buildings in the event of unsafe conditions. Although petroleum industry evacuation plans are usually associated with natural gas, sour gas and high vapour pressure liquid releases, it is possible for an oil spill to require an evacuation due to sour crude and / or fire at a production facility or offshore platform.

Evacuation procedures should at least address the following topics:

When to Evacuate

- ❒ Assess an evacuation based on the type of incident, leak volumes, spill composition, meteorological conditions, terrain, emission sources and population location.
- ❒ In general, it is recommended that any occupied buildings downwind of a leak are checked and evacuated if any oil vapours are detected.
- ❒ State in the contingency plan the radial distance for which all occupied buildings should be evacuated and under what conditions.
- ❒ Consider in-place sheltering versus evacuation. This may be possible when there is a greater safety risk involved with moving people quickly in proximity to the incident.

Who Does the Evacuation

- ❒ Identify who conducts and is responsible for the evacuation. In some cases, the local law enforcement agency, if their manpower permits, handles all evacuation procedures in consultation with the Company. In other cases, the Company will coordinate the evacuation, either in person or via telephone. Regardless of who does the evacuation, it must be clearly stated in the contingency plan.
- ❒ Consider a prepared "Evacuation Message" or checklist that either an on-site notifier or a telephone notifier could use to ensure that all information is relayed.

Evacuate to Where

- ❒ Identify safe, accessible, and sheltered facilities with the necessary amenities. Make pre-arrangements with the facility owner.

When to Return

- ❒ Identify who is responsible for giving permission for evacuees to return. This is usually a decision made jointly between the Company

(On Scene Coordinator), government representatives and the law enforcement agency.

Public Consultation

- ❒ Make prior efforts to inform the public of the local industrial operations. This can assist with evacuation procedures by minimizing apprehension and encouraging evacuee assistance.

- ❒ For companies with pipeline operations over a large geographic area prepare a profile of the various communities that the pipeline traverses. The profiles could contain:

    - population centres (i.e.: hamlet, village, town, city, county, municipal district, rural municipality),
    - population size,
    - population centre proximity to operating facilities,
    - local emergency services (i.e.: police, ambulance, fire, medical services) and whether these are professional or volunteer,
    - emergency measure organizations and local disaster plans,
    - maps showing the facilities in relation to the physical surroundings.

8.0 Spill Prevention

Spill prevention describes measures which may be taken by Company personnel to prevent the accidental discharge of oil.

A Company should review all spill incidents (cause, response and effect) to aid in the development of the Plan and also to identify possible improvements in operating procedures, equipment and facilities.

A prevention program should be developed for each of the scenarios in the risk assessment process and be made available to all personnel. This will directly assist on-going maintenance programs, inventory control, operation checklists and the development of the Company's environmental audit and training programs.

Spill prevention programs are important in the petroleum industry to:

- reduce the likelihood of accidental discharges of petroleum products, process fluids, and chemicals;
- establish operating practices and training programs to deal with and control spills;
- limit the contamination of groundwater aquifers, surrounding soils and the environment; and
- reduce the costs and time required for cleanup and rehabilitation of lands contaminated by spills.

General Prevention Practices

The following general practices should be observed to develop a spill prevention plan and to prevent accidental discharges.

- ❒ Examine each area of the facility and identify the potential source of accidental discharges. The frequency of inspection will be highest for those facilities which do not have modern equipment and automatic monitoring systems. Inspections should include:
    - examination of pipes subject to vibration, dead piping, or temporary connections,
    - examination of tank material, siting and overall condition,
    - examination of past spills and spills at similar locations or facilities.

- ❒ Modify existing facilities or install new equipment or instrumentation. This may include alarms, automatic shutdown equipment, or fail-safe equipment to prevent, control or minimize potential discharges resulting from equipment failure or operator error.

- ❒ Establish maintenance and / or corrosion abatement programs to ensure the continued adequacy of all equipment. These may include corrosion monitoring, chemical inhibition, pigging, the installation of corrosion resistant equipment (e.g. internal / external coatings) or corrosion prevention devices (e.g. cathodes).

- ❒ Install spill detection devices such as sensors or monitoring wells, as required.

- ❒ Establish schedules of tests and inspections of lines, vessels, valves, alarm systems, sensors, hoses, and other potential sources of an accidental discharge.

- ❒ Prepare clear and accessible operating procedures to minimize situations where there is a high potential for accidental discharge.

- ❒ Develop training programs on discharge prevention. Make these programs easily and frequently available to operating personnel.

- ❒ Develop contingency and shutdown plans for response to natural disasters and to minimize the potential for discharges, or situations causing environmental damage.

Onshore Wellheads

- ❒ Is the wellhead piping regularly checked for corrosion?

- ❒ On wells with packers and annulus fluid, is the fluid properly inhibited to protect the well casing from corrosion?

- ❒ Are wellhead barricades installed to prevent vehicle collision?

Onshore Pumping Oil Wells

- ❒ On pumping oil wells is there adequate lubricant application of the stuffing box packing?

- ❒ In environmentally sensitive areas, has a second stuffing box been considered to minimize spills in the event of rod breakage?
- ❒ Is there a need for installation of a secondary pressure switch?
- ❒ Are the rattigan rubbers checked and replaced, if necessary, each time the well is serviced?
- ❒ Are vibration switches installed?
- ❒ Are the safety bolts in place on the horse's heads?
- ❒ Are the bridle cables inspected for fraying, and replaced if necessary?
- ❒ Where necessary, does the wellhead stuffing box have a built-in BOP capability?

Pipelines

- ❒ Are pipeline warning signs in place on all road and watercourse crossings?
- ❒ Is adequate brushing conducted on pipeline right-of-ways?
- ❒ Are all ground disturbances on and around the pipeline right-of-way reported to the field office?
- ❒ Is the Company a member of a national underground pipeline locating database system? (only available in a limited number of countries).
- ❒ Are high volume natural gas liquids (NGL) or liquefied petroleum gas (LPG) and oil pipeline right-of-ways patrolled regularly (i.e.: aircraft or ground surveillance)?
- ❒ Have above ground structures been adequately protected against vandalism or collision by vehicles?
- ❒ Where pipelines cross large watercourses, is the downstream pipeline pressure monitored daily?
- ❒ Are periodic underwater inspections conducted of pipeline river and creek crossings?
- ❒ Are annual visual inspections conducted of pipeline river and creek crossings?

- ❒ Has visual monitoring been conducted where pipeline right-of-ways may be subject to erosion (i.e.: hill sluffing)?
- ❒ Have all pipelines been ranked as to their risk if a leak occurs?
- ❒ Is there a plan in place to monitor high risk pipelines?
- ❒ Do the pipeline field operators know the maximum operating pressure for each pipeline system?
- ❒ Is the maximum operating pressure exceeded during pigging operations?
- ❒ Are annual pressure tests conducted on pipelines which cross river and creeks?
- ❒ Have meter or pressure gauges been installed to monitor daily line inlet and outlet volumes and pressures.?
- ❒ Are all inlet line headers protected by check valves?
- ❒ Are tests routinely conducted on pipeline systems which have emergency shutdown systems?
- ❒ Where possible, has the pipeline operating pressure been reduced?
- ❒ Have spools been installed or considered to monitor internal corrosion?
- ❒ Is there a chemical inhibition program in place to prevent internal pipeline corrosion?
- ❒ If corrosion has caused a failure, has the section of the pipe been removed and analysed?
- ❒ In areas of high environmental sensitivity, has the pipeline been internally coated or polyethylene liners installed?
- ❒ Are de-scaling programs considered when planning internal pipeline chemical treatment?
- ❒ Are monthly readings recorded from a cathodic protection system using a rectifier?
- ❒ On pipelines where persistent pro-ration factor problems occur, has the line been checked for integrity?

Production Facilities

- ❒ Are tanks and dikes of regulation size to hold the production volumes during unattended hours of operation?
- ❒ Are overflow tanks of adequate size and kept empty at all times?
- ❒ Has the integrity of the dike been adequately maintained?
- ❒ If the facility is located in an environmentally sensitive area should more diking be considered?
- ❒ Have dikes been constructed around chemical storage tanks?
- ❒ Is the chemical consumption on the site high enough to replace drums with bulk storage?
- ❒ Are chemical pumps checked daily?
- ❒ Have "no-flow" controls been installed on recycle pumps?
- ❒ Could recycle pumps be mounted on top of a volume tank, to contain any packing drips?
- ❒ Have bull plugs or blank flanges been installed on all open-ended pipes or dead-end valves?
- ❒ Do all lines indicate flow direction?
- ❒ Do all lines indicate the contents?
- ❒ Are valves tagged to prevent erroneous operation?
- ❒ Have drip barrels been placed under the end of loading lines?
- ❒ On truck loading lines, does the end terminate within the tank dike?
- ❒ For truck unloading, does the line go into the top of the tank?
- ❒ Is the proper pump packing used with the type of service?
- ❒ Is there a guideline for what type of packing should be used for what service?
- ❒ Where possible, have 24 hour alarms been installed?
- ❒ Are sight-glass valves closed when not in use? Are they adequately protected from breakage?

- ❒ Are the scrubber drains tied into a common drain system or tank?
- ❒ Is there a bypass on the discharge side of all high pressure positive displacement pumps?
- ❒ Is fired equipment inspected regularly (i.e.: burner gaskets in good shape, bolts tight)?
- ❒ Are internal inspection programs conducted on vessels during processing plant and facility turnarounds?
- ❒ When internal corrosion is found in a vessel are steps taken to eliminate the problem within the operation?
- ❒ In areas where problems re-occur, are steps taken to eliminate the problem?
- ❒ Is there a procedure in place to conduct daily mass balances on produced products and waste liquids?
- ❒ Are there adequate vandalism prevention methods in place?
- ❒ Is there an adequate training program in place for new and existing personnel?
- ❒ Is a facility walk around conducted prior to leaving a facility?

9.0 Training

Oil spill training is required to meet minimum company, national and international policies, guidelines and regulations. High standards have been set by the public and government agencies for cleaning up major spills from tanker and barge accidents as well as small, chronic discharges from transfer and facility operations. Increasing environmental awareness has helped to create the high expectations now demanded of petroleum companies and regulatory authorities in dealing with spills.

Minor spills are far more numerous and ultimately more costly when site remediation and disposal are considered. Training provides personnel with the means to respond safely and effectively to most spill situations -- regardless of the discharged volume. In this regard, the practical implementation of contingency plans should be stressed as they relate to Level 1, 2 and 3 spills. Comprehensive training programs should also include prevention procedures so that the likelihood of accidents is reduced. This is primarily because spill control methods have limitations that must be made clear to trainees.

Training should also be company specific, i.e., it should embody a sound understanding of the fuel handling procedures and spills which are most likely to be involved in the environment of concern. A combination of knowledge is required of potential spill sources, response strategies, countermeasures options, potential impacts and a range of mitigation methods which are practical and that can be readily understood and applied.

It is suggested that the following steps be taken when developing training programs:

Step 1 Program Outline

The objectives and scope of the training should be reviewed in terms of potential spill sources and the application of the contingency plan. Response Team members should be aware of the steps that need to be taken during an emergency ranging from initial notification to control and cleanup, and finally post-incident review. The geographical boundaries and spill scenarios are often discussed in detail during this phase as well as the budget. Decisions can also be made on the amount of classroom and field instruction that are to be included and associated support needs.

Step 2 Program Development

Packages should then be developed that include several basic items which can be used by company trainers to ensure ongoing training. An outline has

been included in this guideline that will help to clarify the development of various modules using the following elements:

- a trainer's manual (including a number of scenarios and exercises),
- a set of overheads (acetates),
- a set of slides, and
- video (facilities, equipment, response methods).

As many of these components as possible should be prepared dealing with company situations: terminal facilities, available vessels, personnel, equipment, shorelines, etc.

Step 3 Train the Trainers

Initially, training should be conducted at one location attended by personnel from several operations including potential trainers. A specialist should be contracted to design and instruct the course. Alternately, and depending on the size of the company, multiple initial training sessions could be held, one in each of the potential trainer's regions. Follow-up sessions are recommended at a central location to allow each of the trainers to review the material presented and clarify issues/questions about the course or materials.

Subsequent training courses, to be conducted by company trainers, should be attended by a qualified trainer, to assist in the delivery of the course and to ensure that other trainers are fully prepared to continue the training by themselves. Trainers from outside of central company operations can be provided with a checklist in order to gather site-specific data required to complete contingency plans and/or contribute to prevention programs and further development of training, if required.

Step 4 Delivery of Spill Response Training

Company trainers should deliver the remaining training sessions and follow this up at least annually. At the same time, they can help to indicate further data required to upgrade contingency plans since training often serves to highlight deficiencies. Outside specialists or company personnel should be available to provide further assistance, should trainers need this.

Step 5 Updating

The training program should be reviewed and updated as roles and responsibilities change, new equipment is acquired, and facilities and operations evolve. Dating pages and using a 3-ring binder as well as taking photographs of new skimmers, booms, pumps, vessels and other hardware and materials should be planned.

A sample training course is included in the next section. It can be used as a model on which to formulate a basic spill response training package. More specific training modules can also be developed that deal with sensitivity mapping, computer models, risk assessment, prevention, contingency plans and other individual topics such as dispersant application, in situ burning, shoreline cleanup, bioremediation and biological impacts.

Table 9-1
Sample Training Syllabus
"Effective Oil Spill Prevention & Response"

MODULE 1 ***Spill Response Planning***
- Sources and Causes of Spills
- Physical and Chemical Properties
- Fate and Behaviour of Spills
- Impacts on Natural Resources and Property
- Response Priorities

MODULE 2 ***Administration***
- Reporting Requirements and Procedures
- Contingency Plan
- Spill Report Form

MODULE 3 ***Self-Auditing***
- Self-Auditing Procedures and Checklist
- Developing a Self-Audit Checklist
- Checklist Contents
- The Real Cost of a Spill

MODULE 4 ***Health & Safety***
- Health Risks and Hazards
- Spill Response Safety Guidelines
- Personal Protection Equipment
- Site Security

MODULE 5 ***Containment***
- Spills on Land
- Spills into Small Watercourses
- Spills on Water

MODULE 6 ***Recovery***
- Selection of Recovery Methods
- Skimmers
- Sorbents

MODULE 7 ***Transfer***
- Application of Pumps
- Hoses & Connections
- Selection Criteria
- Main Pump Types
- Vacuum Systems

MODULE 8 ***Storage & Disposal***
- Separation and Reduction of Wastes
- Selecting Storage Options
- Disposal Options
- Regulations

MODULE 9 ***Post Spill Activities***
- Cleanup Options
- Site Restoration
- Personnel Decontamination
- Equipment Cleaning and Maintenance
- Debriefing and Equipment Review

The amount and frequency of training will vary depending on the circumstances of the operation.

- ❒ Use the duties of the response personnel identified in the contingency plan to determine the oil spill and other emergency response training requirements.

- ❒ Record completed training with the person's name, date, type of training, and course name. The administrator of the plans should keep this information up-to-date.

Table 9-2
Example of a Training Record

Person	Course Name	Type	Date
John Smith	On Scene Coordinator	Oil Spill Response	June 1997

- ❒ Consider the training requirements for long duration spill cleanups when additional manpower is continually required. This may require a continuous training program as personnel are rotated through the cleanup operations.

- ❒ Identify spill response duties and training requirements in an employee's position description.

- ❒ Recognize the merits of external training certification programs. Internal training requirements should also be monitored.

- ❒ Vary oil spill equipment exercises in their location, time of year and type of equipment. Promote more "hands-on" activity. This should include the selection of optimum sites for deploying boom, conducting skimming operations and storing and transferring collected liquid. Communication equipment and systems should be tested at the same time to ensure that operations at the terminal, refinery and on water are coordinated.

- ❒ Include members of the local emergency response agencies (police, fire, and emergency measures) and the government agencies in all training programs and equipment and plan exercises.

10.0 Safety

Personnel safety is a prime consideration at a spill site. Spill response can present overlapping safety concerns (e.g. boat operations, working on watercourses, flammable conditions) that are entirely different from the safety concerns of regular industry duties.

This section identifies some general safety considerations that should be included in training programs and as part of any spill response operation.

Toxicology

Inhalation, ingestion, eye and skin contact risks are unique to each product handled. Refer to specific health hazards in MSDSs *before* a spill occurs.

Inhalation of petroleum vapours may:

- dull the sense of smell,
- cause dizziness,
- cause headaches,
- irritate eyes.

Increased quantities may cause a loss of consciousness or even death. Mucous membranes such as the eyes, nose, throat and lungs are especially sensitive to vapours.

Direct skin contact with petroleum products may cause irritation and prolonged contact may lead to skin disorders.

Use adequate personal protective equipment when responding to spills.

Fire and Explosion Hazards

The risk of fire and/or explosion can exist during oil and chemical spills--particularly in confined spaces. Risk varies with each product and site, and must be evaluated before personnel enter the spill area by using the following evaluation criteria:

- need to enter the area,
- potential fire hazard of the material spilled,
- reaction potential between spilled or stored products,
- toxicity and oxygen levels.

Safety precautions include:

- Monitor ambient gas levels using a calibrated meter in good working order.
- Use explosion-proof equipment; do not use open lights, flames, internal combustion engines, or non-approved radio transmitters in potentially flammable atmospheres.
- Ground equipment during transfer of flammable products.

Understand the operation of all gas monitors and know the acceptable exposure limits of all petroleum and chemical products that you handle.

Assessing Fire and Explosion Risk

A key measurement of the risk of fire or explosion is the Lower Flammability Limit (LFL), which is the lowest concentration of a vapour that will combust. A general guide is:

Reading		Action
less than 10% of the LFL	***then***	proceed
between 10% and 20% of the LFL	***then***	proceed with caution
greater than 20% of the LFL	***then***	DANGER - leave the area

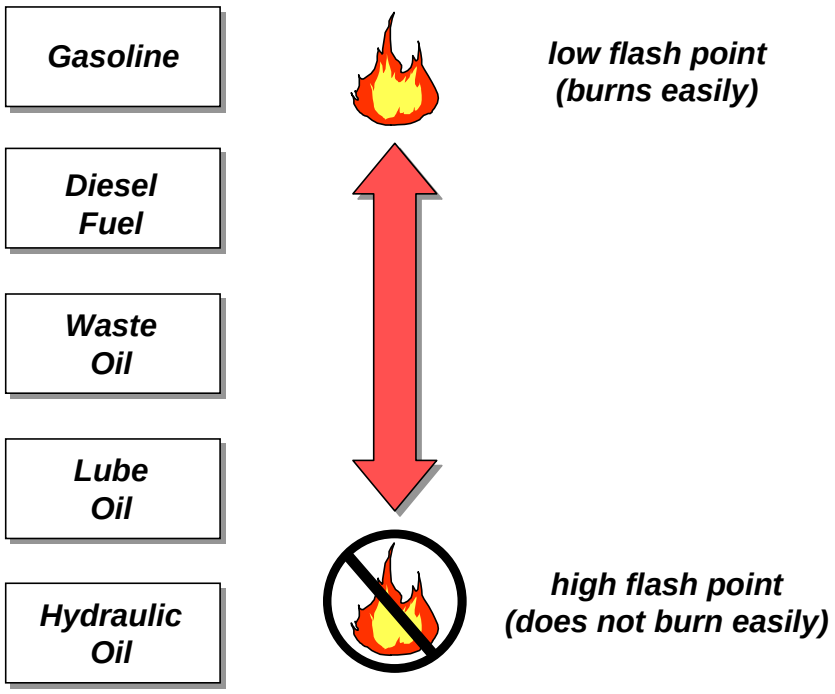
Most gas monitors do not operate properly when ambient oxygen is below 14% to 16%; oxygen content should also be measured in confined spaces. If 10% LFL is exceeded or any doubt of concentration exists, wear self-contained breathing apparatus (SCBA).

Exposed Situation	Precautionary Measure (if safe to do so)
Surface Water	Block entry of contaminant into storm sewers, drains, ditches, streams, lakes.
Underground Services	Block entry of flammable liquids into sewers. Identify and protect underground electrical, gas, water and sewer systems from equipment damage during cleanup activities.
Low Lying Areas	Vapours will collect in hollows prior to dissipating. Use caution before cleaning up spills in ditches.

Containers	Apparently empty or partially filled containers may contain explosive vapours. **Do not enter** empty tanks prior to checking both oxygen and explosive gas levels. Properly label all containers used to store liquids collected during spill cleanup.

Flash Point

Flash point is the lowest temperature at which an ignition source will cause the product to burst into flame. The more volatile petroleum products, such as gasoline, have a lower flash point and a greater danger of potential fire or explosion.



General Safety Guidelines

Supervisors

- All responders must receive safety training and know emergency procedures.
- Training must include the use of all required protective and testing equipment.
- Information on hazardous products must be made available to all responders.
- A first aid attendant must be available to workers during spill response.

Field Personnel

- Evaluate the spill situation before taking action.
- Never attempt response actions alone.
- Do not respond to a situation that is beyond your training.
- Do not rely on your senses to determine hazardous conditions; use personal protective gear and monitoring equipment.
- Check data/condition of any item that is critical to the response operation.
- Assume the worst until you know otherwise.
- Always overprotect yourself.
- Do not rely too heavily on equipment - consider backups.
- Do not use contact lenses in contaminated environments (they may trap chemicals).
- Never lend or borrow critical safety equipment.
- Use extra caution when entering confined spaces.

General Safety Practices

- Personnel should be trained in first aid and have replenished kits available.

- Training should include CPR and life breathing techniques.
- Hard hats, safety boots with oil/chemical-resistant soles, vests that are highly visibility and goggles should be worn when appropriate to do so.
- Be aware of tides, flooding, high currents and cold water when working near water.
- Shift work during spills should be scheduled so that everyone is well rested.
- Wash skin that comes into contact with oil with soap and water as soon as possible.

Precautionary Response Actions for a Spill

- Approach from uphill, upwind or in direction of current -- as appropriate.
- Eliminate sources of ignition.
- Determine the type of product spilled.
- Warn others in the area of the incident.

Alcohol and Substance Abuse

- Spill response demands full use of all faculties and quick decisions. Alcohol, narcotics, hallucinogens, depressants, stimulants and other substances can seriously impair performance and judgement, leading to accidents and injuries. No personnel should respond to spills while under the influence of such substances.
- Medication should not cause drowsiness, dizziness or disorientation. If called for spill duty and concerned with medication or alcohol consumed, advise supervisor and make arrangements that will not jeopardize your safety or that of co-workers.

Responsibility for Safety

The responsibility for safety is shared between employer and employees. Cooperation, common sense, working in a safe manner and watching out for the safety of others are key safety concepts. Everyone is responsible to ensure the safety of themselves and others.

Supervision

Adequate supervision of workers is key to ensuring a safe working environment; however, a single supervisor is often assigned to a number of workers and cannot always see everything. An effective practice is to use the "Buddy System". This requires two individuals to work cooperatively and follow three basic rules:

- Never let your "buddy" out of your sight.
- Always communicate with your "buddy".
- Look for signs of overexposure or fatigue by talking and/or observing your "buddy" frequently.

Personal Protection Equipment

- Inhalation and skin penetration are common routes of chemical entry. Required personal safety equipment is specific to each spill and can include gloves, impermeable coveralls, boots, goggles, helmets, and ear and respiratory protection.
- Respiratory protection is not always required; however, when working in enclosed spaces or in the presence of poisonous or asphyxiating gases, always wear an approved breathing apparatus.
- Air-purifying respirators and SCBAs protect against oil and chemical vapours. Air purifying respirators are mechanical filters, chemical cartridges or gas masks. They are cheap, easy to wear, and have no tanks to fill up. However, they function only in low levels of certain chemicals; they provide no protection for oxygen deficiency; breakthrough can occur; and there is no warning of overload unlike SCBAs.

Protection provided by the mask varies widely for individuals, depending on fit. A respirator face piece fit test should be done for each individual. Also note:

- Facial hair renders respirators ineffective; users must be clean shaven.
- Cartridges and filters must be properly selected for the anticipated hazard.
- Cartridges have limited service life; replace them regularly if used or not.

- Air-purifying respirators do not protect against SO_X, CO or other toxics.
- Workers must be trained in the correct use of respirators.
- Regular eyeglasses cannot be worn with full face respirators; workers wearing glasses must be provided with appropriate eyewear.
- Wear SCBAs when air-purifying devices do not provide sufficient protection.
- SCBAs have a service time of approximately 30 minutes.
- Clean, decontaminate, inspect and refill respiratory equipment after use.

Site Security

For safety purposes, the following steps should be taken to secure the spill site:

- Restrict access to those involved in response activities.
- Post warning signs at access points.
- Request police assistance where evacuation or traffic control are required.

11.0 Incident Command Systems (ICS)

This section provides a brief definition and example of an Incident Command System (ICS) which can be used as an alternate to the spill responsibilities described in the Responsibilities section of the Contingency Plan. Companies may wish to prepare for a similar ICS for their specific operations.

The first hours of an oil spill are critical to the success of the response. This is especially true for Level 2 and 3 spills.

During this time, there can be many conflicting responsibilities:

- notifying government agencies, the public, and water users,
- mobilizing resources and choosing response strategies,
- assessing impacts,
- preparing news releases,
- spill monitoring.

The response team may also be dealing with conflicting concerns from government agencies, public interests groups, the media and even Company management. Confusion, inefficiency and improper decision making can and does occur.

To combat these problems, the ICS was developed to standardize organizational structures, terminology, procedures and communications among organizations.

An ICS enables any Company to function in a multi-organizational environment. The system can help manage events of any kind; from the smallest oil spill to a complex national or international disaster. An ICS has four main features that will integrate all of the diverse groups of personnel into an effective response team.

Modular Organization

An ICS recognizes five major areas:

- Command,
- Operations,
- Planning,
- Logistics, and
- Finance.

An Incident Commander has management control over the entire response and builds a support organization from the top down based on the size and complexity of the incident. If one person can handle all aspects of the spill, as might happen in a small wellhead leak, then no further organization is required. However, if the incident grows in complexity, additional management and personnel enter the organization.

Identifying the full organizational structure for the worst case scenario is key to the success of the system. The Incident Commander would activate only those parts of the system that are required.

Management Span of Control

A principle of the ICS is that individuals with emergency management responsibilities should have no more than seven persons directly reporting to them. If more than seven people report to a manager, then the manager should subdivide the unit to avoid becoming overloaded.

Unified Command Structure

An ICS makes allowance for multiple jurisdictions. All parties who have a responsibility in a multi-jurisdictional incident, help to determine what are the common goals strategies and tactics. For example, a logistics planner for the Company may work with the government logistics expert in the Logistics Section. This can be the most challenging objective of an ICS.

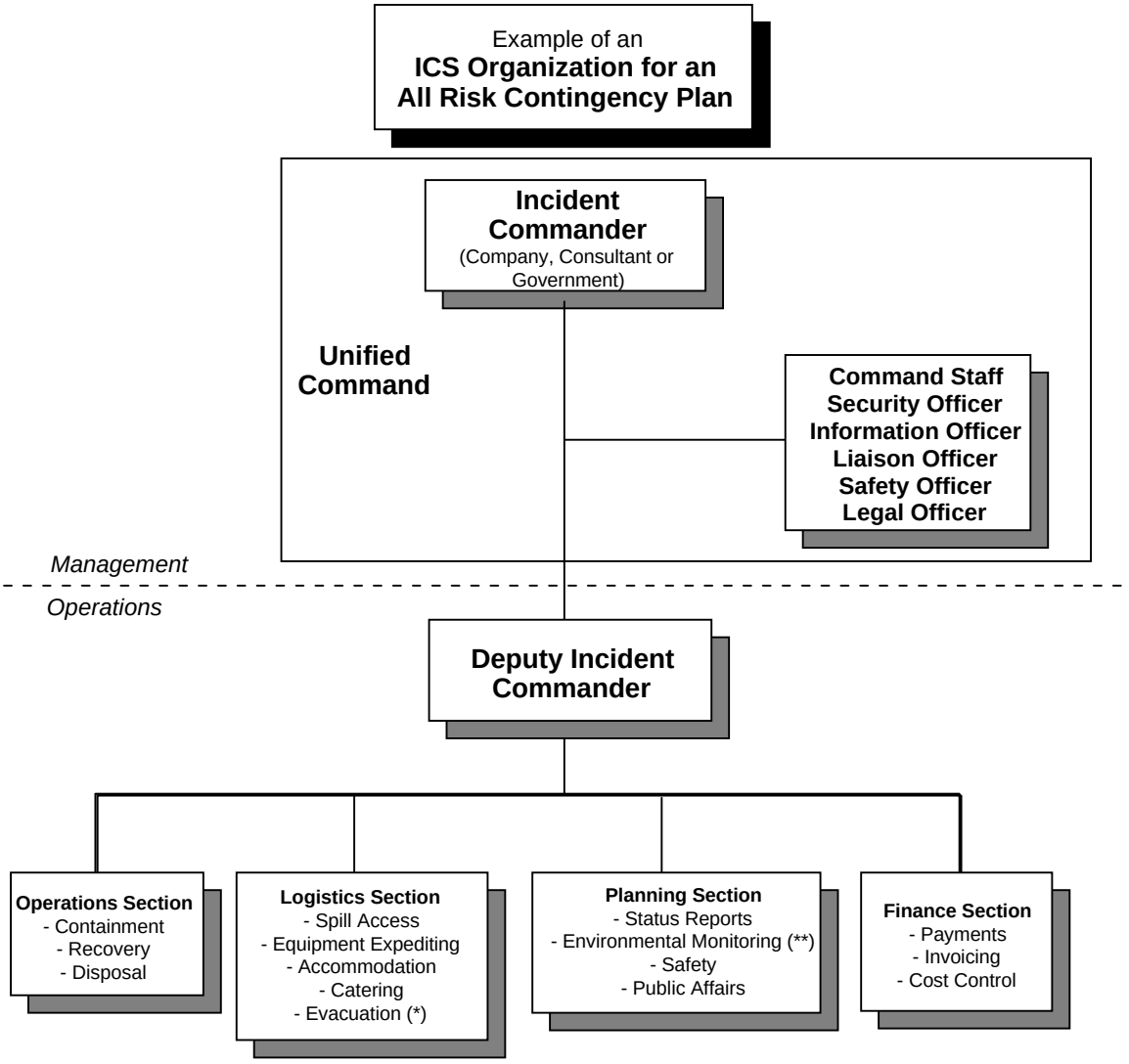
Common Terminology

In an ICS a common vocabulary is used for organizational structures, functions, resources and facilities. This reduces the potential for confusion.

Recently there have been suggestions that an ICS could more correctly define its function by being renamed as a “Response Management System”. The Unified Command, as represented in Figure 11-1, would be aptly called the Emergency Management Board.

Regardless of the title which the system takes, it has proven to be a viable system for managing a multi-organizational response. However, the designated boxes of an ICS organization structure are only definitions and suggestions for control and must be flexible.

Figure 11-1



* Evacuation possibly coordinated by a government agency.

** Environmental Monitoring possibly coordinated by government department.

12.0 Command Centres

Considerable time and expense may be required to develop an effective communications and command "centre". Emergency personnel would use a command centre during an oil spill response as a place to meet and plan their activities and as a place to maintain their logistical planning information such as maps, charts, and reference books.

This section identifies the design and equipment that should be considered in the use of a command centre. The centre may be developed at the time of the spill or more preferably on a pre-planning basis. Companies who have operations concentrated in a specific geographical area, such as an onshore production field, or a marine supply terminal, should consider having a dedicated command centre.

Large spills usually require command centres from where the complete response operation is directed. The centre provides several key elements:

- A known sheltered place where supervisory personnel can meet and discuss management issues relating to the cleanup.
- Communications, both internal and external including direct links to vessels, helicopters, and vehicles.
- Storage of reference materials such as charts, computerized sensitivity maps, and modelling systems.
- Possible first aid care.

Table 12-1
Types of Command Centres

Type of Command Centre	Advantages	Disadvantages
Existing Building or Operations Room • Usually located at an existing company facility.	• Familiar to personnel and administrative methods. • Negligible capital cost. • Reference information is readily available.	• Non mobile. Personnel may have to travel considerable distances between the command centre and the spill site. • Centre may have other uses during normal operations; time may still be required to set up facility.
Self Contained Mobile Facility • Includes buses, vans and trucks.	• Unit is mobile and ready at all times. • Not dependent on availability of contractors equipment for transport.	• Potential high initial cost. • Self mobile vehicle is maintenance intensive (unit includes vehicle mechanical).
Trailer • May be either tractor trailer or industrial trailer type. • Tractor trailer type preferred due to increased strength and clearance for rough terrain.	• Medium initial cost. • An existing trailer may possibly be retrofitted.	• Dependent on availability of contractors equipment for transport. • Limited off road use. • Vehicle maintenance requirements for chassis and hydraulics.
Skid Mounted Building • Industrial type trailer mounted on steel skids.	• Transportable via several transportation methods including: flatbed, railcar, all-terrain transporter, helicopter. • Lower cost. • Low maintenance required for general upkeep. • Diverse off-road uses.	• Dependent on availability of contractors equipment for transport.
Modular Kits • Fabricated panels of wood, sheet metal, fibreglass, or reinforced plastic.	• Transportable by air and smaller vehicles. • Low maintenance. • Can include all features of other options.	• Requires assembly on-site. • Can be damaged in transit. • Limited in size.

Tents	• Transportable by air and smaller vehicles. • Low maintenance.	• Limited operations in some weather conditions. • May limit the operation of computers and communication equipment.

Table 12-2
Command Centre Equipment

Equipment	Considerations
Power Supply	Compatible to area of intended operation. Power generator.
Furnishings	Meeting area, ample desk area for computers, map storage, fire extinguishers and other safety equipment, kitchen, exterior and interior lighting, sleeping facilities.
Communications	Phones: Conventional, mobile, cellular, satellite. Fax: Dual machines with capabilities for on-site usage via conventional, cellular or mobile phones. Public Address System Mobile Radios: Options include intrinsically safe operation, hands free, submersible, voice security scanner, charger units. Television

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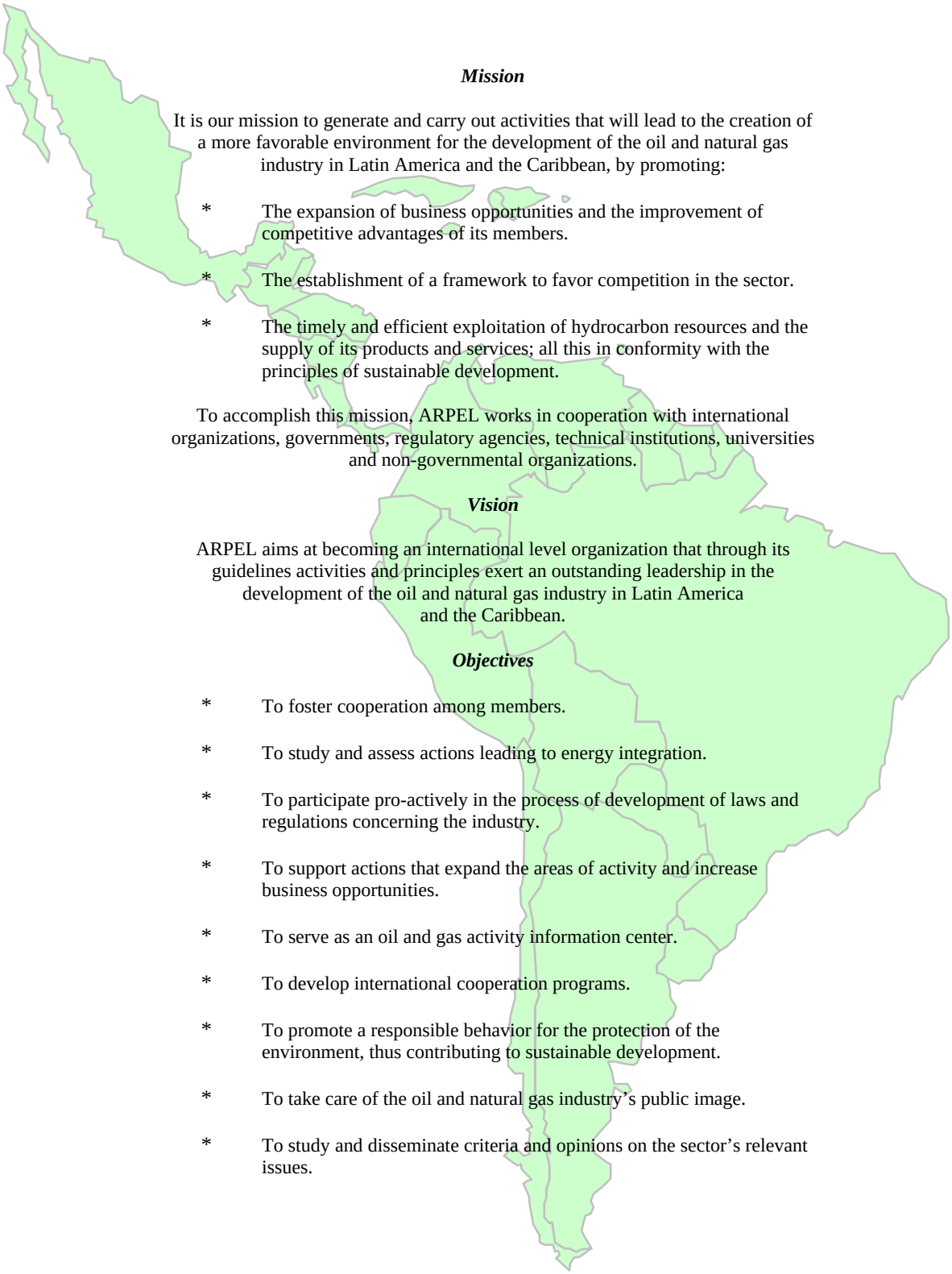

Mission

It is our mission to generate and carry out activities that will lead to the creation of a more favorable environment for the development of the oil and natural gas industry in Latin America and the Caribbean, by promoting:

* The expansion of business opportunities and the improvement of competitive advantages of its members.
* The establishment of a framework to favor competition in the sector.
* The timely and efficient exploitation of hydrocarbon resources and the supply of its products and services; all this in conformity with the principles of sustainable development.

To accomplish this mission, ARPEL works in cooperation with international organizations, governments, regulatory agencies, technical institutions, universities and non-governmental organizations.

Vision

ARPEL aims at becoming an international level organization that through its guidelines activities and principles exert an outstanding leadership in the development of the oil and natural gas industry in Latin America and the Caribbean.

Objectives

* To foster cooperation among members.
* To study and assess actions leading to energy integration.
* To participate pro-actively in the process of development of laws and regulations concerning the industry.
* To support actions that expand the areas of activity and increase business opportunities.
* To serve as an oil and gas activity information center.
* To develop international cooperation programs.
* To promote a responsible behavior for the protection of the environment, thus contributing to sustainable development.
* To take care of the oil and natural gas industry's public image.
* To study and disseminate criteria and opinions on the sector's relevant issues.

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