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079 The Development of  
a Canadian Oil-Spill  
Countermeasures  
Training Program

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ENVIRONMENTAL STUDIES RESEARCH FUNDS

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THE DEVELOPMENT OF A CANADIAN  
OIL-SPILL COUNTERMEASURES TRAINING PROGRAMME

by

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## SUMMARY

A comprehensive training programme for oil spill countermeasures has been developed for the Canadian offshore oil and gas industry. The programme comprises twelve training modules on the following subjects: Introduction to Oil Spill Behaviour (course length: 1 1/2 h), Advanced Course on Oil Spill Behaviour (8 1/2 h), Overview of Oil Spill Control Techniques (2 1/2 h), Oil Spill Response Organization and Strategies (2 h), Countermeasures Overview for Spill Superintendents (9 h), Surveillance and Monitoring Techniques (17 h), Containment and Recovery Techniques (5 h), Chemical Dispersion Techniques (18 h), Shoreline Protection and Cleanup Techniques (14 h), Disposal Techniques (8 h), Hands-on Experience with Equipment (16 h), and Company Simulated Spill Response Exercise (8 h).

Various combinations of these modules are to be used to fully train persons with the following responsibilities in a company's oil spill response organization: the emergency director in overall charge of the emergency event, the spill superintendent in charge of the spill management team at the scene of the accident, the five supervisors working for the spill superintendent in specialized spill control areas (such as containment and recovery, and shoreline cleanup), the foremen who work for the supervisors, and secondary advisers such as marine and logistics supervisors, lawyers, and public relations officers.

Detailed learning objectives have been written for each of the training modules to serve as guides for course designers. Recommendations are made regarding which courses should be produced first and which can be delayed. Training priority is given to the spill superintendent and the supervisors.

## RÉSUMÉ

Un programme de formation complet en contre-mesures de déversements pétroliers a été conçu pour l'industrie des hydrocarbures marins. Il comprend les douze modules suivants: notions fondamentales du comportement des nappes d'huile (durée: 1.5 h), notions avancées du comportement des nappes d'huile (8.5 h), survol des techniques de maîtrise des déversements (2.5 h), organisation et stratégies de réponse aux déversements (2 h), survol des contremesures à l'intention du directeur des travaux (9 h), techniques de contrôle et de surveillance (17 h), techniques de confinement et de récupération (5 h), techniques de dispersion chimique (18 h), techniques de protection et de nettoyage des rivages (14 h), techniques de disposition des déchets de nettoyage (8 h), manipulation de l'équipement (16 h) et exercice de mobilisation simulé d'une société pétrolière contre un déversement (8 h).

Diverses combinaisons de ces modules serviront à former complètement les membres suivants du groupe d'intervention: le responsable du cas d'urgence, le directeur des travaux, chacun des cinq chefs d'équipe du directeur chargés d'une tâche spécialisée (tel que le confinement et la récupération, ou le nettoyage des rivages), les contremâîtres se rapportant aux chefs d'équipe, et les conseillers tels que les avocats, les agents de communication et les surveillants d'opérations marines et de soutien.

Nous donnons les objectifs d'apprentissage détaillés pour chaque cours et chaque module afin de guider les concepteurs des cours sur mesure. Nous recommandons également quels cours sont à dispenser immédiatement et quels sont ceux qui peuvent être différés. La priorité est accordée à la formation du directeur des travaux et de ses cinq chefs d'équipe.

## INTRODUCTION

The objective of this project was to develop a programme to train oil industry personnel who have countermeasures responsibilities with respect to oil spills on "Canada lands". Although some spill-control training programmes are offered in Canada and in other countries that can provide a level of general training, it is believed that the situation is inadequate for current and future needs.

The Canadian Oil and Gas Industry is far from monolithic on matters related to oil spill control; the oil spill response organizations of companies operating on Canada lands are independent and vary considerably in complexity, size, and approach. To develop a training programme that satisfies all companies, it helps to recognize the following facts: a limited number of skills are required to fight a marine oil spill, and to be effective any response organization must employ trained personnel who have these skills. It is true that some companies would wish to use in-house employees mostly whereas others would prefer to hire external people; that some would use many individuals while others would use few; and that some would adopt certain techniques to manage spill incidents which others would not. The fact remains, however, that personnel (in-house or external) must be trained in certain specific subject areas that are common to any approach.

To focus on the problem we have chosen to concentrate on marine oil spills of major proportions (such as oil-well blowouts) and on the response training needed for these. These large spills represent the greatest oil spill concern on Canada lands and require a comprehensive response effort ranging from high-level company officials to foremen and their cleanup teams. The training needs with respect to smaller spills are already being adequately satisfied by several good Canadian training courses designed for foremen. The foremen involved in a major offshore spill are thus not the prime target of this study; rather it is those higher in the organizational structure of the response team.

This report is divided into chapters that discuss the four distinct phases conducted in the study. The first phase identified the exact training needs for the Canadian offshore oil industry in terms of spills of concern, who needs to be trained, and specific subjects of that training. This phase was based, in part, on in-depth interviews conducted with company environmentalists in Calgary, Halifax, and St. John's and on an analysis of company oil spill contingency plans submitted to the government regulatory body for Canada lands, the Canada Oil and Gas Lands Administration (COGLA). The second phase involved the evaluation of numerous existing courses in Canada and in other countries in order to identify which courses satisfy the training needs identified in the first phase and to determine which, if any, are suitable for inclusion in the proposed Canadian Oil Spill Training Programme, with or without modification. The third phase involved the development of a detailed curriculum for the programme, which includes appropriate courses currently available in Canada and elsewhere, supplemented by newly developed courses to fill deficiencies. Detailed course outlines for each new course are provided which serve as a framework for the actual development of the courses. The final phase provided a summary and recommendations on programme implementation, course delivery, and other future requirements.

It should be emphasized that a rigorous, professional approach has been used in designing the Canadian Oil Spill Training Programme. There are a number of standard methodologies used by training professionals, and those adopted here are a blend of the concepts published in recent years by internationally recognized experts. As with many specialized disciplines, the jargon of the trade often presents difficulties for the layman. We have tried as much as possible to avoid such jargon in order to enhance readability. Nonetheless, the report is necessarily detailed because of the many response team positions and existing courses that required analysis.

## TRAINING REQUIREMENTS

Modern training design follows the same systems approach that has been successfully applied in the engineering of such complex machines as space vehicles. In training, as in engineering, the process involves the accurate identification of requirements, the setting of performance objectives, the application of specific analysis techniques, the development of a product, and the measurement of this product against the performance objectives. This section is concerned with the first step in the process, that of identifying the needs.

A four-step method was followed in determining the oil spill response training needs. First, industry and government representatives were interviewed to obtain their views of the requirements, then personnel requiring such training were identified in terms of their response team job descriptions. Each major response team position was then analysed in terms of the information, skills and depth of training required in the position to carry out each job function.

### GENERAL REQUIREMENTS AS EXPRESSED BY INDUSTRY OFFICIALS

Interviews were conducted with both oil industry and government representatives responsible for oil spill response preparedness in order to obtain their views of training requirements in general. A total of twelve oil companies (see Appendix I) operating in Canada lands, plus the Canadian Coast Guard (CCG), Marine Emergencies, were consulted. In the interests of ensuring that results would be both comprehensive and complete a standard questionnaire was developed for the interviews (Appendix I), although discussions were not limited solely to its content. The following synopsis addresses the main issues discussed in the interviews.

## Level of Interest

Most companies interviewed have some interest in the development of a Canadian oil spill training programme. Several large operators which do not have extensive in-house oil-spill training programmes are particularly interested in having efficient courses in Canada to which they can send employees. Other major companies, although having in-house programmes, are nevertheless interested in the training programme from the viewpoint of their having the option of using its training packages or modules. Even though several of the smaller companies showed little enthusiasm for the development of a Canadian Oil Spill Training Programme, they felt that they would nonetheless take advantage of the programme once developed.

## View of Existing Courses

Although the oil company representatives appeared to be somewhat satisfied with available training courses, they realized that these courses are lacking with respect to Canada lands operations. Problems were identified such as redundant or inapplicable subjects, the use and discussion of equipment not specific to their requirements, unnecessary detail or "padding", and courses too lengthy to satisfy the needs of busy managers.

The major operators use available courses such as those offered by the Petroleum Industry Training Service (PITS), the Offshore Countermeasures Training Unit (OCTU), Texas A&M University and British Petroleum (B.P.), as well as cooperative exercises and in-house courses. The smaller companies operating offshore are faced with more stringent staff shortages and are less able to provide time for oil spill response training.

Within the government the CCG has developed in-house training programmes, including the Marine Emergency Management Course, to meet part of its needs rather than adapt to existing courses.



## Spill Situations on Which to Focus

Almost all operators on Canada lands want training with respect to both large and moderate spills. The one exception is a major operator who feels that training for response to large spills is of less importance because experts, already highly trained and knowledgeable, would be hired to deal with the situation. Most companies are not particularly interested in specific training for tanker spills, at least at this time; the exceptions are three major operators with various marine transportation interests. All companies are interested in land spills as well as spills offshore.

## Training Priorities

It was felt that the superintendents and supervisors in a response team who have direct cleanup responsibilities in the event of a spill, and who must make decisions on highly specialized matters, are in the greatest need of training. These employees would include the spill superintendent (the person in direct charge of the oil spill cleanup operation) and the supervisors who report to him (shoreline cleanup supervisor, dispersant supervisor, offshore containment and recovery supervisor, etc.).\*

Second priority was assigned to the positions of expert advisers, that is, those who have expert knowledge on all aspects related to both countermeasures and the effects of spills. Most companies have on staff at least one such expert; these persons are usually fully qualified on appointment as a result of their professional education and oil spill training and experience, and remain so through continuing participation in courses, workshops, seminars, conventions, and field trials. Any gaps in the qualifications of new appointees must be filled quickly as all levels in the response team depend upon the advice of these experts.

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\* The response team positions mentioned here are discussed in more detail in the next subsection.

Training priority for the emergency director, namely, the senior company official in charge of the entire emergency event, was lower than for the above positions because the position mainly requires excellent managerial skills which incumbents would possess by the time they attained these levels in the company. Nevertheless, a general understanding of oil spill management problems is required to enable the director to properly interpret and evaluate reports and recommendations made to him by the response team. In essence, he expects the spill superintendent and field supervisors to be fully trained and the expert advisers to be fully qualified.

The next-to-lowest training priority was given to the workcrew foremen because their training can be done locally, requires little time for each session, and must be very specific with respect to the equipment used. It is interesting to note, however, that the CCG gives this training, for their Pollution Equipment Maintainers (PEM's), the highest priority on the ground that effective initial action can often be taken locally before higher response levels are mobilized.

Finally, the lowest priority was given to the positions in the response plan that involve a support role, such as logistics, marine activities, administration, and public relations. It is acknowledged that these functions are very important but the consensus was that they can be performed adequately without an inordinate amount of spill response training. At least two major companies conduct in-house spill response training for their support supervisors by means of "war games" exercises. This training makes the supervisors more aware of their responsibilities in the event of a spill and of the requirements of the emergency director and spill superintendent.

#### Trainee Numbers

Estimates given by company officials of the number of potential oil spill response personnel requiring training varied from two to three for some

companies to 200-300 for others. The wide variation in the estimates was due to different interpretations as to who truly needs training and the nature of the programmes that would be available for such training. Because the establishment of firm trainee numbers and training loads is crucial for guiding course development and for determining course viability, this subject is given more detailed treatment in the section on programme implementation.

#### Accreditation

The concept of certifying participants was regarded as unnecessary by most of those interviewed, including the CCG. Certification was seen by three major companies as having value in oil spill response training for setting standards of training quality and course attendance, that is, for accrediting training courses rather than participants. On the other hand, three other major companies, the minor operators in general, and the CCG felt that a certification scheme in any form was not necessary, and would add little value.

#### Special Oil Spill Training Concerns

The most common training problem described by the oil industry was that of time - time for the training of busy people when courses are lengthy and time to travel to distant locations. Selection of the most appropriate course or courses for a given individual is also a problem for some operators. Recommendation of particular courses is mainly by word-of-mouth rather than by formal, detailed assessment. There is also a need for training modules or packages for specialized areas that can be used for in-house training programmes. Some problem of motivation toward spill training exists where experience on-the-job has taught the individual that there is a very low probability of spill occurrence. Even in the CCG, whose response team members are spill-dedicated and do not have spill response assigned as a secondary duty, many trainees do not realize how complex a spill response may become until they receive training.

## ANALYSIS OF REQUIREMENTS FOR THE RESPONSE TEAM

In performing an analysis of oil spill training requirements it is necessary first to determine what positions comprise an oil spill response team and then to determine what the job responsibilities for these positions are. To determine these, our first step was to review all contingency plans submitted to COGLA by operators on Canada lands. This review showed that organizational detail and complexity vary with degree of company involvement in Canada lands exploration, with company size and policy, and with other factors. For example, it is clear that some companies will hire outside experts to fill some response team positions whereas others will rely entirely on in-house personnel. In some plans as many as 20 or more discrete positions are identified, whereas other plans combine functions into perhaps six to ten positions. Considerable variation in job titles for the various response team positions is also found, which can be a cause for some confusion when comparing one plan with another.

The differences between various plans create an inconvenience for training design purposes as job positions and responsibilities are not standardized. For example, it is difficult to develop a training course for so-called On-Scene-Commanders when companies have different roles and duties ascribed to that position. This problem is overcome by recognizing that all plans involve the same functional features, as they must to be effective. Thus it is possible to develop a generic response team chart which is applicable to all company plans (Figure 1). Note that there are six categories and that they are grouped more in terms of training needs than in terms of job importance or reporting structure. All company plans, regardless of complexity or size, have positions which can be slotted into the categories noted in the generalized chart. In several company plans each position combines the roles of two or more of the categories shown in Figure 1. This simply implies that, for training purposes, the person filling the position will require training in several areas. Note that we have given titles to the categories which may differ from those used in several company plans. To avoid misinterpretations we will more often simply refer to the various categories by the use of letters.

**FIGURE 1 : POSITION CATEGORIES IN A GENERALIZED  
RESPONSE ORGANIZATION**

**CATEGORY A1**  
EMERGENCY  
DIRECTOR

**CATEGORY A2**  
SPILL  
SUPERINTENDENT

**CATEGORY B**

<b>B1</b>	<b>B2</b>	<b>B3</b>	<b>B4</b>	<b>B5</b>
<b>TRACKING &amp; SURVEILLANCE SUPERVISOR</b>	<b>CONTAINMENT &amp; RECOVERY SUPERVISOR</b>	<b>CHEMICAL DISPERSAL SUPERVISOR</b>	<b>SHORELINE CLEANUP SUPERVISOR</b>	<b>DISPOSAL SUPERVISOR</b>

**CATEGORY C**  
FOREMEN

**CATEGORY D**

<p><b>ADVISERS</b></p> <ul style="list-style-type: none"> <li>-Safety</li> <li>-Security</li> <li>-Public Affairs</li> <li>-Legal</li> <li>-Government Liaison</li> <li>-Claims/Complaints</li> <li>-Etc.</li> </ul>	<p><b>SUPPORT SERVICES</b></p> <ul style="list-style-type: none"> <li>-Logistics</li> <li>-Air Services</li> <li>-Marine Services</li> <li>-Communications</li> <li>-Administration &amp; Finance</li> <li>-Procurement</li> <li>-Manpower</li> <li>-Historian</li> <li>-Etc.</li> </ul>
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**CATEGORY E**

<p><b>SPILL COUNTERMEASURES EXPERT</b></p>	<p><b>ENVIRONMENTAL IMPACT EXPERT</b></p>
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A brief description of each category follows.

Category A1: Emergency Director. All plans identify a senior company official in charge of the entire emergency response effort. This Emergency Director is responsible not only for all phases of spill response but also for other related emergency response actions (e.g., well control). He is the chief spokesman vis-a-vis other companies, the government, the press, and, of course, higher executives within his own company. In most company plans he is the senior manager for exploration and/or production in the involved area and hence already has a good understanding of the region, outstanding managerial skills, established authority over those in the response organization, and a high degree of spending authority on behalf of the company. His base of operations during the spill control effort would usually be at his normal regional headquarters and not in the field at the scene of the accident.

Category A2: Spill Superintendent. This person manages all primary spill response activities in the field and reports to the Emergency Director on a regular basis. The position requires managerial skills, an ability to make important decisions under stress and a high level of knowledge regarding oil spill control strategies and techniques. In most companies this position would be filled by a senior operations manager in the district office who already has an important field responsibility vis-a-vis the company's operations in the involved district, and considerable established authority over those who are selected to work for him during a spill.

Some companies combine the functions of the two management categories, A1 and A2, into one position. Others have three positions to cover these functions. In any case, the main characteristic that distinguishes the two categories is that the top category, A1, mainly requires strong executive and managerial skills and a strong authority within the company (as many as 10 responsibility centres could report to him in a major spill response effort, such as legal, public relations, administration, logistics, communications, and

spill superintendent) but requires only basic or broad training in the spill response area. The A2 position, on the other hand, is a more specialized position which requires a comprehensive knowledge of spill management itself, and, hence, is a major target for oil spill response training.

Category B: Field Supervisors. This category involves the supervisors who direct the main field activities and who report to the Spill Superintendent. The distinct activities are spill surveillance and monitoring (B1); containment and recovery (B2); chemical dispersal (B3); shoreline protection and cleanup (B4); and disposal (B5). Many companies simply have two positions to cover these activities, one for on-land shoreline cleanup and disposal, and the other for offshore duties, that is, spill surveillance, recovery and treatment. In any case, individuals with a working knowledge of these five specialized areas are required in a proper spill response organization.

Category C: Workcrew Foremen. The workcrew foremen conduct the different activities for the field supervisors. They must know specific techniques and equipment thoroughly and have practical experience in their use.

Category D: Secondary Support Positions. Several contingency plans identify positions at the superintendent, supervisor and adviser level with responsibilities for services such as marine and logistics support, communications, safety, security, legal advice, and public relations. Some awareness spill training is all that is required for these positions. Certain companies believe that some of these positions warrant further in-depth training but that it is best performed within the organization.

Category E: Spill Experts. Of crucial importance to a spill response organization, especially when dealing with major spills, are the two positions of spill countermeasures expert and environmental impact

expert, discussed earlier. These positions are highly specialized and are usually held by professionals with several years experience in spill related jobs; as such, the Canadian Oil Spill Training Programme cannot pretend to thoroughly train new, unskilled individuals in these positions. Rather it is recommended that companies fill these positions with individuals who are fully qualified, or that they be prepared to train them over the long-term by having them participate actively in conferences, seminars, field trials, and other educational experiences that will serve to increase their knowledge to the expert level. Spill expert categories are not analysed further in this study.

#### ANALYSIS OF TASKS FOR RESPONSE TEAM CATEGORIES

As outlined in the previous subsection, there are five categories (excluding the spill expert positions) within an oil spill response team for which oil spill training is required. This subsection describes the exact job functions for the various positions within each category. These are used ultimately to derive "knowledge and skill requirements" for all positions.

To determine job functions the first steps were to study the positions identified in the industry contingency plans filed with COGLA, to summarize the various job descriptions given to each position, and to rationalize differences from plan to plan. Then for each position in this generalized response team a more detailed job description was prepared by expanding on the tasks involved in each job function. The result, provided below, is a set of job descriptions for the generalized response team that is in sufficient detail for training design purposes.

This process was performed for all positions except those in Category D, that is, the support positions. It was recognized at the outset that these positions would require only general awareness training with respect to oil spill response, as the oil spill duties associated with the positions would not differ



significantly from the incumbents' routine responsibilities. Hence, a rigorous task analysis was not performed for these positions; nevertheless in certain instances job descriptions are provided here because they were readily available from company contingency plans; these might be of use to some companies for future contingency planning purposes.

#### Oil-Spill Response Team Job Descriptions

##### Job description for category A1: Emergency Director

1. Ensures spill source is shut off and approves overall action plan.
2. Approves command centre location and set-up.
3. Ensures that other operators at risk are alerted and that identified contacts inside and outside the company are notified.
4. Determines level of response required based on severity of the spill.
5. Activates the response team and issues preliminary instructions.
6. Directs the planning and conduct of spill response operations
  - a) Receives summaries of reports concerning: marine operations; well control; spill response operations: air support; general equipment supply; crew changes; remote sensing; weather; government requirements; daily costs, and liability and compensation.
  - b) Approves decisions concerning: priorities for the allocation and acquisition of resources for marine operations; well control; spill containment, recovery, dispersal, shoreline cleaning and protection, transport and disposal; air support, surveillance and remote sensing; general equipment, supplies and crew changes in both the short and long term; government requirements for spill response changes; significance of weather changes to the action plan; approval of ongoing daily expenses and updating of long term budget; and approval or referral of claims for liability/compensation to the insurance representative.

- c) Makes decisions on major financial commitments.
  - d) Reports to management and government.
7. Approves the final report.

Job description for category A2: Spill Superintendent

1. Selects command centre location.
2. Proposes an overall plan of action for containment, cleanup and disposal to the Emergency Director.
3. Directs the spill response operation:
  - a) for surveillance by: deciding appropriate techniques; requesting necessary manpower and equipment; deciding area and schedule of tracking; and by using the results in other response activities.
  - b) for containment and recovery by: deciding priorities for deployment considering sea state, wind and weather; applying the appropriate technology considering the capabilities of the equipment; requesting necessary manpower and equipment support; arranging for storage; and evaluating response-related proposals from other sources.
  - c) for shoreline protection and cleanup by: deciding on shoreline priorities; deciding on a monitor-only response or on the best technology for protection re boom type and deployment configuration, beach flooding, and threatened wildlife; deciding on priorities for cleanup based on shore type and energy level; deciding on best cleanup methods and shoreline restoration techniques; and requesting necessary manpower and equipment.
  - d) for dispersal by: deciding the role of dispersants; initiating the government approval process; deciding dispersant type and quantity or ratio, and application method; and ensuring that government guidelines are followed.
  - e) for disposal by: deciding on the best disposal technique(s); recommending disposal sites; and requesting necessary manpower and equipment.

4. Reports regularly to the Emergency Director.
5. Is responsible for safety and security of all response operations.
6. Arranges for specialist assistance based on assessment of magnitude of the problem.
7. Supervises final report, including oil recovery rates, cleanup cost data and chronological record of spill control events.

Job description for category B: Field Supervisors

**B1: Surveillance and Monitoring Supervisor**

1. Recommends most appropriate surface and airborne surveillance technique(s).
2. Initiates and coordinates slick trajectory prediction systems.
3. Requests necessary equipment and supplies.
4. Directs the surveillance operation.
5. Ensures that data from all surveillance sources are provided in a user-practical format.
6. Prepares required summaries and projections of spill location and fate.
7. Evaluates effectiveness of surveillance operation and slick prediction systems.
8. Reports progress to Spill Superintendent.
9. Ensures the safety and security of the operation.
10. Approves all time sheets and ensures adequate records are kept.

**B2: Containment and Recovery Supervisor**

1. Recommends containment and recovery priorities and technique(s),
2. Requests necessary equipment and manpower.
3. Directs on-site deployment of equipment.
4. Evaluates effectiveness of the operation.
5. Repositions resources as necessary.
6. Directs the repair and maintenance of equipment.
7. Directs oil transfer to storage.

8. Obtains samples of recovered oil.
9. Reports progress to Spill Superintendent.
10. Ensures the safety and security of the operation.
11. Approves all time sheets and ensures adequate records are kept.

**B3: Chemical Dispersal Supervisor**

1. Determines dispersibility of the oil.
2. Recommends most appropriate dispersing technique(s).
3. Obtains necessary government approvals.
4. Requests necessary equipment, supplies and manpower.
5. Directs the dispersion operation.
6. Evaluates the effectiveness of the operation including taking samples as necessary.
7. Repositions resources as necessary.
8. Directs repair and maintenance of equipment.
9. Reports progress to Spill Superintendent.
10. Ensures the safety and security of the operation.
11. Approves all time sheets and ensures adequate records are kept including all required government reports.

**B4: Shoreline Protection and Cleanup Supervisor**

1. Recommends cleanup priorities
2. Recommends most appropriate shoreline cleanup technique(s) including specialized techniques such as steam, high-pressure water, detergents, beach flooding, booming, sorbents and beach cleaning machines.
3. Requests necessary equipment and manpower.
4. Directs field crews in the cleanup operation.
5. Evaluates the effectiveness of the operation and decides when it is satisfactorily complete.
6. Repositions resources as necessary.
7. Directs repair and maintenance of equipment.
8. Obtains accommodations and transport for field workers.
9. Prepares recovered material for storage/disposal.
10. Reports daily progress to Spill Superintendent.

11. Ensures the safety and security of the operation.
12. Approves all time sheets and ensures adequate records are kept.

**B5: Disposal Supervisor**

1. Recommends most appropriate disposal technique(s).
2. Requests necessary equipment, supplies and manpower and ensures appropriate types and numbers of containers are available.
3. Requests transportation to the disposal site(s).
4. Obtains necessary government approvals.
5. Directs the disposal operation.
6. Evaluates the effectiveness of the operation.
7. Directs repair and maintenance of equipment.
8. Reports daily progress to Spill Superintendent.
9. Ensures the safety and security the operation.
10. Approves all time sheets and ensures adequate records are kept.

**Job description for category C: Work-crew Foremen**

1. Deploys, operates, repositions, recovers, cleans and stores specialized equipment used in all phases of oil spill response in the assigned area of responsibility.
2. Conducts routine maintenance and carries out minor operating repairs in the field.
3. Ensures that safety practices are followed.
4. Administers time sheets for all employees under him.

**Job descriptions for category D: Secondary Support Positions**

**Logistics Officer**

1. Establishes on-scene command centre at direction of the Spill Superintendent, and ensures that it includes:
  - a) communications - radio, telephone, telex
  - b) secretarial staff and materials
  - c) meeting room(s)
  - d) maps/charts
  - e) accommodations
  - f) security arrangements
  - g) media facilities

- h) access to transportation
- 2. At the direction of the Spill Superintendent mobilizes required men, equipment and supplies to designated control point locations, arranging transportation as required.
- 3. Arranges for food and shelter requirements of operations personnel and for other local purchasing.
- 4. Arranges for refueling and maintenance of all equipment and vehicles.
- 5. Contracts services of cooperatives or other contractor personnel and equipment.
- 6. Coordinates the use of aircraft and helicopters.
- 7. At the direction of the Spill Superintendent releases excess personnel and equipment when no longer required in the interests of safety and efficiency.
- 8. Maintains a record of expenditures and a diary of events.

#### Communications Officer

- 1. Arranges for communications equipment for the command centre and the operational field units, including exclusive use of certain telephones and radio frequencies.
- 2. Arranges for suitable personnel to operate the communications network, on a 24-hour basis if required.
- 3. Provides for maintenance and trouble-shooting of the radio equipment.
- 4. Ensures adequate secretarial services and office supplies for the command centre.
- 5. Maintains logs of messages and of activities at the command centre and a record of all radio equipment issued.

#### Public Relations Officer

- 1. Assists in determining the company's stance to the spill and what information can be released at the command centre and at the operational sites.
- 2. Assists and advises the Emergency Director, Spill Superintendent, and on-site operational personnel regarding all aspects of public relations.

3. Provides liaison with news media, local public, assisting forces such as police and fire, and special interest groups.
4. Provides written releases to the media and other audiences with approval of Emergency Director.
5. Arranges for a press room with maps and telephones as required.
6. Conducts such interviews and tours of government, media or public representatives as are consistent with established policy.

#### Claims and Complaints Officer

1. Receives complaints and claims from outside agencies and individuals arising from the spill or the cleanup operation.
2. Refers handling of claims to the commercial insurance adjuster.
3. Provides company policy direction for and liaison with the commercial adjuster.
4. Takes prompt appropriate action on all complaints, but will not make claim settlement payments.
5. Liaises with the company legal adviser when insurance settlement is open to doubt.
6. Advises the Emergency Director on the procedure for handling claims and complaints and for minimizing future claims and complaints.

#### Safety Officer

1. Advises Spill Superintendent of all standard and special safety considerations and of the need for safety specialists, as necessary.
2. Inspects spill location and containment and recovery sites for safe working conditions.
3. Deploys any special safety features or equipment required e.g., signs, barricades, breathing apparatus.
4. Initiates measures at all sites for security of company property, crowd control and public protection.
5. Co-ordinates first aid requirements and supervises care of injured personnel.
6. Reports, investigates and records all accidents.

## Job descriptions for category E: Spill Experts

### Spill Countermeasures Expert

1. Ensures that the company contingency plan is written, complete and up-to-date, and is exercised regularly.
2. Keeps abreast of state-of-the-art oil spill response techniques and technology.
3. Maintains contact with government and other agencies on oil spill response matters.
4. Advises all members of the response team with respect to technical aspects of the spill response.

### Environmental Impact Expert

1. Maintains contact with government and natural resource agencies on environmental matters.
2. Initiates and co-ordinates any field surveys, on-site impact assessments, etc. to identify locations of and degrees of actual and potential harm to the environment.
3. Advises Spill Superintendent and Supervisors on the ecological factors related to cleanup techniques.
4. Advises Supervisors regarding cleanup and restoration operations and identifies additional requirements to satisfy environmental requirements.
5. Ensures that adequate records are kept to document environmental impact of the spill.

### Knowledge and Skill Requirements by Job Function

On the basis of the above job descriptions (for the A through C categories only) specific knowledge and skill requirements were developed for each job function in each position. This was accomplished by numerous free-wheeling discussions within the project team. Knowledge and skill requirements were proposed and then analysed in depth for applicability and completeness. Cross-comparisons between job descriptions were made to ensure consistency within the response team. Finally, each knowledge and skill requirement was rated as High, Medium or Low with respect to its importance to that position.



In developing these training content statements it was frequently found that the same training content applied in more than one function for a given position. In the interests of brevity no attempt was made to repeat descriptions of training requirements within the same job. Repetitions from one position to another do occur, because each position description must stand independently of the others.

The end result, skill and knowledge requirements for each of the response team positions (A through C) listed by job function, is rather overwhelming in detail, and hence is reserved for Appendix II. These skill and knowledge requirements later became the basis for deriving detailed course outlines that were used to design the training courses.

#### Training Subjects and Level of Coverage

Another way of presenting knowledge and skill requirements (henceforth simply called "subjects") for the various response team positions is to list all subjects required by the team as a whole and then to indicate the depth of knowledge or skill each position needs in each subject area. This format is particularly convenient for use in evaluating existing oil spill courses (the task described in the next section). The new format was developed by consolidating all the subjects listed in Appendix II into a common set of subjects (omitting repetitions) and assigning to each position a number from 0 to 3 which denotes the level of knowledge or skill needed for each of the common subjects. The numbers referring to depth or level of training correspond to the following:

<u>Assigned Number</u>	<u>Meaning</u>
0	not required for job duty.
1	requires general awareness only; low technical content.

- 2 requires good knowledge of concepts, principles and operational factors of importance, but still requires occasional guidance or expert advice to handle job function.
- 3 requires thorough knowledge of subject; able to handle job function on stand-alone basis without guidance or reliance on expert advisers.

The set of subjects listed below has been divided into two subsets. The first subset (Table 1) lists subjects that can be taught in international or national-based courses. The second subset (Table 2) describes subjects that are so specific to individual companies or local (or even regional) requirements that they must be taught on an in-house basis or similar such basis (e.g., by local co-ops).

TABLE 1

UNIVERSAL TRAINING SUBJECTS AND KNOWLEDGE  
LEVEL REQUIRED PER POSITION

<u>SUBJECT</u>	<u>KNOWLEDGE LEVEL REQUIRED BY POSITION CATEGORY</u>				
	A1	A2	B	C	D
<u>I. GENERAL MANAGEMENT</u>					
1. Factors affecting command centre locations: communications, support staff availability, accommodations, transportation, government/media liaison, access to site.	1	3	0	0	3
2. Response organization for spills.	2	3	2	1	1
3. Overall strategies for dealing with spills and basic features of all operations.	2	3	2	1	1
4. Interdependence of the various factors of spill response.	2	3	1	0	0
5. Manpower and equipment requirements re spill size; cost factors re spill size.	3	3	1	0	1
6. Implications of well control/salvage operations to spill response re operational conflicts, equipment and personnel assignments.	3	1	0	0	0
7. Implications of media briefings in areas of responsibility and liability.	3	3	1	1	1
8. Form and style of media presentations; Practical experience in real or simulated situations.	3	3	0	0	0
9. Potential impact of spills re environment, socio-economic public relations perspectives.	2	3	1	0	1
10. Fate and behaviour of spilled oil based on type, amount, season, weather currents, and ice.	1	3	3	1	1

TABLE 1 (CONT.)

UNIVERSAL TRAINING SUBJECTS AND KNOWLEDGE  
LEVEL REQUIRED PER POSITION

<u>SUBJECT</u>	<u>KNOWLEDGE LEVEL REQUIRED BY POSITION CATEGORY</u>				
	A1	A2	B	C	D
<u>I. GENERAL MANAGEMENT</u>					
11. Differences between batch spills (e.g. tankers) and continuous spills (e.g. blowouts).	1	3	3	0	0
12. Implications of spill condition and behaviour re spill control options and strategies.	1	3	3	0	0
13. Practical experience in the overall management of real or simulated spill control operations.	3	3	0	0	0
<u>II. SURVEILLANCE*</u>					
14. Surveillance methods, capabilities and limitations of remote sensing equipment re sea state, temperature, ice conditions.	1	2	2	0	0
15. Factors associated with the compatibility of different pieces of surveillance systems and equipment.	0	0	1	0	0
16. Interpretation and analysis of data provided in layman's terms from each available system, excluding first order data, and consolidation and conclusions from all surveillance sources, including methods of evaluating surveillance results.	0	1	2	0	0
17. Methods of predicting oil fate and behaviour and preparation of summaries and projections.	0	1	2	0	0
18. Practical experience directing real or simulated surveillance operations.	0	0	2	0	0

\* Assumes that actual surveillance operations would be performed by outside remote sensing specialists under contract to company and under supervision of company's surveillance supervisor.

TABLE 1 (CONT.)

UNIVERSAL TRAINING SUBJECTS AND KNOWLEDGE  
LEVEL REQUIRED PER POSITION

<u>SUBJECT</u>	<u>KNOWLEDGE LEVEL REQUIRED BY POSITION CATEGORY</u>				
	A1	A2	B	C	D
<u>III CONTAINMENT &amp; RECOVERY</u>					
19. Containment and recovery principles of operation and techniques of use.	1	2	3	2	1
20. Selection of containment and recovery equipment for various spill types and conditions.	0	1	3	0	0
21. Availability of major pieces of containment and recovery equipment locally, regionally, nationally and internationally, and how to access them.	0	1	3	0	1
22. Effectiveness of containment and recovery equipment re sea state, wind, weather, currents and spill characteristics.	1	2	3	1	0
23. Offshore transfer and storage techniques for dealing with recovered oil re advantages and disadvantages, implications of emulsions, equipment logistics.	0	2	3	1	0
24. Hands-on experience with all types of locally available containment and recovery equipment or their equivalents, and experience in repositioning equipment under changing wind conditions.	0	0	2	3	0
25. Practical experience directing real or simulated containment and recovery operations.	0	1	3	0	0
26. Evaluation of overall containment and recovery operations including recovery rates, emulsified vs non-emulsified state of recovered product, etc.	0	2	3	0	0
27. Logistics and support requirements for containment and recovery equipment.	0	2	3	1	0

TABLE 1 (CONT.)

UNIVERSAL TRAINING SUBJECTS AND KNOWLEDGE  
LEVEL REQUIRED PER POSITION

<u>SUBJECT</u>	<u>KNOWLEDGE LEVEL REQUIRED BY POSITION CATEGORY</u>				
	A1	A2	B	C	D
<u>IV. CHEMICAL DISPERSION</u>					
28. Principles of dispersants and description of important dispersing techniques incl. advantages and disadvantages.	1	2	3	1	1
29. Logistical problems of applications, and costs of dispersants, aircraft, vessels and manpower	1	2	3	0	1
30. Availability of major items in a dispersant operation (chemical, aircraft, etc.) locally, regionally, nationally and internationally, and how to access them.	0	1	3	0	1
31. Dispersant effectiveness re dispersant type, oil type, aging, weather conditions, sea state and temperature.	1	2	3	0	0
32. Methods to determine dispersibility of oil; Field evaluation techniques including sampling procedures and problems.	0	0	3	0	0
33. Dispersant-use decisions re environmental trade-offs, logistics and supply, and effectiveness.	2	3	3	0	1
34. Government regulations and guidelines; Requirements for obtaining approvals for the use of dispersants.	1	2	3	0	3
35. Areal identification of oil slicks warranting dispersal.	0	1	3	0	0
36. Practical experience in the direction of real or simulated dispersal operations.	0	1	3	0	0

TABLE 1 (CONT.)

UNIVERSAL TRAINING SUBJECTS AND KNOWLEDGE  
LEVEL REQUIRED PER POSITION

<u>SUBJECT</u>	<u>KNOWLEDGE LEVEL REQUIRED BY POSITION CATEGORY</u>				
	A1	A2	B	C	D
<u>V. SHORELINE CLEANUP</u>					
37. Conventional methods of booming shorelines for protection; advantages and limitations.	1	2	3	2	0
38. Knowledge of shoreline processes.	0	1	3	1	0
39. Description of main techniques and equipment for shoreline cleanup incl. capabilities and limitations re shoreline type, seasonal conditions, access, etc.	1	2	3	2	0
40. Environmental impact of shore oiling, implications for cleanup, and environmental effects of various cleanup techniques.	1	2	3	1	0
41. Transfer and storage problems related to shoreline cleanup.	0	1	3	0	0
42. Manpower and overall equipment requirements for a major spill re shoreline cleanup.	1	2	3	0	1
43. Availability of major pieces of shoreline cleanup equipment and how to access them.	0	1	3	0	1
44. Setting cleanup priorities re shoreline characteristics and environmental, socio-economic, political and aesthetic factors; Problems of deciding when cleanup is complete considering these factors.	1	2	3	0	0
45. Practical experience in the direction of real or simulated shoreline cleanup operations.	0	1	3	0	0

TABLE 1 (CONT.)

UNIVERSAL TRAINING SUBJECTS AND KNOWLEDGE  
LEVEL REQUIRED PER POSITION

<u>SUBJECT</u>	<u>KNOWLEDGE LEVEL REQUIRED BY POSITION CATEGORY</u>				
	A1	A2	B	C	D
VI. <u>DISPOSAL</u>					
46. Disposal and temporary storage techniques; capabilities and limitations of each; logistics and cost factors.	1	1	2	0	1
47. Environmental implications related to disposal options, effectiveness of disposal methods in the short-term and long-term.	1	1	2	0	0
48. Practical experience in the direction of real or simulated disposal operations.	0	1	3	0	0



TABLE 2

COMPANY OR AREA-SPECIFIC TRAINING SUBJECTS

<u>SUBJECT</u>	<u>KNOWLEDGE LEVEL REQUIRED PER POSITION</u>				
	A1	A2	B	C	D
1. Company contingency plan; Response team personnel, job functions and responsibilities; Experience in using plan in real or simulated situations.	2	3	2	1	1
2. Contacts to be made within and outside company to notify that spill has occurred, actions taken and possible impacts.	2	3	2	2	2
3. Classification of spills as minor, intermediate and major according to amount, impact, and level of response in personnel and equipment required for control.	1	3	1	0	0
4. Implications of setting levels of response with respect to public reaction, government requirements, government/industry liaison level required, cost of response and level of effort required in the company.	2	3	1	0	0
5. Updating severity evaluation based upon source control operations, surveillance and tracking reports, ice and weather requirements, sampling operations, and availability of specialized help.	1	3	1	0	0
6. Legal liability and limits; Insurance coverage; Claims procedures and limits; Compensation process.	2	2	0	0	3
7. Budgeting and record-keeping for the spill response operation; Spending limits; Reporting.	1	3	2	0	3

TABLE 2 (CONT.)

COMPANY OR AREA-SPECIFIC TRAINING SUBJECTS

<u>SUBJECT</u>	<u>KNOWLEDGE LEVEL REQUIRED BY POSITION CATEGORY</u>				
8. Specific oil spill control and cleanup equipment available in-house and locally, through co-ops and from government agencies; General capabilities and limitations of each; Methods of accessing this equipment; Problems re logistics and costs in obtaining various oil spill control equipment from outside the company.	1	3	3	0	1
9. Local, regional and national guidelines or regulations regarding the use of dispersants.	1	2	3	0	1
10. Municipal and provincial guidelines and regulations re disposal methods; Disposal site locations available and actions to obtain unlisted site locations; Methods for obtaining approvals for the development of new disposal sites.	1	1	3	0	0
11. Main aspects of equipment maintenance and repair; Safety aspects related to all equipment available through the contingency plan.	0	1	3	3	0

## Summary of Training Requirements for Each Response Team Category

The information provided in Tables 1 and 2 and that available in Appendix II are sufficient to define the training requirements of each response team position category. These are used in the next section to measure the extent to which existing courses are wholly or partially effective in satisfying the various knowledge and skill requirements of the team positions, and in the section on curriculum design they are used again as a basis for developing course outlines for newly designed courses. A summary of the training requirements for each category follows.

A1 category. As the overall emergency director, an "A1" student requires in-depth training on spill management subjects and general awareness training on a small number of technical subjects. It is recognized that such a student would likely come from the executive ranks of a company and would have a limited amount of time available for oil spill training. Therefore, the ideal course should cover the required subject material with a minimum of extraneous material.

A2 category. As the spill superintendent responsible for overall cleanup strategies, allocation of resources, and leadership of the cleanup team, an "A2" student requires in-depth training on spill management and medium depth of coverage on a considerable number of operational subjects. General awareness training on the highly specialized subjects would complete the ideal curriculum of an A2 student.

B category. As the field supervisor solely responsible for directing one or more cleanup units, "B" students require in-depth training on all aspects of their area(s) of concern (i.e., containment and recovery, dispersion etc.). This intensive training in the entire range of subjects in his area is required because of the "stand-alone" nature of the B positions. On some spill management subjects, only medium or general awareness type of training is required.

C category. As the foreman responsible for the operation of equipment and supervision of a cleanup crew, "C" students require training only in the operational aspects of their specific area of interest. General awareness training is required for only a few other subjects such as fate and behaviour of spills, cleanup strategies, and principles of various cleanup operations. It is assumed that this training would be supplemented by operating experience and exercises with company or cooperatively owned equipment.

D category. As a member of the support staff for the cleanup team, "D" students require only general awareness training on the several subjects relating to their specific job. Such subjects include the response organization, basic cleanup strategies, and logistic and cost factors.

#### CONCLUSIONS REGARDING TRAINING REQUIREMENTS

1. Oil industry representatives feel that existing external courses only partially meet their oil spill training needs.
2. Most training requirements can be satisfied through universally applicable courses; some in-house or locally-based courses are necessary to train response team personnel with respect to the specifics of company contingency plans and policies, and local equipment and regulations.
3. Maximum course length is five days.
4. Accreditation of training courses, rather than trainees, would be feasible and would help managers to select the best training courses for their staff.

5. The major training requirement is for a comprehensive course for Spill Superintendents (A2 category) and Field Supervisors (B category). A short course for Emergency Directors (A1 category) is also a priority.
  
6. Support superintendents, supervisors and advisers (D Category) (in such areas as marine support, administration, public relations) require some oil spill "awareness" training.

## EVALUATION OF EXISTING COURSES AND TRAINING ORGANIZATIONS

### EVALUATION METHODOLOGY

The purpose of this section is to evaluate the effectiveness of existing oil spill training courses in satisfying the knowledge and skill requirements of the response team position categories described earlier.

A number of different methods exist for the evaluation of training courses, including:

- \* subjective evaluation,
- \* participant's report,
- \* supervisor's report,
- \* course material evaluation,
- \* course visit interview,
- \* examination or test results,
- \* on-the-job performance evaluation, and
- \* direct course audit.

Five of these options were open for this programme, namely, Subjective Evaluation based on the evaluator's background and interpretation of information available; Participant's Reports based on interviews with course attendees; Course Material Evaluation based on an objective evaluation of course outlines and notes against specified criteria; Course Visit Interview based on interviews with course officials or instructors, preferably at the course location; and Direct Course Audit based on full participation in the course presentation.

It was impossible to base the evaluation for every course on the same options. For example, some evaluations involved a direct course audit and analysis of course materials whereas others involved interviews with attendees combined with a study of course material. In the few cases for which little more than a brochure was available the evaluation was based on a subjective evaluation alone.

The evaluation of existing oil spill countermeasures training was a five-step process:

- \* information collection,
- \* initial screening,
- \* development of approaches for course selection and evaluation,
- \* in-depth description and evaluation of each selected course, and
- \* in-depth evaluation of existing courses with respect to the needs of response team categories.

#### INFORMATION COLLECTION AND INITIAL SCREENING

The evaluation process was begun by sending letters to 25 training organizations in North America and Europe requesting detailed information on their courses on the subject of oil spill countermeasures. Correspondents were asked to provide:

- \* the goals of each course,
- \* target population descriptions,
- \* detailed course content,
- \* training methods used,
- \* evaluation methods used,
- \* past evaluation results, and
- \* copies of training manuals.

Appendix III contains a list of the organizations contacted and a copy of the letter.

Replies were received from 14 of those contacted, of which half provided detailed course information or manuals. No correspondent provided all the material requested and in general no two sources provided the same kinds of material. However, in most cases sufficient information was obtained to perform a preliminary, subjective screening to determine which courses should

be selected for more detailed analysis. Appendix IV provides summaries of this screening based on a subjective evaluation of the nature and scope of the training.

It can be said that almost all existing oil spill response training courses have been designed without the use of detailed statements of "learning objectives", which we feel are necessary to fully specify the depth of content in each subject area. It therefore became necessary to estimate depth of content by participant interviews where possible or from notes and manuals.

It is also evident that formal evaluation of student progress is seldom done, although in several cases performance in practical exercises is evaluated on a team basis and forms the core of the post-exercise debriefing discussion. However, except in the case of military organizations, no formal examinations are administered for any of the known courses.

Courses were screened out of further evaluations for a number of reasons. Some courses, designed for special groups or in-house use only, are simply not open to outsiders. Other courses have been developed with a pronounced local emphasis, e.g., tropical regions, and would be largely inappropriate to Canadian needs. Still other courses have been designed to promote specific products or equipment. Certain courses were found to be not related to oil spill response in spite of the terminology used in the course title. Finally, some courses were screened out because of heavy emphasis on an academic method, with no active encouragement of trainee participation through questions, drills and exercises.

#### COURSE SELECTION AND EVALUATION

Based on the preliminary screening of course material the following courses were selected for follow-up evaluation:

- \* BP Oil Spills Clearance Course
- \* Transport Canada Marine Emergency Management Course
- \* Texas A&M University Oil Spill Control Course



- \* Corpus Christi University Oil Spill Prevention and Control Course
- \* PITS On-Scene Spill Commander Course
- \* Lambton College Major Oil Spill Response Course
- \* OCTU Equipment Operator's Course

The method developed for follow-up evaluation of the most promising courses is the result of consultation amongst all project personnel. The result of these discussions was the development of a two-dimensional evaluation matrix for existing courses. This concept was refined further into a course evaluation grid allowing each of the knowledge and skill requirements from the needs analysis (Table 1) to be evaluated for a given course against depth of coverage, methodology of instruction, presentation quality and relevancy.

Courses selected after the initial screening were each evaluated using this grid, based on direct interviews with course participants, instructors, or administrators. Where this was not possible, course manuals, notes and handouts were used. In some cases a combination of sources were used. No attempt was made to fill every square of the grid. To do so would have been redundant in many cases where the same information would be repeated. However, depth-of-coverage information was collected for every subject matter topic required. In addition to the course evaluation grid, a linear questionnaire was used in interviews to provide further background not provided by the grid. A copy appears as Appendix V. Complete evaluation interviews required a minimum time of two hours.

The result of this complex and detailed procedure was a description, for each response team position, of the subjects taught in the courses matched against the knowledge and skill requirements identified by the needs analysis. Following this, general descriptive statements for each course were prepared, giving the length of the course, its content, methods used, type of evaluation, and presentation quality. These evaluation summaries are given in Appendix VI.

## IN-DEPTH EVALUATION OF TRAINING COURSES

In the previous section, 48 distinct subjects were identified (see Table I) for oil spill training (beyond company specific requirements) and each position category was assigned numbers denoting the depth of training required for each of these subjects. In this subsection the courses selected for in-depth evaluation are similarly graded with respect to the coverage they provide for each of the subjects, and these grades are compared to those required by the various position categories.

### Scoring Courses Numerically

The explanation of the grade values for content required and for content provided are given below.

<u>Number</u>	<u>Depth of Knowledge Required by Trainee</u>	<u>Depth of Knowledge Provided by Course</u>
0	not required	not covered
1	general awareness	introductory - type instruction
2	good knowledge of principles and operational matters; enough to handle most situations with only occasional reference to expert	medium depth of coverage

<u>Number</u>	<u>Depth of Knowledge Required by Trainee</u>	<u>Depth of Knowledge Provided by Course</u>
3	thorough knowledge of subject; enough to handle job function on stand-alone basis.	in-depth instruction including problem solving and practice.

The numerical evaluation of existing courses with respect to the depth of coverage they provide in 48 subjects is compared to that required by each position in Table 3.

TABLE 3

NUMERICAL EVALUATION OF EXISTING COURSES

<u>SUBJECT AREA</u> (Refer to Table 1 for description of subjects)	<u>DEPTH OF COVERAGE REQUIRED PER POSITION</u>							<u>DEPTH OF COVERAGE PROVIDED IN COURSES</u>				
	A1	A2	B	C	D	BP	MEMC	TEX A&M	CORPUS CHRISTI	PITS	LAMBTON	OCTU
1. <u>General Management</u>												
1. Command centre	1	3	0	0	3	0	3	1	1	2	0	0
2. Response org.	2	3	2	1	1	1	3	1	1	1	1	1
3. Overall strategies	2	3	2	1	1	1	1	1	1	1	1	1
4. Spill factors interdep.	2	3	1	0	0	0	1	0	1	1	0	0
5. Support requirements	3	3	1	0	1	1	1	0	1	0	1	0
6. Impl. of well control	3	1	0	0	0	0	0	0	0	0	0	0
7. Impl. of media brief.	3	3	1	1	1	2	3	1	1	1	1	0
8. Media presentations	3	3	0	0	0	3	3	2	0	1	1	0
9. Potential spill impacts	2	3	1	0	1	2	2	1	2	1	0	1
10. Fate & behaviour	1	3	3	1	1	2	1	1	2	2	1	1
11. Batch vs blowout	1	3	3	0	0	0	0	0	0	0	0	0
12. Response strategies	1	3	3	0	0	1	1	1	1	1	0	0
13. Overall management	3	3	0	0	0	2	3	2	0	1	0	0

TABLE 3 (Cont'd)

NUMERICAL EVALUATION OF EXISTING COURSES

<u>SUBJECT AREA</u> (Refer to Table I for description of subjects)	<u>DEPTH OF COVERAGE REQUIRED PER POSITION</u>										<u>DEPTH OF COVERAGE PROVIDED IN COURSES</u>			
	A1	A2	B	C	D	BP	MEMC	A&M	CHRISTI	PITS	LAMBTON	OCTU		
II. <u>Surveillance</u>														
14. Sur. methods	1	2	2	0	0	1	1	1	1	0	0	0		
15. Equip. compatibility	0	0	1	0	0	0	0	0	0	0	0	0		
16. Data interp./analysis	0	1	2	0	0	0	0	0	0	0	0	0		
17. F&B predictions	0	1	2	0	0	0	0	1	0	0	0	0		
18. Prac. experience	0	0	2	0	0	0	0	0	0	0	0	0		
III. <u>Containment and Recovery</u>														
19. C&R principles	1	2	3	2	1	3	1	2	2	2	1	2		
20. Equip. selection	0	1	3	0	0	1	0	1	1	1	1	3		
21. Equip. availability	0	1	3	0	1	1	0	1	1	1	1	1		

TABLE 3 (Cont'd)

NUMERICAL EVALUATION OF EXISTING COURSES

<u>SUBJECT AREA</u> (Refer to Table 1 for description of subjects)	<u>DEPTH OF COVERAGE REQUIRED PER POSITION</u>							<u>DEPTH OF COVERAGE PROVIDED IN COURSES</u>				
	A1	A2	B	C	D	BP	MEMC	TEX A&M	CORPUS CHRISTI	PITS	LAMBTON	OCTU
III. <u>Containment and Recovery (cont.)</u>												
22. Equip. effectiveness	1	2	3	1	0	2	1	2	1	1	0	1
23. Trans/storage methods	0	2	3	1	0	0	0	1	0	0	0	3
24. Prac. experience	0	0	2	3	0	3	0	3	1	0	2	3
25. Exper. in directing	0	1	3	0	0	2	1	2	0	0	0	0
26. Eval. of operations	0	2	3	0	0	1	0	1	0	0	0	0
27. Logistics req'ments	0	2	3	1	0	2	0	1	0	0	1	0







## Course Evaluations

For each course, the course scores were compared with the training requirements for each course subject. Various statistical analyses were used to aid in the evaluation; these are described fully in Appendix VII. In this subsection the evaluation for each training category is discussed with reference to the in-depth evaluation of each course, and the following terms are defined:

- **satisfactory coverage:** course provides instruction to within 1 of the level required (i.e., for a subject requiring level 3 instruction, a course which provides level 2 or level 3 would be deemed to provide satisfactory coverage);
- **exact coverage:** course provides instruction at exactly the required level;
- **extraneous material:** course provides instruction extraneous or irrelevant to that required; and
- **subjects requiring in-depth instruction:** course subjects which require level 2 or level 3 instruction

British Petroleum Oil Spill Clearance course. The British Petroleum (BP) course is given in Southampton, England. Originally a 10-day live-in course, it has been reduced to six days, partly through the extensive use of evening time for syndicate work. It covers 31 of the 48 identified course subjects, approximately half of the subjects given at greater than an introductory/general awareness level. Major emphasis is on containment and recovery, and practical exercises in this area are good. Coverage of spill management subjects is generally not in-depth.

**A1 Category:** Of the 28 subjects required by A1, most are satisfactorily covered. However, of the subjects requiring in-depth training, few are fully

covered. Furthermore, approximately half of the course material is extraneous to the needs of the A1 category. Generally, the course is not acceptable for an A1 student, as it underteaches the required spill management topics and overteaches the more technical topics.

A2 Category: Of the 44 subjects required by A2, most are covered satisfactorily. Of the subjects requiring in-depth training, although more than half are covered satisfactorily, less than a quarter are fully covered. Only a small amount of the course material is judged to be not required by an A2 student. Generally, the course is marginally acceptable for the A2 category, with its main weakness in the spill management subjects which require level 3 instruction.

B Category: Approximately half of the required subjects are covered satisfactorily. Even considering only the containment and recovery subject area (course subjects 19 through 27, and the strongest subject area for this course), only five of the nine course subjects are covered satisfactorily. The course does not provide enough in-depth knowledge for a B-level student.

C Category: Although the required subjects are covered satisfactorily, more than half of the course material is not required by a C-level student.

D Category: As for the C category, a high percentage of the required subjects are satisfactorily covered but an unacceptably high percentage of the course material is extraneous to a D-student's needs.

Transport Canada Marine Emergency Management Course. The Marine Emergency Management Course (MEMC) is given by Transport Canada at the federal government training facility in Cornwall, Ontario. This is a 10-day course, designed to meet the training needs of pre-designated On-Scene Commanders in the federal government, although others have been accepted, including several from the oil industry. General spill management is covered in-depth through extensive case study and syndicate work. Though its

excellent coverage of spill management subject areas would make it valuable for potential spill managers in the private sector, the course length is viewed as a major drawback.

Twenty four of the 48 identified course subjects are covered. Additional topics, not included in the 48 identified subjects, include operation of the joint Canada/United States contingency plan, industry interface from the government standpoint, pollution law, protection and indemnity (P&I) clubs, and crisis management in the public service. These five subject areas are not required for any of the levels under consideration; in total they comprise almost 20% of the allotted time.

**A1 Category:** Of the 28 required subjects, approximately half are covered at exactly the required level and most are covered satisfactorily. For the subjects requiring in-depth training, this course is the only one that covers more than half of them satisfactorily for the A1 category. Including the additional material noted above, as much as 30% of the course material is not required by an A1 student. Although the course is well suited to the needs of the A1 category the course length is prohibitive for prospective A1 students.

**A2 Category:** Of the 44 required subjects, most are covered satisfactorily. For the important subjects for the A2 category, this course is one of only two (the BP course is the other) that covers more than half satisfactorily. The course scores more poorly on the subjects requiring level 1 instruction, covering only three out of those 16 subjects. This is indicative of the emphasis of the course, which is on spill management functions rather than on spill operation subjects. Generally, the course is well suited to the needs of the A2 category although supplementary training would be required on certain technical subjects. The course length of 10 days is prohibitive for A2 students.

**B Category:** Of the 44 subjects required by positions in the B category, approximately one quarter are covered satisfactorily. The course does not provide the in-depth knowledge of the operating functions that are required by a student in the B category.

C Category: Although a high percentage of required subjects are covered satisfactorily, the course is much too detailed in spill management subjects for a C category student.

D Category: As for the C category, a high percentage of required subjects are satisfactorily covered but an excessive amount of the course is extraneous material.

Texas A&M University Oil Spill Control course. The Texas A&M Oil Spill Control course is provided in Galveston, Texas by the extension service of Texas A&M University. This five-day course was one of the first of its kind in the world. It has an international reputation as a good introductory course in oil spill response, with excellent hands-on equipment exercises. Emphasis is on containment and recovery. The course covers 29 of the 48 identified course subjects, 23 of which receive level 1 (general awareness) instruction.

A1 Category: Of the 28 required subjects, most are covered satisfactorily. However, of the subjects requiring in-depth training, few are covered satisfactorily. As well, almost half of the course is extraneous to an A1 student's needs. The course is too general for this category in its depth of coverage, especially on the important spill management subjects.

A2 Category: Of the 44 required subjects, most are covered satisfactorily. However, of the subjects requiring in-depth training, half are covered satisfactorily but few are fully covered. Because of this deficiency, which is mainly in the important subject area of spill management, the course is judged unsatisfactory for A2 requirements.

B Category: Of the 44 required subjects less than half are covered satisfactorily. Even considering only the subject area of containment and recovery (subjects 19 through 27), which is the only area which receives significant coverage, the course is unsatisfactory for a B-category student. Of

the nine required subjects in containment and recovery, only four are covered satisfactorily and none is covered exactly as required. Sufficient in-depth instruction is not provided for a B-category student.

C Category: Of the 14 required subjects, almost all are covered at exactly the required level. Of all the courses that were evaluated, this course provides the content closest to that required. However these high marks are tempered somewhat by the high percentage (approximately half) of extraneous course material.

D Category: Of the 16 required subjects, almost all are covered satisfactorily. However, an unacceptably high percentage of the course material is extraneous to a D-student's needs.

Corpus Christi University Oil Spill Prevention and Control course. This five-day course is given by the National Spill Control School of the state university at Corpus Christi, Texas. It covers a wide variety of material, the majority of which is presented at the introductory/general awareness level; 21 of the 48 identified course subjects are covered. Additional topics, not included in the 48 identified subjects, include history of spills and control legislation (U.S. oriented), rescue and rehabilitation of birds, and legal decisions in oil spills (U.S. oriented). These three subject areas are extraneous to the course requirements for all training categories; in total they comprise almost 20% of the allotted time.

A1 Category: Of the 28 required subjects, more than half are covered satisfactorily. However, few of the subjects requiring in-depth training are taught to required depth. Furthermore, including the additional material noted above, a substantial portion of the course is extraneous to the needs of an A1-category student. The course is considered unsatisfactory for this level because of deficiencies in the important subject area of spill management.

A2 Category: Of the 44 required subjects, most are covered satisfactorily. However, of the subjects requiring in-depth training less than half are taught satisfactorily. The course is too general in nature for an A2-category student.

B Category: Of the 44 required subjects, less than half are covered satisfactorily. The in-depth knowledge required by a B-category student could not be gained from this course.

C Category: Of the 14 required subjects, almost all are covered satisfactorily. However, including the additional material noted previously, more than half of the course material is extraneous to a C-student's needs and, because of this, the course is judged unsatisfactory for a C-category student.

D Category: Of the 16 required subjects, all but one are covered satisfactorily. However, as for the C category, an unacceptably high proportion is extraneous to a D-student's needs.

Petroleum Industry Training Service On-Scene Commander Course. The Petroleum Industry Training System (PITS) On-Scene Spill Commander course is one of several oil-spill related courses provided by this non-profit organization, which is governed by the oil industry. This three-day course is designed for the on-site spill manager for spills into rivers and lakes. It is clearly geared to meet the needs of inland Alberta and is given in Calgary, Alberta.

The course covers 20 of the 48 identified course subjects. All of the subjects are covered at the general awareness level except for three which receive a medium depth of coverage.

A1 Category: Although most of the required subjects are covered satisfactorily, too few of the subjects requiring in-depth instruction are covered satisfactorily. The course does not provide the in-depth knowledge of spill management functions required by an A1-level student.

A2 Category: Of the 44 required subjects, about half are covered satisfactorily but few are covered at exactly the required level. Furthermore, of the subjects requiring in-depth training less than half are covered satisfactorily. The course does not provide enough in-depth instruction, especially in the spill management subjects area, to be acceptable for an A2 student.

B Category: Too few of the required subjects are covered satisfactorily, to meet the in-depth training needs of a B student.

C Category: Although almost all of the required subjects are covered satisfactorily, approximately half of the course material is not required by a C-category student. This extraneous material is mainly in the area of spill management including public relations, role of regulatory agencies, and contingency planning. For response to smaller spills in inland waters where a foreman might assume the additional roles of emergency director and spill superintendent, these spill management subjects would not be extraneous to his needs but rather useful. For such spills this course would be suitable for the student whose responsibility combines the roles A1 through C.

D Category: As for the C category, although a high proportion of the required subjects is satisfactorily covered, an excessive amount of the course material is extraneous to a D-student's needs.

Lambton College Major Oil Spill Response course. The Lambton College Major Oil Spill Response course is a four-day course provided in Sarnia, Ontario. The Lambton College of Applied Arts and Technology works closely with government and industry in the presentation of this and other environmental programmes. In this introductory course for oil-spill response in inland waters, emphasis is on containment and recovery, with some opportunity for hands-on experience. The course covers 19 of the 48 identified course subjects, almost all at the introductory/general awareness level.

A1 Category: Although more than half of the required subjects are covered satisfactorily, only one of the subjects requiring in-depth training receives satisfactory coverage. Furthermore, of the material provided, approximately one-third of the course material is extraneous to A1 needs. Therefore this course does not satisfy the specific needs of an A1-category student.

A2 Category: Although more than half of the required subjects are covered satisfactorily, less than one-third of the subjects requiring in-depth training are covered satisfactorily. The needs of an A2 student would not be met with this course.

B Category: As only one-quarter of the required subjects are covered satisfactorily, the highly specialized needs of a B-category student would not be met by this course.

C Category: All of the required subjects are covered satisfactorily. A fairly high percentage of the course would be extraneous to a C student's needs but this is not a serious problem as the extraneous material is all at the general awareness level. This course is well suited to the requirements of a C-category student.

D Category: Of the 16 required course subjects, almost all are covered satisfactorily. As for the C category, a fairly high percentage of the course is extraneous to a D-level student's needs. The generally introductory nature of this course makes it well suited to the needs of a D-category student who has responsibilities for spill response in inland waters.

Offshore Countermeasures Training Unit Equipment Operators course. The Oilspill Countermeasures Training Unit (OCTU) Equipment Operators course, Offshore One, is given in St. John's, Newfoundland. OCTU is sponsored by the oil industry and was established at the College of Fisheries, Marine Engineering and Electronics, specifically to meet the need for practical training on oil spill response equipment. This five-day course emphasizes the handling and operation of equipment. Little time is spent in the classroom as it is an equipment operator's course.

A1 Category: Although most of the required subjects are covered satisfactorily, more than half of the course material provided is not required by an A1 student. Generally the course has too much coverage of cleanup techniques and too little coverage of management functions to be acceptable for either A1- or A2-category students.



A2 Category: Less than half of the required subjects are covered satisfactorily. Insufficient coverage of the spill management subjects makes this course unacceptable for A2 students.

B Category: Only one-quarter of the required subjects are covered satisfactorily. Even for the subject area of containment and recovery (course subjects 19 through 27), less than half of the required subjects are covered satisfactorily. Sufficient in-depth coverage is not provided by this course for a B-category student.

C Category: Satisfactory coverage is provided for most of the required subjects. Excellent coverage is provided for the containment and recovery subject area.

D Category: Although all but one of the required subjects are covered satisfactorily, more than half of the course material is extraneous to a D student's needs.

#### SUMMARY OF EVALUATIONS BY TRAINING CATEGORY

In this subsection the conclusions of the course evaluations are summarized for each category of training.

##### A1 Category

The MEMC course is the only one to satisfy the need for in-depth training on spill management functions. However, the course length of 10 days is prohibitive as A1 students are likely to come from the executive ranks of a company and would not be able to afford that much time. As this course deals almost exclusively with spill management subjects, supplementary training in other areas, at the introductory/general awareness level, would be required by a prospective A1 student. This course may be considered acceptable for this category subject to these limitations, however, a new course is recommended which could be tailored to A1 needs.

The BP course is a poor alternative because it is deficient in spill management training while providing substantial operational training that is extraneous to A1 needs. A prospective A1 student would require extra spill management training to supplement the BP course.

All other courses are not recommended for the A1 category because they are severely deficient on the spill management subjects and they provide too much extraneous material in other subject areas.

#### A2 Category

The MEMC course and the BP course are comparable in depth of coverage versus that required and although neither is wholly recommended, either one would be an acceptable alternative. An A2 student attending the MEMC course would require extra training at an introductory level on certain operational and technical aspects of spill response, and an A2 student attending the BP course would require supplemental in-depth training on spill management subjects. Further, the MEMC course length of 10 days is prohibitive for this category.

All other courses are too general in nature, especially on the important spill management subjects, to be recommended for the A2 category. A new course is recommended for this category.

#### B Category

None of the courses that were evaluated provides sufficient in-depth training for the needs of a B-category student. New courses are recommended for all five B categories.

#### C Category

All courses provided excellent coverage of required subjects, hence the main criterion for ranking the courses is the type and amount of extraneous material. Unfortunately all courses have a substantial amount of extraneous material.

The Texas A&M, PITS, Lambton College and OCTU courses are equally suitable for the C category. Of these, the Texas A&M course has the best match-up of course content to training requirement. The Lambton and OCTU courses have the least amount of extraneous material and are given first recommendation for this reason.

#### D Category

Although all courses received high marks on coverage of course content, the amount of extraneous material was excessive in each case. A new course is required, although the Lambton College course is an acceptable alternative.

## DESIGN OF TRAINING CURRICULUM AND COURSES

It is clear from the previous section that, except for the case of foremen (Category C), existing courses do not satisfy the oil-spill training requirements identified in this report and that new courses need to be developed. Eight courses are required: three for the positions of emergency director (A1), spill superintendent (A2), and the secondary support positions (D) and five for the field supervisors (B1 to B5).

The starting point for the design of the training curriculum and the specific courses for the above positions is the knowledge and skill requirements identified in Appendix II and in Table 1 of Chapter 2. These identify, in general terms, the subject areas and topics in which the student is expected to be knowledgeable, and the level or depth of knowledge required in each subject. The task now is to expand these statements-of-knowledge requirements into "learning objectives".

A learning objective, as defined by some professional trainers, is simply a statement that describes the learning outcome in specific, observable, or measurable terms. This is usually accomplished by the use of action verbs classified according to the type of learning activity involved. Thus stated, learning objectives allow both students and trainers to know unambiguously what is expected of them.

### PROGRAMME CURRICULUM IN MODULAR FORMAT

#### Rationale for Using Modular Format

Accordingly, the first attempt in designing the regional training courses for the eight target positions involved writing and listing detailed learning objectives for each position using, as a basis, the information available in

Table 1. While doing this it became clear that many learning objectives and combinations of learning objectives were common to more than one position. For example, although the positions in the B category (the five supervisors) require very different training in their respective areas of specialization, they all require basically the same kind and level of training on the subjects of oil spill response, organizational structures, and strategies. It was decided that the most efficient way of dealing with these situations was to organize the courses and curriculum on a modular basis so that courses containing similar subject matter could use identical training modules. There are two obvious advantages in doing this. First, the use of common training modules would ensure that all members of the response team were taught the same information in given subject areas, which would facilitate communication amongst team members. Second, individual modules could be used, as appropriate, by companies or government agencies in training provided outside the context of the Canadian Oil Spill Training Programme. This latter capability was a particular request at the start of this study of companies that already have in-house oil-spill training programmes.

To satisfy all course requirements in a modular format, a 12-module system or curriculum was constructed which is described in this section. First, an overview of the system is presented. There follows detailed descriptions of each of the 12 training modules, in the form of learning objectives. Finally, by way of a summary, the required training courses for each of the position categories are presented.

#### Curriculum Overview

Table 4 presents an overview or summary of the Canadian Oil Spill Training Programme Curriculum. The matrix matches the nine response team positions or categories with the 12 training modules. The times given are the amounts of time required for each course.

TABLE 4

CANADIAN OIL SPILL TRAINING PROGRAMME CURRICULUM BY TRAINING MODULES

## RESPONSE TEAM POSITIONS

<u>TRAINING MODULES</u>	A1	A2	B1	B2	B3	B4	B5	C's	D's
1. Introduction to Oil Spill Behaviour (1.3 hrs)	x						x	x	x
2. Advanced Course on Oil Spill Behaviour (8.5 hrs)		x	x	x	x	x			
3. Overview of Oil Spill Control Techniques (2.4 hrs)	x		x	x	x	x		x	x
4. Oil Spill Response Organization and Strategies (1.7 hrs)	x	x	x	x	x	x	x		x
5. Countermeasures Overviews for Spill Superintendents (8.8 hrs)		x							
6. Surveillance and Monitoring Techniques (4.8 hrs)									x

Note: Subject matter requirements are specified by Section 4.4

TABLE 4 (Cont.)

CANADIAN OIL SPILL TRAINING PROGRAMME CURRICULUM BY TRAINING MODULE

RESPONSE TEAM POSITIONS

<u>TRAINING MODULES</u>	A1	A2	B1	B2	B3	B4	B5	C's	D's
7. Containment and Recovery Techniques (17.0 hrs)				x					
8. Chemical Dispersion Techniques (17.9 hrs)							x		
9. Shoreline Protection and Cleanup Techniques (13.6 hrs)							x		
10. Disposal Techniques (8.0 hrs)								x	
11. Hands-on Experience with Equipment (16 hrs)									x
12. Company Simulated Spill Response Exercise (8 hrs)	x	x	x	x	x	x	x	x	x
TRAINING TIME PER POSITION (hrs):	13.4	27.0	25.4	37.6	38.5	34.2	19.0	19.7	13.4

Note: Subject matter requirements are specified by Section 4.4

A few features of the curriculum are worth noting.

- a) Once trained in classroom-based courses, all positions (except foreman) are required to participate in a company-run simulated spill response exercises. This would test newly-learned skills, provide some experience in using these skills, increase knowledge of the company's organizational system and approach for spill response, and allow team members to become more familiar with each other and with the role of others.
- b) Aside from the company exercise, only about five hours of training time are required for the A1 position. The time was kept short in recognition of the time limitations the executive has for such training. The support advisers would receive exactly the same training.
- c) As discussed in the previous section, a new course for category C (foremen) is not required because existing courses (e.g., OCTU and Lambton) already satisfy the requirements of this category, especially insofar as containment and recovery systems are concerned. This category is included in Table 4 simply for completeness. Training Module 11 (Hands-on Experience with Equipment) refers to these existing courses.
- d) The three important field supervisory positions of containment and recovery (B2), chemical dispersal (B3) and shoreline protection and cleanup (B4) require about the same amount of training in terms of time (about 35 hours). The surveillance and monitoring supervisor (B1) requires less because it is assumed that the actual work will be done by a specialized contractor; the disposal supervisor (B5) requires less because his job, although important, requires little knowledge of oil spill behaviour and control, and can be accomplished on a less urgent basis than the other supervisors, thus allowing time for on-the-job education and consultation with experts.



- e) A special course (Module 5) to train spill superintendents on oil spill countermeasures was designed because of the special and important nature of their job. As an option, consideration was given to having spill superintendents attend all A1 and all B courses but it was decided that this was excessive in terms of time, and went well beyond the requirements of the position identified in Table 1.

#### Detailed Learning Objectives for Training Modules

The following are detailed descriptions of the training modules (noted in Table 4) provided in terms of learning objectives. Learning objectives for Module 11 are not provided; this module, Hands-on Experience with Equipment, as stated earlier is simply the training programme of existing courses (e.g., OCTU, Lambton, or equivalent).

For all other modules, any qualified instructor who is familiar with the subject matter could be expected to prepare appropriate course materials within the time periods allowed for each. Times given are based on a 50-minute "instructor hour".

## MODULE 1 - INTRODUCTION TO OIL SPILL BEHAVIOUR (1.3 hrs)

### GENERAL DESCRIPTION

The purpose of this module is to introduce the subject of offshore oil spill behaviour and fate from subsea and above-surface oil well blowouts and from surface batch spills. The time in hours, required to teach each objective is given in brackets after each.

#### Learning Objectives

- \* State the two basic kinds of offshore oil spills and the five major "spill processes" that affect their behaviour and fate. (0.1 h)
- \* Calculate, using the spreading curves provided, the areal extent to which batch oil spills can spread as a function of spill size. (0.1)
- \* Calculate the distance travelled by a slick in 24 hours when carried by a water current of 1/2 knot (0.85 m/s) and driven by winds (in the same direction) of speed 20 knots (10 m/s). (0.1)
- \* Describe the competing process of dispersion and emulsification, and explain how these processes affect the impact of an oil spill. (0.1)
- \* Explain how sea state, emulsification and oil evaporation affect the natural dispersion of an oil spill. (0.1)
- \* State three main spill behavioural differences between a light, non-viscous oil spill and a heavy, viscous oil spill. (0.1)
- \* Describe in general terms the near-source behaviour of subsea and above-surface oil well blowouts, and name the three factors that determine the dimensions of the downstream oil slick. Explain why blowout slicks are much thinner and dispersible than batch spills. (0.2)

- \* Name the oil spill process that can occur during a subsea blowout that significantly increases the viscosity and thickness of the resulting oil slick. (0.1)
- \*\* (Arctic only) Describe generally the behaviour of oil spills on ice, under ice and amongst ice, in terms of advection, spreading, evaporation and dispersion. (0.2)
- \* Describe generally the behaviour and effects of oil spills impacting the following coastal areas: rocky shorelines, sand beaches, marshes and fixed installations (marinas, harbours, fish plants, fish impoundments). (0.2)

## MODULE 2 - ADVANCED COURSE ON OIL SPILL BEHAVIOUR (8.5 hrs)

### GENERAL DESCRIPTION

More detailed descriptions of oil spill behaviour than Module 1 are provided. Calculations are made for all important spill processes. Near-source behaviour of blowouts is described in detail. A two-hour session on arctic oil spill behaviour is included but can be omitted as appropriate.

### Learning Objectives

- \* Describe in general terms the chemical composition and physical characteristics of crude oils, condensates, diesel, bunker and gasoline. (0.3 h)
- \* Describe the main features of the oil spill processes of advection, evaporation, spreading, emulsification, dispersion, dissolution, biodegradation and oxidation. (0.3)
- \* Explain the effects of winds and currents on the movement of oil spills, and the major limitations of real-time predictions of spill fate. (0.3)
- \* Explain the importance of spill evaporation with respect to the behaviour and control of offshore spills; describe the major factors controlling spill evaporation; and calculate, using the Stiver and Mackay system, the evaporative loss associated with several different spills. (0.7)
- \* Describe the spill process of spreading including the three phases of spreading according to Fay, the effect of spill size or thickness, the thick/thin phenomenon of spreading, the effects of windrowing and surface fragmentation and diffusion, and the spreading behaviour of waxy and emulsified crude oils. Calculate, using curves provided, the area of an oil slick as a function of spill size. (1.0)

- \* Calculate, using graphical techniques, the distance travelled by an oil slick given the water current and wind velocities for 12-hour periods, with at least one change in direction and speed. (0.4)
- \* Explain the importance of water-in-oil emulsification with respect to spill behaviour and countermeasures, and describe how the process is likely affected by the chemical composition of the oil, the density and viscosity of the oil, evaporation, spill thickness, temperature and sea state. State some Canadian oils that tend to emulsify quickly and others that do not. (0.4)
- \* Name the five parameters that influence the rate of natural dispersion of an oil spill; describe how evaporation and emulsification affects natural dispersion; and calculate the dispersion rate of several different oil spills using curves and tables provided. (0.5)
- \* Describe the near-source behaviour of subsea and above-surface blowouts; name the three factors that determine the dimensions of the downstream oil slick; calculate the thickness and width of several different blowouts using tables and curves provided; and explain why blowout slicks are much thinner and dispersible than batch spills. (0.9)
- \* Name the oil spill process that can occur during a subsea blowout that significantly increases the viscosity and thickness of the resulting slick, and state the possible factors that cause this effect. (0.2)
- \* Describe the explosion and safety hazards associated with offshore oil and gas blowouts, and calculate, using curves provided, the downstream limit of the ignition zone for different blowouts. (0.4)
- \*\* (Arctic only) Describe the behaviour of oil spills on ice, under ice and amongst ice, in terms of advection, spreading, evaporation and dispersion. Describe the behaviour of an oil spill from a subsea blowout in the Beaufort Sea transition zone in late summer and describe the general location, distribution and properties of the discharged oil in the spring. (2.0)

- \* Describe generally the behaviour of oil spills impacting the following coastal areas: shorelines, sand beaches, marshes, and fixed installations (marinas, harbours, fish plants, etc.). (1.0)
- \* List and describe the hazards associated with handling hydrocarbons. (0.1)

## MODULE 3 - OVERVIEW OF OIL SPILL CONTROL TECHNIQUES (2.4 hrs)

### GENERAL DESCRIPTION

The five basic response steps for oil spills are covered briefly: surveillance and monitoring, containment and recovery, dispersion, shoreline protection and cleanup, and disposal.

#### Learning Objectives

- \* List and briefly describe the five basic steps that may be involved in responding to offshore oil spills. (0.2)
- \* State the three main objectives of an oil spill surveillance and tracking programme; list the four most commonly used systems for surveillance; and state three environmental situations in which oil spill surveillance is nearly impossible. (0.2)
- \* Describe the physical features of commercially available containment booms; describe briefly three types of boom failure; state the upper limits for effective containment re: sea state and water current. (0.2)
- \* Explain the importance of timely response for the successful booming of an offshore batch oil spill. (0.1)
- \* Compare the general booming configuration for a) an offshore blowout, and b) a large tanker accident. (0.2)
- \* List the five generic types of oil skimmers; state the maximum capability of commercially available skimmers; and describe limitations of offshore skimmers with respect to sea state, oil properties including viscosity and thickness, difficulties of use, logistics, and general equipment availability. (0.3)
- \* State the overall estimated effectiveness of a containment and recovery operation for oil spills from blowouts in winter and summer a) on the Grand Banks, and b) in the southern Beaufort Sea. (0.1)

- \* Explain how dispersants work on oil spills, and how dispersant effectiveness is affected by oil type, oil weathering, oil viscosity, slick thickness, sea state and temperature. (0.2)
- \* Describe the environmental trade-offs associated with the use of chemical dispersants, and how these trade-offs are affected by dispersant operations that are only partially effective. (0.1)
- \* State, in terms of a 10,000 BOPD blowout spill on the Grand Banks against which dispersants are used: the amount of dispersant required daily; the number of vessels or aircraft required for application purposes and the number of missions required daily; the number of daily Hercules flights needed to transport dispersant to the area; and the daily cost of the operation. (0.2)
- \* Describe the general role of government agencies in the dispersant-use decision-making process; and name the person(s) in your company responsible for government liaison in this area. (0.1)
- \* Describe briefly the conventional methods for protecting shorelines from oil spill impact, and state their limitations in terms of amount of equipment, vessels and manpower required. (0.1)
- \* Describe briefly the two main techniques for cleaning up oiled shorelines, and describe their limitations with respect to shoreline type, access and seasonal conditions. (0.1)
- \* Estimate, using curves provided, the manpower and cost requirements for a shoreline cleanup operation as a function of length of shoreline oiled. (0.1)
- \* List the major environmental, socio-economic, political and aesthetic factors that influence the establishment of shoreline cleanup priorities. (0.1)
- \* List the major problems associated with the disposal of oil-contaminated material from a shoreline cleanup programme. (0.1)



## MODULE 4 - OIL SPILL RESPONSE ORGANIZATION AND STRATEGIES (1.7 hrs)

### GENERAL DESCRIPTION

A standard response organization chart for a major offshore oil spill is discussed including roles of and interactions between positions. Changing requirements with time, meeting media needs and the role of government agencies are included.

### Learning Objectives

- \* Describe a standard response organization for a major offshore oil spill in terms of: positions and job descriptions; and lines of communication. Using your company's contingency plan, name the persons who will hold the positions or do the jobs noted above. (0.4)
- \* Describe the roles and interactions of the various positions in the response organization with regard to making appropriate dispersant-use decisions and in using dispersants against a 10,000 BOPD offshore blowout. Describe the same for a containment and recovery operation. (0.5)
- \* (For Emergency Director (A1) and Spill Superintendent (A2) only) Describe, for an offshore oil well blowout, the major conflicts and inter-relationships between the well control operation and the spill cleanup operation. Describe the environmental, safety and costs implications of igniting an offshore oil well blowout or of extinguishing a blowout on fire. (0.2)
- \* Describe a scenario for a major shoreline cleanup operation including how the equipment and manpower requirements will change over time, and how the personnel will be supported in the field. (0.2)
- \* List 10 "do's" and "don'ts" in terms of dealing with the media and outside groups during a spill control operation. (0.1)

- \* Estimate the cleanup and damage costs for offshore oil spills as a function of spill size by using curves provided. (0.1)
- \* Describe the role of government agencies during a cleanup operation. (0.1)
- \* State your company's policy with respect to damage claims and legal responsibility. (0.1)

## MODULE 5 - COUNTERMEASURES OVERVIEW FOR SPILL SUPERINTENDENTS (8.8 hrs)

### GENERAL DESCRIPTION

This module is intended to provide introductory background on spill countermeasures to designated spill superintendents having no oil spill background. Surveillance, tracking, containment, recovery, equipment availability, and storage are covered briefly. Dispersion is discussed including dispersant use decision-making. Shoreline protection and cleanup is also covered.

### Learning Objectives

- \* List and briefly describe the seven basic steps that may be involved in responding to offshore oil spills. (0.2)
- \* State the three main objectives of an oil spill surveillance and tracking programme. List the four most commonly used systems for surveillance. State three environmental situations in which oil spill surveillance is nearly impossible. (0.2)
- \* Describe the use and limitations of drift buoys for tracking oil slicks. Describe the use of buoys for tracking oiled ice. State the rule-of-thumb for oil slick movement. Briefly describe the use of computer models to predict slick movements. (0.6)
- \* Describe the main characteristics of any containment boom. (0.1)
- \* Briefly describe three types of boom failure; state the upper limits for effective containment re: sea state and water current. (0.1)
- \* Explain the importance of timely response for the successful booming of an offshore batch spill. (0.1)
- \* Compare the general booming configuration for a) an offshore blowout, and b) a large tanker accident. (0.2)

- \* List the five generic types of oil skimmers; state the maximum capability of commercially available oil spill recovery devices; and describe limitations of offshore skimmers with respect to sea state, oil properties including viscosity and thickness, difficulties of use, logistics, and general equipment availability. (0.3)
- \* List and specify the locations of the main offshore skimmers currently used in Canada. (0.2)
- \* List the equipment requirements for an in-situ burning operation, and the advantage of using this technique. (0.2)
- \* List the available methods for storing recovered oil. (0.3)
- \* State the overall estimated effectiveness of a containment and recovery operation for oil spills from blowouts in winter and summer
  - a) on the Grand Banks, and b) in the southern Beaufort Sea. (0.1)
- \* List the environmental and oil property factors that influence natural dispersion rates and explain how each affects oil spill dispersion. Explain how the weathering processes of evaporation and water-in-oil emulsification affect natural dispersion. (0.8)
- \* Explain the physio-chemical action of dispersants on oil spills. (0.1)
- \* Describe the advantages and disadvantages of using dispersants over offshore mechanical recovery techniques. (0.2)
- \* Describe the environmental trade-offs associated with the use of chemical dispersants, and how these trade-offs are affected by dispersant operations which are only partially effective. (0.3)
- \* Describe the major features of the S.L. Ross Dispersant Use Decision Making Method and the Beaufort Sea Dispersant Use Mapping System. (1.0)
- \* State the logistical concerns in a large scale dispersant operation, including: the amount of dispersant required daily, the number of vessels or aircraft required for application purposes and the number of missions required daily; the number of daily Hercules flights needed to transport dispersant to the area; and the daily cost of the operation. (0.2)

- \* Describe the general role of government agencies in the dispersant use decision-making process. Name the person(s) in your company responsible for government liaison in the area. (0.1)
- \* Describe dispersant effectiveness with respect to:
  - distribution of product onto thick and thin portions of slick
  - slick thickness vs drop size
  - oil type and viscosity
  - mechanical mixing at surface
  - sea state
  - temperature (1.0)
- \* Explain the limitations of laboratory results (on dispersibility of an oil) as compared with those achieved in the field. (0.2)
- \* Describe reasons for using a sensitivity ranking scheme when responding to a large offshore spill. List the factors that are normally considered in any sensitivity ranking system. (0.3)
- \* Describe briefly the conventional methods for protecting shorelines from oil spill impact; state their limitations in terms of amount of equipment, vessels and manpower required. (0.1)
- \* Describe, in general, the variation in the persistence of stranded oil on a shoreline as a function of:
  - oil type (i.e., light vs weathered or emulsified crudes)
  - oil thickness
  - depth of oil penetration
  - prevailing winds (i.e., onshore vs offshore)
  - presence/absence of sea ice
  - exposure to waves
  - wave energy level (0.5)
- \* Describe four possible adverse consequences of the incorrect technique or degree of shoreline cleanup. Describe in general, the situations in which a 'leave alone' action is preferable to 'active' cleanup operations. (0.3)
- \* Describe the six general methods of shoreline cleanup, referring to applicability of shoreline type and manpower and equipment requirements. (0.5)

- \* Estimate, using curves provided, the manpower and cost requirements for a shoreline cleanup operation as a function of length of shoreline oiled. (0.1)
- \* List three techniques for dispersing of oiled debris and granular material, and two techniques for disposing of oil and oil/water mixtures. Compare the environmental effects of each of the five techniques considering short-term and long-term effects. (0.4)
- \* List the major problems associated with the disposal of oil contaminated material from a shoreline cleanup programme. (0.1)

## MODULE 6 - SURVEILLANCE AND MONITORING TECHNIQUES (4.8 hrs)

### GENERAL DESCRIPTION

Major subject areas covered in this module are: aerial observation, remote sensing techniques, trajectory predictions, and interpretation of results. Operating principles and constraints of state-of-the-art systems is stressed.

### Learning Objectives

#### A. Aerial Observation (0.8 hrs)

- \* State the optimal conditions for the aerial observation of oil at sea with respect to flying altitude, visibility conditions, sun angle and sea state. (0.1)
- \* Compare the use of helicopters and fixed-wing aircraft for the aerial observation of oil at sea, including such factors as flexibility of search pattern, speed, range and safety. (0.2)
- \* Describe, in general, the variation in the appearance of an oil slick as a function of slick thickness. Describe the occurrence and general characteristics of windrows. List five phenomena unrelated to oil spills that may be mistaken for an oil slick when viewed from aircraft. Describe the use of a 'cross-wind ladder search' for locating an offshore oil spill. (0.5)

#### B. Remote Sensing Techniques (2.0 hrs)

- \* Describe the use and limitations of drift buoys for tracking oil slicks. State the normal operating range and battery life of a tracking buoy. (0.3)
- \* State the operating principle and main operational constraints of each of the following:
  - low light level television (L<sup>3</sup>TV),

- laser fluorosensor,
- ultraviolet/infrared line scanner,
- synthetic aperture radar (SAR),
- side looking airborne radar (SLAR),
- conventional and U.V. filtered aerial cameras
- U.V. TV
- infrared TV
- microwave radiometer. (1.0)
- \* Describe the limitations on airborne remote sensing due to general environmental constraints. (0.4)
- \*\* Describe the use of buoys for tracking oiled ice, including buoy deployment and data retrieval. State typical values for winter pack ice movement. (0.3)

C. Trajectory Predictions (0.07 hrs)

- \* State the rule-of-thumb for oil slick movement. (0.2)
- \* Describe briefly the use of computer (mini or micro) models to predict slick movements, name the inputs required, and name the expected outputs. Name a trajectory model available within your company, or a contractor available to do trajectory predictions. (0.1)
- \* Describe how statistically derived environmental inputs may be used for probabilistic trajectories. (0.2)

D. Interpretation of Results (1.3 hrs)

- \* Describe the output data from several surveillance systems. (0.3)
- \* Manage a simulated surveillance operation in terms of:
  - a) selection of surveillance systems,
  - b) selection of flight lines,
  - c) specification of mission frequency, and
  - d) termination of the operation. (1.0)

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\*\* for Beaufort region trainee only.



## MODULE 7 - CONTAINMENT AND RECOVERY TECHNIQUES (17.0 hrs)

### GENERAL DESCRIPTION

Detailed coverage is given on containment and recovery operations for an offshore blowout and for a nearshore operation. Major topics are: selection of booms, selection of recovery devices, application strategies and methods, effectiveness and repositioning, transfer and storage, repair and maintenance, and practical operations. Equipment handling and operation management are stressed.

### Learning Objectives

#### A. Selection of Containment Booms (2.6 hrs)

- \* Describe the main characteristics of any containment boom. State the main differences between booms for offshore and nearshore use (with respect to freeboard, draft, and tensile strength). List and describe the common types of boom connectors. (0.4)
- \* Describe the effects of current, waves, tide, and wind on containment booms. (0.2)
- \* For an offshore blowout containment and recovery operation:
  - state the type of boom required;
  - estimate the length of boom required;
  - list the manpower and vessel requirements; and
  - list the ancillary equipment required. (0.8)
- \* For a nearshore containment operation:
  - state the type of boom required;
  - estimate the length of boom required;
  - list the manpower and vessel requirements; and
  - list the ancillary equipment required. (0.8)
- \* List and specify the locations of the main containment boom stockpiles in Canada. (0.2)

- \* List and describe two fireproof booms and the advantages and limitations of in-situ burning. (0.2)

B. Selection of Recovery Devices (2.0 hrs)

- \* List the five main (generic) types of skimmers. (0.2)
- \* Describe the principle of operation and name commercially available examples of:
  - weir skimmers
  - oleophilic belt skimmers
  - oleophilic disc skimmers
  - suction skimmers
  - mechanical skimmers
  - hydrodynamic skimmers. (0.8)
- \* Compare the use of weir, oleophilic, suction, mechanical and hydrodynamic skimmers with respect to:
  - sea state conditions of calm, harbour chop, and ocean swell;
  - oil types of light, medium and heavy oils;
  - oil thickness of less than 10 mm, 10 mm to 1 cm, greater than 1 cm. (0.8)
- \* List and specify the locations of the main offshore skimmers currently used in Canada. (0.2)

C. Application Strategies and Methods (2.5 hrs)

- \* Describe the vessel requirements and configuration of containment booms for the purpose of:
  - containing a moving offshore slick for physical recovery
  - containing the spillage from a damaged tanker
  - diverting a nearshore slick to an onshore collection point
  - protecting an environmentally sensitive bay
  - overcoming the effects of a strong current. (0.7)
- \* For inshore containment, describe the use of cascading booms. (0.2)

- \* Explain the importance of paravanes for towing or anchoring a boom. (0.1)
- \* Describe the various types of anchors used at sea and for shore connections; select an appropriate anchor for a given situation. (0.3)
- \* Define the scope of an anchor line. State a typical value of scope. (0.1)
- \* Calculate the tension in a boom given the dimensions and the current and wind values. Specify a mooring system for the example. Describe the sequence of deployment for the example in an offshore or nearshore location. (0.7)
- \* Describe the deployment and operation of a fireproof boom at an offshore blowout. (0.3)
- \* Name the persons in your company contingency plan who would be responsible for obtaining equipment from outside sources. (0.1)

D. Repositioning (0.4 hrs)

- \* State the main reasons for repositioning of containment and recovery systems. (0.1)
- \* Describe the sequence of activities involved in repositioning a system set up for an offshore blowout. (0.3)

E. Effectiveness (1.1 hrs)

- \* State the cause and corrective action for:
  - oil droplets surfacing 5 to 10 m downcurrent of a boom
  - oil droplets splashing over the top of the boom
  - submerged boom ends
  - boom planing (i.e., not remaining vertical in the water)
  - oil leaking at shore connection points. (0.5)
- \* State the cause and corrective action for:
  - excessive water pickup with weir skimmers

- oil losses downcurrent of an oleophilic belt skimmer. (0.3)
- \* State the normally expected values for recovery rate and water content in recovered oil for:
  - Framo ACW 400
  - Morris MI-30
  - Walosep W3
  - V.E.P. Arctic Skimmer. (0.3)

F. Transfer and Storage (2.4 hrs)

- \* List the available methods for storing recovered oil. (0.3)
- \* Define suction head, net positive suction head, discharge head, friction head, and total head. (0.3)
- \* List the main types of pumps available for transferring recovered fluids. (0.3)
- \* Compare the use of centrifugal and positive displacement pumps for transferring recovered fluids. State the optimal pumps for the following applications:
  - high viscosity fluids
  - high suction head
  - high flow rate required
  - some debris in fluid
  - pumping an oil/water mixture that may emulsify
  - self-priming required
  - intermittent flow (i.e., pump may run dry for short periods)
 (0.8)
- \* Describe the effect of emulsification on the volume of recovered fluids. Describe the use of emulsion breaking techniques. (0.3)
- \* Describe methods for measuring oil content in holding and storage facilities. State the permissible oil content of discharged waters. (0.4)

G. Repair and Maintenance (1.5 hrs)

- \* Explain the importance of post-operation inspection of all equipment used. (0.2)
- \* List the main wear points of a containment boom. List the main parts of a boom which would be inspected after use. List the main repair and spare parts for a containment boom. (0.6)
- \* Describe the normal operating checks that should be made of a diesel/hydraulic drive skimmer. List the parts of a skimmer which should be inspected after use. (0.6)
- \* Explain the importance of not washing oleophilic surfaces with detergents. (0.1)

H. Practical Operations (4.5 hrs)

- \* Participate in a demonstration of containment, recovery and transfer equipment. (2.0)
- \* Manage a simulated containment and recovery operation in terms of:
  - a) selection of equipment
  - b) equipment deployment
  - c) evaluation of effectiveness
  - d) transfer and storage methods
  - e) termination of the operation. (2.0)
- \* Describe the major safety considerations in a containment, recovery and transfer operation. (0.5)

## MODULE 8 - CHEMICAL DISPERSION TECHNIQUES (17.9 hrs)

### GENERAL DESCRIPTION

Major subject areas covered in this module are: dispersant theory, dispersant use decision-making, application techniques, dispersant effectiveness and contingency planning for dispersant use. Evaluation of a field operation under simulated spill conditions is expected.

### Learning Objectives

#### A. Dispersant Theory (1.7 hrs)

- \* Describe the process of natural dispersion of oil slicks. List the environmental and oil-property factors that influence natural dispersion rates and explain how each affects spill dispersion. Explain how the weathering processes of water-in-oil emulsification and evaporation affect natural dispersion. (0.9)
- \* Describe the general chemical composition of dispersants. Explain the physio-chemical action of dispersants on oil spills. (0.2)
- \* Compare the two types of dispersants in general use for offshore applications and the dosages required for each for effective application. (0.3)
- \* Evaluate a classroom demonstration using dispersants and oil in beakers with respect to the phenomenon of "herding", requirement for mixing, and the non-sticky nature of the treated oil. (0.3)

#### B. Dispersant Use Decision-Making (1.7 hrs)

- \* Explain the advantages and disadvantages of using dispersants over offshore mechanical recovery techniques. (0.2)

- \* Describe the major environmental trade-offs associated with the use of dispersants. State the implications of incomplete dispersion (i.e., less than 100% of the surface slick dispersed). (0.3)
- \* Describe the major features of the S.L. Ross Dispersant Use Decision-Making Method and the Beaufort Sea Dispersant-Use Mapping System. (1.0)
- \* Name the persons in your company in charge of contacting government agencies concerning dispersant use approvals and advising you on environmental matters related to dispersant use. List the information requirements for dispersant use approval. List the dispersants approved for use in Canada. (0.2)

C. Application Techniques (7.5 hrs)

- \* Describe the WSL system for dispersing oil spills in terms of major components, procedures and strategies for use, and treatment capacities. (0.6)
- \* Describe the advantages and disadvantages of using workboats for dispersant application, and describe examples of spill situations in which workboat systems are appropriate. (0.2)
- \* Explain the problems of using undiluted concentrate dispersants with conventional workboat systems. State how these problems can be overcome. (0.1)
- \* Demonstrate the procedure for assembling and making operational the WSL System, and evaluate the field operation of the system under simulated spill conditions. (3.0)
- \* State the major advantages and disadvantages of using aircraft for a dispersant operation compared to ship-based systems. (0.1)
- \* List three aircraft types utilized for dispersant application including their maximum payloads. Describe the major features of the Biegert ADDS, the helicopter bucket system and the spray systems for fixed aircraft. (2.0)

- \* Describe aerial application problems with respect to
  - uneven dosage of oil slick
  - use of improper chemicals
  - determining targets for dispersion
  - time taken to respond (1.0)
- \* Describe the major safety considerations associated with aircraft-based and ship-based systems. (0.5)

D. Dispersant Effectiveness (2.2 hrs)

- \* Describe dispersant effectiveness with respect to:
  - distribution of product onto thick and thin portions of slick
  - slick thickness vs dispersant drop size
  - sea state
  - mechanical mixing at surface
  - oil type and viscosity
  - temperature (1.0)
- \* Describe laboratory methods for determining the dispersibility of a specific oil. Explain the limitations of laboratory results as compared with those achieved in the field. Describe methods of determining the real-time dispersibility of an oil spill. (0.5)
- \* Describe possible factors for poor results and methods for increasing dispersion effectiveness. (0.3)
- \* Evaluate and describe the effectiveness of using dispersants on a small oil spill in sheltered waters (see 4th item in C above; same field demonstration)
- \* Discuss the results of dispersant use in previous actual spills and experiments. (0.4)

E. Contingency Planning for Dispersant Use (4.8 hrs)

- \* Calculate dispersant dosages and application rates for given spill situations. (1.0)
- \* Calculate the time and number of missions required for treating given spills using different application methods. (0.5)



- \* Outline an organizational chart for an aerial dispersant operation in which communication lines are indicated. (0.5)
- \* Describe in detail the logistical requirements of using dispersants for a 10,000 BOPD blowout, 300 km offshore Nfld., taking into consideration:
  - transportation of product from local stockpiles and from Houston and London
  - utilization of suitable airports and runways
  - source, availability and required numbers of suitable aircraft and workboats
  - methods, vehicles and equipment required to unload transport aircraft and load spraying aircraft or vessels
  - limitations with respect to weather and safety constraints. (2.0)
- \* List the equipment and material recommended as stockpiles for handling offshore spills of size 100 tons and 10,000 tons. (0.2)
- \* Describe systems for assessing the dispersibility of the target oil spill on an on-going basis. (0.5)
- \* Name chemicals, equipment and expert advisers who can be helpful during a spill and demonstrate that they are available as required. (0.1)

## MODULE 9 - SHORELINE PROTECTION AND CLEANUP TECHNIQUES (13.6 hrs)

### GENERAL DESCRIPTION

Major subject areas covered in this module are: shoreline categorization, behaviour and persistence of stranded oil, environmental impact of shoreline oiling and cleanup, shoreline protection methods, shoreline cleanup methods, logistics, and evaluation of cleanup operations. A practical exercise is included to provide experience in the management of simulated operations.

### Learning Objectives

#### A. Shoreline Categorization (0.9 hrs)

\* State the descriptive features of the following shoreline types:

- mud/tidal flats
- tundra beaches
- sand beaches
- pebble beaches
- cobble beaches
- boulder beaches
- mixed sediment
- salt marshes
- estuaries
- dunes
- exposed rocky headlands
- sheltered rocky coasts
- wave cut platforms
- man-made structures. (0.7)

\* On a typical beach profile, locate the:

- low water mark
- high water mark
- inter-tidal zone

- backshore
- beach crest
- storm crest. (0.2)

B. Shoreline Processes (1.1 hrs)

- \* Define a storm surge. (0.1)
- \* State typical values for tidal variations (vertical and horizontal) in your specific region. (0.1)
- \* Compare the expected erosion rates of the following general shoreline types:
  - sand beaches,
  - pebble/cobble beaches,
  - exposed rocky headlands,
  - wave cut platforms, and
  - icy beds. (0.3)
- \* Describe the phenomenon of slumping of exposed cliffs, and its significance with respect to shoreline dynamics. (0.2)
- \* Describe the effect of ice on shoreline dynamics. (0.2)
- \* Describe the effect of a longshore current on sediment transport and oil deposition. (0.2)

C. Behaviour and Persistence of Stranded Oil (1.9 hrs)

- \* Describe, in general, the variation of oil adherence to shore sediments as a function of oil characteristics. (0.1)
- \* Locate the expected zone of oil deposition on sediment beaches. Describe how wave splash can alter the normal oil deposition on rocky surfaces or man-made structures. Describe, in general, the expected oil deposition in a salt marsh. (0.4)
- \* Describe, for sediment beaches (i.e., sand, pebble, cobble, boulder or mixed), the variation of oil penetration as a function of oil properties and sediment size. Describe the effect of mixed sediment sizes on stranded oil penetration. Describe the expected oil penetration on a saturated mud or tidal flat. (0.5)

- \* Describe, in general, the variation in the persistence of oil stranded on a shoreline as a function of each of the following parameters:
  - oil type (i.e., light vs weathered or emulsified crudes),
  - oil thickness,
  - depth of oil penetration,
  - prevailing winds (i.e., onshore vs offshore),
  - presence/absence of sea ice,
  - exposure to waves, and
  - wave energy level. (0.5)
- \* State the reasons for stranded oil persisting on mud/tidal flats and in salt marshes, and not persisting on rocky surfaces, man-made structures and pebble, cobble and boulder beaches. (0.2)
- \* Describe the phenomenon known as 'asphalt pavement', and state which shoreline types are susceptible. (0.2)

D. Environmental Impacts of Shoreline Oiling and Cleanup (0.9 hrs)

- \* State the possible toxic effects of beached oil on intertidal plants and animals. (0.1)
- \* List three common human activities that are adversely affected by beached oil. (0.1)
- \* Describe reasons for using a sensitivity ranking scheme when responding to a large offshore spill. List the factors that are normally considered in any sensitivity ranking system. (0.3)
- \* Describe four possible adverse consequences of the incorrect technique or degree of shoreline cleanup. Describe, in general, the situations in which a 'leave alone' action is preferable to 'active' cleanup operations. Compare the effects of removing a 3 to 10 cm layer of beach material with those of removing a 25 to 50 cm layer, with respect to both biological effects and subsequent beach stability. (0.4)

E. Shoreline Protection Methods (1.4 hrs)

- \* Define and state the purpose of exclusion booming. (0.2)
- \* Define diversion booming and state the reasons for employing it rather than exclusion or containment booming. Describe the use of cascading diversion booms. (0.3)
- \* Describe the general characteristics of booms used for nearshore countermeasures. State the water current limitations which apply to any booming operation. (0.2)
- \* State the reasons for considering the use of chemical dispersants in a nearshore zone. State the limiting oil property which usually negates the nearshore use of dispersants in response to an offshore spill. (0.3)
- \* Define a sacrificial beach, and state reasons for designating such an area. (0.2)
- \* Describe the various types of anchors used at sea and for shore connections. (0.2).

F. Shoreline Cleanup Methods (3.3 hrs)

- \* State the six general methods of shoreline cleanup. (0.1)
- \* State the type of shoreline on which oiled sediment removal is applicable. (0.2)
- \* Compare, with respect to beach trafficability and depth of material removed, the use of the following equipment for oiled sediment removal:
  - elevating scrapers,
  - front-end loader (rubber tired or tracked),
  - bulldozer,
  - backhoe, and
  - dragline or clamshell. (0.3)
- \* Compare the removal rates using earthmoving machinery with those using manual labour. Estimate the quantity of material (per km) that will result from a sediment removal operation, using typical values for depth of material removed and oiled beach width. (0.3)

- \* State the shoreline features for which high-pressure flushing is applicable. State why only low-pressure flushing should be used for certain shoreline types, and name those types. Describe a beach flushing operation, including techniques for 'flushed' oil recovery. (0.5)
- \* Describe situations in which steam-cleaning would be advantageous compared with high or low-pressure flushing. (0.2)
- \* Describe situations in which direct pumping or skimming techniques may be employed. (0.1)
- \* Describe situations in which simply tilling the upper oiled layer into the substrate would be used as a method of enhancing natural biodegradation. (0.2)
- \* State the maximum height to which oiled sand should be piled. (0.1)
- \* Describe why it is essential that one must not remove more sand or substrate from a beach than is necessary. Describe why imbedded rocks and boulders should not be displaced from a beach. (0.3)
- \* Describe the importance of accepting slight oiling of some areas rather than unnecessarily removing beach material and vegetation. (0.1)
- \* State two techniques for removing liquid oil from tidal pools and depressions. (0.1)
- \* Describe the technique to be used when flushing, wave action and/or tidal variations removes oil from the beach face to the adjoining water surface. Describe the use of flushing and subsequent skimming for removing oil from shorelines containing boulders, scattered rocks and tidal pools. (0.3)
- \* State why rocky cliffs may not require cleanup action. (0.1)
- \* For oiled salt marshes describe the importance of only cleaning as is necessary. For muddy areas and tidal flats, describe the importance of not forcing the oil into the substrate by machinery or people trampling the area. (0.4)

G. Logistics (1.6 hrs)

- \* State the manpower and equipment requirements for nearshore protection such as exclusion or diversion booming. (0.2)
- \* State the areal pickup rate, personnel required, fuel requirement, ancillary equipment required, and access requirements for:
  - a motorized grader (tracked and rubber-tired),
  - a front-end loader (tracked and rubber-tired),
  - a bulldozer,
  - a high pressure flushing unit,
  - a low pressure flushing unit, and
  - a tractor towed tilling unit. (0.8)
- \* Describe a scenario, focusing on the logistical aspects, in which a 5 km length of sandy shoreline is cleaned using tracked graders and tracked front end loaders, and the oiled sediment prepared for delivery to a permanent disposal site. (0.6)

H. Evaluation of Shoreline Cleanup Operations (0.5 hrs)

- \* State the main two conditions that must be met before cleanup operations on a particular shoreline are terminated. (0.1)
- \* State six factors which may cause, singly or in combination, cleanup actions to be terminated. (0.2)
- \* Describe techniques for measuring oil content in removed sediments. (0.1)
- \* Describe the importance of expert advice for post-spill monitoring of ecological effects. (0.1)

I. Practical Operations (2.0 hrs)

\* Manage a simulated shoreline protection and cleanup operation in terms of:

- a) protection priorities
- b) selection of protection techniques
- c) cleanup priorities
- d) selection of cleanup techniques
- e) evaluation of effectiveness
- f) logistical aspects. (2.0)



## MODULE 10 - DISPOSAL TECHNIQUES (8.0 hrs)

### GENERAL DESCRIPTION

This module includes a detailed discussion of disposal technique selection considering environmental implications, soil requirements and essential safety precautions. Logistical considerations and management of a simulated disposal operation are included.

### Learning Objectives

#### A. Selection of Techniques (4.8 hrs)

- \* List the three main techniques for disposing of oiled debris and granular material. List the two main techniques for disposing of oil and oil/water mixtures. Compare the environmental implications of using each of the five techniques, considering short-term and long-term effects. (0.3)
- \* State the general soil requirements for a burial site. Describe the types of wastes which are suitable for burial. List the predesignated disposal sites in your region (or name the appropriate reference documents). Describe the regulatory procedures which must be followed prior to waste burial. List the support equipment required for a major burial operation. Describe the post-burial monitoring of a disposal site. (0.8)
- \* Describe the process of natural biodegradation of oil. Describe how this process may be enhanced. (0.2)
- \* State typical application rates for landfarming. Describe the types of wastes which are suitable for landfarming. List the equipment required for a major landfarming operation. Describe the ideal soil conditions for landfarming. Describe site improvements to prevent excessive runoff and erosion. Describe the applicable regulatory guidelines on landfarming oiled wastes. Describe methods of monitoring the effectiveness of landfarming of oiled wastes (0.6).

- \* Describe the wastes which are conducive to in-situ burning. State the main operational advantage of in-situ burning. State the conditions required for in-situ burning. State the minimum ignitable oil thickness for fresh, weathered and emulsified oils. Describe how pool thicknesses can be increased to achieve this minimum value. State typical rates for in-situ burning. State typical burning efficiencies. List the equipment required for ignition of contained oil pools. Describe the essential safety precautions. (0.8)
- \* List the types of wastes which may be disposed through open-pit burning. State the site conditions which will allow open-pit burning, and those which negate consideration of this technique. Describe the equipment which may be used to enhance burning efficiencies. List the support equipment required for an open-pit burning operation. Describe the essential safety precautions. (0.8)
- \* For the following list of equipment, describe their operation, name any commercially available units, state their capacity, state the type of waste for which they are suited, and state the monitoring required to ensure effective burning:
  - rotary kiln,
  - portable incinerators,
  - production test flare burners (or offshore burners),
  - rotary cup flare burners. (0.5)
- \* List the support equipment required for a continuing burning operation using a portable incinerator at a series of coastal sites. (0.2)
- \* Describe the techniques which may be used to increase the efficiency and throughput rate of a production flare burner when used to burn emulsions or oil/water mixtures. (0.2)
- \* Describe the techniques for breaking emulsions. (0.2)
- \* State the requirements for the disposal of oily water. (0.1)

B. Logistics (1.2 hrs)

- \* Compare the manpower and support equipment requirements for the three main solid disposal techniques (i.e., burial, burning, farming). Compare the manpower and support requirements for the two main liquid disposal techniques (i.e., reprocessing, burning). (0.8)
- \* Describe methods for temporary storage of oiled solid wastes. (0.2)
- \* Name the available references which list potential permanent disposal sites. (0.2)

C. Practical Operations (2.0)

- \* Manage a simulated disposal operation of liquid and solid wastes in terms of:
  - a) selection of techniques
  - b) evaluation of operations
  - c) logistical aspects. (2.0)

## MODULE 12 - COMPANY SIMULATED SPILL RESPONSE EXERCISE (8 hrs)

### GENERAL DESCRIPTION

A problem-solving format is used in this exercise in order to maximize interplay between members of the response team. Where several different companies take part in the same exercise, response teams will benefit significantly from the discussions that can be generated from one team to another as well as within teams. Areas of concern include alerting and communication, interaction with government agencies, media relations, spill escalation, spill response, cleanup and disposal, and records and documentation.

### Learning Objectives

#### A. Spill Assessment

- \* Describe the company call-out or alerting procedure. (0.2)
- \* Explain how the company ensures close, detailed contact between (a) headquarters and remote field operations, (b) separate elements of field operations, both ashore and afloat. (0.3)
- \* List the kinds of information required for operational planning and state the sources of this information. (0.3)
- \* Describe the actions that should be taken if the spill is bigger than can be handled within company resources. (0.2)
- \* Describe the risk to people, property and the environment for a given spill. (0.5)
- \* Determine the lead time required to protect each sensitive area, for a given spill. (0.4)
- \* State who will be notified about this spill, outside of the company, giving names, location and telephone numbers, and stating by whom these actions will be taken. (0.2)

B. Resource Mobilization

- \* Decide on the best location for the command post for a given spill and state the reasons for this choice. (0.4)
- \* Describe the roles of each of the members of the command post in this spill. (0.2)
- \* List the outside assistance that will be required to fully respond to this spill in terms of who to contact, what to ask for, where it will come from and when it will be required. (0.4)
- \* Develop a comprehensive plan of action for the initial response to this spill indicating response priorities and equipment and manpower allocations to specific locations for specific purposes such as surveillance and tracking, protection and containment, recovery and storage, restoration and disposal. (1.0)

C. Response Operations

- \* Describe the specific safety measures to protect workers on this spill. (0.4)
- \* Explain the necessity for measures to restrict public access to the spill site or spill impact areas. (0.2)
- \* Determine the actions necessary to remedy an ineffective response activity in any phase of the response from surveillance, through containment and recovery, chemical dispersion, and shoreline cleanup, to disposal. (0.8)
- \* Identify shortfalls in needed equipment, manpower or supplies in any phase of the operation resulting from unexpected developments in spill behaviour. (0.5)
- \* Describe the facilities for food, accommodations, shift changes, first aid etc. you will require for this operation. (0.2)
- \* Describe how the events in this spill are being recorded or documented for subsequent reporting. (0.2)

- \* Describe how the costs of response to this spill are being controlled, and explain how significant over-runs will be handled. (0.2)
- \* State who the government representatives are who have a legal interest in this spill, and describe their roles in relation to your operation. (0.2)
- \* Describe how you plan to handle the media in this situation with respect to numbers allowed access, nature of access, information made available, communications made available and transportation and accommodations provided. (0.4)
- \* Identify the main sections of the final report to be written on this incident and list those who will receive a copy. (0.2)
- \* Formulate recommendations that would prevent recurrence of this type of accident. (0.6)

## SUMMARY OF TRAINING COURSES FOR RESPONSE TEAM MEMBERS

The proposed curriculum given below prescribes the training for identified categories of response personnel. This curriculum should not be seen as a hierarchy. Rather it should be viewed as a structure into which individuals with oil spill response duties would fit according to their position and responsibilities within their company. In addition to the following course requirements, all categories except for foremen are required to participate in a one-day company-simulated spill exercise (Module 12).

### Category A1 - Emergency Director

#### Oil Spill Management course

Course description:	A 5.4-hour course consisting of lectures, case studies and supplementary reading, to provide in-depth treatment of a wide variety of spill management subjects. Subject content is provided in Modules 1, 3 and 4.
Target population:	Senior personnel with responsibility for managing the company's entire response effort in the event of a major spill.
Acceptable alternative:	MEMC provided by Transport Canada at Cornwall, Ontario although the course length of 10 days is considered prohibitive.
Supplementary training:	None

### Category A2 - Spill Superintendent

#### Spill Superintendent course

Course description:	A 19-hour course using lecture presentations as well as case studies and syndicate work. Subject content is provided in Modules 2, 4 and 5.
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Target population: Middle- to high-level company managers pre-designated to be in charge of control operations at the scene of a serious spill.

Acceptable alternative: 1. Transport Canada Marine Emergency Management Course, Cornwall, Ont. (lacks some technical subjects and requires 10 days).  
2. British Petroleum Oil Spill Clearance Course, Southampton, England (lacks spill management subjects and requires 6 days).

Supplementary training: None for Spill Superintendent Course. If MEMC course is chosen, supplementary technical training is required. For the BP course, supplementary training in spill management subjects is required.

#### Category B1 - Surveillance Supervisor

##### Surveillance Supervisor's course

Course description: A 17.4-hour course emphasizing in-depth speciality subject matters. Subject content is provided in Modules 2, 3, 4 and 6.

Target population: Supervisors in the oil industry with this field responsibility in the event of spills.

Acceptable alternative: None

Supplementary training: None

#### Category B2 - Containment and Recovery Supervisor

##### Containment and Recovery Supervisor's course

Course description: A 37.6-hour course emphasizing in-depth speciality subject matter, experience in handling equipment and supervising simulated field operations. Subject matter is provided in Modules 2, 3, 4 and 7.



Target population: Supervisors in the oil industry with this field responsibility in the event of spills.  
Acceptable alternative: None  
Supplementary training: None

#### Category B3 - Chemical Dispersant Supervisor

##### Chemical Dispersant Supervisor's course

Course description: A 30.5-hour course emphasizing in-depth speciality subject matter, experience in handling equipment and supervising simulated field operations. Subject matter is provided in Modules 2, 3, 4 and 8.  
Target populations: Supervisors in the oil industry with this field responsibility in the event of spills.  
Acceptable alternative: None  
Supplementary training: None

#### Category B4 - Shoreline Protection and Cleanup Supervisor

##### Shoreline Protection and Cleanup Supervisor's course

Course description: A 26.2-hour course emphasizing in-depth speciality subject matter, experience in handling equipment and supervising simulated field operations. Subject content is provided in Module 2, 3, 4 and 9.  
Target population: Supervisors in the oil industry with this field responsibility in the event of spills.  
Acceptable alternative: None  
Supplementary training: None

## Category B5 - Disposal Supervisor

### Disposal Supervisor's course

Course description:	An 11-hour course emphasizing in-depth speciality subject matter and supervising simulated field operations. Subject content is provided in Modules 1, 4 and 10.
Target population:	Supervisors in the oil industry with this field responsibility in the event of spills.
Acceptable alternative:	None
Supplementary training:	None

## Category C - Spill Workcrew Foreman

(Two existing courses equally satisfy this requirement)

### A. Lambton College Major Oil Spill Control course

Course description:	A four-day course conducted by the Lambton college of Applied Arts and Technology in Sarnia, Ontario, dealing with large-scale river and land spills. Hands-on experience with equipment is a major feature. Most of the subject content requirements of Modules 1, 3 and 11 are satisfied.
Target population:	Spill response crew members from both industry and government, especially at the junior management or foreman level.
Acceptable alternative:	<ol style="list-style-type: none"><li>1. Texas A&amp;M Oil Spill Control Course, Galveston, Texas (contains much subject matter related to small spills and U.S. regulations).</li><li>2. Petroleum Industry Training System (PITS) On-Scene Spill Commander Course, Calgary, Alberta (contains much subject matter related to small, inland spills).</li></ol>

**Supplementary Training:** Training on local equipment will be necessary, if different than that used in course.

**B. OCTU Equipment Operator's course**

**Course description:** A five-day course given by the College of Fisheries, Navigation, Marine Engineering and Electronics at St. John's, Newfoundland, designed specifically to meet the need for practical training on marine spill response equipment. Major emphasis is on handling and operation of cold ocean offshore equipment. Most of the subject content requirements of Modules 1, 3 and 11 are satisfied.

**Target population:** Spill response crew members from both industry and government.

**Acceptable alternative:** As above, under section A.

**Supplementary training:** Training on local equipment will be necessary, if different than that used in course.

**Category D - Secondary Support Supervisors**

**Secondary Support Supervisor's course**

**Course description:** A 5.4-hour course providing introductory subject matter related to spill behaviour and impact, and the nature of various types of spill response. Subject matter content is provided in Modules 1, 3 and 4.

**Target populations:** Those in such activities as supply, communications, safety, public relations, and claims who continue their normal function within the context of the oil spill emergency.

**Acceptable alternative:** Lambton College Major Oil Spill Control Course, Sarnia, Ontario

**Supplementary training:** None

## PROGRAMME IMPLEMENTATION

Having designed the curriculum of the proposed Canadian Oil Spill Training Programme it remains to discuss factors related to its implementation. The key issues are the programme's market, delivery methods, and implementation priorities.

### PROGRAMME MARKET

A crucial factor related to implementation is the market for the programme. If the demand for the entire programme is high, then all courses can be developed and funded on a cost-recovery basis. In contrast, if the demand is low, then one must proceed with caution and develop only those courses that are considered to be of the highest priority, recognizing that even these might require financial subsidization.

At this point it is difficult to estimate the current market potential for an industry-sponsored oil-spill training programme. Even at the beginning of this study, when interest was relatively high, there was no clear indication of the number of potential trainees for such a programme or of the funds that would be made available for its ultimate development and implementation. The situation is even more uncertain now because of the recent, dramatic downturn in the offshore oil and gas industry.

To determine the existing and future market for the programme it is necessary that an industry survey be done of all companies initially interviewed (see Appendix I) to determine the current and future training requirements that each has, or will have, with respect to the various response team position categories referred to in this document. Once this is done the direction that further development should take will become clear. During this market analysis, Canadian government and foreign individuals should perhaps be considered as targets for training. Although the proposed training courses have been designed to address the needs of the oil industry alone, it is likely

that the oil-spill training requirements of government agencies such as the Canadian Coast Guard and the Environmental Protection Service should be at least partially satisfied by the offerings of the industry programme. The same might be said for industry and government persons from other countries who have offshore spill control responsibilities similar to those that exist in Canada.

Lacking information to the contrary, we will take the long-term view and make the assumption that there indeed is a market for the Canadian Oil Spill Training Programme. The short-term approach would be to design a highly-modified programme around the existing cadre of environmental specialists in the Canadian petroleum industry who are already qualified to act in certain oil-spill response positions. This approach would be unwise, however, because deficiencies would develop once these specialists leave their positions. It is our view, therefore, that the Canadian Oil Spill Training Programme should be implemented to satisfy long-term objectives, and should incorporate training courses for all positions that are considered essential for oil spill response, including those that presently have qualified incumbents.

The existence of already-qualified personnel for certain oil-spill response roles is relevant, however, not so much for determining programme content but rather for deciding the order in which the various training courses or modules should be developed. Thus, important spill response team positions for which there are few or no qualified candidates should be addressed first, whereas those for which several persons are already qualified can be left for last, as is discussed later.

Another important issue that affects the market potential of the training programme is the attitude of oil companies with respect to the idea of banding together to fight major offshore oil spills. The underlying assumption throughout this study has been that each company will respond to its own spills on an independent basis. This assumption is derived from the various oil company contingency plans filed with government agencies. In most plans, the response team positions are occupied by company employees, except where

local industry cooperatives are identified. It is these employees who are the prime targets for oil-spill training. Hypothetically, however, if a company were to have access to already-qualified personnel from an all-company pool of experts, then that company would require minimum oil-spill training. If all companies adopted this approach there would be little need for a Canadian Oil Spill Training Programme. Although the all-industry approach to fighting major oil spills might indeed be adopted on an ad-hoc basis at future spills, we must assume at this time that this cannot be relied on to happen and that industry contingency plans will operate as currently stated; that is, company employees will assume most of the oil-spill response duties without extensive reference to external company experts. It is clear, then, that these employees will need comprehensive training.

In summary, until an appropriate market analysis is performed, we shall assume that there is a significant demand for a Canadian oil spill training programme. That is the assumption upon which the following two sections have been prepared.

#### PROGRAMME DELIVERY

A delivery method for each of the 12 training modules discussed earlier must be developed using one or more of the following options:

- \* central training facility
- \* travelling instructor teams
- \* correspondence or reading training
- \* programmed instruction
- \* computer assisted training
- \* audio-visual training package

In choosing the most appropriate approach, consideration must be given to the problems of time, group size, location, frequency, resource availability, facility availability, and cost. The following recommendations on programme delivery for the various response team categories take into account

as many factors as possible. These must be considered tentative, however, because group size, course frequency, and other considerations related to programme demand are uncertain at this stage.

#### Categories A1 and D

It has been mentioned several times that the company executives who will fill the position of Emergency Director (A1) are extremely busy individuals who have, and need, little time for oil-spill training. As noted in Table 4, the total training time for A1's, aside from in-house training and the one-day, company-simulated spill response exercise, has been kept to only about five to six hours (Modules 1, 3 and 4). It is logical therefore that A1 individuals not be required to travel outside their base of operations for such limited training. It is recommended rather that a team of instructors travel to the company location to deliver the course, in cooperation with the company environmentalist and training department. Conveniently, company individuals in the D-category (secondary advisers, such as marine superintendent and air support supervisor) are also required to take the identical set of courses (Modules 1, 3 and 4). It therefore makes sense that the courses be taught to A1's and D's together. If there are not enough A1's and D's within a company to justify a company-specific programme, then such individuals could be trained in a course attended by A1's and D's from other companies in the same city (for example, St. John's, Calgary, or Halifax). Again, these courses would be managed by a travelling team of instructors, assisted by industry environmentalists located in the designated city.

For the one or two companies that already have in-house oil-spill training programmes, the travelling instructor team would be redundant, and Modules 1, 3 and 4 (or their equivalent) could be given entirely by in-house personnel.

## Categories B1 to B4

As noted in Table 4, four of the five oil-spill supervisors (surveillance (B1), containment and recovery (B2), dispersants (B3), and shoreline cleanup (B4)), are required to have identical training preliminary to advanced courses in their areas of specialization. These preliminary courses are Modules 2, 3 and 4. The total training time for this set of courses is about 13 instructor-hours or about two days of training. If market analysis shows that B-category personnel are relatively dispersed across the country then it might be advantageous to give these introductory courses at some centrally located training facility. This choice would be particularly justified if government participants were also involved in such training. If, on the other hand, almost all B-category candidates are located in only one or two cities, then the approach of using travelling instructor teams would seem to be more efficient.

In terms of the specialized courses for the B1, B2, B3 and B4 categories (Modules 6-9) central-facility training is probably necessary because since the courses generally require both specialized equipment and access to marine facilities. The exception might be Module 6 (Surveillance and Monitoring Techniques) which could be in the form of an audio-visual training package to be used on a self-learning basis.

## Category B5

The training for the disposal supervisor (B5) is different than for the other B categories in that an in-depth knowledge of offshore oil-spill behaviour and control is not required. In addition, the job of oil-spill disposal is one that does not have the same sense of urgency and requirement for teamwork as do the other B jobs. Furthermore, a B5 supervisor has the time during a spill to consult with technical experts and provincial specialists in developing a satisfactory solution for ultimate disposal of collected oily debris.



All these factors suggest that the most suitable training package for the B5 supervisor should be in the form of a reading programme combined with a video cassette, both of which should be designed with real-time reference use in mind.

#### Category A2

The training for the Category A2 candidate, the spill superintendent, is similar to that given to his supervisors. He is required to take a course on response organization and strategies (Module 4) and a comprehensive course on oil-spill behaviour (Module 2) in advance of attending a specially designed course for him on oil-spill countermeasures (Module 5). The total training time of these is 19 hours or about 2 1/2 to 3 days. There are two delivery options for these courses. The A2 candidate could attend a three-day course at a central training facility with other A2's from across the country. Or, he could attend the 2-day set of courses given to the B category trainees (Modules 2, 3 and 4) following which he could immediately take the Module 5 training course at the central training facility, or could take this course at a later date in his home location when given by the travelling instructor team. This second option (of having the A2 trainee attend the preliminary B courses) gives him about two hours of redundant training (Module 3) but provides him with the opportunity of working with his future supervisors, albeit in a classroom setting. Again, which option is chosen will depend on the demand for the courses, trainee location, and other market factors that have yet to be precisely determined.

#### Category C

As stated, the training needs of Category C personnel are already adequately addressed by existing courses for foremen. Trainers for these courses might wish to supplement their programmes by using Modules 1 and 3 (introductions to oil-spill behaviour and control) to ensure that the foremen receive the same facts in these areas as do the other response team members.

## Company Training

All response team categories except foremen are required to participate in a company-sponsored, one-day, simulated spill response exercise. Learning objectives are provided in Module 12 to assist company officials, if required, in the development of such an exercise. Another company responsibility is to ensure that the oil-spill training requirements that are highly specific to the company's operations (see Table 2) are satisfied. This means, for example, that personnel be trained with respect to the intricacies of the company's contingency plan and its policies and procedures with respect to spills, and any local or regional environmental regulations that apply in areas where the company operates.

In terms of a delivery system, it might be advisable that these in-house training responsibilities be combined into a two-day training session, the first day on lecture subjects and the second on the simulated response exercise. This decision would be for the company oil-spill environmentalist and training department to make.

## IMPLEMENTATION PRIORITIES

Excluding Module 11 (existing courses for foremen) and Module 12 (company response exercise), 10 training modules require development for inclusion in the Canadian Oil Spill Training Programme. Because the production of training courses is costly and time-consuming it must be decided which courses are of high priority and require immediate attention and which can be developed at a later date. The most satisfactory way of determining this is to survey the companies in need of oil-spill training and ask them directly. In the absence of knowing the exact views of companies on this matter, we have attempted to analyse the situation on a intuitive or theoretical basis, although this analysis may prove faulty once a market survey on the subject is performed.

In our view and in the view of companies interviewed at the beginning of this study, the most important position in an oil-spill response organization is the spill superintendent (A2). This is the person at the scene of the accident in charge of cleaning up the spill with the help of supervisors with specialized responsibilities. It is vital that the highest priority be given to training the spill superintendent not only because this position is very important and must be filled by a company official (thus preventing the hiring of outside contractors for the position), but also because the designated spill superintendent is usually an official of authority in a management job with the company and, once trained and motivated in oil-spill control matters, will see to it that others in the company are similarly trained and motivated.

Another reason for giving high priority to the training of A2 personnel is that few persons in the industry are already trained to carry out A2 responsibilities. There is thus an urgent need to train such individuals.

It is clear then that those training modules that apply to the A2 category need immediate development. These would be Modules 2, 4 and 5.

The next priority level would be the B category positions. Referring to Table 4 it is seen that if Module 3 were developed just after Modules 2 and 4 then introductory courses would be available for all A2 and B categories (except B5) in preparation for more advanced training.

Once these modules are developed, the development of Module 1 would complete the training material required for the A1 and D categories.

What remains are the level B specialized courses. Except for the B5 course (Module 10 - disposal) these are all important for one reason or another, and it is difficult to rank the modules in terms of implementation priority. The following attempts to do so, however.

Because of the high current interest in dispersants and the low level of training available in Canada in this area, Module 8 should perhaps be developed first.

The need for shoreline cleanup training (Module 9) has been underestimated in the past because the potential difficulties and sensitivities involved in shoreline cleanup are not easily appreciated; nor are the tremendous cost savings that can be realized by a well-managed operation using highly trained individuals. Except for some highly rated, government-sponsored oil-spill and shoreline workshops held in Canada in the 1970's, little training in this area has taken place, especially insofar as management training for major cleanups is concerned. For this reason we have given Module 9 a high priority for implementation.

The next priority is assigned to Module 7, Containment and Recovery Techniques. Although there are several experts in industry (and in government) who already would qualify as Containment and Recovery Supervisors (B2), this area of oil-spill control remains the backbone of the industry yet many companies have no in-house expertise in the area. The extent to which companies prefer to rely on industry cooperatives to provide Containment and Recovery Supervisors (and foremen) will largely determine the implementation priority of this module.

The next priority is given to Module 6, Surveillance and Monitoring Techniques. The company supervisor in this highly specialized area would normally be assisted by one of several contractors who are expert in remote sensing. Notwithstanding, there are certain basic knowledge and skill requirements in this important area that demand attention.

The last priority is to develop Module 10 on disposal techniques which, as has been noted, also could be in the form of an audio-visual training package.

In summary, it is recommended that the order in which the ten training modules are developed is as follows:

- Module 2:       Advanced Course on Oil-Spill Behaviour
- Module 4:       Oil-Spill Response Organization and Strategies
- Module 3:       Overview of Oil-Spill Control Techniques
- Module 5:       Countermeasures Overview for Spill Superintendents
- Module 1:       Introduction to Oil-Spill Behaviour
- Module 8:       Chemical Dispersion Techniques
- Module 9:       Shoreline Protection and Cleanup Techniques
- Module 7:       Containment and Recovery Techniques
- Module 6:       Surveillance and Monitoring Techniques
- Module 10:      Disposal Techniques

## CONCLUSIONS

### TRAINING REQUIREMENTS

1. Interviews with oil industry officials indicate that there is a general need for a comprehensive programme to train personnel who have responsibilities in oil-spill control, especially insofar as major marine spills are concerned. Although certain training courses are available, companies feel that these are lacking in several respects, including their discussion of redundant or inapplicable subjects, the training on equipment and techniques not used in Canada, and courses too lengthy to satisfy the needs of busy managers.
2. A detailed review of all industry contingency plans submitted to the government indicates that, although the plans vary considerably in organizational detail and complexity, they all involve the same functional features, as they must to be effective. For training purposes, a generic response team chart which is applicable to all company plans was developed on the basis of this knowledge. This generalized response team contains the following six categories: an Emergency Director (A1) in overall charge of the emergency event; a Spill Superintendent (A2) in charge of the spill management team at the scene of the accident; Supervisors working for the Spill Superintendent in five specialized areas (surveillance and monitoring (B1), containment and recovery (B2), chemical dispersal (B3), shoreline protection and cleanup (B4), and disposal (B5); Foremen (C) who in turn work for the supervisors; Secondary Support Positions (D) such as marine and logistic support supervisors, lawyers, public relation officers, etc.; and finally environmental impact and spill countermeasures experts (E).

3. A detailed task analysis including job descriptions for the most important of the above response team categories was completed. On the basis of these job descriptions specific knowledge and skill requirements were developed for each job function in each position.
4. These knowledge and skill requirements were consolidated into a common set of training subjects, and the depth of training required by each response team position was then determined for each subject. This was done for two groups of subjects: one that could be taught in national or international courses (48 broad subject areas in total) and the other that would require company in-house or local training (11 subjects). These training subjects and depth-of-training indices for each category were then used as a basis for evaluating existing oil-spill training courses and for designing new training courses.

#### EVALUATION OF EXISTING COURSES

5. Existing oil-spill training courses were evaluated in detail by objectively determining how well each course satisfies the knowledge and skill requirements identified for each position category. After an initial screen, seven courses were selected for detailed analysis. It was found that, although four courses (Texas A&M, PITS, Lambton College and OCTU) are suitable for training personnel in Category C (foremen), no courses are completely suitable for the other response team positions. This is because either too little material on required subjects is taught, too much extraneous material is presented, or courses are too long to satisfy the needs of busy company officials. For the spill management positions A1 and A2, two courses were found to be suitable except for the prohibitive length of the courses (up to 10 days excluding travel time). These are the BP course in England (weak on spill management subjects) and the Canadian Government's MEMC programme in Cornwall, Ontario (weak on technical subjects). The conclusion was that new courses for all positions except foremen would require development.

## DESIGN OF TRAINING COURSES

6. Detailed curriculum and training courses for the following eight categories were developed: emergency director (A1), spill superintendent (A2), the secondary support positions (D) and the five specific supervisors (B1 to B5). The programme curriculum was constructed using a modular format so that courses containing similar subject matter could use identical training modules, and separate modules could be used, as desired, by companies with in-house training programmes. A total of 12 training modules were outlined, each described by means of detailed learning objectives. The module titles and training times for each is listed below:

1.	Introduction to Oil-Spill Behaviour	(1.3 h)
2.	Advanced Course on Oil-Spill Behaviour	(8.5 h)
3.	Overview of Oil-Spill Control Techniques	(2.4 h)
4.	Oil-Spill Response Organization and Strategies	(1.7 h)
5.	Countermeasures Overviews for Spill Superintendents	(8.8 h)
6.	Surveillance and Monitoring Techniques	(4.8 h)
7.	Containment and Recovery Techniques	(17.0 h)
8.	Chemical Dispersion Techniques	(17.9 h)
9.	Shoreline Protection and Cleanup Techniques	(13.6 h)
10.	Disposal Techniques	(8.0 h)
11.	Hands-on Experience with Equipment	(16 h)
12.	Company Simulated Spill Response Exercise	(8 h)



Courses for each of the eight categories, stated in terms of the above modules, would be as follows:

<u>Position Category</u>	<u>Training Modules Required</u>
A1 - Emergency Director	1, 3, 4, 12
A2 - Spill Superintendent	2, 4, 5, 12
B1 - Surveillance Supervisor	2, 3, 4, 6, 12
B2 - Containment and Recovery Supr.	2, 3, 4, 7, 12
B3 - Dispersant Supervisor	2, 3, 4, 8, 12
B4 - Shoreline Cleanup Supr.	2, 3, 4, 9, 12
B5 - Disposal Supervisor	1, 3, 10, 12
C - Foremen	1, 3, 11
D - Support Advisers	1, 3, 4, 12

#### PROGRAMME IMPLEMENTATION

7. Assuming that there is a significant market demand for the Canadian Oil Spill Programme, the priorities for implementation of the 12 modules were briefly examined. The tentative conclusion was that they should be developed in the following order: Modules 2, 4, 3, 5, 1, 8, 9, 7, 6 and 10.

## RECOMMENDATIONS

1. It is recommended that a market survey of companies in Canadian offshore oil and gas industry be performed to determine the current and future oil-spill training requirements that each has with respect to the response team categories identified in this report.
2. After the market analysis is completed, the industry should outline a plan and schedule for developing and implementing the training modules recommended in this report.
3. The remaining budget for this study should be used to develop the highest priority modules (as determined by the market analysis) and further funds should be identified to complete the Canadian Oil Spill Training Programme to a viable level.
4. The industry should investigate and determine the delivery system for the programme, including perhaps the use of existing training establishments, that most satisfies its needs.

**APPENDICES**



## APPENDIX I

### COMPANIES INTERVIEWED AND QUESTIONS ASKED FOR TRAINING NEEDS ANALYSIS

#### COMPANIES INTERVIEWED

Esso Resources Canada Ltd.

Dome Petroleum Ltd.

Petro-Canada Resources

Mobil Oil Canada Ltd.

Gulf Canada Resources Ltd.

PanCanadian Petroleum Ltd.

Husky Oil Operations Ltd.

Canterra Energy Ltd.

Bow Valley Industries Ltd.

Suncor Inc.

Chevron Canada Resources Ltd.

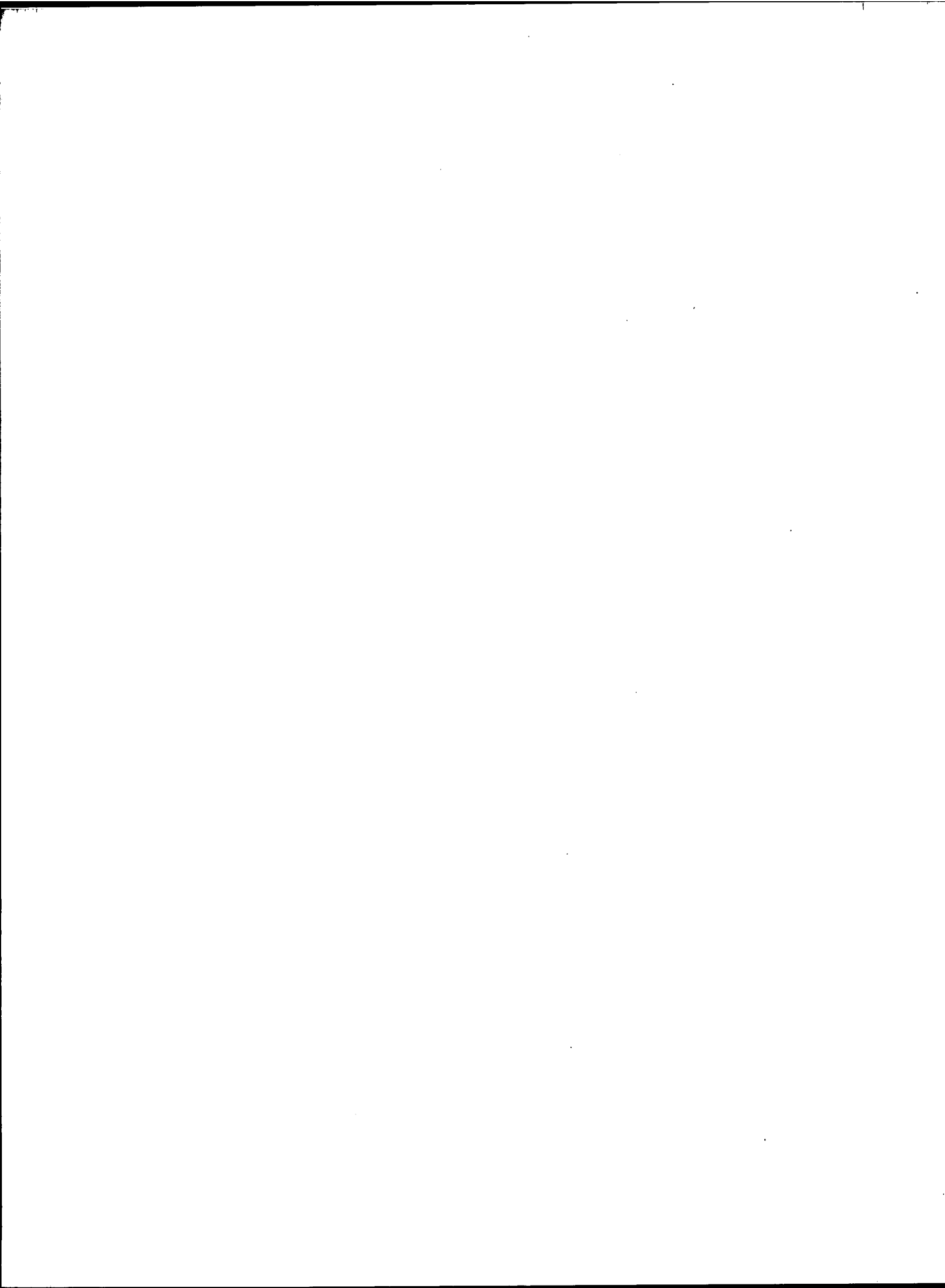
Shell Canada Resources Ltd.

#### SOME QUESTIONS RELATED TO NEEDS ANALYSIS

1. Explain in general your company's interest in the development of a Canadian oil spill control training and certification program.
2. What types of spill situations should the training program cover? Spill type (blowout, tanker etc.)? Size of spill? Land vs offshore?
3. What spill response team positions are in your current contingency plan(s)? Do you anticipate changes in the future?

4. Which of these positions are important enough to warrant significant expenditures towards training? Rank the positions in terms of such importance.
5. For each of the important positions, describe the major training problems you see. What is the magnitude of the training effort for each position? Rank the positions in terms of training costs.
6. Estimate the number of people in your organization requiring training.
7. Estimate how frequently each of the positions is staffed: One year? Two years? etc.
8. To what extent does your company rely on industry oil spill co-ops and cleanup contractors? Do the answers to the above questions apply for your contractors and for co-op individuals?
9. What existing training programs does your company take advantage of? What is your evaluation of the training courses you have attended in their ability to satisfy your company's needs?
10. What certification scheme do you feel is appropriate for the Canadian oil spill training program? Who should control the certification process? Government? Industry? Government/Industry jointly?

11. To what extent should government be involved in the ESRF sponsored Canadian oil spill program?
  
12. Explain any relevant policies or approaches your company has on training that might help in the design of a Canadian oil spill training program, e.g.
  - (a) limits on length of absence from work for training
  - (b) limits on travel, tuition, accommodation costs, etc.
  - (c) potential union problems regarding training
  - (d) acceptability of foreign courses for lower level employees
  - (e) in-house vs outside training
  - (f) financial incentives for receiving certified training
  - (g) etc.





## APPENDIX II

### OIL SPILL RESPONSE TEAM TRAINING CONTENT BY JOB FUNCTION

(Note: Often the same knowledge and skill requirements apply in more than one job function for a given position. For convenience, these requirements are not repeated within the same position; repetitions do occur, however, from one position to another since each position job description must stand independently of the others)

#### CATEGORY A1: EMERGENCY DIRECTOR

<u>Knowledge and Skill Requirements</u>	<u>Priority</u>
Function 1      Source Shut-off and Initial Containment	
a) Well control procedures, techniques and implications re other emergency operations;	L
b) Spill response equipment on hand for initial containment;	L
c) Implications of ignition of well.	H
Function 2      Command Centre Location	
a) Factors affecting command centre location: communications, support staff availability, accommodations, transportation, government/media liaison, access to site.	L

Priority

Function 3      Alerting and Notification

- |  |   |
|--|---|
| a)    Contacts to be made within and outside company to alert re possible impact;                        | H |
| b)    Contacts to be made within and outside company to notify that spill has occurred and action taken. | H |

Function 4      Severity of Spill

- |  |       |
|--|-------|
| a)    Fate and behaviour of oil based upon type and amount of oil spilled, season, weather, currents;  | M     |
| b)    Potential spill impacts from perspective of<br>1) environment, 2) socio-economics, 3) public relations;  | H/H/H |
| c)    Classification of spills as minor, intermediate and major according to amount, impact, and level of response in personnel and equipment required for control;  | H     |
| d)    General capabilities of equipment and personnel available locally, through co-ops and from government agencies;  | M     |
| e)    Implications of setting levels of response with respect to public reaction, government requirements government/industry liaison level required, cost of response and level of effort required in the company | H     |

Function 5      Activating Response Team

- a) Response team personnel, job functions and responsibilities; H
- b) Updating severity evaluation based upon source control operations, surveillance and tracking reports, ice and weather requirements, sampling operations, and availability of specialized help H

Function 6      Spill Response Operations

- a) Overall strategies for dealing with spills and basic features of all operations; interdependence of various facets of a spill response; H
- b) Overall manpower and equipment requirements re spill size; cost factors re spill size; H
- c) Implications of well control/salvage operations to spill response re operational conflicts, equipment and personnel assignments; H
- d) General surveillance methods, capabilities and limitations of remote sensing and spill detection equipment; M
- e) Decision-making regarding general problems of containment, recovery, and logistics and supply; H
- f) General dispersant-use decisions re government regulations, environmental trade-offs and logistics and supply; H
- g) Problems of shoreline cleaning re oil type, energy level, monitor-only response, and general cleanup priorities, importance of restoration, manpower requirements and logistics; H
- h) General description of transport and storage options, advantages and disadvantages; implication of emulsions and emulsion breaking, transport equipment logistics; L

- i) General description of problems of disposal; M
- j) Legal liability, liability limits, insurance coverage, claims procedures and limits, compensation process; H
- k) Budgeting and record-keeping for the spill response operation, spending limits, reporting;
- l) Kinds of activity which require government approval; H
- m) Implications of media briefings in areas of responsibility and liability; H
- n) Form and style of media presentations. H

## CATEGORY A2: SPILL SUPERINTENDENT

### Knowledge and Skill Requirements

### Priority

#### Function I Plan of Action

- |    |   |       |
|----|---|-------|
| a) | Overall strategies for dealing with spills and basic features of all operations; interdependence of various facets of a spill response;   | H     |
| b) | Overall manpower and equipment requirements re spill size; cost factors re spill size;  | H     |
| c) | Spill response equipment on hand for initial containment;   | H     |
| d) | Methods of on-site containment using readily available materials;   | H     |
| e) | On-site facilities for temporary storage of recovered oil;  | M     |
| f) | Fate and behaviour of oil based upon type, amount, season, weather, currents;   | H     |
| g) | Potential impact re 1) environment, 2) socio-economic and 3) public relations perspectives;   | H/L/L |
| h) | Capabilities of equipment and personnel available locally, through co-ops and from government agencies  | H     |
| i) | Implications of different levels of response with respect to costs and level of effort within company;  | H     |
| j) | Surveillance methods, capabilities and limitations of remote sensing and spill detection equipment re sea state, temperature, ice conditions, methods for prediction of oil fate and behaviour; | H     |
| k) | Decision-making with respect to detailed practical problems of containment, recovery, logistics and supply;   | H     |
| l) | Dispersant-use decisions re government regulations, environmental trade-offs and logistics and supply;  | H     |

Priority

- m) Shoreline cleanup re oil type, energy level, appropriate response, cleanup priorities, restoration, environmental impact implications, manpower and logistics requirements; H
- n) Transport and storage options re advantages and disadvantages of each, implications of emulsions, emulsion breaking, transport equipment logistics; H
- o) Disposal options re capabilities and limitations of flare burners, incinerators, landfills and burial, land farming, recycling, regulations and long-term environmental implications; H
- p) Air support surveillance and remote sensing air safety-zone authority, capabilities and limitations of aircraft, airborne dispersant systems with respect to weather and payload restrictions, availability, effectiveness and cost; H
- q) Budgeting and record-keeping for spill response operations. M

Function 2      Equipment Supply

- a) Knowledge of all spill response equipment in a generic sense re capabilities and limitations; H
- b) Availability of all equipment locally and regionally in accordance with company contingency plan; H
- c) Major pieces of equipment available in Canada and internationally; L
- d) Where and how to access spill equipment nationally and internationally; L
- e) Need for compatibility of different pieces of equipment; L

Priority

- f) Problems of logistics and costs of obtaining equipment from outside the company; M
- g) Availability of ancillary equipment L

Function 3 Spill Response Direction

- a) General effectiveness of available containment and recovery equipment re sea state, wind, weather, currents and spill characteristics; H
- b) Limitations placed on use of equipment by external operating conditions; H
- c) Storage options for dealing with recovered oil such as tankers, barges, pillow tanks, dracons, etc. with their advantages and disadvantages; M
- d) Setting shoreline cleanup priorities; general methods of shoreline protection and cleanup; general description of environmental impact of shoreline oiling and its implications for cleanup activities; manpower and equipment requirements for all major shoreline countermeasures; H
- e) Disposal site locations available; actions to obtain unlisted site locations, disposal site approvals; L
- f) Dispersant effectiveness re dispersant type, oil properties, weather conditions, sea state, temperature, logistical problems of dispersant application, sources of supply and costs of dispersant, aircraft, vessels and manpower; H
- g) Surveillance methods re capabilities and limitations of remote sensing and spill detection equipment re sea state, temperature, ice conditions; H

Priority

- h) Practical experience in the direction of real or simulated spill response operations; H
- i) Interdependence of various facets of a spill response H

Function 5 Safety and Security

- a) Safety and security aspects of all spill response operations; H
- b) Safety precautions re specific major pieces of equipment and re operations near aircraft. H



## CATEGORY B1: SURVEILLANCE SUPERVISOR

<u>Knowledge and Skill Requirements</u>	<u>Priority</u>
Function I      Recommends Techniques	
a) Surveillance equipment on hand for immediate use;	H
b) Fate and behaviour of oil based upon type, amount, season, weather, currents;	H
c) Capabilities of equipment and personnel available locally, through co-ops and from government agencies, re company contingency plan;	H
d) Surveillance methods in detail; capabilities and limitations of remote sensing equipment re sea state, temperature, ice conditions; capabilities and limitations of aircraft re weather, payload restrictions, effectiveness and cost;	H
e) Availability of major pieces of surveillance equipment in Canada and internationally;	H
f) Where and how to access surveillance equipment nationally and internationally	H
g) Need for compatability of different pieces of surveillance systems and equipment;	H
h) Problems of logistics and costs of obtaining equipment from outside company;	H
i) Availability of ancillary equipment;	H
j) Limitations placed on use of equipment by external operating conditions.	H

Priority

Function 3 Directs Operations

- a) Practical experience directing real or simulated surveillance operations. H

Function 4 Surveillance Data

- a) Interpretation and analysis of data provided in layman's terms from each available system, excluding first order data; H
- b) Consolidation and conclusions from all surveillance sources. H

Function 5 Summaries and Projections

- a) Methods of predicting oil fate and behaviour; H
- b) Preparation of summaries and projections. H

Function 6 Effectiveness

- a) Methods of evaluating surveillance results. H

Function 7 Safety and Security

- a) Safety and security of surveillance operations; H
- b) Safety and security aspects of specific equipment and working near aircraft. H

## CATEGORY B2: CONTAINMENT AND RECOVERY SUPERVISOR

<u>Knowledge and Skill Requirements</u>	<u>Priority</u>
Function 1      Recommends Techniques	
a) Principles of operation of containment and recovery equipment and techniques suitable for all spills to be encountered, from local, regional, national and international sources;	H
b) Containment and recovery equipment and materials on-site for initial containment;	H
c) Fate and behaviour of oil based on type, amount, season, weather, and currents;	M
d) Capabilities of equipment and personnel available locally, through co-ops and from government agencies;	H
e) Effectiveness of available containment and recovery equipment re sea state, wind, weather, currents and spill characteristics;	H
f) Limitations placed on use of equipment by external operating conditions;	H
g) Offshore storage options for dealing with recovered oil, with their advantages and disadvantages;	H
h) Conventional methods of booming shorelines for protection:	H
i) Manpower and equipment requirements for all containment and recovery operations;	H
j) Availability of major pieces of containment and recovery equipment in Canada and internationally, and where and how to obtain them;	H
k) Availability of ancillary equipment;	H
l) Problems re logistics and costs of obtaining equipment from outside company;	M

Priority

- m) Safety and security aspects of all containment and recovery operations; H
- n) Safety precautions re specific major pieces of equipment and re operations near aircraft. H

Function 2 Directs Operation

- a) Hands-on experience with all types of locally available equipment or their equivalents; H
- b) Practical experience directing real or simulated containment and recovery operations. H

Function 3 Evaluates Effectiveness

- a) Evaluation of containment and recovery operations including recovery rates, emulsified vs non-emulsified oils; H
- b) Methods of measuring oil content in holding and storage facilities. H

Function 4 Repositioning Resources

- a) Weather and current changes (actual and forecast) requiring repositioning of resources; H
- b) Improving recovery rates by repositioning; H
- c) Logistics and support requirements for repositioning; H
- d) Practical experience in repositioning operations. H

Priority

Function 5    Repair and Maintenance

- |    |   |   |
|----|---|---|
| a) | Main aspects of equipment servicing and repair; | M |
| b) | Causes of equipment wear and failure.           | H |



## CATEGORY B3: CHEMICAL DISPERSAL SUPERVISOR

<u>Knowledge and Skill Requirements</u>	<u>Priority</u>
Function 1      Dispersability	
a)    Dispersant effectiveness re dispersant type, oil properties, weather conditions, sea state, temperature, logistical problems of application;	H
b)    Methods to determine dispersibility of oil.	H
Function 2      Dispersing Techniques	
a)    Detailed description of all dispersing techniques with their advantages and disadvantages	H
b)    Dispersant-use decisions in detail re environmental trade-offs, logistics, supply and cost.	H
Function 3      Approvals	
a)    Government regulations and guidelines; requirements for obtaining approvals.	H
Function 4      Equipment Sources	
a)    Equipment, supplies and manpower required for each dispersing technique;	H
b)    Sources of dispersant equipment and trained personnel.	

Priority

Function 5 Directing Operation

- a) Areal identification of oil slicks warranting dispersal; H
- b) Practical experience in the direction of real or simulated dispersal operations. H

Function 6 Evaluation

- a) Field evaluation methods of dispersant operations; H
- b) Sampling objectives, techniques and problems. H

Function 7 Repairs

- a) Main aspects of equipment maintenance and repair. M

Function 8 Safety

- a) Safety aspects of dispersant operations by specific method. H



## CATEGORY B4: SHORELINE CLEANUP SUPERVISOR

<u>Knowledge and Skill Requirements</u>	<u>Priority</u>
Function 1      Recommends Techniques	
a) Knowledge of shoreline processes; main methods of shoreline protection and cleanup; environmental impact of shore oiling and its implications for cleanup; manpower and equipment requirements for major shoreline countermeasures; environmental implications of cleanup operations; restoration techniques;	H
b) Transport and storage problems related to shoreline cleanup;	H
c) Methods of overcoming shortages of supplies, equipment and personnel;	
d) Capabilities and limitations of shoreline cleanup equipment;	H
e) Availability of equipment and personnel locally and regionally through co-ops and from government agencies;	H
f) Availability of major pieces of shore cleaning equipment in Canada and internationally and how to access them;	H
g) Need for and importance of expert advice;	H
h) Problems re logistics and costs of obtaining equipment from outside company;	H
i) Limitations placed on use of equipment by external operating conditions;	H
j) Safety and security aspects of all shoreline cleanup operations;	H
k) Safety precautions re specific major pieces of equipment.	H



## CATEGORY B5: DISPOSAL SUPERVISOR

### Knowledge and Skill Requirements

### Priority

#### Function 1      Recommends Techniques

- |    |   |   |
|----|---|---|
| a) | Disposal options, capabilities and limitations of each;   | H |
| b) | Capabilities of equipment and personnel available locally, through co-ops and from government agencies    | H |
| c) | Methods of overcoming shortages of equipment, supplies and personnel;                                     | H |
| d) | Availability of major pieces of equipment in Canada and internationally and where and how to obtain them; | H |
| e) | Need for compatibility of different pieces of equipment;  | H |
| f) | Problems re logistics and costs in obtaining equipment from outside company;                              | H |
| g) | Temporary storage options and their advantages and disadvantages;   | H |
| h) | Environmental implications and cost factors related to disposal options;                                  | H |
| i) | Municipal and provincial guidelines and regulations re disposal methods;                                  | H |
| j) | Effectiveness of disposal methods in the long-term;   | H |
| k) | Disposal site locations available, actions to obtain unlisted site locations;                             | H |
| l) | Safety and security aspects of disposal operations and equipment.   | H |

#### Function 4      Approvals

- |    |   |   |
|----|---|---|
| a) | Obtaining government approvals for use of disposal methods; | H |
| b) | Approvals for development of new disposal sites.            | H |

Priority

Function 5 Directs Operations

- a) Practical experience in the direction of real or simulated spill disposal operations. H

Function 6 Effectiveness

- a) Short-and long-term problems of disposal and their solution. H

Function 7 Repair and Maintenance

- a) Main aspects of equipment servicing and repair; M
- b) Causes of equipment wear and failure. H

## CATEGORY C: WORKCREW FOREMEN

### Knowledge and Skill Requirements

### Priority

#### Function 1 Using Equipment

- a) Basic understanding of the properties, fate and behaviour of oil spills based on type, amount, season, weather, currents; H
- b) General knowledge of working principles of specific equipment to be used; capabilities and limitations with respect to different types of oil; H
- c) Practical hands-on experience with locally and regionally available equipment during real or simulated spills. H

#### Function 2 Maintenance and Repair

- a) Routine maintenance and minor field servicing of all equipment for which responsible. H

#### Function 3 Safety and Security

- a) Safety and security of field operations; H
- b) Safety and security aspects of equipment for which responsible and of working near aircraft. H



## APPENDIX III

### LIST OF OIL SPILL TRAINING ORGANIZATIONS CONTACTED

Director of Training  
Warren Spring Laboratory  
P.O. Box 20  
Gunnels Wood Road, Stevenage  
Herts, England SG1 2BX

Director of Training  
B.P. Research Centre  
Sunbury-on-Thames  
Middlesex, England TW16 7LN

Director of Training  
B.P. International Limited  
Environmental Control Centre  
Britannic House, Moor Lane  
London, England EC2Y 9BU

CONCAWE  
Attn: Director of Training  
Koningin Julianaplein 30-9  
2595 AA Den Haag  
Netherlands

Director of Training  
State Pollution Control Authority  
Box 8100, Oslo DEP  
Oslo, Norway

Mr. Terence M. Hayes  
Inter-Regional Consultant, Maritime Pollution  
U.N. International Maritime Organization  
4 Albert Embankment  
London SE1 7SR

National Swedish Board for Technical Development

Attn: Dallberg C.

Chief Executive Officer

FACK S-100

72 Stockholm, Sweden

U.S. Environmental Protection Agency

Spill Prevention Branch

Oil and Special Materials Control

Division WH 543

Washington, DC 20460

U.S.A.

U.S. Environmental Protection Agency

Attn: Wilder, I

Chief Oil and H.M. Spills Branch

Edison, NJ 08817

U.S.A.

U.S. Environmental Protection Agency

Attn: Lukco, BJ

National Training and Operational Technology Centre

Yorktown, VA 23690

U.S.A.

Director of Training

Marine Safety School

U.S. Coast Guard Res. Training Centre

Yorktown, VA 23690

U.S.A.

Department of the Navy

Naval Facilities Engineering Command

Attn: Director of Training

200 Stovall Street

Alexandria, VA 22332

U.S.A.



Oil and Hazardous Material Control  
Training Division  
Texas Engineering Extension Service  
Texas A&M University System  
F.E. Drawer K  
College Station, TX 77843  
U.S.A.

National Spill Control School  
Corpus Christi State University  
6300 Ocean Drive  
Corpus Christi, TX 78412  
U.S.A.

Crowley Environmental Services Corp.  
3400 E. Marginal Way South  
Seattle, Washington 98134  
U.S.A.

Mr. J.R. Mortenson  
Clean Bay Inc.  
2070 Commera Ave.  
Concord, CA 94520

Clean Bay Inc.  
Ste 220  
2280 Diamond Blvd.  
Concord, CA 94520

Clean Sound Co-operation  
2406 13th Avenue S.W.  
Seattle, WA 98134

College of Fisheries  
Oil Spill Countermeasures Training Unit  
Attn: Capt. Jack J. Strong  
P.O. Box 1860, Parade Street  
St. Johns, Newfoundland  
AIC 5R3

Petroleum Industry Training Service

2115 27th Avenue N.E.

Calgary, Alberta

T2E 7E4

Lambton College of Applied Arts and Technology

P.O. Box 969

1457 London Road

Sarnia, Ontario

N7T 7K4

The Banff Centre

School of the Environment

Box 1020

Banff, Alberta

T0L 0C0

Gulf Marine Management Co.

P.O. Box 1167

Pittsburg, PA 15203

Mr. Michael R. Lynch

Northgate House

70 Bloomfield Ave.

Bath, Avon, England BA2 3AA

Canadian Coast Guard

Marine Emergencies Branch

Place de Ville, Tower A

Ottawa, Ontario

Letter to Oil Spill Training Organizations

07 September 1984

Dear:

The Federal Government of Canada in cooperation with the Canadian Oil Industry has initiated a program to develop a systematic and comprehensive approach to the training of all levels of personnel with oil spill countermeasures responsibilities in Canada. This includes the contingency planner and the various expert advisors to the O.S.C. as well as the usual members of a fully constituted response team. This work is being done under contract by S.L. Ross Environmental Research Limited and L.C. Oddy Training Design Ltd.

It is our intention not to "re-invent the wheel" but to partially satisfy Canadian training requirements by sending trainees to qualified training courses that exist in Canada and abroad. It is well known that several fine training programs exist but how well each meets Canadian needs from an overall perspective and how they might fit into a certification scheme for oil spill response personnel have yet to be determined.

To this end we have performed an initial screen of training centres and have identified yours as being one of the most promising. We thus would prevail upon you to provide us with up-to-date information on all your oil spill related courses. Our need is for more detail than is usually contained in recruiting brochures. We need to know:

- 1) The goals of each course
- 2) Target populations
- 3) Detailed course content
- 4) Training methods used
- 5) Evaluation methods
- 6) Past evaluation results.

Copies of training notes issued to students and instructors would be most helpful. A follow-up visit to promising establishments is planned.

We recognize the proprietary nature of many of the materials and wish to stress that we undertake to stringently follow all exposure restrictions and copyrights. We give our warranty that material provided in response to this request will be treated with total confidence and will not be released without written permission.

We would like to emphasize the importance of your response to this request. The development of a Canadian Oil Spill Countermeasures Training and Certification Program must be created by building upon existing training first, and extending these into areas where needs are not being satisfied, later. Of course, appropriate agreements will have to be worked out before the integration of different programs into the over-all curriculum.

Your co-operation in this endeavour will be both appreciated and recognized.

Yours truly,

S.L. Ross Environmental Research Limited  
and  
L.C. Oddy Training Design Limited

## APPENDIX IV

### PRELIMINARY COURSE SUMMARIES INITIAL COURSE SCREENING

#### B-P International Limited Oil Spills Clearance Course

<u>Duration</u>	6 days
<u>Purpose</u>	An oil spill management course for senior and middle managers worldwide.
<u>Content</u>	Fate and Effects, Strategies of Oil Clearance, Contingency Planning, Containment and Recovery, Shoreline Protection, Beach Cleaning, Equipment Theory and Demonstration, Practical Exercises by Syndicates in Beach Cleaning, Containment and Recovery, Spill Response and Media.
<u>Method</u>	Mainly lecture with some A/V. Exercises are by syndicates. Practical combines demonstration and hands-on. No formal evaluation of abilities. Instructors knowledgeable and readily adjusted to class needs.
<u>Remarks</u>	This is seen as a command course oriented to field experience, rather than a spill management course. Good use is made of exercises throughout.

## INITIAL COURSE SCREENING

Transport Canada

### Marine Emergency Management Course

<u>Duration</u>	10 days
<u>Purpose</u>	To prepare participants to successfully oversee the management of the response to a major marine emergency. The focus is on threats most likely to occur in Canadian waters.
<u>Content</u>	Pollution Countermeasures Overview, Operational Planning, Pollution Law, Incident Management, Functions, Contracts and Funds, Industry Interface, Crisis Management, Public Relations, Stress Management, Joint CAN/US Operations, Response Management, Case Studies.
<u>Method</u>	Course is designed to meet specified learning objectives. Case study method used extensively throughout, supplemented by guest speakers and instructors.
<u>Remarks</u>	Course is expressly designed for senior managers with responsibilities during marine emergencies. Successful participants will be able to resolve marine emergencies efficiently, while meeting the environmental, administrative, legal and managerial standards of the Canadian government. Some redundant topics for industry participants.

## INITIAL COURSE SCREENING

### Mobil Oil Corporation Management of Major Spill Incidents

<u>Duration</u>	4 1/2 days
<u>Purpose</u>	To prepare high level managers in the management aspects of a major spill.
<u>Content</u>	Experiences with Major Incidents, Containment and Recovery, Contingency Planning, Worldwide Response Capability, Disposal, Environmental Concerns, Dispersants, Shoreline Protection and Cleanup, Communications, Safety, Response Organization for Large Spills, Equipment Exercises, Command Post and Field Exercises.
<u>Method</u>	Combination of lectures, films and exercises. Helicopter over-flight forms basis of planning exercise. Command post exercise requires remote management by radio.
<u>Remarks</u>	An in-house course for Mobil which really simulates spill stress. Auditing by outsiders can be arranged and program design advice is volunteered.

## INITIAL COURSE SCREENING

### The Banff Centre School of Management Response Management Programs

Duration

5 days

Purpose

The Banff Centre programs deal with general management rather than training of special techniques. The Response Management Programs provide a leadership role in environmental management and responsible development of natural resources, focussing on the mutual benefits to all when sound, responsible management practices are adopted.

Content

Programs included in 1984-85 are: Native Canadian Relations and Resources Development Issues, Northern Resource Development, Strategic Planning in Resource Development, and How to Present Environmental Evidence, among others.



## INITIAL COURSE SCREENING

United States Navy  
Contingency Planning and Response for  
On-Scene Co-ordinators and On-Scene Commanders

<u>Duration</u>	5 days
<u>Purpose</u>	To prepare Navy On-Scene Co-ordinators and Commanders to meet their responsibilities in the response to oil and hazardous substance pollution incidents.
<u>Content</u>	Identification of the Problem, National Contingency Plan, Navy Response Organization, Navy Response Program, Resources, Contingency Planning Concepts and Procedures, Spill Response Roles.
<u>Method</u>	Lecture method with videotape and 35mm presentations highlighted by guest speakers from government agencies.
<u>Remarks</u>	This course is for Navy personnel and naturally devotes considerable time to matters of internal concern, but much material is of general interest also.

## INITIAL COURSE SCREENING

Texas A&M University  
Oil Spill Control Course

<u>Duration</u>	5 days
<u>Purpose</u>	To provide participants with the information and training necessary to handle an oil spill within the capabilities of available equipment and manpower.
<u>Content</u>	Contingency Planning, Communications, Security, Public Relations, Damage Claims, Properties of Oil, Movement, Containment and Cleanup, Reporting, Disposal, Equipment Design, Contractors and Cooperatives, Surveillance, Sorbents, Field Exercises.
<u>Method</u>	Mainly lectures and slides or films. Good hands-on experience with equipment.
<u>Remarks</u>	An introductory course to spill response, with particular emphasis on containment and recovery.

## INITIAL COURSE SCREENING

Corpus Christi State University  
Oil Spill Prevention and Control Course

<u>Duration</u>	5 days
<u>Purpose</u>	To present an overview of the problems created by spills of oil, with a focus on available equipment and techniques for organization and preparation to clean up these spills in all environments.
<u>Content</u>	History of Spills, Control Legislation, Physical and Chemical Reactions, Oil Spill Control, Recovery and Disposal, Equipment Exercises, Bird Rehabilitation, Communications, News Media, Underground Spills, Court Decisions, Contingency Planning.
<u>Method</u>	Lectures by instructors and guest speakers. Comprehensive text plus films and slides. Equipment demonstrations mainly.
<u>Remarks</u>	Mainly a course at the introductory level. Staff rated highly in ability to communicate with students.

## INITIAL COURSE SCREENING

Lambton College  
Major Oil Spill Control Course

<u>Duration</u>	4 days
<u>Purpose</u>	To teach detailed response guidelines which will enable trainees to join the industry-government effort to standardize procedures for response to major oil spills.
<u>Content</u>	• Properties and Behaviour of Oil, Equipment, Communications, Safety and Security, Shoreline Protection, Cleanup and Restoration, Reporting and Documentation, Contingency Planning, C.C.G., Joint CAN/US Plan, Legislation, NEELS, Public Relations, Bird Rehabilitation, Exercises.
<u>Method</u>	Mainly lectures and A/V by guest speakers. Some good hands-on with equipment.
<u>Remarks</u>	A modest extension of the Inland Oil Spill Response Course to include the international waters of the St. Clair River. Should not be taken for an "off-shore" course. Mainly introductory.

## INITIAL COURSE SCREENING

### Petroleum Industry Training Service On-Scene Spill Commander Course

<u>Duration</u>	3 days
<u>Purpose</u>	For any person who may be involved in directing and making the final decisions during the containment and recovery of an oil spill.
<u>Content</u>	Role of O.S.C., Contingency Planning, Crew Organization, River Control Point Selection, Cleanup and Disposal, Regulatory Agencies, Public Relations, Case Histories and Workshop.
<u>Method</u>	Lectures and A/V with guest speakers. Sizeable time given to workshop scenario.
<u>Remarks</u>	Course is seen as an on-site supervisor course rather than one for the O.S.C. Most technical areas are introductory. For spills in streams mainly but some sections have general application.

## INITIAL COURSE SCREENING

College of Fisheries  
Oilspill Countermeasures Training Unit  
Equipment Operator's Course (Offshore I)

<u>Duration</u>	5 days
<u>Purpose</u>	To provide potential equipment operators training in running and handling response equipment in cold ocean conditions.
<u>Content</u>	Organization, Types of Spills, Safety, Diesel Engines, Operating Small Boats, Radio Communication, Offshore Countermeasures, Nearshore Operations, Dispersant Spraying, Shoreline Cleanup and Disposal.
<u>Method</u>	Some lecture and A/V but mainly hands-on equipment.
<u>Remarks</u>	Course is for equipment operators. Considerable pains are taken to ensure each participant handles and uses each piece of equipment.

## INITIAL COURSE SCREENING

### IMO Specialized Courses

#### Marine Pollution Prevention, Control and Response

<u>Duration</u>	4 1/2 days
<u>Purpose</u>	To familiarize industry personnel with the causes, effects and response methods for dealing with oil spill incidents. Technical personnel from the maritime and petroleum fields of developing countries attend.
<u>Content</u>	Local Marine Pollution, Properties of Local Crude Oils, Behaviour, Fate and Effects of Spilled Oil, Techniques of Control, Recovery and Disposal, Aerial Identification, Sampling and Analysis, Oil Spill Equipment, International Compensation and Liability, Contingency Planning, Exercise.
<u>Method</u>	Lectures, video-tapes, slides, exercises-practical and paper.
<u>Remarks</u>	Designed for developing countries, emphasis is placed on tropical and sub-tropical environments and the development of national and regional contingency plans.

## INITIAL COURSE SCREENING

Institute of Petroleum/Warren Springs Laboratory  
Oil Pollution Control Course

<u>Duration</u>	4 days (plus two free P.M.'s)
<u>Purpose</u>	To provide training in oil pollution clean-up, equipment and techniques and the behaviour of pollutants at sea.
<u>Content</u>	Nature and Fate of Oil, Dispersants and Dispersant Application, Booming, Recovery, Beach Cleaning, Waste Oil Disposal, Contingency Planning, Prediction and Detection, Compensation, Co-operatives, Practical Equipment Exercise and Problem-Solving Scenario.
<u>Method</u>	Lecturing 50-60% with video or film from field exercises. Practical exercise include dispersant application demonstration and group work on equipment. Depth of coverage cannot be evaluated due to lack of information.
<u>Remarks</u>	This is a marine-oriented course with a major focus on dispersant use. Although for "middle and junior management" the main subjects covered do not seem strongly oriented to <u>management</u> . Nominal roles for 1983 and 1984 show world wide attendance, mainly from warmer regions - none from Canada known.



## INITIAL COURSE SCREENING

### U.S.C.G. Marine Safety School Response Training Module

<u>Duration</u>	3 1/2 weeks
<u>Purpose</u>	To train Coast Guard and other selected response personnel to plan and respond to emergencies involving oil and hazardous chemicals. The training is open to a limited number of students from various government entities but is <u>not available to students from industry or the private sector.</u>

## INITIAL COURSE SCREENING

### CONCAWE

#### Oil Spill Clean-up Technology Task Forces

Duration

No courses given

Purpose

CONCAWE is the oil companies' European organization for environmental and health protection. Under CONCAWE task forces have been established to prepare a number of reports and field guides dealing with all aspects of land-based spill response, including both onshore and inshore.

Content

A severely limited list of CONCAWE publications includes: Disposal Techniques for Spilt Oil, A Revised Inland Oil Spill Clean-up Manual, A Field Guide to Coastal Oil Spill Control and Clean-up Techniques, Characteristics of Petroleum and Its Behaviour at Sea, and Principal Response Activities for Coastal Oil Spills in Europe.

## INITIAL COURSE SCREENING

### State of Norway Oil Spill Response Training

<u>Duration</u>	1 - 4 days depending on course
<u>Purpose</u>	Courses are provided to local authorities, and government response forces, in all phases of oil spill response from hands-on equipment training exercises and local contingency planning, to joint local-state administrative, strategic, and tactical simulations.
<u>Content</u>	Depending on the course, subjects include: Problem definition, Local committee organization, Communications, Contingency Planning, Oil Recovery Equipment, Simulation Exercises at administrative, strategic, tactical and practical levels, both ashore and at sea.
<u>Method</u>	Lectures and practical demonstrations are reinforced by extensive use of simulation exercises using fixed spill models based on real spills. Practical equipment deployment exercises are frequent.
<u>Remarks</u>	This is a government sponsored training program which appears to have successfully integrated local oil spill response training with the activities of government action committees and strike teams.



## APPENDIX V

### QUESTIONNAIRE USED IN COURSE EVALUATION INTERVIEWS

#### Course Evaluation Criteria

1. Content - Goal/Need Oriented  
Balanced  
Relevant  
Understandable
2. Methods - Appropriate  
Varied  
Effective  
Remedial
3. Presentation - Logical  
Stimulating  
Involving  
Supportive  
Timely
4. Measurement - Frequency  
Verification  
Revision  
Audience
5. General - Prerequisites  
Response Team Suitability

# CANADIAN OIL SPILL RESPONSE TRAINING & CERTIFICATION PROGRAM

Course: \_\_\_\_\_

Date: \_\_\_\_\_

## Course Evaluation Interview

### CONTENT

1. Is it made clear from the beginning what the course objectives are?
2. Are detailed learning objectives specified for each part of the course?
3. Are real life situations used to illustrate concepts and principles discussed?
4. What is the balance between theory and practical work?
5. Does the course contain substantial amounts of material that are irrelevant to the Canadian situation (e.g. gov't regulations, mangrove swamps)? Estimate a percentage.

### METHODS

1. What is the balance between lectures, films, exercises, case studies, computer games etc.
2. How do the audio-visuals used really assist in the learning beyond their entertainment value?
3. What remedial action is taken to help individuals who are unable to master course content?
4. How do the teaching methods used require the students to become actively involved in working with the subject matter?

## PRESENTATION

1. Is the allotted time sufficient for each subject?
2. Were the presenters enthusiastic about their subjects?
3. Were the presenters knowledgeable about their subjects?
4. Do the presenters get participants involved by asking questions and encouraging ideas?
5. Were remedial actions taken to help anyone having difficulty?
6. Did practical equipment sessions provide "hands-on" opportunity, or were they mostly "demonstration"?

## MEASUREMENT

1. To your knowledge, how frequently has this course been given in its present form?
2. Could the course still be effective if parts were deleted? If so, identify them.
3. Are there effective parts of the course that could "stand alone" and be used in other programs? If so, identify them.
4. Is student progress monitored during the course by tests, interviews, etc.?
5. How is student achievement of the course objectives measured?

GENERAL

1. What prerequisite training is required for entry to this course?
  
2. For what spill response team members would you recommend this course?  

<input type="checkbox"/> Emergency Director	<input type="checkbox"/> Dispersal Supervisor
<input type="checkbox"/> Spill Superintendent	<input type="checkbox"/> Disposal Supervisor
<input type="checkbox"/> C & R Supervisor	<input type="checkbox"/> Shoreline Cleanup Supervisor
<input type="checkbox"/> Surveillance Supervisor	<input type="checkbox"/> Workcrew Foremen
<input type="checkbox"/> Would <u>NOT</u> recommend	
  
3. What changes would you suggest be made to the course to make it more effective for oil spill response training in Canada?
  
4. What other comments would you like to make?



## APPENDIX VI

### SUMMARIES OF COURSES SELECTED FOR IN-DEPTH EVALUATION

#### B-P International Limited Oil Spills Clearance Course

Length: 6 days

Main Subjects:

1. Fate and Effects
2. Strategies of Oil Clearance
3. Contingency Planning
4. Containment and Recovery
5. Equipment Theory and Demonstration
6. Case History
7. Shoreline Protection
8. Beach Cleaning Exercise
9. Spray Boom Demonstration
10. Containment and Recovery Exercise
11. Spill Exercise
12. Media Exercise

Manual:

- Not directly used on course
- 8 sections
- varying formats and sources

## Depth of Coverage

1. General Spill Management  
Mostly at awareness level only. Manpower and equipment requirements and management experience covered in-depth in scenario exercise, for those whose role required it. Not covered: command centre, interdependence of spill factors, implications of non-spill operations, implications of spill type.
2. Surveillance  
General methods to awareness level only. Remainder not covered.
3. Containment and Recovery  
Medium level coverage or better on most. Best covered section of the course but off-shore transfer and storage, and evaluation of operations not covered.
4. Dispersion  
Mainly awareness only but notes go much further (but not used in class). Logistics, decision-making, aerial identification and Canadian regulations not covered. No practical experience.
5. Shoreline Cleanup  
General awareness level for about half of required content. Availability of equipment, need for expert, priority setting, practical experience directing operations and fate prediction not covered.
6. Disposal  
Mainly not covered. General awareness re techniques and limitations.

## Methods

Mainly lecture method with some A/V. Syndicate exercises on contingency planning and media. A role-play scenario exercise completes the course. Practical work combines demonstration and hands-on.

## Evaluation

No testing of students in formal sense. Scenario exercise is evaluated by discussion of group actions. Program evaluated by Training Division, probably by questionnaire.

## Presentation Quality

Knowledgeable staff. Some presentations too theoretical.

## Conclusion

Weak on spill management, surveillance and disposal. More of a Command Course oriented to field experience. Main focus on Containment and Recovery. Content is at level 1 for other subject areas. Experience directing different spill response activities is available during the scenario exercise, but this would only be for those fortunate enough to be selected for directing position.

## COURSE SUMMARY

### Transport Canada Marine Emergency Management Course

Length: 10 days

Main Subjects:

1. Pollution Countermeasures Overview
2. Pollution Countermeasures Systems
3. Joint CAN/US Plans and Operations
4. Operational Planning and Exercise
5. Stress Management
6. Major Marine Disaster (Kurdistan)
7. Incident Management Functions
8. Industry Interface
9. Media Relations and Media Encounter
10. Pollution Law
11. P. and I. Clubs
12. Response Management
13. Crisis Management in the Public Service
14. Case Studies (5)

Manual:

Assembled for each course. Not available.

## Depth of Coverage:

### 1. General Spill Management

In-depth coverage of command centre factors, response organization, media implications and presentations. Medium coverage on potential spill impact. Other requirements to awareness level except differences batch and continuous not covered.

### 2. Surveillance

Awareness level on methods, limitations and a/c safety zone authority. Remainder not covered.

### 3. Containment and Recovery

General awareness on equipment, effectiveness and via case studies directing operations. Not covered: basic methods, offshore transfer and storage, hands-on experience, evaluation of operation and repositioning.

### 4. Dispersion

General awareness on dispersants, techniques, logistics, effectiveness, and government requirements. Not covered: field evaluation, decision-making, aerial identification and practical experience.

### 5. Shoreline Cleanup

Not part of this course but, as with some other subject areas, is contained in various handouts (eg. CONCAWE publications). Environmental impact, priority setting, cleanup problems covered to introductory level.

### 6. Disposal

Disposal techniques, effectiveness of methods, and practical experience not covered. Introductory level on environmental implications.

#### Methods:

Lectures, exercises and case studies are all used. Evening work by syndicates is expected for 5 case studies. Some slides and films also used - eg. Black Tide and a film on group behaviour. Discussion and sharing experience is encouraged. Guest speakers and consultants are guided by lesson plans and terminal behaviour objectives.

#### Evaluation:

Informal only: Student questionnaire used for each subject area re relevance. Final case study is evaluated by teams. Media presentatins are judged for effectiveness.

#### Conclusion:

This is an excellent course for predesignated OSC's in government, but it requires 10 days and cannot be shortened. Sections on Media Relations and Stress management could be transferred to other training. Sections that would probably be redundant for industry include: Joint CANUS Plans, Kurdistan, Industry Interface, Pollution Law, P&I Clubs Crisis Management in the Public Service, and those Case Studies not dealing with management.

## COURSE SUMMARY

Texas A&M University  
Oil Spill Control Course

Length: 5 days

### Main Subjects:

1. Oil Spills in the Environment
2. Prevention, Past Experience and Planning
3. Physical and Chemical Considerations
4. Aerial Surveillance
5. Containment, Cleanup, Restoration and Disposal
6. Tools for Spill Control (incl. Communications, Sorbents)
7. Information Procedures, Legal Considerations
8. Contractors and Co-operatives
9. Federal Roles
10. Field Operations and Exercises

### Manual:

Impressive format - uniform typing, printed dividers. Gives strong impression of being organized as a textbook. Impressive breadth of content - eg. oil movement deals briefly with several local wind effects and variations in tidal currents; suggested topics for response team training; BUT level of content often Introductory only.

## Depth of Coverage:

1. Spill Management  
Interdependence of spill factors, manpower/equipment requirements or priorities of spill vs operational conflicts, batch vs continuous spills not covered. Introductory on Command Centre, strategies, media, fate and effects. Medium coverage on organization (in exercise) and implications of media briefings.
2. Surveillance  
Introductory re methods, equipment, aircraft but nothing on remainder.
3. Containment and Recovery  
Mostly medium coverage but in-depth hands-on equipment in exercise. Awareness only on evaluation and logistics.
4. Dispersion  
Logistics, field evaluation, regulations, aerial identification, or practical direction not covered. General awareness on remainder.
5. Shoreline Cleanup  
Mainly to general awareness level. Availability of equipment, prediction of fate and behaviour, and practical experience in cleanup not covered.
6. Disposal  
Introductory on effectiveness, techniques, limitations, environmental implications. No practical.



**Methods:**

Mainly lectures and slides with some films or video. Hands-on exercises with equipment. Spill response exercises - assigned/volunteered roles - video-taped and discussed.

**Evaluation:**

Questionnaire only - no tests. Some individual evaluation when video exercise is discussed.

**Conclusion:**

Although this course has a good set of notes, it is mainly an introductory course and has medium to in-depth coverage to a significant degree only in Containment and Recovery.

## COURSE SUMMARY

### Corpus Christi State University Oil Spill Prevention & Control Course

Length: 5 days

#### Main Subjects:

1. History of Spills and Control Legislation
2. Physical and Chemical Reactions
3. Prevention Programs
4. Oil Spill Control, Containment, Recovery, Disposal
5. Equipment Demonstrations
6. Rescue and Rehabilitation of Birds
7. Working with News Media
8. Biological Impact of Oil
9. Legal Decisions in Oil Spills
10. Contingency Planning

#### Course Materials:

Not available.

## Depth of Coverage:

### 1. Spill Management

Command Centre, priorities of response vs operations, media briefing practice, batch vs continuous spills and overall management not covered. Communications, organization, strategies, requirements, media and control options to awareness level. Medium on spill impact, fate and behaviour.

### 2. Surveillance

Not covered except introductory methods.

### 3. Containment and Recovery

Offshore storage, hands-on equipment, directing experiences, evaluation and logistics not covered. Introductory re equipment effectiveness, but medium coverage on basic techniques, principles of operation.

### 4. Dispersion

Logistics problems, field evaluation, decision-making, regulations, aerial identification and practical experience not covered. Introductory on basic techniques and effectiveness.

### 5. Shoreline Cleanup

Transfer and storage, manpower/equipment requirements, availability equipment, need for expert, priority setting, practical experience, predicting fate not covered. Introductory on general methods, impact, equipment capabilities.

### 6. Disposal

Environmental and cost implications and practical experience not covered. Introductory on techniques and methods.

**Methods:**

Mainly lectures, some films including those of equipment manufacturers. A/V's of superior quality. Equipment familiarization mainly from demonstrations and classroom sample.

**Presentations:**

Instructors found superior in communication abilities and were well grounded in subject matter. Attention to student problems noteworthy.

**Evaluation:**

None except in Safety area where adherence to safe practice is assured. Lack of training standards cited as reason students not evaluated.

**Conclusion:**

Mainly an introductory course with good emphasis on meeting student needs. Little if any hands-on experience with equipment.

## COURSE SUMMARY

### Petroleum Industry Training Service On-Scene Spill Commander Course

Length: 3 days

#### Main Subjects:

1. Role of On-site Spill Commander
2. Contingency Planning
3. Crew Organization
4. River Hydrology and Control Point Selection
5. Cleanup and Disposal Practices
6. Spill Equipment and Deployment Methods
7. Role of Regulatory Agencies
8. Public Relations
9. NEPCO 140
10. Workshop (1 1/2 days)

#### Manual:

Papers from a variety of sources but formats generally compatible and overall impression is very favorable. Looks like too much for 3 days, so how much do guest speakers really cover.

## Depth of Coverage:

### 1. Spill Management

Role of OSC as decision maker and manager to introductory level. Goes to medium level in contingency planning and control point selection on rivers. There seems to be a fair degree of repetition between different sections.

### 2. Surveillance

No coverage re offshore or open waters except in small lakes. In-depth coverage of stream hydrology and selection of control points in streams. Ice conditions only re streams.

### 3. Containment and Recovery

Good coverage of all equipment and methods related to streams and lakes; in-depth re boom deployment in streams.

### 4. Dispersion

Virtually nil; brief one-page reference to methods.

### 5. Shoreline Cleanup

Basic techniques covered to general awareness but PROSCARAC publication "Cleanup Methods for Oil Contaminated Stream Banks" goes much further.

### 6. Disposal

Good general description of methods in reference noted in (5.) above.

## Additional

Significant sections on Safety, Government Role, Public Relations (especially detailed), Guidelines for Training Exercises.

**Methods:**

Largely lectures by industry speakers, but about half by W. Wiebe. Workshop is paper exercise using team problem-solving. Reports by teams would reduce discussion, we feel.

**Evaluation:**

Student questionnaire only - no amount of detail, topics missing or redundant, relevance to needs and level of content.

**Presentation Quality:**

Not evaluated.

**Conclusion:**

Course is for the on-site spill manager for spills into rivers and lakes rather than the O.S.C. Relies mainly on several PROSCARAC publications and often does not appear to go as far into the subject matter as they do. Best coverage is in field of spill management, but not for the high level Emergency Director. Most technical areas to introductory level except boom deployment in-depth and shoreline cleanup to medium level in streams. Course is clearly geared to meet Alberta inland needs.

## COURSE SUMMARY

### Lambton College Major Oil Spill Response Course

Length: 4 days

#### Main Subjects:

1. Canadian Oil Industry Spill Response
2. Contingency Planning
3. Role of O.S.C.
4. Industry Equipment (Co-op Slide Presentation)
5. Communications
6. Behaviour of Oil Spills
7. Safety and Security
8. Role of C.C.G. and Joint CAN/US Plan
9. Shoreline Protection
10. Cleanup and Restoration, Disposal
11. Cleanup under Ice
12. Legislation (Ontario)
13. Reporting and Documentation
14. Public and Media Relations
15. Scenario Exercise (St. Clair River Collision)

#### Manual:

Copious manual. For 4 day course looks like any in-depth coverage would be difficult. For our purposes, there are quite a few redundant sections.



## Depth of Coverage:

### 1. Management

Command Centre, interdependence, spill vs operational priorities, impact, types of spills, implications re strategies, practical experience not covered. Remainder to awareness level except medium level on communications.

### 2. Surveillance

Not covered.

### 3. Containment and Recovery

Introductory on basic methods, principles of operation, some hands-on equipment and some coverage of logistics. Effectiveness, offshore transfer and storage, practical experience directing and evaluation of operation not covered.

### 4. Dispersion

Not covered. Some very brief reference in notes.

### 5. Shoreline Cleanup

Transfer and storage problems, availability of equipment, need for expert, practical experience or prediction not covered. Introductory on protection, processes, methods, techniques and equipment, manpower requirements, priorities, completeness of cleanup. Environmental impact only to medium level.

### 6. Disposal

Nil on most sections, very brief reference to disposal options.

Methods:

Based on methods in inland course - mainly lectures with some A/V's where available. Mixture of industry and college instructors. Very uneven quality of lecture presentation and no learning objectives stated to ensure volunteers are consistent. Scenario method uses team reports, making significant discussion or exchange unlikely.

Evaluation:

No evaluation on student progress. Questionnaire completed by students of very general nature..

Conclusion:

Course may attempt too much in 4 days and must cover almost everything at an introductory level only. Nil on marine (saltwater) situations; is intended for inland waters. Appears to have limited hands-on equipment sessions - unlike the inland course.

## COURSE EVALUATION SUMMARY

OCTU College of Fisheries  
Equipment Operators' Course  
(Offshore One)

Length: 5 days

Main Subjects:

1. Safety at the Spill Scene
2. The Environment
3. Oil Spills in Cold Oceans
4. Contingency Plans
5. Oil Characteristics
6. Containment Equipment  
(in detail Hurum Boom, Vikoma Seapack, Vikoma Oceanpack)
7. Recovery Equipment  
(Vikoma Seaskimmer, Framo, Cargo Pumps, Miniskimmers)
8. Dispersants and Beach Cleaning
9. Warren Springs Equipment
10. Examination of Equipment and Deployment Exercises

Manual: Equipment Operators' Course Manual

Used for "Offshore One and Two" and as a basic reference for "Command One".

### Depth of Coverage:

In addition to specific and detailed instructions on setting up and operating oil spill response equipment for offshore and nearshore operations, the course includes brief sections on spill response organization, types of spills, safety, radio communications, shoreline cleanup and disposal. The role of wind, waves, temperature and ice are also very briefly referred to. All subjects covered to introductory or awareness level supported by significant hands-on practice with all equipment, both ashore and afloat. Preventive maintenance and troubleshooting is covered on the follow-up course "Offshore Two".

### Methods:

Lectures are kept to a minimum. Practical work begins with demonstration and examination of equipment and continues with extensive practice on all phases of equipment operations. Several films are shown.

### Evaluation:

No formal tests are given but each participant's ability to properly use each piece of equipment correctly and safely is checked against checklists during practical sessions.

### Conclusion:

This is an operator's course, with the least amount of theory included consistent with the operator understanding what he is trying to do.

## APPENDIX VII

### EXPLANATION OF STATISTICAL ANALYSES

For each course, the course scores were compared to the training requirements for each course subject. The various statistical analyses used to compare the courses are described below. Table 4 presents a summary of the statistical analyses.

#### I. Course Content: Satisfactory Coverage

For each training category, the number of non-zero training requirement values were counted. (For example, the AI category requires some training in 28 of the 48 identified course subjects.) The course scores were then compared to the training requirement values for each subject area. For this analysis, satisfactory coverage of a particular subject was defined as the course providing training within  $\pm 1$  of the specified training requirement. Of the required course subjects (i.e., 28 for the AI level) the percentage that are satisfactorily covered was calculated for each course.

Using the  $\pm 1$  mark range for satisfactory coverage allows some latitude in comparing course coverage to training requirement. At least for an initial indication of course suitability it was felt unwise to judge too strictly. However it must be noted that giving a satisfactory rating to a course subject which scores one mark less than required does present some difficulties. The two cases of a) a subject requiring level 3 and the course providing level 2, and b) a subject requiring level 1 and the course providing level 0 - are both considered in the calculation as satisfactory coverage though neither is truly acceptable. It is a moot point which is worse; in the case of the former, the wide gap of training between level 2 (concepts and principles) and level 3 (in-depth knowledge) is ignored, and in the latter case a general awareness

requirement is not covered at all. Recognizing this problem, the measurement is used only as an initial indication and a stricter criterion is used below in sub section 2.

## 2. Course Content: Exact Coverage

This calculation was done as above but in this case the  $\pm 1$  mark range for satisfactory coverage was not used. Only the course subjects which were covered at exactly the right level were counted in this percentage. Using this much stricter criterion for course content results in a good indication of which courses suit specific training needs rather than trying to suit a broader range of training categories.

## 3. Extraneous Material

This is essentially a measure of the percentage of course units not required by a particular category. For this calculation, the sum of a course's subject scores is taken as the total course units. This reflects, somewhat, the time a course devotes to the 48 subjects. Of the total course units the percentage not required by a particular category was calculated. For example, adding all of the subject scores of the BP course results in a sum of 49. Comparing each score, subject by subject, with the training requirement for the A2 category, the BP course provides greater than required training for subjects #19 (+1), #24 (+3), #25 (+1) and #28 (+1). The sum of plus scores is six, as a percentage:  $6/49 = 12\%$ .

## 4. Important Subjects: Satisfactory Coverage

This calculation was based only on the satisfactory coverage ( $\pm 1$  mark range) of subjects requiring level 2 or level 3 training, the rationale being that coverage of these subjects is more important than the coverage of subjects requiring only level 1 instruction. The calculation was not done for the C and D categories as they have, with one exception, no subjects requiring level 2 or level 3 instruction.

## 5. Important Subjects: Exact Coverage

Again considering only the subjects requiring level 2 or level 3 instruction, this calculation counted only the course subjects which were covered at exactly the right level and not just within the  $\pm 1$  mark range.

SUMMARY OF STATISTICAL ANALYSES

COURSE	CATEGORY	COURSE CONTENT SATIS. COVERAGE	COURSE CONTENT EXACT COVERAGE	EXTRANEIOUS MATERIAL	IMPORTANT SUBJECTS SATIS. COVERAGE	IMPORTANT SUBJECTS EXACT COVERAGE
BP	A1	79%	32%	47%	60%	20%
	A2	77%	30%	12%	64%	21%
	B	43%	7%	16%	36%	5%
	C	93%	50%	63%	---	---
	D	81%	50%	73%	---	---
MEMC	A1	86%	61%	34%*	70%	40%
	A2	73%	20%	20%*	57%	21%
	B	23%	5%	56%*	15%	0
	C	71%	36%	95%*	---	---
	D	100%	44%	87%*	---	---
TEX A&M	A1	82%	39%	42%	50%	0
	A2	68%	18%	11%	50%	7%
	B	32%	5%	17%	23%	0
	C	100%	79%	53%	---	---
	D	94%	50%	75%	---	---



SUMMARY OF STATISTICAL ANALYSES

COURSE	CATEGORY	COURSE CONTENT SATIS. COVERAGE	COURSE CONTENT EXACT COVERAGE	EXTRANEOUS MATERIAL	IMPORTANT SUBJECTS SATIS. COVERAGE	IMPORTANT SUBJECTS EXACT COVERAGE
CORPUS CHRISTI	A1	79%	39%	41%*	40%	10%
	A2	59%	9%	24%*	36%	4%
	B	27%	7%	28%*	18%	0
	C	93%	50%	70%*	---	---
	D	94%	44%	78%*	---	---
PITS	A1	79%	29%	22%	40%	0
	A2	57%	9%	0	32%	4%
	B	23%	7%	17%	13%	0
	C	93%	50%	52%	---	---
	D	94%	44%	61%	---	---
LAMBTON	A1	71%	29%	33%	20%	0
	A2	55%	11%	10%	29%	4%
	B	23%	7%	5%	13%	3%
	C	100	50%	38%	---	---
	D	94%	63%	38%	---	---
OCTU	A1	75%	11%	55%	30%	0
	A2	43%	5%	33%	21%	4%
	B	25%	7%	6%	15%	5%
	C	79%	57%	39%	---	---
	D	94%	38%	61%	---	---

includes extraneous material discussed in Sections 3.4.2.2 and 3.4.2.4.