Environmental Excellence in Exploration


**An Initiative of the Prospectors & Developers Association of Canada**

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# 1.0 SPILL MANAGEMENT

Spills have the potential to cause severe environmental damage as well as considerable economic and image consequences for you and your employer. You must ensure that you treat any spill with great care, and deal with it promptly to minimize the possibility of it becoming a major issue.

The principal objectives of this spill management section are to

- Provide readily accessible emergency information to the cleanup crews, your management and government agencies in the event of a spill.
- Comply with your organization's environmental and crisis management policies.
- Comply with national and local regulations and guidelines pertaining to the preparation of contingency plans and notification requirements.
- Promote the safe and effective recovery of spilled materials.
- Minimize the environmental impacts of spills to water or land.
- Facilitate the management of wastes according to environmental legislation.

You should place strong emphasis on the avoidance of spills. Information on this subject is provided to you in the sections dealing with the management of Hazardous Materials. You should prominently post, in several locations, a list of co-ordinates for those to contact, and in what order, in the event of a spill

Petroleum based products are used in almost all exploration projects. Since these products are the most common hazardous material at exploration sites and are often present in large quantities, the non-material specific information in this section is geared toward helping you deal with spills of petroleum products (typically diesel-type fuels). Spills mitigation techniques for non-petroleum based hazardous materials such as antifreeze and sewage are covered in the subsection on Material Specific response and mitigation.

Much of the information provided here is intended to cover situations up to and including large spills. Information is included on dealing with small spills where appropriate. You should scale the level of organization and planning for spill mitigation to the size of your project and the amount of fuel stored at the exploration site. You should scale the amount and type of spill response equipment accordingly as well.

Many exploration activities will be carried out by companies or individuals under contract to your organization. You should ensure that contractors are fully aware of your organization's spill response plan and that appropriate contractors are involved in reporting, mitigation and documentation of spills.

## 1.1 Definition

Definition
Legal spill definitions vary depending on material, jurisdiction and environment. This section deals mainly with petroleum products as they are utilized in most exploration programs. Other hazardous materials in significant quantities are more likely encountered with mining projects.

Spill definitions vary depending on whether a spill takes place on water, land or ice. You should always be aware of and abide by local regulations.

The practical thresholds for significant (reportable) spills of petroleum products are as follows:

- Land-based spills - 70 litres.
- Spills on water - any amount.
- Spills on snow/ice - if spillage can be recovered before it enters a waterway, use and-based threshold (70l), otherwise report any spillage.

You should report any spillage of the following non-hydrocarbon materials:

- Toxic substances such as solvents and antifreeze.
- Contaminated water.
- Sewage.

You must report any spill that results in human injury or loss of wildlife.

All spills should be cleaned up regardless of size as part of regular maintenance. Reporting a spill is good business practice and can protect your company. If you report small spills and have a good relationship with regulatory bodies, you have a better chance of not being blamed for larger unreported spills that you are not responsible for.

You should be aware that some jurisdictions require that probable spills (where it is uncertain if a spill actually occurred) be reported.

You should keep in mind that using contractors for activities such as surveys, trenching and drilling does not absolve you of responsibility for spills.

## 1.2 Planning

Planning
Planning is essential to successful spill response operations. You should create a response structure that is appropriately scaled to the size of the exploration project. Proper planning is needed to ensure that

- Personnel responding to spills know their respective roles.
- Personnel respond to spills in a safe manner.
- Spills are dealt with on a timely basis.
- The proper mitigation technique is used.
- The spill and mitigation efforts are well documented and reported.

As an integral part of planning, you should

- Develop a response plan suited to spill scenarios applicable to your exploration project.
- Document this plan and ensure that spill responders are familiar with it.
- Solicit suggestions from staff familiar with local conditions.
- Review your plans on a regular basis or when the scope of your project changes.

You should also practice responding to various spill scenarios that may occur at your exploration sites.

## 1.2.1 Public

Your Spill Team Leader should be the sole contact during any spill incident. In a small company, this may be you, but you may be able to delegate this role in a larger organization. All communication with the public should be coordinated through your corporate head office if you have one.

Your Team Leader will assess the potential impact of a spill on the public and will communicate as required (for example, directly to the local fire department, if there is one) to ensure the safety of all concerned.

## 1.2.2 Responsibilities

This section provides guidelines for Spill Response Team organization. These cover situations up to and including large exploration projects. You should scale duties and responsibilities to the size of the project. Smaller projects will require individuals to cover multiple roles.

You should document the duties and responsibilities of the following:

- First Person On-Scene,
- Spill Response Team, and
- Team Leader.

You should identify and list those individuals who are designated as potential Team Leaders and members of the Spill Response Team. Their individual responsibilities are outlined below.

### *1.2.2.1 First Person on-Scene*

If you are the First Person On-Scene, you should take the following steps:

1. Assess the initial severity of the spill and safety and environmental concerns.

2. Identify the source of the spill.
3. Determine the size of the spill and stop or contain it, if possible.
4. Notify the Team Leader.
5. Immediately stop work, transfer or fuelling operations, control all sources of ignition.
6. If possible and safe to do so, put out any fire and stop any leak that may be present.
7. If possible, prevent access of spilled material to water.

#### *1.2.2.2 Team Leader*

As Team Leader, you should

1. Ensure that all safety measures are taken for the preservation and protection of human life.
2. Identify potential fire hazards and request standby or response from the Fire Response Team.
3. When safe to do so, ensure that the source of the spill is secured.
4. Notify additional trained Spill Response Team personnel, if required.
5. Restrict further operations that may interfere with a sustained response to the spill incident.
6. Evaluate the size of the response to be initiated and make assessments relating to the necessity of calling out response contractors.
7. Implement protective measures and containment procedures to minimize environmental damage.
8. Oversee containment, cleanup and restoration operations.

You should also

1. Establish internal communications.
2. Liaise with other managers, as required.
3. Establish external communications.
4. Report the spill.
5. Document all events.

You should then prepare a written report which will be sent as soon as possible to the appropriate

authorities. You should include pertinent information on the spill occurrence in the report as follows:

- Name and phone number of reporter.
- Time of spill or leak.
- Time of detection of spill or leak.
- Type of product spilled or leaked.
- Amount of product spilled or leaked.
- Location of spill or leak.
- Source of spill or leak.
- Type of accident - rupture, collision, overflow, other.

You should include in this report information on

- The owner of product and their phone number, if known.
- Whether the spill or leak is still occurring.
- Whether the spill or leaked product is contained and, if not, where it is flowing.

Your report should also identify the local climatic and other factors such as

- Wind velocity and direction.
- Temperature.
- Proximity to water bodies, water intakes and facilities.
- Tidal action (if applicable).
- Snow cover and depth, terrain and soil conditions.

You should ensure that the spill is monitored throughout the spill response process to ensure safety and to direct cleanup efforts. You should also investigate and identify measures to prevent similar spills.

If you are the project's Environment Manager, you should

- Provide cleanup advice to the Team Leader.
- Assist in the preparation of press releases.
- Develop safe and effective spill management and prevention practices.

- Provide advice to the Spill Response Team of storage and disposal options.
- Update and distribute Spill Contingency Plan.
- Ensure that the Environmental Department reports spills to the 24 hour Spill Line and obtains confirmation of receipt of spill report.

Subsequent to the spill occurrence and cleanup you should

- Ensure that there are follow-up reports prepared on the spill event, cleanup and environmental impacts.
- Ensure that Post-Spill reports are completed and take action, as necessary, to prevent a recurrence.

As part of your role, you will also be expected to

- Ensure that the Spill Emergency Response Team is adequately trained in spill response.
- Organize spill response training and exercises.
- Liaise with government agencies as required.

#### *1.2.2.3 Response Team*

The basic premise of spill response is that the Team Leader will specifically direct all aspects of any spill incident. The specific duties of the Spill Response Team members will be performed under the direction, and at the discretion, of the Team Leader. The size of the team activated (number of individuals to respond) will be based on the

- Location of the spill.
- Amount of substance spilled.
- Area over which the spill has spread.
- Environmental sensitivity of the area affected.

The Spill Response Team will consist of individuals drawn from a list of trained personnel. In small companies and organizations, these roles will probably be compressed into fewer people than in larger organizations.

If you are part of the Spill Response Team you should

1. Stop or reduce the discharge, if safe to do so.
2. Deploy booms, sorbents and other equipment and materials as required to construct

snow or earthen barriers or a ditch to contain a spill on land. Deploy solid flotation boom for spills of non-volatile products on water.

3. If possible, prevent access of spilled material to water.

4. Deploy additional spill response equipment as directed by the Team Leader.

5. Continue cleanup as directed by the Team Leader or until relieved.

6. Restore damaged environment and property as directed.

The feasibility of containing and recovering a spill will largely be determined by its location and the rate of the release, spreading, transport and evaporation. You should compare these rates with the total time needed to deploy response equipment in order to evaluate whether or not containment, or sorbent and skimming operations can be effectively implemented. If you have pre-assembled spill cleanup kits this will expedite response and reduce the total deployment time needed, including

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

The Spill Response Team will determine whether or not a spill has entered a waterway and whether or not access by land or water to control points is possible so that booms, absorbents and skimmers or vacuum trucks can be deployed. It will check maps and consult with personnel familiar with the spill area.

Your team should also establish priorities to optimize utilization of personnel and gear needed for all cleanup phases (containment, removal, storage, transfer and disposal) at selected sites, and allow additional time for adverse weather, flying or driving conditions.

### 1.2.3 Inspections

You should ensure that you fully document all inspections with written and photographic evidence.

**During a Spill Response**

You should monitor spills throughout the spill response to ensure safety and to direct cleanup efforts. You will need to determine

- Explosive gas concentrations in the atmosphere using an explosion meter.
- Spill movement and behaviour in order to properly direct response efforts.
- Any and all threats to the safety of people, property and the environment.

**After a Spill Has Been Contained**

You should monitor cleanup and restoration activities through regular documented inspection reports.

### 1.2.4 Media

During the course of a spill response, your primary objectives must be containment and corrective action. At the same time, concern is warranted for the public relations aspect of the spill. Placing the incident in perspective and offsetting any potential spread of misinformation will be the responsibility of the Team Leader. You should not, therefore, make any statement concerning a spill incident unless directed by the Team Leader. The Team Leader should be the sole contact during the incident.

Any information that you release during the initial stages of the emergency operations should be simple statements of fact including the following:

- Name of the Company.
- Time of incident.
- Spokesperson's name and position.
- Any other indisputable facts such as company steps taken for containment or cleanup.

You should include a comment to the effect that you or your company intends to do everything within its capabilities to reduce the danger of damage to property or environment. Unless clearance has been obtained from the Team Leader, you should not make any releases containing the following information:

- Damage estimate in dollars.
- Comments concerning possible cause.
- Speculations concerning liability or its legal consequences.
- Any statement to the effect that property or ecology can be completely returned to its pre-incident state.

## 1.3 Response and Mitigation

Response and Mitigation
You should only consider initiating response action if safety permits and, in the case of large spills, in conjunction with the permission and advice of regulatory agencies unless they cannot be reached.

The feasibility of containing and recovering a spill will largely be determined by its location and the rates of its

- Release.
- Spreading.
- Transport.
- Evaporation.

You should compare these rates to the total time needed to deploy response equipment in order to evaluate whether or not containment, or absorbent and skimming operations can be effectively implemented. You should ensure that you have pre-assembled spill cleanup kits to expedite response to the spill. This should also reduce the total time needed for

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

You should determine whether or not a spill has entered a waterway and whether or not access by land or water to control points is possible so that booms, absorbents and skimmers, and vacuum trucks can be deployed. You should check maps and consult with personnel familiar with the spill area.

The following subsections deal with responsing to the various materials that can be involved in a spill, and how to manage the spill on land, ice and snow and water.

## 1.3.1 Material Specific

This section contains information on the physical properties of specific hazardous materials that are often used in exploration activities. The information is provided for general guidance and the PDAC does not warrant its accuracy. You should verify the information from other sources.

Materials discussed in this section are generally divided into groups with similar physical properties and response techniques. These materials fall into three categories, which are

- Diesel, hydraulic, lube and waste oils.
- Gasoline and Jet B aviation fuel.
- Other hazardous materials.

In addition to physical properties, the subsections below give brief spill mitigation guidelines and cautions that are specific to the material discussed.

### *1.3.1.1 Diesel, Hydraulic, Lube and Waste Oils*

This section contains information on physical properties, safety and response techniques for Diesel fuel, Hydraulic Oil and Lube and Waste Oils. This information will help you to deal effectively

with a spill of any of these in your exploration program.

Each is dealt with separately in the subsections below.

## Physical Properties and Safety

**Diesel Fuel**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Clear, yellow or red
- FLASHPOINT 40°C (minimum)
- ODOUR Petroleum
- POUR POINT -50 to -6°C
- SOLUBILITY Insoluble
- VISCOSITY Not viscous
- VAPOUR Will sink to ground levels
- SPECIFIC GRAVITY Floats on water (0.8-0.9)

SAFETY MEASURES/WARNINGS

- Vapours are heavier than air and form easily at high temperatures.
- Empty containers can contain explosive vapours.
- Toxic gases form upon combustion.
- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting and unconsciousness.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles; nitrile, Viton and PVC are suitable materials. DO NOT USE NATURAL RUBBER or NEOPRENE.
- Wear full-face organic vapour cartridge respirator where oxygen is adequate, otherwise wear positive-pressure SCBA.

PRECAUTIONS

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

**Hydraulic Oil**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Straw-yellow liquid
- FLASHPOINT 215°C
- ODOUR Petroleum
- POUR POINT -25°C
- SOLUBILITY Generally insoluble
- VISCOSITY Medium (265 cSt, 15°C)
- VAPOUR Few vapours emitted
- SPECIFIC GRAVITY Floats on water (0.9)

SAFETY MEASURES/WARNINGS

- Vapours are heavier than air but are unlikely to form.
- Toxic gas can form in fire and at high temperatures.
- CO, CO2 and dense smoke are produced upon combustion.
- Oil mist or vapour from hot oil can cause irritation of the eyes, nose, throat and lungs.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles; PVC, Nitrile, and Viton are suitable materials. DO NOT USE NATURAL RUBBER.

PRECAUTIONS

- Avoid excessive heat, which can cause formation of vapours.

- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

**Lube Oil**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Amber liquid
- FLASHPOINT 190-220°C
- ODOUR Petroleum
- POUR POINT -35 to -40°C
- SOLUBILITY Generally insoluble
- VISCOSITY Medium (255 cSt, 15°C)
- VAPOUR Few vapours emitted
- SPECIFIC GRAVITY Floats on water (0.9)

SAFETY MEASURES/WARNINGS

- Vapours are heavier than air but are unlikely to form.
- Toxic gas can form in fire and at high temperatures.
- CO, CO2 and dense smoke are produced upon combustion.
- Oil mist or vapour from hot oil can cause irritation of the eyes, nose, throat and lungs.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles; nitrile, PVC and Viton are suitable materials. DO NOT USE NATURAL RUBBER.

PRECAUTIONS

- Avoid excessive heat, which can cause formation of vapours.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.

- Eliminate ignition sources.
- Restrict access and work upwind of spill.

**Waste Oil**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Black to brown liquid
- FLASHPOINT 100-200°C
- ODOUR Petroleum
- POUR POINT -30 to -40°C
- SOLUBILITY Generally insoluble
- VISCOSITY Medium (200-300 cSt )
- VAPOUR Few vapours emitted
- SPECIFIC GRAVITY Floats on water (0.9)

SAFETY MEASURES/WARNINGS

- Vapours are heavier than air but are unlikely to form.
- Toxic gas can form in fire and at high temperatures.
- CO, CO2 and dense smoke are produced upon combustion.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles; nitrile, PVC and Viton are suitable materials. DO NOT USE NATURAL RUBBER.
- Use of organic vapour cartridge respirator is highly unlikely (as above).

PRECAUTIONS

- Avoid excessive heat, which can cause formation of vapours.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

## Response Techniques

This section contains abbreviated spill response procedures only. You should see the section appropriate to the spill environment for details (for example, Water).

If a spill occurs, you should

- Eliminate ignition sources.
- Stop source if safe to do so.

There are specific steps that you should take to deal with a spill of these materials, and they are dependent upon the medium in which the spill occurs. Each of these is detailed below, with guidelines.

**On Land:**

- Do not flush into ditches or drainage systems.
- Block entry into waterways and contain with earth or other barrier(s).
- Remove small spills with absorbent pads.
- On tundra use peat moss and leave in place to degrade, if practical.

**On Snow and Ice:**

- Block entry into waterways and contain with snow or other barrier.
- Remove minor spills with absorbent pads or snow.
- Use ice augers and pump when feasible to recover diesel under ice.
- Slots in ice can be cut over slow-moving water to contain oil.

**On Muskeg:**

- Where possible, do not deploy personnel and equipment on marsh or vegetation.
- Remove pooled oil with absorbent pads or skimmer.
- Flush with low-pressure water to herd oil to collection point.
- Minimize damage caused by equipment and excavation.

**On Water:**

- Contain spill as close to release point as possible.

- Use spill containment boom to concentrate slicks for recovery.
- On small spills, use absorbent pads to pick up contained oil.
- On larger spills, obtain and use skimmer on contained slicks.

**In Rivers and Streams:**

- Prevent entry into water, if possible, by building a berm or trench.
- Intercept moving slicks in quiet areas using (absorbent) booms.
- Do not use absorbent booms/pads in fast currents and turbulent water.

**Storage and Transfer:**

- Store closed, labelled containers outside away from flammable items.
- Electrically ground containers and vehicles during transfer to designated disposal/treatment area.

**Disposal:**

- Segregate waste types.
- Place contaminated materials into marked containers.

### *1.3.1.2 Gasoline and Jet B Aviation Fuel*

This section contains information on physical properties, safety and response techniques for Gasoline and Jet B Aviation fuel. This information will help you to deal effectively with a spill of either of these in your exploration program.

Each is dealt with separately in the subsections below.

#### Physical Properties and Safety

You should always remember that both Gasoline and Jet B form vapours that can ignite and explode. You must never smoke in their vicinity. You should also ensure that all containers are properly grounded while being filled.

**Gasoline**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Colourless liquid (can be dyed)

- FLASHPOINT -50°C
- ODOUR Gasoline/Petroleum
- FREEZING PT. -60°C
- SOLUBILITY Insoluble
- VISCOSITY Not viscous (<1 cSt)
- VAPOUR Will sink to ground levels
- SPECIFIC GRAVITY Floats on water (0.7-0.8)

SAFETY MEASURES/WARNINGS

- Vapours form instantaneously and are heavier than air.
- Empty containers can contain explosive vapours.
- Vapours can travel to distant sources of ignition and flash back.
- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting and unconsciousness.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles; nitrile, Viton and PVC are suitable materials. DO NOT USE NATURAL RUBBER or NEOPRENE.
- Wear full-face organic vapour cartridge respirator where oxygen is adequate; otherwise wear positive pressure SCBA, if circumstances warrant.

PRECAUTIONS

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

**Jet B Aviation Fuel**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE White or pale yellow liquid
- FLASHPOINT -20 to -25°C
- ODOUR Gasoline/Petroleum
- FREEZING PT. -50°C
- SOLUBILITY Negligible
- VISCOSITY Not viscous (<11 cSt)
- VAPOUR Will sink to ground levels
- SPECIFIC GRAVITY Floats on water (0.75-0.8)

SAFETY MEASURES/WARNINGS

- Vapours instantaneously form, and are heavier than air.
- Low-lying areas can trap explosive vapours.
- Vapours can travel to distant sources of ignition and flash back.
- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting and unconsciousness.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves footwear and goggles; nitrile and Viton are suitable protective materials. DO NOT USE NATURAL RUBBER, NEOPRENE OR PVC.
- Wear full-face organic vapour cartridge respirator where oxygen is adequate; otherwise wear SCBA, if circumstances warrant.

PRECAUTIONS

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.

- Eliminate ignition sources.
- Restrict access and work upwind of spill.

## Response Techniques

This section contains abbreviated spill response procedures only. You should see the section appropriate to the spill environment for details (for example, Water).

If a spill occurs, you should

- Eliminate ignition sources.
- Stop source if safe to do so.

There are specific steps that you should take to deal with a spill of these materials, and they are dependent upon the medium in which the spill occurs. Each of these is detailed below, with guidelines.

**On Land:**

- Block entry into waterways by diking with earth or other barrier.
- Do not contain spill if there is any chance of igniting vapours.
- On shop floors and in work or depot yards, apply particulate absorbents.
- On tundra use peat moss and leave to degrade if feasible to do so.

**On Snow and Ice:**

- Block entry into waterways by diking with snow or other barrier(s).
- Do not contain spill if there is any chance of igniting vapours.
- In work/depot yards, apply particulate absorbents.

**On Muskeg:**

- Remove pooled gasoline or Jet B with pumps, if safe to do so.
- Where possible, do not deploy personnel and equipment on marsh or vegetation.
- Low-pressure flushing can be tried to disperse small spills.
- Burn carefully only in localized areas, for example, trenches, piles or windrows.
- Do not burn if root systems can be damaged (low water table).

- Minimize damage caused by equipment and excavation.

**On Water:**

- Do not attempt to contain or remove spills. Gasoline and Jet B will evaporate relatively quickly, and can therefore be dangerous. Neither responds well to booming or absorbent recovery.
- Use booms to protect water intakes and sensitive areas.

**Storage and Transfer:**

- Store closed labelled containers in cool ventilated areas away from incompatible materials.
- Electrically ground containers and vehicles during transfer to designated disposal/treatment area.

**Disposal:**

- Segregate waste types, if necessary.
- Place contaminated materials into marked containers.

### *1.3.1.3 Other Hazardous Materials*

This section contains information on physical properties, safety and response techniques for Antifreeze, Propane, Acetylene and Raw Sewage, all of which may be considered hazardous materials. This information will help you to deal effectively with a spill of any of these in your exploration program.

Each is dealt with separately in the subsections below.

#### Physical Properties and Safety

**Ethylene Glycol Antifreeze**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Colourless liquid
- FLASHPOINT 111°C
- ODOUR Slight; undetectable <25 ppm
- POUR POINT -13°C

- SOLUBILITY Soluble in all proportions
- VISCOSITY Not viscous (~22 cSt)
- VAPOUR Will sink to ground levels
- SPECIFIC GRAVITY Same as water (1.0)

SAFETY MEASURES/WARNINGS

- Vapours are heavier than air.
- Ingestion of significant quantities can be lethal.
- Eye contact causes irritation.
- Skin contact can cause intoxication due to absorption.
- Inhalation of vapours can cause intoxication, headache, vomiting, unconsciousness with convulsions, and even death. Avoid inhaling vapours, particularly in enclosed places.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles; neoprene, nitrile, PVC are suitable protective materials.

PRECAUTIONS

- Monitor empty containers for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.

**Propane**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Colourless gas
- FLASHPOINT -104°C
- ODOUR natural gas odour
- FREEZING PT. -190°C
- SOLUBILITY Insoluble
- VISCOSITY n/a

- VAPOUR Will sink to ground levels
- SPECIFIC GRAVITY Liquid floats on water

SAFETY MEASURES/WARNINGS

- Vapours form instantaneously and are heavier than air.
- Vapours can travel to distant sources of ignition and flash back.
- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting and unconsciousness.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles; nitrile and Viton are suitable protective materials. DO NOT USE NATURAL RUBBER, NEOPRENE OR PVC.
- Avoid frostbite burn to skin and eyes from contact with propane.(New information, and worth preserving.)
- Wear full-face organic vapour cartridge respirator where oxygen is adequate, otherwise wear positive-pressure SCBA.

PRECAUTIONS

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.

**Acetylene**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Colourless gas
- FLASHPOINT -18°C

- ODOUR Garlic - like
- FREEZING PT -82°C
- SOLUBILITY Slightly soluble
- VISCOSITY n/a
- VAPOUR Will sink to ground levels
- SPECIFIC GRAVITY Liquid floats on water (0.6)

SAFETY MEASURES/WARNINGS

- Vapours form instantaneously and are heavier than air.
- Empty containers can contain explosive vapours.
- Vapours can travel to distant sources of ignition and flash back.
- Eye contact causes irritation.
- Material can accumulate static charges.
- Inhalation of vapours can cause irritation of the respiratory tract, headache, vomiting and unconsciousness.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles; nitrile and Viton are suitable protective materials. DO NOT USE NATURAL RUBBER, NEOPRENE OR PVC.
- Wear full-face organic vapour cartridge respirator where oxygen is adequate, otherwise wear positive-pressure SCBA.

PRECAUTIONS

- Monitor for explosive atmosphere.
- Avoid contact with strong oxidizers, such as nitric acid, sulphuric acid, chlorine, ozone, peroxides.
- Eliminate ignition sources.
- Restrict access and work upwind of spill.
- Gases stored in cylinders can explode when ignited.

- Keep vehicles away from accident area.

**Raw Sewage**

TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

- APPEARANCE Brown to black liquid
- FLASHPOINT n/a
- ODOUR Pungent, foul
- POUR POINT 0-10°C
- SOLUBILITY Partly soluble
- VISCOSITY variable
- VAPOUR n/a
- SPECIFIC GRAVITY 1.2-1.5

SAFETY MEASURES/WARNINGS

- Inhalation of fumes can cause nausea.
- Ingestion may be harmful.
- Eye contact causes irritation.
- Repeated skin contact can cause irritation.

PERSONAL PROTECTION

- Always wear impervious, chemical-resistant clothing, gloves, footwear and goggles.

PRECAUTIONS

- Prevent from contacting water.
- Keep personnel away from spill area.
- Demarcate area and keep vehicles and equipment away.

## Response Techniques

This section contains abbreviated spill response procedures only. You should see the section appropriate to the spill environment for details (for example, Water).

There are specific steps that you should take to deal with a spill of each of these materials, and they are also dependent upon the medium in which the spill occurs. Appropriate measures are detailed below for the individual situations, with guidelines.

**Antifreeze**

- Eliminate ignition sources.
- Restrict access and work upwind of spill.

On Land:

- Block entry into waterways.
- Do not flush into ditches or drainage systems.
- Contain spill by diking with earth or other barrier.
- Remove minor spills with universal absorbent.
- Remove large spills with pumps or vacuum equipment.

On Snow and Ice:

- Block entry into waterways.
- Do not flush into ditches or drainage systems.
- Contain spill by diking with snow or other barrier.
- Remove minor spills with universal absorbent.
- Remove contaminated snow with shovels and mechanical equipment.

On Muskeg:

- Remove pooled antifreeze with pumps.
- Where possible, do not deploy personnel and equipment on marsh or vegetation.
- Burning is not feasible.
- Minimize damage caused by equipment and excavation.

On Water:

- Ethylene glycol sinks and mixes with water.
- Isolate/confine spill by damming or diversion.

Storage and Transfer:

- Store closed, labelled containers in cool, ventilated areas.
- Store away from incompatible materials; for example, organics, finely divided metals and oxidizable materials.

Disposal:

- Segregate waste types.
- Place contaminated materials into marked containers.

**Propane and Acetylene**

- Vapours cannot be contained when released.
- Water spray can be used to knock down vapours only if there is no chance of ignition.
- Small fires can be extinguished with dry chemical or CO2.
- Personnel should withdraw immediately from area unless a small leak is stopped upon first detection.
- If tanks are damaged, gas should be allowed to disperse and no attempt at recovery should be made.
- Personnel should avoid touching release point on containers since frost quickly forms. Keep away from tank ends.

**Raw Sewage**

On Land:

- Block entry into waterways.
- Do not flush into ditches or drainage systems.
- Contain spill by diking with earth or other barrier.
- Remove spills with pumps or vacuum equipment.
- On tundra, use peat moss and leave in place to degrade, if feasible.

On Snow and Ice:

- Block entry into waterways.
- Do not flush into ditches or drainage systems.

- Contain spill by diking with snow or other barrier.
- Remove contaminated snow with shovels or mechanical equipment.

On Muskeg:

- Where possible, do not deploy personnel and equipment on marsh or vegetation.
- Remove pooled sewage with pumps or vacuum equipment.
- Leave in place if more damage will result from cleanup.
- Minimize damage caused by equipment and personnel.

On Water:

- Sewage sinks and mixes with water.
- Isolate/confine spill by damming or diversion.
- If not possible to confine and pump, disperse using water flushing.

Storage and Transfer:

- Store closed labelled containers in cool, ventilated areas.
- Avoid contact with collected material.

Disposal:

- Consider using as a fertilizer in designated areas.
- Place into marked containers.
- Transport to the designated sewage treatment plant.

### 1.3.2 Land

In the case of a spill, you must move rapidly to respond to the accident. Quick containment of oil, on land, is necessary to ensure that spilled oil does not spread over a large surface area, thus increasing the potential for greater surface coverage and subsurface contamination. This is particularly so when spills occur in loosely packed materials such as sand, soil and rock (pebbles, cobbles, boulders).

You should always remember that the potential for penetration and spreading increases with light products such as

- Diesel.
- Jet B.
- Gasoline.

All oil-based products are heavier than air and will flow, either as a liquid or gas, to low points down hill and away from the initial spill source. However, your first priority must always be for the protection and preservation of life. One of the main considerations that you should keep in mind when assessing a spill is the type of material that has been spilled.

If it is a volatile product (for example, gasoline) that has been spilled, you must immediately consider the potential for fire and explosion from a nearby source of ignition. Your main actions must include

1. Removal of ignition sources.
2. Notification and evacuation of personnel at risk.
3. Completion of an assessment, based upon your observations, to determine if it is safe to commence any spill counter measures operations. If it is not safe, you should not respond.

In most cases you can dig a simple trench ahead of the spill on the downhill side. Spilled oil will then flow into the trench and you can remove it with absorbent booms, pads, buckets or pumps. To facilitate this, you should

- Construct a soil berm down slope of the spill.
- If appropriate, use synthetic, impervious sheeting to act as a barrier.
- Where possible, recover spills through manual or mechanical means including shovels, heavy equipment and pumps.
- Absorb petroleum residue with synthetic absorbent pad materials.
- Recover spilled and contaminated material, including soil and vegetation.

Once removed, contaminated oil or soil can be placed into drums or containers for later disposal.

You should never flush oil-based products into ditches or drainage systems. You should block entry into waterways and contain the spill with earth or other barrier(s).

**Small Spills**

You can clean up small spills with absorbent pads. On tundra, peat moss can be spread and left in place to degrade, if practical.

In situations where small spills of hydrocarbons have soaked into soil on level ground in remote areas, you may find it best to attempt biological remediation. To do this, you should turn over the

contaminated soil by shovel, and mix fertilizer and straw into the soil. This should result in the breakdown of the hydrocarbons by bacteria. The soil should be tested annually to determine hydrocarbon levels.

In the event of a small spill, it is important to weigh the advantages of cleanup versus the potential negative impacts on the terrain. Considerable damage can be caused by both personnel and equipment to wet or sensitive areas. In many cases, the best solution may be to add nutrients to the contaminated area and monitor the site to ensure that the spill does not migrate to an adjacent sensitive area.

In areas of muskeg, for example, you should typically not deploy personnel and equipment on marsh or vegetation. You should remove pooled oil with absorbent pads or a skimmer. If possible, you should flush oil with low pressure water to herd it to a collection point. You must be sure to minimize damage caused by equipment and excavation.

It is recommended that, for small oil spills in muskeg, you mix the spilled material with peat moss and allow it to degrade during summer months. More damage can be done by attempting cleanup using mechanical removal methods.

It is possible that, due either to safety or the condition of ground (too soft), that cleanup should be delayed until conditions improve. In either case, you should consult all parties involved in order to determine when and how cleanup should be undertaken. Site monitoring will also be required during the interim phase in order to ensure that the spill does not spread to any sensitive areas around the contaminated site.

### 1.3.3 Ice and Snow

You should be aware that oil can remain relatively fresh, that is, in an unweathered state, under snow and ice for several months or more after a spill. Evaporation rates for Gasoline and Jet B will still be high when they are ultimately exposed to atmosphere. Oil can also move up and down small hills (several metres high) due to the capillary action of the snow.

You can use snow and ice to create berms to keep spills from spreading. Extra care should be taken to block entry into waterways and contain with snow or other barrier.

You should remove minor spills with absorbent pads or snow.

**Spills on Snow**

You can take several measures to deal with spills on snow. These include

- Blocking its entry into waterways and containing it with snow or other barrier.
- Trenching or ditching to intercept or contain flow of fuel or petroleum products on snow, where feasible (ice and snow are amenable to trenching/ditching).
- Compacting the snow around the outside perimeter of the spill area.
- Constructing a dike or dam out of snow, either manually with shovels or with heavy equipment such as graders and dozers where available.

- If feasible, the use of synthetic liners to provide an impervious barrier at the spill site.

If the spilled material escapes from the primary site, you should locate the low point of the spill area and clear channels in the snow, directed away from waterways, to allow non-absorbed material to flow into the low point. Once collected in the low area, your options include shovelling spilled material into containers, picking it up with mobile heavy equipment, pumping liquids into tanker trucks or using a vacuum truck to pick up material.

You should pick up and dispose of liquid oil wastes or oil-contaminated snow at a land disposal site approved by government authorities and fire or safety consultants. You should transport contaminated material to an approved disposal site. The equipment that you use will depend on the magnitude and location of the spill.

**Spills on Ice**

Where spills have occurred on ice, you should

- Contain material spilled using methods described above for snow if feasible or attempt mechanical recovery with heavy equipment.
- Prevent fuel or petroleum products from penetrating ice and entering watercourses.
- Remove contaminated material, including snow/ice as soon as possible.

Containment of fuel or petroleum products under an ice surface is difficult given the ice thickness and winter conditions. However, if the materials get under ice, you should

- Determine the area where the fuel or petroleum product is located.
- Drill holes through ice using an ice auger to locate the fuel or petroleum product, and once detected, cut slots in the ice using chain saws and remove ice blocks.

In frozen rivers, you can cut angled slots or holes about 1 m wide in the ice, where safety permits, to allow possible spill recovery. The oil will rise up into the openings where it will concentrate, and be available for recovery using skimmers or pumps,

You can pick up fuel or petroleum products collected in ice slots or holes via suction hoses connected to a portable pump, vacuum truck or standby tanker. You should take care to prevent the end of the suction hose clogging up with snow, ice or debris.

### 1.3.4 Water

You should attempt to contain spills as close to the release point as possible. You should use spill containment booms to concentrate slicks for recovery. However, gasoline and Jet B fuels do not respond well to booming and, because of their high evaporation rates, can be dangerous to deal with. On small spills, you can use absorbent pads to pick up contained oil. On larger spills, obtain and use a skimmer on contained slicks.

Full tanker trucks that break through ice into the water below will remain buoyant since the

densities of fuel and petroleum products are less than water. In such a case your first priority is to recover the driver of the truck safely. Buoyancy of the truck will be maintained while pumping at least a portion of its contained fuel from the truck to another vessel until the truck can be retrieved safely. You must make every effort to pull out the truck as soon as possible.

Where sumps are used to contain drilling fluids, you should place an absorbent pad in the sump. The pad will float on the surface of the sump and soak up any fuel that makes its way into the sump during routine drilling operations. Further information on the use of sumps in drilling to contain return water is given the Hazardous Materials section of the document. In the case of larger spills, booms should be deployed in the sump as described below.

When spills occur near rivers and streams, you should attempt to prevent entry into water by building a berm or trench. If oil enters a stream or river, moving slicks should be intercepted in calm areas using absorbent booms. You should not use absorbent booms or pads in fast currents and turbulent water.

**Use of Booms**

You can use the following strategies to contain spills on slow moving or calm water:

- Contain spills on open water immediately to restrict the size and extent of the spill. Fuel and petroleum products, which float on water, may be contained through the use of booms, absorbent materials, skimming, or the erection of culverts.
- Deploy containment booms to minimize spill area, although effectiveness of booms may be limited by wind, waves and other factors.
- Use absorbent booms to slowly encircle and absorb spilled material. These absorbents are hydrophobic (absorb hydrocarbons and repel water).
- Once booms are secured, use skimmers to draw in hydrocarbons and minimal amounts of water. Skimmed material can be pumped through hoses to empty fuel tanks/drums.
- Recognize that culverts permit water flow and can allow you to capture and collect fuel along the surface with absorbent materials.
- Use absorbent pads and similar materials to capture small spills/oily residue on water.

Determining the best possible strategy for containment will depend on a number of factors:

- Speed of slick travel.
- Location of possible containment sites.
- Availability of personnel and equipment.
- Location of sensitive areas.
- Safety of operations.

You will find that booming with either absorbent or non-absorbent booms is an effective means of

containing spills on slow-moving waters and in lakes. Effective containment using conventional booming techniques will be very difficult in streams or rivers where currents exceed 0.7 knots (0.4 m/s). At these speeds, oil will become entrained in the water flowing under the boom resulting in significant losses. Some improvement can be achieved in waters flowing at 1-2 knots (0.5-1 m/s) if the boom is deployed at an angle of less than 90° to the direction of flow.

Absorbent booms or socks can also be used to provide a barrier to floating oil. These types of booms should be checked regularly to ensure that they do not become saturated with either water or oil since they will tend to float very low in the water or even sink and release oil downstream.

**Marine Spills**

A marine oil spill could occur at any point along a fuel transfer system between a tanker and on-shore storage tanks. The general strategy for near-shore marine spill responses is for you to limit the spread of oil on water through down-wind or down-current booming and collection at an accessible shoreline location.

Oil stranded on a beach can be manually removed or refloated at high water. When dealing with refloated oil, you should set a boom down wind for collection. You can herd any oil on the water's surface using water hoses with nozzles having a diffused spray setting.

If there is oil stranded on the mid to lower levels of tidal flats, you may be able to collect it in the natural tidal pools formed in the sand. Collection in such pools can be accelerated by low-pressure deluge washing of the higher sections of the flats and the manual digging of drainage ditches leading to the collection points.

You can recover oil on sea water by the use of skimmers. For maximum encounter rates, you should place skimmers at the apex of a collection boom. Skimmers may also be used in larger tidal pools. You must pump liquid oil and oily water into suitable containers such as 45 gallon (205l) drums or larger dedicated tanks.

You should collect oil in shallow pools and fresh oil stranded on beaches using absorbent pads. Absorbents must be bagged for disposal. You must collect oil mixed with sand and bag it for disposal. Because of the instability of sand beaches, and the resultant difficulty in operating heavy equipment, you may find that oily sand removal may be limited to manual shovel activities.

### 1.3.5 Alternative Techniques

In-situ combustion (burning) is a disposal method which may be available for fuels and petroleum products. Prior to any attempts at in-situ burning, however, you must consult with experts and obtain approval from government authorities. Unauthorized burning of fuels and petroleum products is very dangerous and you should never attempt it. This technique is discussed separately in more detail below.

Chemical response methods are also available to you, and may include the use of the following:

- Dispersants.
- Emulsions-treating agents.

- Visco-elastic agents.
- Herding agents.
- Solidifiers.
- Shoreline cleaning agents.

Biological response methods include nutrient enrichment and natural microbe seeding.

**Burning**

The in-situ burning of spilled oil may be useful option, particularly in arctic conditions, where terrain or safety concerns may make conventional cleanup methods impractical. It is critically important that the decision to burn be made as soon as possible after the spill because as the more volatile light ends evaporate, burning becomes more difficult. For this reason, it is recommended that you obtain prior approval from the necessary regulatory agencies (that is, before the program is commenced).

Application

You can initiate in-situ burning by using a large-size portable propane torch (Tiger Torch) to ignite the fuel/petroleum products. Highly flammable products such as gasoline or alcohol, or combustible material such as wood, may be used to promote ignition of the spilled product.

The objective is to raise the temperature for sustained combustion of the spilled product. The best results will be achieved when burning fresh (less than 24 hours old) spills in winter or in muskeg with a high water table. Burning can also be effective in containment trenches or ponds where a significant oil thickness can collect.

You should take special care in winter conditions, as the heat from the burn will melt adjacent snow, increasing the potential for penetration of the oil, and potentially transporting the oil to the surrounding area. You must also exercise care during the summer in fragile arctic or alpine terrain. Naturally occurring bog and other plants on the tundra can burn creating more damage than the original spill. Material for burning should be isolated from the surrounding terrain (in windrows or containers) prior to burning if there is any chance whatever of adjacent areas being inadvertently set on fire.

You may dispose of fuel or petroleum products that have collected in ice slots by in-situ burning if sufficient holes are drilled in the ice. Once all the holes are drilled, the oil which collects in the holes may be ignited. Before doing so, however, you must consult with fire/safety consultants and government authorities to obtain approval.

Limitations

The burning of heavy or weathered oil is very difficult or impossible. Severe weather conditions such as high winds, snow and rain may also make burning impossible. You should not carry out burning in areas with vegetation cover which has not been severely damaged by the oil as more damage will result than if the oil is left to degrade naturally.

You should consider burning only in localized areas, where the spilled material has pooled

naturally or been contained via dikes, trenches, windrows, depressions or ice slots. You should take care in muskeg with a relatively low water table as burning may destroy sensitive root systems.

You must pick up and dispose of oil residues left after controlled, in-situ burning at a land disposal site approved by government authorities and fire and safety consultants.

Safety

As with conventional cleanup methods, safety of operations is paramount in burning operations. You should only carry out burning in contained areas or where fire breaks are employed. Muskeg and tundra can smoulder for a considerable time after a burn and care should be taken to ensure that it does not ignite later, either from underground (root) systems or surface materials. Your personnel involved in the burn should be fully trained in safe burning procedures including methods for avoiding the inhalation of potentially dangerous smoke or vapours.

## 1.4 Site Restoration

Site Restoration
Site restoration, stream banks and general "shoreline" cleanup of lakes are the final spill response steps. Due to seasonal variations and various types of stream banks and muskeg, a standard restoration program cannot be prescribed. Your early consultation with environmental advisors is critical to ensuring cleanup efforts do not create adverse impacts.

As a general rule, your cleanup should minimize the impact to shoreline or muskeg, particularly vegetated areas, during all phases of spill response. Cleanup can cause more damage to such habitat than an untreated spill, especially where permafrost and vegetation are involved.

You should assess the area requiring cleanup in terms of three factors:

- Environmental sensitivity.
- Property, archeological or other damage.
- Natural cleansing action at the site.

Oil typically does not adhere to the banks of fast-moving rivers. Little or no cleanup action can usually be taken. On the other hand, muskeg can undergo long-term contamination and reduced environmental productivity that cleanup may or may not help to alleviate because of other damage inflicted. Whatever method you choose to deal with an area affected by a spill, it is vital that you minimize damage to root systems.

In the cleanup process you should always

- Obtain approval and instruction prior to conducting cleanup operations.
- Be particularly careful if oil has entered marshy areas and wetlands. You should not deploy personnel and equipment into such areas without explicit approval from environmental authorities. Damage to both upland and water areas may result.

- Approach vegetated areas and other sensitive zones from the water side, if possible and if cleanup is to be attempted. Be aware that various plant species, birds, fish and animals can all be adversely affected by cleanup operations. In the Arctic, breeding and blooming periods during the summer months are particularly critical.

## 1.5 Reporting

Reporting
Reporting of the spill, whether to your management or to the appropriate authorities, is the responsibility of the designated Team Leader. You should determine if the situation constitutes a crisis and, if so, you should follow your Crisis Management policy if you have one.

When reporting an incident to regulatory authorities, you should provide the following information:

- Name and telephone number
- The time, location and source of the spill
- The type of spilled material
- The owner of the spilled material, if known
- The cause of the spill, if known

You should report spills or accidents that immediately threaten public safety, such as gasoline and chemical spills, directly to the local fire department or other appropriate authority.

**Timing of Reports for Spills**

You should make the initial report with the highest priority and by the quickest means available after the incident. You should add particulars not immediately available in a supplementary message(s) as soon as possible after the initial reports.

You should transmit follow-up reports as needed at regular intervals to keep those involved informed of developments. As a general guideline, in the case of a major spill you should transmit your initial report within one-half hour of the incident, and you should send follow-up reports at least each hour thereafter.

## 1.6 Disposal

Disposal
For appropriate disposal, you should refer to data describing the physical properties of the spilled material and identify hazards and disposal requirements. These data will generally be found in the Material Safety Data Sheets (MSDS) or their equivalent.

As a general rule, you should segregate waste materials as much as possible.

During disposal you should use the appropriate personal protective equipment (for example, gloves, goggles, face shield, apron, boots) and exercise appropriate care to place spilled material into a suitable, properly marked container.

Spilled materials must be disposed of at an approved site, and it is your responsibility to check with local authorities for the most appropriate location.

## 1.7 Spill Kits

Spill Kits
You should have spill kits available for use at any exploration operation in which fuels or other potentially hazardous materials are being used. Your choice of spill kits should be suited to the environment and the size of exploration project. Guidelines for the contents of spill kits for land and water-based situations are given in the subsections that follow.

You must also ensure that fire protective equipment is readily available and that your personnel are properly trained in the use of fire extinguishers and hoses.

### 1.7.1 Spill Kits - Land

For land based spills, you should consider the following as appropriate spill kits. The makeup of these will depend upon the size of your exploration operation.

Standard Spill Kit

- A 45 gallon (205 L) 16 gauge drum.
- Two closing rings - one for ease of entry into the drum and the other to ensure absolute containment of hazardous products for transport and temporary storage.
- One pair of neoprene oil and chemical resistant gloves.
- One protective disposable suit.
- One pair of protective goggles.
- 12 m of 12 cm containment boom.
- 25 absorbent pads - approximately 46 x 46 cm x 8 mm thick.
- 23 m of absorbent blanket - approximately 70 cm x 8 mm thick.
- 2 polyethylene bags approximately 71 x 46 x I65 cm - 3 mm thick.
- Shovel.

Spill Kit for areas with limited fuel storage (< 1,000 l)

- One pair of neoprene oil and chemical resistant gloves.
- One pair of protective goggles.
- 10 absorbent pads - approximately 46 x 46 cm x 8 mm thick.
- 1 polyethylene bag approximately 71 x 46 x I65 cm - 3 mm thick.
- Shovel.

### 1.7.2 Spill Kits - Water

As with the land spills, your water spill kit size will depend upon the amount of fuel and other petroleum products stored at your exploration site. Some guidelines for these are set out below.

Spill kits for areas with limited (< 2,000 litres) fuel storage should include the following:

- 1 rope (min. 15 m length).
- 1 container of Gap Seal drum sealant.
- 6 absorbent "socks" (1 m length).
- 2 mini booms.
- 1 drum roll kit.
- 1 bag of peat moss.
- 5 hazardous waste bags.
- 3 pairs chemical resistant safety gloves.

Spill kits for areas with extensive fuel storage (>2,000 litres) should include the following:

- 1 150m flotation boom.
- 6 15kg grapnel anchors.
- 3 Norwegian anchor buoys.
- 8 standard marine buoys (yellow).
- 4 100m coils anchor rope (1 cm).
- 5 200m coils towline (1 cm Rope).
- 1 6m response boat with 80 HP outboard motor.
- 2 lifejackets.

- 20 bags peat moss.
- 1 1.3m absorbent Roll.
- 15 absorbent Pads.
- 2 fire extinguishers.
- 1 drum skimmer.
- 1 pump.

Waste Storage

- 3 175l drum response kits c/w lids.

Personal Equipment

- 1 emergency eyewash station.
- 20 pairs POL resistant gloves.
- 7 pairs POL resistant goggles.
- 1 bag of 20 disposable respirators.
- 2 pairs safety hip waders.
- 1 toolbox with assorted tools.
- 2 6.5 gallon (25l) containers c/w lids.
- 100m nylon rope (1 cm thick).

## 1.8 Documentation

Documentation
You should keep good written and photographic records of spill occurrences, and written records of your spill response procedures. Spill documentation records include but are not limited to

- Spill response plans.
- Inspections and audits of worksites and work activities.
- Lists and MSDS sheets for potential toxic substances and contaminants in use at worksites.
- Internal and external memos and reports on work activities.

- Spill report, accident and incident reports.
- Documentation of a spill cleanup, including photographs.
- Inspections of a spill site after cleanup.
- Training records.
- Regulatory requirements and notices.

**Documentation for Spill Incident**

You should prepare a written report which should be sent as soon as possible to your company's management. Company management should then expedite delivery of the written report to the appropriate regulatory authorities. Pertinent information that you should include in this report is as follows:

- Name and phone number of reporter,
- Time of spill or leak,
- Time of detection of spill or leak,
- Type of product spilled or leaked,
- Amount of product spilled or leaked,
- Location of spill or leak,
- Source of spill or leak, and
- Type of accident - rupture, collision, overflow, other.

You should also include information on

- Owner of product and their phone number, if known.
- Whether the spill or leak is still occurring.
- Whether the spill or leaked product is contained and, if not, where it is flowing.

In addition, you should include relevant climatic information such as

- Wind velocity and direction.
- Temperature.
- Proximity to water bodies, water intakes and facilities.
- Tidal action (if applicable).

- Snow cover and depth, terrain and soil conditions.

### 1.8.1 Spill Report Form

An example of a Spill Report Form is attached below.

| | | | |
|---|---|---|---|
| **Spill Report Time:**<br>**Page 1 of 3 Date:** | | | |
| **Sent To:** | **Sent By:** | | |
| | | | |
| **Fax No.:** | **Fax:**<br>**Tel:** | | |
| **Incident Details** | | | |
| | **Actual Spill**<br>**Probable Spill** | **Incident Time:**<br>**Incident Date:** | |
| **Incident Description and Consequences:**<br>**Include the following information if appropriate**<br>• Were there injuries?<br>• Was help required from external contractors or local authorities?<br>• Were regulatory authorities notified (names, date, phone numbers)? | | | |

| | | | |
|---|---|---|---|
| | | | |
| **Control / Containment Measures Taken:**<br>**[Provide Annotated Map if Possible]** | | | |
| | | | |
| | | | |
| | | | |

| | | | |
|---|---|---|---|
| **Incident Report**<br>**Page 2 of 3** | | | |
| Spill Data | | | |
| **Pollutant:** | | Spill Start Time: | |
| **Batch** | **Continuous** **Present Flow Rate:** | | |
| | | | |

| | | | |
|---|---|---|---|
| **Quantity Spilled:** | | | |
| **Quantity at Risk of Spilling:** | | | |
| **Contained . . .** | **Not Contained . . .** | **Sinking** | **Not Sinking** |
| **Spill Movement (to):** | | **Onshore**<br>**Downhill** | **Offshore**<br>**Stationary** |
| **Spill Speed:** | | **Spill Thickness :** | |
| **Spill Area / Extent:**<br>**[Provide Annotated Map if Possible]** | | | |
| **Shoreline/Land Sensitive Areas Impacted / Resources at Risk:**<br>**[Provide Annotated Map if Possible]** | | | |
| **Protection / Clean-up Measures Initiated:**<br>**[Provide Annotated Map if Possible]** | | | |

| |
|---|
| |

| | | | |
|---|---|---|---|
| **Spill Incident Report Weather Update Time:**<br><br>**Page 3 of 3 Weather Update Date:** | | | |
| Environmental Data | | | |
| **General Weather Conditions:** | | | |
| **Weather Outlook:** | | | |
| **Sunrise Time:** | | **Sunset Time:** | |
| **Air Temperature:** | | **Sea Temperature:** | |
| **Barometric Pressure:** | | **Rising Falling** | |
| **Ceiling:** | | **Cloud Cover - Percent:** | |
| **Precipitation:** | | **Visibility:** | |

| | | | |
|---|---|---|---|
| **Wind - Speed:** | | **Wind - Direction (from):** | |
| **Wave - Direction (from):** | | **Swell - Direction (from):** | |
| **Height:** | | **Height:** | |
| **Period:** | | **Period:** | |
| **Rising Tide - Prev Low:** | | **Next High:** | |
| **Time:** | | **Time:** | |
| **Falling Tide - Prev High:** | | **Next Low:** | |
| **Time:** | | **Time:** | |
| **Surface Current Speed:** | | **Surface Current Direction (to):** | |
| **Ice Cover - Percent:** | | **Ice Cover - Type:** | |
| **ADDITIONAL COMMENTS** | | | |
| | | | |

**Contact Lists**

It is your responsibility to obtain contact information for the jurisdiction you are working in. All of this information can be obtained from the web sites of various national, provincial, territorial and municipal governments.

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**Preamble**

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2. All information that we may collect about User during User's visit to the Web site, is subject to the PDAC's comprehensive Privacy Policy.

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**Other**

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