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Overview

Purpose and Scope

The purpose of this Spill Contingency Plan is to outline response actions and mitigation procedures for potential spills of any size. It details spill response procedures that will minimize potential health and safety hazards, environmental damage, and clean-up efforts. This Spill Contingency Plan has been prepared to provide direction for the prevention and/or mitigation of spills and in the event of a reportable spill to the environment during Husky operations (reclamation, care and maintenance) of EL494.

The plan provides information about the area, potential spill locations and response to those spills, potential contaminants, storage of potential contaminants, and training of response personnel. This plan is to be used in conjunction with the Husky NWT Emergency Response Plan (ERP). The NWT ERP provides organizational charts and emergency response positions in the event of a spill.

Spills of hydrocarbons, produced water, process chemicals and water, or oilfield waste can cause significant environmental impacts to water, soil, plants, and animals which can affect landowner and regulator relations. Spill prevention measures are the most effective way to minimize environmental and community impacts and mitigate financial liability.

Spills are most likely to occur at facilities during handling, transfer and tank filling. All work will be planned to achieve zero spills by:

- **Design:** incorporating spill prevention measures when designing and modifying facilities including adequate product volume storage, belly pans, etc.,
- **Routine Containment:** providing drip trays, enviro-boxes, tanks, or similar devices at locations that are chronic sources of leaks or spills, such as; injection pumps/wells, vessel drain lines, truck/barge loading lines, lube oil and floor drains, etc.,
- **Automation:** using alarms, automatic shutdown equipment or fail-safe equipment to prevent, control or minimize potential spills,
- **Non-routine Containment:** containing wastes and potential spills during turnarounds and servicing operations (e.g., tank and vessel cleaning or repairing),
- **Preventative Maintenance and Testing:** undertaking preventative calibration, maintenance, corrosion abatement, and testing programs,
- **Monitoring:** conducting regular inspections of facilities and operations to identify potential or actual spill or release sites, and
- **Continuous Improvement:** reviewing past spill incidents to determine where maintenance or increased operator diligence is required.

Environmental Policy

Husky Energy

HEALTH, SAFETY AND ENVIRONMENT

POLICY

Husky is committed to operational integrity. Operational integrity at Husky means conducting all activities safely and reliably so that the public is protected, the health and well-being of employees is safeguarded, contractors and customers are safe, impact to the environment is minimized, and physical assets (such as facilities and equipment) are protected from damage or loss.

The Company conducts its business so as to maximize positive impacts on current and future generations in accordance with Husky's values.

In particular, Husky will:

- Demonstrate leadership and commitment to operational integrity by providing support to meet this HSE policy, as well as providing a culture where there is recognition for positive performance and disciplinary action, where appropriate, for breaches of this policy.
- Cooperate with staff and workplace health and safety committees in the identification and implementation of reasonable measures that ensure the health and safety of staff and those who work on our behalf.
- Require every member of staff, and those who work on our behalf: to be a leader in HSE; to exercise personal responsibility in preventing harm to themselves, to others, to the environment and to physical assets; and, to stop any work that is or becomes unsafe.
- Require every member of staff and those who work on our behalf: to report all incidents regardless of severity. Incidents will be investigated to determine the root cause, lessons learned will be shared, and, corrective actions will be taken. Husky aims to sustain an incident free workplace.
- Require organizations that employ individuals that work on our behalf to meet the expectations of this policy.
- Identify and mitigate risk to as low as reasonably practicable during design, construction, commissioning, operation and decommissioning of all assets.
- Prepare for and respond to emergencies efficiently and effectively.
- Comply with relevant laws, regulations and industry standards and take any additional measures considered necessary to meet the intent of this policy.
- Demonstrate continuous improvement by: establishing leading and lagging key performance indicators and measurable performance goals, monitoring and reporting on the progress of our performance, and, conducting risk-based audits.

Rob Peabody
President & CEO

Potential Spill Sources

Potential spill sources are listed in the table below. Any equipment identified as having a leak or has caused a spill will be removed from service and placed in a designated spill quarantine area for further analysis and/or repair.

Location	Source(s)	
CAMP	Fuel Caches Generators Mechanical Repair Areas Structural Defects	Improper Containment Improper Transfers Sewage System
EQUIPMENT*	Breach of Hydraulic Line or Pump Breach of Fuel Line or Tank Breach of Coolant line or Radiator Improper Fueling Procedure	Tracking or Contaminants on Tires
STAGING AREA (BARGE LANDING)	Fuel Caches Generators Mechanical Repair Areas Storage Tanks	Improper Containment Improper Transfers
QUARRIES	Fuel Caches Storage Tanks Generators Mechanical Repair Areas	Improper Containment Improper Transfers Equipment (see above*)
ACCESS ROADS	Breach of Hydraulic Line or Pump Breach of Fuel Line or Tank Breach of Coolant line or Radiator Tracking or Contaminants on Tires	Equipment (see above*) Loss of Load due to Vehicle Crash Ice Road Break Through

Potential Contaminants

Overall for all hazardous materials discussed below, impacts are lower during winter as snow is a natural sorbent and ice forms a barrier limiting or eliminating soil or water contamination, thus spills can be more readily recovered when identified and reported. Known potential contaminants will be identified by Safety Data Sheets (SDS's) maintained at the project site (drilling/completion sites or central office locations). As additional products (potential contaminants) are brought to the project area they will be added to the site SDS listing. For further detail regarding potential contaminants for the program, refer to the Waste Management Plan.

Gasoline

***Environmental Impacts**:* Gasoline may be harmful to wildlife and aquatic life. It is not readily biodegradable and has the potential for bioaccumulation in the environment. Gasoline is quick to volatize. Runoff into water bodies must be avoided.

***Worst Case Scenario*:** All fuel drums were punctured or open simultaneously and contents seeped into surrounding soil and water bodies. This could cause illness or death to aquatic life and indirectly affect wildlife feeding from the land and water.

Diesel Fuel

Environmental Impacts: Diesel may be harmful to wildlife and aquatic life. It is not readily biodegradable and has the potential for bioaccumulation in the environment. Diesel burns slowly and thus risk to the environment is reduced during recovery as burn can be more readily contained compared with volatile fuels. Runoff into water bodies must be avoided.

Worst Case Scenario: Contents of fuel tankers leaking into soil and water bodies when unloading around the Mackenzie River or tankers flip when crossing the Ice Bridge. This could cause illness or death to aquatic life and indirectly affect wildlife feeding from the land and water.

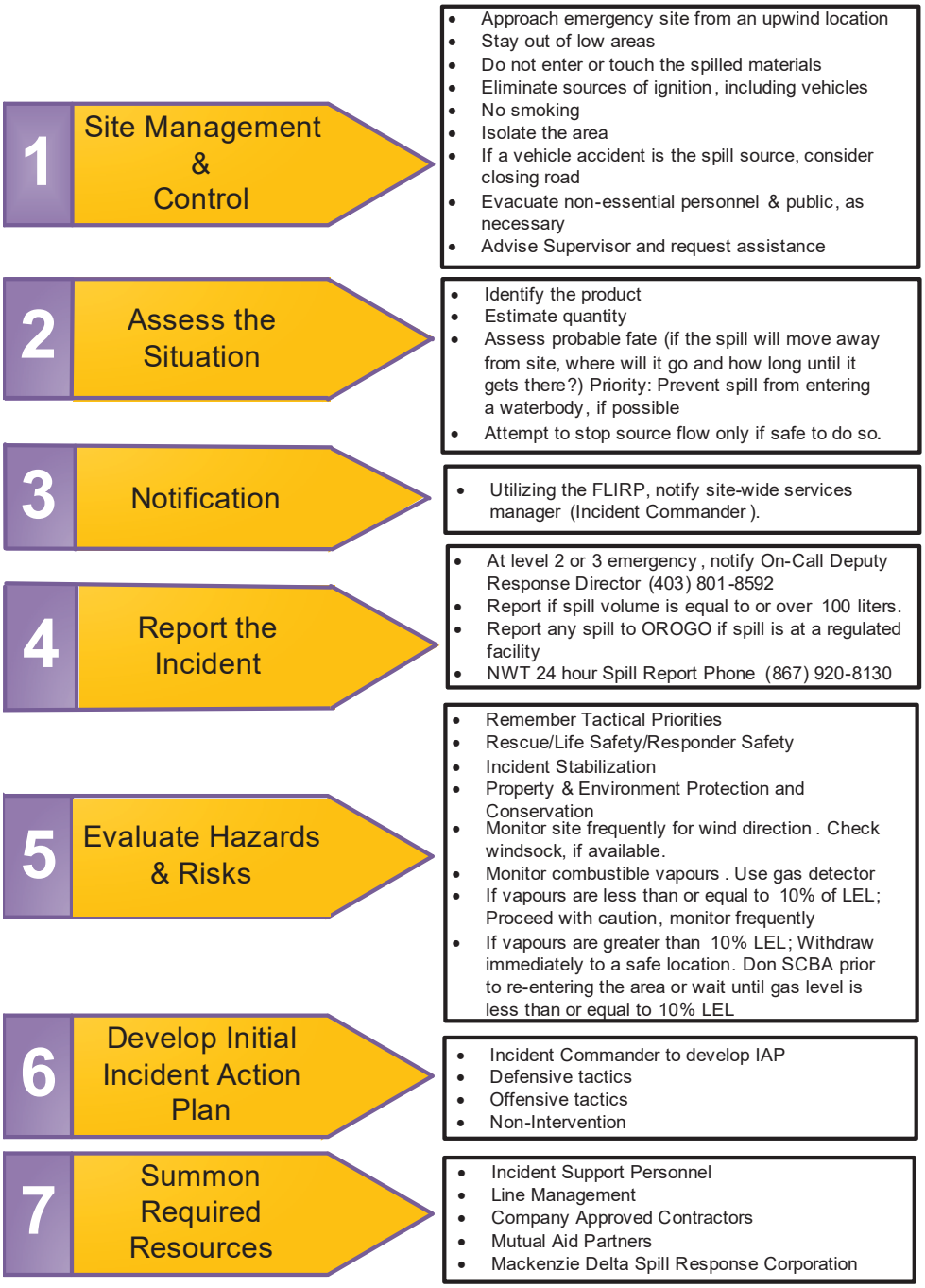
Aviation Fuel

Environmental Impacts: Aviation fuel may be harmful to wildlife and aquatic life. It is not readily biodegradable and has the potential for bioaccumulation in the environment. Aviation fuel volatizes relatively quickly. Runoff into water bodies must be avoided.

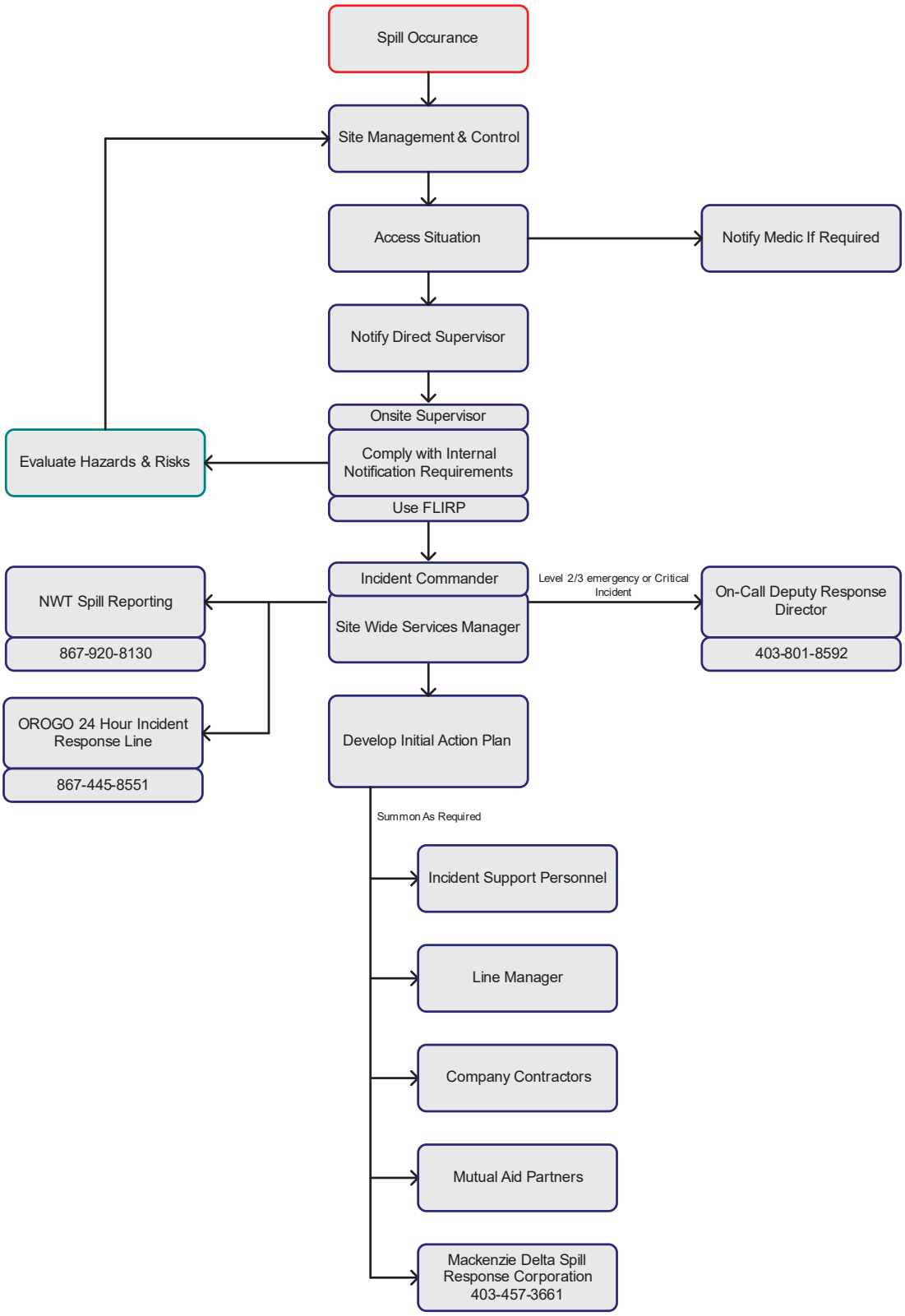
Worst Case Scenario: All fuel drums were punctured or open simultaneously and contents seeped into surrounding soil and water bodies. This could cause illness or death to aquatic life and indirectly affect wildlife feeding from the land and water.

Initial Spill Response Actions

Safe Approach Procedures at a Spill Site



Spill Notification Flowchart



Site Assessment Considerations

- Are there any nearby public (workers, traffic, residents) that would need to be evacuated or diverted from the spill area?
- Is there a fire or explosion hazard? What is the ignition source?
- Is there H_2S or other toxin present? Are concentrations safe or is additional PPE needed?
- Are there any areas deemed hazardous? (Mark with flags)
- What are the ground and weather conditions? (Snow, gravel, sand etc.)
- Where is the location of the leak, the type of release and the volume released? Is it reportable? Has it been reported to the regulator?
- How long has the spill been taking place?
- Are air monitoring trailers required?
- Is the spill into a watercourse or a water body?
- Is the spill contained or migrating? Which direction? How far can it go?
- If the spill is not contained, determine and prioritize the containment points and methods to be used.
- What lands or water bodies may be affected? (Farm, livestock, brush, drinking water, etc.)
- How is it going to be contained and cleaned up?
- How to access the spill site, the source of the spill and recovery points?
- What equipment is required? Is oil spill equipment (oil spill co-op) required?
- Where can spill responders park so as not to interfere with spill equipment? (Minimize vehicular traffic as much as possible at the spill site.)
- Are there any residences in the area? Do they have water wells that could be affected?
- Should the spill site be cordoned off to prevent wildlife / livestock from entering?
- Will a media response be required?

Control and Containment Considerations

- If possible, immediately shut off the source of the spill ensuring your own safety.
- Determine what will be affected by the spill.
- Assess speed and direction of spill and cause of movement (water, wind and slope)
- Prioritize and set up containment points.
- Where possible, prevent a spill from entering a watercourse.
- Have a contingency plan ready in case spill worsens beyond control or if the weather or topography impedes containment.
- Use safest and simplest method to get job done within resource and safety capabilities.
- Isolate and depressurize (ESDs, manual block valves, manual valve isolation).
- Plug and patch (e.g. fix faulty valve or hole in drum).
- Absorb or adsorb (e.g. applying adsorbent pads to oil spill).
- Transfer (e.g. removing product to waste truck or new container).
- Containerize (e.g. put leaking drum into over-pack drum).
- Reposition (e.g. upright or roll and chock leaking container).
- Others (e.g. hot-tap, vent and burn, flaring).
- Contain the spill – containment is a priority for limiting environmental damage.
- Contain as close to source as safe and practical.
- Avoid excessive walking or driving on the spill area.
- Consider ground disturbance guidelines.
- Determine where bell holes or trenches would be most effective.
- Keep trenches as shallow and narrow as possible, to prevent additional clean-up and minimize groundwater impact. Supplement with berms where possible.
- Use practical containment tools and equipment including shovels, dump trucks, sand bags, plastic bags, heavy earth moving equipment, "Plug and Patch", foam, salvage covers, adsorbents, booms, hose, redwood plugs, etc.
- If weirs are installed, they should be able to handle large flow rates and surges.
- Surface run off may have to be diverted from the spill site if wet conditions are present.
- Ensure the health and safety of the persons responding to the spill.
- Once containment has been achieved, recovery and clean-up operations begin immediately.
- Recover as much product and saturated debris as possible.
- Keep environmental disturbance to a minimum.

Spill Containment Methods

Land Spill Assessment

Following the initial hazard assessment and development of a site safety plan, gather detailed information on the location and effects of the spill on the land base.

Identify and document the spill boundary with the appropriate equipment, including:

- PPE
- Gas detection monitors
- Compass
- Measuring device (ie GPS)
- Shovel
- Quantabs or conductivity meter for produced water or emulsion spills
- Hoe, drill or sampling equipment if sub-surface contamination is suspected
- Camera

First ensure that there are no flammable vapours in the area. Produce a sketch of the spill and take appropriate photographs. Next, identify land uses in areas affected by the spill. Look at whether the spill affects private land owners (farm, acreage, residential, etc.), public land (green areas, parks), dispositions (pipelines, utilities, roads, facilities, trappers, etc.), or sensitive areas (protected areas, wildlife habitat, archaeological resources etc.).

Based on the land use in the spill area, determine the possible public that could be directly impacted; evaluate site for wildlife and livestock, and determine the approval requirements for accessing the spill site.

It is important to note the terrain, soil types, characteristics and conditions, as well as the vegetation types on site. Surface run-off patterns, erosion potential, moisture levels and movement of the water table can all impact the severity of the spill and the way in which it can be contained, so it is imperative to take note of all these things before proceeding with cleanup.

When the previous considerations have been addressed, the next course of action is to determine the equipment resources that are required to control the spill. The initial assessment will impact what equipment will be used, how it will be transported to the spill site and how it will improve or create access to the spill.

Land Spills

Land spills will spread outward from the initial spill point toward lower-lying areas. Penetration downward into the soil will also occur at a rate that is dependent on the soil type and the nature of the product spilled. During spills in winter, petroleum will spread under the snow making definition of the extent of the spill area difficult.

The Incident Commander and ICS Operations personnel should:

- Attempt to restrict spills on land to as small an area as possible based on site conditions.
- Prevent the spill from entering water bodies or flowing watercourses or flowing into manholes or culverts, within the bounds of safety and practicality.

The method chosen for land containment and recovery is dependent on site conditions and the equipment available. A summary of common options is presented in the following table:

Land Containment Options		
Containment Method	**Technique Description**	**Comments**
Earth or Sand Dike (All seasons)	Earth or sand at or near the site is used to contain spilled material on flat or sloped surfaces. Sandbags filled with soil or sand are used to contain spill. Augment with poly-sheeting if available.	Sufficient dry earth, gravel or sand needs to be available to contain spill. Earth may be frozen. Surface disturbance to remove earth or sand may result in erosion, especially on steep slopes. Work crews and/or earth-moving equipment are required to build dike.
Snow or Ice Dike (Winter only)	Snow or ice at or near the site is used to contain spilled material on flat or sloped surfaces. Augment with poly-sheeting if available.	Sufficient snow or water needs to be available to contain spill. Snow or ice dike will melt quickly in warm weather. Contaminated snow or ice may need to be removed or stored for treatment. Work crews and/or earth-moving equipment are required to build snow dike. Water spraying equipment may be required to construct ice dike.
Sorbent Dike (All seasons)	Sorbent material is used to contain spill.	Useful only in small spills, as purchase of large quantities of sorbent is expensive and impractical. Contaminated sorbent may need to be replaced or squeezed out during incident. Contaminated sorbents need to be disposed in compliance with government legislation. Sufficient sorbent or sorbent boom, work crews and storage containers or a lined storage area for contaminated sorbents needs to available to build sorbent dike.
Trench or Sump (All seasons)	A trench or sump is excavated downslope on sloping terrain to limit surface or subsurface spill movement. Work crews and/or earth-moving equipment are required to build trench or sump, as well as plastic or other impermeable sheeting for a trench liner.	It is recommended that the trench be dug to the bedrock or permafrost, which will then provide containment layer for the spilled fuel. Clean topsoil should be removed before trench construction. Frozen soil, bedrock close to the surface or soil type (e.g. sand) may make this option impractical. Surface disturbance to remove earth or sand may result in erosion or further penetration in sandy soil. Ensure no other pipelines or underground utilities are in the excavation area.

Land Recovery Options		
Recovery Method	**Technique Description**	**Comments**
Vacuum Truck	A vacuum truck is used to recover spilled material from a dike or trench in areas accessible by trucks or heavy equipment.	The method depends on site access. Surface disturbance and soil damage may result from movement of the vacuum truck to and from the site. Topsoil may need to be stripped from the site before starting recovery activities.
Pumping Spilled Material into Storage	A pump is used to recover spilled material from a dike or trench in areas not accessible by vacuum trucks.	Pumps need to be safe for use at the spill site and compatible with the product to be pumped. Surface disturbance and soil damage may result from movement of the pump and storage equipment to the site. Skid tanks, tanker trucks, port-a-tanks, fuel bladders, permanent tanks, or a lined excavated area need to be available to provide storage for the recovered material. A work crew and power supply for the pump needs to also be available.

Water Spill Assessment

Begin by assessing the characteristics of the affected watercourse including width, depth and velocity. Shoreline characteristics and sensitivities also need to be taken into consideration. The degree of oil impact, degree of sensitivity (ecological, cultural, human use, etc.) and the physical limitations can all affect the way in which a spill will be contained.

Preventing potential impacts on stakeholders can be done by advising downstream water users that contaminated water may pass their intakes. Their reserve water supplies (if any) may permit them to close the intakes until the spilled product passes. Examples of users include area residents, cities and towns.

Water Spills

Spills into a Watercourse

Petroleum products will spread outward from the origin of the spill, eventually achieving a stable thickness on the water. Spills on rivers, creeks or streams will flow downstream, contaminating riverbanks and vegetation, affecting wildlife, fish and water users in the area of the spill.

The rate of spill movement will depend on the current speed of the water and the time of year. Current may flow faster in the deepest channels in the river and slower in shallower areas, due to varying volumes of water. Flow in a watercourse will also be faster in the spring, because of snowmelt entering the watercourse from the surrounding area. River currents in summer and fall will be generally slower than in the spring. Wind and wave action will also affect the rate and direction of spill travel.

Spill velocity on a watercourse may be estimated quickly by using a current velocity meter or by timing the movement of a floating object on the watercourse over a set distance.

The following table is used for estimating spill velocity based on a 30 metre (100 foot) distance:

Time Required For Object to Travel 30 metres (100 feet) (seconds)	Surface Current Speed			Boom Angle (degrees)
	(km/hr)	(m/s)	(miles/hour)	
216	0.5	0.14	0.3	60°
108	1.0	0.28	0.6	60°
72	1.5	0.42	0.9	60°
54	2.0	0.56	1.2	45°
43	2.5	0.69	1.5	45°
36	3.0	0.83	1.9	45°
31	3.5	0.97	2.1	15°
27	4.0	1.11	2.5	15°
24	4.5	1.25	2.8	15°
22	5.0	1.39	3.1	15°
18	6.0	1.67	3.7	15°

Note: In currents faster than 6.0 km/h (3.7 mph), or in excessively turbulent waters, the use of containment booms may be impractical and other containment or protection methods such as the use of diversion or exclusion booms may be required.

The velocity calculated will be an approximation only, as the watercourse velocity varies at different points across the river, due to changes in river depth and at various points upstream and downstream on the river. In the initial stages of the spill on a watercourse, lighter-end materials will tend to evaporate, especially in warm weather. Other processes that might affect spill behaviour include dispersion of the petroleum into the water, formation of stable oil/water emulsions and stranding or oil along the shoreline.

Containment of a spill on a watercourse should be completed as quickly as possible as the spilled material has the potential to travel a much greater distance and contaminate a larger area than spills on land. The Incident Commander and ICS Operations personnel will implement appropriate containment actions based on the size of the watercourse and current velocity.

Watercourse Containment Options		
Containment Method	**Technique Description**	**Comments**
Containment Boom (Spring to Fall)	A containment boom is placed in the watercourse to prevent migration of the spilled material down-stream of the containment point.	The watercourse needs to be accessible to allow containment activities. If water is too shallow, or current is too fast, the containment boom may not be effective in containing the oil. Oil spill containment equipment, work and safety boats, and a work crew need to be available to conduct this method.
Diversion Boom (Spring to Fall)	Diversion booms are used in large or swift rivers to divert spilled material to calmer water for containment and recovery. May be used in combination with containment boom.	The watercourse needs to be accessible to allow boom to be deployed. High current speeds or turbulence may make deployment impossible, or may cause deployed boom to fail, releasing spilled material downstream. Oil spill containment equipment, work and safety boats, and a work crew need to be available to conduct this method.

Watercourse Containment Options		
Containment Method	**Technique Description**	**Comments**
Sorbent boom (Spring to Fall)	Sorbent booms may be used in narrow, low flow streams or rivers to remove small amounts of surface oil. Chicken wire or containment boom may be used to back up sorbent boom.	The watercourse needs to be accessible to allow boom to be deployed. Sorbent boom use is only viable in low flow watercourses, as boom is not very sturdy and breaks easily. (Chicken wire or containment boom may be used behind sorbent boom to reinforce sorbent boom and prevent breakage). Sorbent boom also has no skirt allowing large amounts of oil to easily flow under it. Sorbent boom will pick up sheen but not large amounts of oil. Sorbent boom is not very effective in cold weather. Large amounts of sorbent boom are expensive, and needs to be replaced in the watercourse when saturated. Used sorbent needs to be stored and disposed of in compliance with government legislation. Sorbent boom, work crew and possibly boats may be required.
Earth or Sand Dike (Spring to Fall)	Dikes are used across very shallow streams and intermittent creeks to contain flowing oil. Dikes can also be used to contain spilled materials along a shoreline.	Sufficient earth or sand is needed to construct the dike. Flowing may be caused if stream or creek is dammed (a containment weir may be used to alleviate this problem – see below) Damage may be caused by evacuation and construction in the watercourse and along the banks. A work crew with shovels, earth-moving equipment, earth or sand, sandbags and/or sheets of metal or wood may be required.
Containment Weir (Spring to Fall)	Containment weirs are physical dams with culverts or pipes constructed in the dam to allow free water movement from a site while containing surface oil.	Containment weirs are used in shallow streams and creeks and are suitable for maintaining a constant water level at the site and preventing flooding. Damage may be caused by excavation and construction in the watercourse and along the banks. A work crew with shovels, earthmoving equipment, earth or sand and piping or culvert material is required.

Watercourse Recovery Options		
Recovery Method	**Technique Description**	**Comments**
Vacuum Truck	A vacuum truck is used to recover free petroleum from water in areas accessible by trucks or heavy equipment.	A vacuum truck and operator are required. Use of this method is subject to site access. Surface disturbance and soil damage may result from movement of the vacuum truck to and from the site. Topsoil may need to be stripped from the site before conducting recovery activities.
Pumping of Spilled Material into Storage	A pump is used to recover free oil from the watercourse in areas not accessible by vacuum trucks.	Pumps need to be safe for use at the spill site and be compatible with the product to be pumped. Surface disturbance and soil damage may result from movement of the pump and storage equipment to the site. Technique will generate large volumes of contaminated water that will require storage. Skid tanks, tankers, port-a-tanks, fuel bladders, permanent tanks or a lined excavated area need to available to provide storage for the recovered material. A work crew and power supply for the pump need to also be available.
Skimmers	Mechanical devices are used to skim oil from water surface or remove oil/water mixture for storage.	Skimmer will need sufficient water depth to float. Weir skimmers work best on thicker layers of oil in flowing water. Will generate large quantities of water/oil mixture. Drum or disc skimmers will pick up thinner layers of oil on slow moving water. Debris and vegetation may clog skimmer making oil pickup difficult. A suction, floating weir, disc or drum skimmer, pump and work crew are required. A secure storage facility (tanker, portable tanks, fuel bladders or excavated, lined storage site) is also required.

Spills into Water Bodies

In the absence of any current or wind, spills on water bodies such as lakes will spread out in all directions from the site of the spill until a uniform stable thickness is reached. If a wind and/or current are present, the spill will move with the wind or current until it reaches the shoreline.

Wave action in the water body may also affect the spill causing oil-in-water or water-in-oil emulsions to form, making recovery and clean-up efforts more difficult.

The Incident Commander and ICS Operations personnel should attempt to contain the spill to as small an area as possible on the water body near the spill source. Dispersion of the spill over a large area on the water body could cause widespread impacts when the spill reaches the shore. If the spill can be contained on the water body, the spilled material is moved toward shore for recovery.

Containment options for spills on water bodies use a containment boom to surround the spill. If the area that may be impinged by the spilled materials is environmentally sensitive, appropriate shoreline protection measures may be implemented as recommended by Husky Environmental Specialists.

Spills into Wetlands or Muskeg

Wetlands are areas with high organic content, which contain large amounts of water in the soil. Wetlands may be continuously covered in water or water levels may fluctuate throughout the year. Muskeg is a land area that contains high moisture content and is boggy in the summer because of large quantities of peat, moss, or other vegetative material in the soil. In winter, muskeg will freeze making excavation extremely difficult.

Spills in wetlands or muskeg can be some of the most difficult spills to contain, recover and clean up because of limited site access for both manpower and equipment. Because of the sensitive nature of these ecosystems, more damage may be caused by emergency response operations than was caused by the original spill. The Incident Commander may consult with government officials or environmental specialists before conducting emergency response operations in wetlands or muskegs. This will ensure that containment, recovery, and clean-up operations represent the most viable option for the spill, based on the type of product, size of spill and site specific safety, operational or environmental concerns.

If all other options are considered unviable, natural recovery may be approved by environmental protection agencies. Natural recovery uses micro-organisms already present in the ecosystem to degrade the oil. Degradation of the oil may be enhanced by addition of other nutrients required by the micro-organisms, to ensure sufficient levels of these nutrients are present to allow degradation to continue.

Natural recovery may be preferable to recovery and clean-up depending on:

- the amount, type and persistence of the oil
- the location of the site
- the nature and uses of the area
- whether the impacts of various clean-up methods are greater than damage related to the actual spill

Natural recovery should be considered if:

- clean-up activities will cause more harm than leaving the site to recover naturally
- leaving the area to recover naturally will not cause further harm to environmentally sensitive areas

Containment operations for wetland or muskeg spills in winter are similar to those for spills on land or ice. If containment operations are conducted at the site in the summer, a combination of land containment and water containment options will be used as appropriate.

A summary of available options is provided in the following table:

Wetland or Muskeg Containment Options		
Containment Method	**Technique Description**	**Comments**
Containment Boom	A containment boom is placed in wetland to prevent migration of oil into non-contaminated areas.	If water is too shallow, or the current is too fast, the containment boom may not be effective in containing the oil. Oil spill containment equipment, work and safety boats and a work crew need to be available to use this method.
Containment Weirs	Containment weirs are physical dams with culverts constructed in the dam to allow free water movement from a site while containing surface oil. Containment weirs are used to maintain a constant water level at spill site for easy oil recovery.	Access to the site by manpower and equipment may be limited. Building of containment weirs may be labour-intensive and time-consuming if done manually. Damage may be caused by excavation and construction in the watercourse and along the banks. A work crew with shovels, earthmoving equipment, earth or sand and piping or culvert material is required to use this method.
Vacuum Truck	Muskeg or wetland areas need to be accessible. A vacuum truck can recover from a trench or water surface.	Surface disturbance and soil damage may result from movement of the vacuum truck to and from the site. Topsoil may need to be stripped from the site before undertaking recovery activities.

Wetland or Muskeg Containment Options		
Containment Method	**Technique Description**	**Comments**
Pumping of Spilled Material into Storage	A pump is used to recover free oil from wetlands or muskeg.	The wetland or muskeg area needs to be accessible for equipment. Pumps need to be safe for use at the spill site and be compatible with the product to be pumped. The technique will generate large volumes of contaminated water that will require storage. Skid tanks, tanker trucks, port-a-tanks, fuel bladders, permanent tanks or a lined excavated area need to be available. A work crew and power supply for the pump need to also be available.
Skimmers	Used to skim oil from water surface or remove oil/water mixture for storage. Drum or disc skimmers will pick up thinner layers of oil on slow moving water.	The wetland or muskeg area needs to be accessible. Skimmer will need sufficient water depth to float. Debris and aquatic vegetation may clog skimmer, making oil pickup difficult. A suction, floating weir, disc or drum skimmer, pump and work crew are required to undertake method. A secure storage facility is also required.
Fresh Water Flushing	Water is flushed through an area to push oil that is in vegetation or on the water surface toward a collection point for recovery. The method can be used in conjunction with trenches.	The wetland or muskeg area needs to be accessible for equipment to allow recovery activities to be conducted. The method is not suitable for areas with extensive vegetation or obstructions. Physical damage may be caused to sensitive environmental areas. Pumps, a power supply, hoses, hot or cold water, and a work crew are required. A lined, excavated area or storage tanks may be required to hold water for treatment or testing.

Ice-Covered Water Spill Assessment

The first step in an ice-covered water assessment is to identify the On-Site Supervisor, Safety Supervisor, Ice Rescue Team and Ice Assessment Team. The applicable equipment will then be identified to ensure that all resources necessary are available to contain the spill. Before beginning an assessment, ensure workers are protected against exposure to cold, warm-up facilities and food have been provided, and designate a rest area off the ice.

Ice assessment team will proceed from the shore and drill one test hole in the ice to determine, ice thickness, current velocity, water depth below ice and current direction of water flow. If the ice is safe to continue, the ice assessment team can proceed across the watercourse. As the assessment team moves away from the shore, it may be necessary to reposition anchors from shore to on-ice with the use of ice anchors.

Following the initial assessment of the ice across the watercourse, the team may move downstream (approximately 9 metres) and drill test holes across the watercourse. At this point, it is important to stagger the holes in order to obtain a more accurate assessment. The On-Site Safety Supervisor will then declare whether or not the weight bearing capacity is sufficient to continue work without the use of safety lines and anchors.

Ice Spills

Spills on Ice

Spills on ice will tend to spread out from the spill source toward lower-lying areas. Surface depressions, cracks and pockets in the ice will cause the spilled material to pool. A significant volume of some oils can be absorbed into ice.

The presence of oil on or in ice increases solar heating and the rate of melting. Subsequent freezing and melting may eventually cause the oil to migrate throughout the surface of the ice. Openings in the ice may allow the spilled material to migrate into open water or allow the spill to be swept under ice, making response operations more difficult.

The information presented should be used as a guideline only in determining typical load-bearing capacity of ice. The Incident Commander and ICS Operations personnel need to determine whether it is safe to work on ice based on actual site conditions.

The ability for ice on a river, stream or lake to support the weight of workers and equipment is determined by effective ice thickness which is based on the thickness of clear ice and presence of white ice.

Clear ice (sometimes called blue ice) is translucent and well compressed with few air pockets. This ice is very strong and has a high load-bearing capacity.

White ice (or snow ice) is very porous, with many air pockets and is much weaker. White ice has approximately half the load-bearing capacity of clear ice. White ice is formed by constant melting and freezing of the top layer of ice due to solar heating or mild temperatures and is normally found on top of clear ice.

Holes should be drilled in the ice at the work site, before starting any on ice operations, to determine the average thickness of white and clear ice.

Effective ice thickness then can be calculated, using the formula in the following table:

Effective Ice Thickness = clear ice thickness + ½ white ice thickness
Example: The spill site has 20 inches of clear ice and 10 inches of white ice 20 inches clear ice + ½ x 10 inches white ice = 25 Effective Ice Thickness
Note: If water lies between layers, use the depth of only the top layer of white ice

Based on the effective ice thickness, a determination can be made as to the stationary and moving loads that may be supported by the ice. Normally less ice is required for continuous movement on the ice than for stationary loads as less pressure is exerted on any one point on the ice during movement.

The following table will assist the Incident Commander and ICS Operations personnel determine the permissible loads on ice based on the effective ice thickness:

LOAD-BEARING CAPACITY OF ICE THICKNESS FOR CONTINUOUS TRAVEL [1]		
Permissible Load	**Effective Ice Thickness - Inches (Centimetres)**	
	Lake	**River**
One person on foot	2.0 (5.0)	2.5 (6.3)
Group, in single file	3.2 (8.0)	3.5 (8.8)
Passenger car 4,400lbs (2000kg)	7.1 (17.8)	8.3 (20.8)
Light Truck 5,500lbs (2500kg)	7.9 (19.8)	9.1 (22.8)
Medium Truck 7,700lbs (3500kg)	10.2 (25.5)	11.8 (29.5)
Heavy Truck 15,000 – 17,500lbs (6800 – 8000kg)	13.8 (34.5)	16.1 (40.3)
20,000lbs (9000kg)	15.0 (37.5)	17.3 (43.3)
50,000lbs (23,000kg)	24.8 (62.0)	28.7 (71.8)
99,000lbs (45,000kg)	31.5 (78.8)	36.2 (90.5)
150,000lbs (68,000kg)	39.4 (98.5)	45.3 (113.3)
240,000lbs (109,000kg)	49.2 (123.0)	56.7 (141.8)
WEIGHT-BEARING CAPACITY FOR STATIONARY LOADS AND WORKING ON ICE		
Permissible Load	**Effective Ice Thickness - Inches (Centimetres)**	
	Lake	**River**
2,200lbs (1000kg)	8.0 (20.0)	9.1 (22.8)
4,400lbs (2000kg)	12.0 (30.0)	14.0 (35.0)
8,800lbs (4000kg)	18.0 (45.0)	21.0 (52.5)
17,600lbs (8000kg)	24.0 (60.0)	27.0 (67.5)
50,000lbs (23,000kg)	44.0 (110.0)	50.0 (125.0)
99,000lbs (45,000kg)	59.0 (147.5)	68.0 (170.0)
150,000 lbs (68,000 kg)	71.0 (177.5)	82.90 (205.0)
240,000 lbs (109,000 kg)	91.0 (227.5)	105.0 (262.5)

Note: These tables are guidelines only for determining the typical load-bearing capacity of ice.

[1] Does not apply to parked loads, or where ice faults are evident.

Temperature may affect the load-bearing capacity of ice on a water body. Air temperatures need to remain below the freezing point of water (0°C) for a sufficient period to allow the ice to adequately support a stationary or moving load. Temperature effects are dependent on ice thickness, as follows:

- less than 50 centimetres (20 inches) of ice: temperature need to be constant for 3 days
- between 50 and 100 centimetres (20 and 40 inches) of ice: temperature need to be constant for 4 days
- over 100 centimetres (40 inches) of ice: temperature need to be constant for 5 days

Sudden drops or increases in temperature can also cause thermal stressing or cracking of ice requiring temporary load restrictions for 3 to 5 days following the change. Thawing due to warm temperatures may also significantly affect ice conditions. On-Site personnel should take extreme care when evaluating ice conditions during a thaw and limit work on or near ice under these conditions.

Containment and clean-up options for spills on ice are similar to those on land and are summarized in the following tables:

On Ice Containment Options		
Containment Method	**Technique Description**	**Comments**
Earth or Sand Dike (All seasons)	Earth or sand at or near the site is used to contain spilled material on flat or sloped surfaces. Sandbags filled with earth or sand are used to contain spill. Augment with impermeable or poly-sheeting if available.	Effective ice thickness needs to be sufficient to support the weight of manpower and equipment required to build dike. Sufficient dry earth, gravel or sand needs to be available to contain spill. Earth may be frozen. Surface disturbance to remove earth or sand may result in erosion, especially on steep slopes. Earth or sand placed on ice needs to be removed before spring break-up. Work crews and/or earth-moving equipment are required to build dike.
Snow or Ice Dike (Winter only)	Snow or ice at or near the site is used to contain spilled material on flat or sloped surfaces. Augment with impermeable or poly-sheeting if available.	Effective ice thickness needs to be sufficient to support the weight of manpower and equipment required to build dike. Sufficient snow or water needs to be available to contain spill. Snow or ice dike may melt quickly in warm weather. Contaminated snow or ice may need to be removed or stored for treatment. Work crews and/or earth-moving equipment are required to build snow dike. Water spraying equipment may be required to construct and maintain an ice dike.

On Ice Containment Options		
Containment Method	**Technique Description**	**Comments**
Sorbent Dike (All seasons)	Sorbent material is used to contain spill.	Useful only in small spills, as purchase of large quantities of sorbent is expensive and impractical. Contaminated sorbent may need to be replaced or squeezed out during incident. Contaminated sorbents needs to be disposed of properly to comply with government regulations. Sufficient sorbent or sorbent boom, work crews and storage containers or a lined storage area for contaminated sorbents needs to be available to build sorbent dike.

On Ice Clean-Up Options		
Clean-up Method	**Technique Description**	**Comments**
Manual Removal by Work Crew and/or Equipment (Winter)	A work crew or earth-moving equipment are used to remove thick oil or contaminated snow and ice.	Effective ice thickness needs to be sufficient to support the weight of manpower and equipment required. All necessary safety precautions should be undertaken for personnel who work near any open water. Manual removal may be a difficult and time-consuming process. A work crew with hand tools or earth-moving equipment (e.g. backhoe) and operators, as well as ice cutting equipment, may be required. Lined storage area or storage drums are required to store contaminated material before treatment or disposal. Oil present in snow may be skimmed off during spring thaw.
Steaming of Ice Surface	Steam is used to melt ice surface to aid in spill clean-up. The technique may be used in association with other clean-up and recovery techniques.	Effective ice thickness needs to be sufficient to support the weight of manpower and equipment required. All necessary safety precautions should be undertaken for personnel who work near any open water. A work crew with steaming equipment is required to undertake this method.

On Ice Clean-Up Options		
Clean-up Method	**Technique Description**	**Comments**
Sorbents (Spring to Fall)	The method is used in isolated areas to clean up small amounts of oil.	Clean-up is labour-intensive and time-consuming. Limited access to site may make this method difficult or impossible. Sorbents are not very effective on weathered oil or in cold weather. Sorbents may freeze to the surface. Sorbents needs to be disposed of properly to comply with government regulations. Sufficient sorbent, work crews and storage containers or a lined storage area for contaminated sorbents needs to be available.
Snow or ice melting	Snow or ice is removed from the clean-up site and melted in heated tanks to allow spilled material to be skimmed off the surface of the melt water. The technique may be used in association with other clean-up and recovery techniques.	Contaminated snow or ice needs to be removed from clean-up site and placed in melting tanks. The method may be labour-intensive and time-consuming, as melting is not be very efficient for clean-up of large volumes of petroleum-contaminated ice. In very cold temperatures, sufficient heat may not be available in the tanks to melt ice. A work crew, heating tanks, skimming equipment, transfer vehicles and operators are required. A lined storage facility for storage of contaminated ice or snow before melting may also be required, as well as storage tanks for storing recovered petroleum.

Spills Under Ice

Spills of petroleum under ice will spread and will travel under the ice at a velocity that is less than the current speed of the watercourse. The spill will tend to follow the path of the main current flow. The spill product may become trapped in crevices, cracks, pockets, and other irregularities under the ice and may freeze from the underside of the ice anywhere downstream or outward from the original spill. This will make recovery and clean-up operations extremely difficult.

Before conducting any response operations to contain, remove and clean up oil under ice, the Incident Commander should ensure that the ICS Operations personnel have calculated the effective ice thickness to ensure it will support the weight of personnel and equipment.

For spills under ice, the Incident Commander and ICS Operations personnel should attempt to determine the location of the spilled material and bring the spill to the surface of the water for containment and recovery. Spill movement under the ice is normally located by drilling holes through the ice using an ice auger downstream of the spill source on a flowing watercourse or outward from the spill source on a non-flowing water body. Alternately, aerial reconnaissance may be used to attempt to locate spilled material in cracks at the surface or under thin ice. Once the spill has been located, containment operations can be conducted to bring the spilled product to the surface.

Containment operations are normally accomplished by constructing slots in the ice. Ice slots allow petroleum products trapped under the ice to rise to the surface for recovery.

The slot is normally constructed at an angle in relation to the shore toward the area of strongest current flow in the river. If the slot is constructed correctly, the spilled material will rise into the slot and flow along it toward the shore for recovery.

The angle of slot construction in relation to the shore depends on the current velocity, similar to a containment boom placed in a flowing river. For higher currents in the river, a shallower angle is used for the ice slot, while a larger angle may be used for lower current flows.

If a slot is constructed at too great an angle to the current, turbulence may occur, sweeping the spilled material under the ice on the downstream side. Plywood or other types of sheeting may be placed on the downstream side of the slot and frozen in place to facilitate containment of the spilled material. The ice slot should be 0.5 to 1.0 metre (1.6 to 3.3 feet) wide, to aid in containment. Ice blocks may be cut using a ditch witch or backhoe if the effective ice thickness is sufficient to allow stationary equipment on the ice. [If ice is too thin for equipment but safe for personnel, crews equipped with chainsaws and proper safety gear can cut the ice.] Ice blocks can be removed to clear the slot or pushed under the ice downstream of the slot if sufficient water depth is available.

Ice blocks are extremely heavy (one cubic foot of ice weighs 24 kilograms (53 pounds). Blocks should be cut to a size that will allow the crews or equipment to remove them easily. To aid in block removal, the ones nearest the shore should be removed first and remaining blocks should be floated toward shore for removal. Plywood or other sheeting can be used upstream of the slot to divert oil into the slot for recovery. Narrow slots may be cut into the ice with a chain saw and sheeting may be wedged into the slots to channel the main current toward the ice slot in a manner similar to a diversion boom in open water.

Under Ice Containment Options

Containment Method	Technique Description	Comments
Ice Slotting	Ice slots are cut into ice on rivers to collect oil moving under the ice. The technique is best used for rivers with current, as oil will be moved toward slot by current.	Effective ice thickness needs to be sufficient to support the weight of manpower and equipment required to build slot. All personnel working near any open water need to take all required safety precautions. The location of the spill needs to be confirmed by drilling holes downstream of the spill source before constructing the ice slot. Total containment of spilled petroleum in an ice slot is unlikely, due to material trapped under ice. Snowmobiles, communications gear, and ice augers may be required to determine the location of the spill. Work crews, chain saws and/or a backhoe or ditch witch are required to construct an ice slot. A recovery device such as a heat-traced ice skimmer is required to recover spilled material. Storage tanks or a lined excavated storage area may be required to store recovered oil/water mixture.

Spills in Broken Ice

The risk to Life Safety of the personnel attempting spill response in broken ice conditions using existing technology is extreme. Emergency operations in broken ice conditions during spring thaw or winter freeze-up are extremely difficult. When oil is mixed with floating ice or covered by a very thin ice cover, ice interferes with the collection of the oil and could damage containment and recovery equipment. The presence of ice also makes the use of boats difficult.

Before authorizing any spill response operations in broken ice conditions, the Incident Commander and ICS Operations personnel, along with the appropriate regulatory agencies, will evaluate whether it is safe or feasible to undertake containment and recovery operations and what methods should be used.

Containment options for spills during freeze-up or break-up are similar to those for spills on a river and on ice. If containment operations are determined to be feasible based on site conditions, the Incident Commander and ICS Operations personnel will attempt to deflect ice away from the containment site.

Deflection of ice may be achieved using log booms or ice dams. A log boom consists of logs cabled together with chain, anchored upstream of a conventional containment boom. An ice dam is constructed upstream of the oil spill site and containment site, to attempt to divert upstream ice away from a containment site.

Log booms are deployed at an angle away from the containment site. Logs are spaced to allow spilled materials and water to move directly toward the containment site, while diverting the ice toward the opposite shore, allowing the ice to pass around the containment site.

Snow Spills

Snow is a natural sorbent, thus as with spills on soil, spilled fuel can be more easily recovered. Generally, small spills on snow can be easily cleaned up by raking and shovelling the contaminated snow into plastic bags or empty barrels, and storing these at an approved location.

Dykes can be used to contain fuel spills on snow. By compacting snow down slope from the spill and mounding it to form a dyke, a barrier or berm is created thus helping to contain the spill. If the quantity of spill is fairly large, a plastic tarp can be placed over the dyke such that the spill pools at the base of the dyke. The collected fuel/snow mixture can then be shovelled into barrels or bags, or collected with sorbent materials.

Fluid Transfer and Handling Spills

Operational Description

Operations will include activities related to: reclamation, care and maintenance; road, lease and general construction; the mobilization of equipment; and the transport of consumables such as; diesel and gasoline. The transportation of diesel and gasoline occurs between the months of June to October, and incorporates the use of public/private roads and deck loaded fuel tanker trucks. Transfer of fluids may include the movement of bulk loads between the barge and shoreline. Day to day refueling of vehicles and equipment will take place at dedicated refueling stations and at worksite locations throughout the project area. For information and guidance on the actions to be taken prior to and during the transfer of fluids between various storage and transportation vessels please reference the ***Fuel Transfer and Handling Plan.***

Product Transfer Areas

During product transfer multiple Product Transfer Areas (PTA's) will be present and set up in two main areas;

At the River PTA:

- Connection between the delivery hose and fuel truck

At the Fuel Farm PTA:

- Connection between the delivery truck and hose
- Connection between the delivery hose and tank

River Product Transfer Area

During the transfer of fuel Husky adopts the Risk Management Method to ensure a quick and effective response to any spill at the River PTA. This would mean that the following measures will be in place at all times fuel transfer is taking place:

- Spill containment measures to be in place around the hose connection point on the barge deck.
- Spill containment booms to be laid out in the river downstream of operations.
- Barge operator safety plans to be followed at all times.
- Fuelling operators to be in place at the barge PTA and truck PTA with effective communication in place between the two.
- Spill containment at the truck PTA will be in place prior to the flow of fuel commencing which will be capable of containing the volume of a potential spill using the calculation:

Flow Rate X Time Taken to Stop Flow + Volume of Fuel in the Transfer Hose = Volume of Potential Spill

Fuel Farm Product Transfer Area

As with the River PTA, a Risk Management method will be employed to ensure a quick and effective response to a fuel release situation. The following controls should be in place before the commencement of fuel transfer:

- Fuel trucks will be positioned over containment trays in road way.
- Any hose to hose connections should be within the berm and lined area around the tanks.
- Operators to be in position at the cut-off switch at the truck and at the tank fill point.
- Effective communications to be in place between both fuelling operators.
- Only trained operators to be used.
- Fuel transport company task based safety plans are to be followed at all times.
- Husky site specific and contractor task hazard assessments including fire and explosion plans to be completed and reviewed before commencing fuel transfer.

Communication

In the event of an incident during fuel transfer operations, a successful outcome is best achieved through a quick response to the incident utilizing ***the initial spill response actions***. Should a fire situation arise, a Forest Officer should be notified as soon as is reasonably practical at the number below.

Forest Officer - 24 HR Emergency Number **1-867-587-3512**

Product Transfer Hazards with Potential Incidents

During the transfer of fluids from tank to tank the following hazards with potential incidents have been identified with the corresponding pre-action followed by consequence.

Hazard(s)	Potential Incident	Result	Environmental Effect	Pre-Action	Consequence
Release	Product delivery person wanders off during transfer	Overfill of heavy equipment/fuel tank	Contaminated soil	Tail-gate meeting discussing fueling process and utilize drip trays. No refueling within 100m of waterbodies	Low - small amount of fuel; cleanup conducted with hand tools
	Fuel hose fails	Product released to environment	Water body, Shale road surface, containment trays	All equipment to be inspected before use and protected where required	High - when in the water course due to the difficulty in containing and recovering product effectively
	Product released to environment	Contamination of environment	Water body, shale road, clay, Sand beach	Spill containment measures at all required areas; booms to be pre placed in river; vehicles will have spill kits for smaller releases	High - due to the likelihood of liquid product to have consequence to receiving environment
Fire	Lightning strike during fuel transfer	Rupture of equipment and possible fire	Water body, shale road, clay, Sand beach	Fuel transfer to cease during electrical storms	Low - due to other measures in place for the limiting of transfer during periods of electrical storm activity
	Fire occurs during transfer	Damage to equipment resulting in product release	Water body, Shale road surface, containment trays	No smoking signs to be posted at PTA; no hot work in PTA; fire watch to be posted; all equipment to be adequately bonded	High - escalation through fire being transferred to vegetation and undergrowth and fluid hydrocarbon escaping

Spill Control Points

Control points are pre-identified locations on watercourses that allow for the staging and deployment of oil spill containment and recovery equipment in response to oil spills that have occurred upstream of the control point.

An ideal control point should have:

- quick access to the watercourse in all seasons, using clear ground, a road or a trail
- adequate work space to conduct operations and to store required equipment with minimal need for clearing of brush and vegetation
- sufficient space to deploy containment and recovery equipment quickly with minimal effort or obstructions (i.e. trees, rocks, steep banks, etc.) and minimal environmental impact
- boat launch location(s) for boats assisting in containment and recovery operations.

Selection of control points with public access is preferred. Reference the ***Area Overview – Emergency Planning Base Area Map*** for potential spill control points identified such as; culverts, bridge crossings and spill kit locations.

River Speed Determination

The speed of the river is required for two main reasons. To determine which downstream Control Point(s) should be activated, as responders will require time to reach the site, perform the boom deployment and set up spill recovery equipment prior to the arrival of the waterborne oil. While a deployment may be performed while the spill is passing through the area, this procedure requires a significant increase in safety precautions.

For conventional boom deployments the speed of the current where the boom is to be deployed will dictate the angle of attack of the boom. If there is variation of speeds across the intended deployment area, use the highest speed to determine the initial boom deployment angle and adjust, if necessary, after the boom has been placed.

A stick or other free floating object thrown in the river, slightly upstream of the intended deployment site, can be used to determine the rate of flow. This procedure is performed as follows:

1. Select the area of river in which the boom is to be deployed
2. Place off 30 meters (100') parallel to the river along the shore and place an identifying mark at each end
3. Throw a stick into the river slightly upstream of the upstream mark and into the fastest flowing water. The boat may be used for this function.
4. Time the interval between the stick passing the upstream and downstream marks
5. Refer to ***River Speed Determination Table*** for River Speed expressed in seconds.

River Speed Determination	
Time Stick Takes to Travel 30 Meters (Seconds)	**Approximate River Speed (kph)**
216	0.5
108	1.0
72	1.5
54	2.0
43	2.5
36	3.0
31	3.5
27	4.0
24	4.5
22	5.0
18	6.0
15	7.0
14	8.0
12	9.0
11	10.0

Boom Angle of Attack

The aim is deploy the spill containment boom in such a manner that it will guide the surface borne spill smoothly to the desired recovery location. In flowing water, a boom cannot be place directly across a river as the current will force the boom onto its side and the spill sill pass underneath.

To counter the force of the current, the boom is placed at an angle to the direction of the current. The faster the flow, the more acute the boom angle. Note that the current direction may not be absolutely parallel to the shore as it may be affected by a number of factors including topography of the river bottom, the depth of water and flows from nearby tributaries.

The river speed, having been determined in accordance with the procedure outlined above, ***Boom Angle of Attack Determination Table*** may be used as a guideline to determine the optimum angle of attack of the boom.

Boom Angle of Attack	
Current Speed (kph)	**Boom Angle (Degrees)**
9.97	15
7.56	20
6.13	25
5.26	30
4.60	35
4.05	40
3.73	45
3.29	50
3.07	55
2.96	60
2.84	65
2.73	70

Boom Angle/Length Correlation

The angle of the boom to be deployed across a given space will dictate the length of boom required to cover a specific area of the river width. The ***Boom Angle/Length Correlation Table*** may be helpful in estimating boom requirements.

Boom Angle/Length Correlation	
Boom Angle (Degrees)	**Required Boom Length (To reach 50 meters)**
90	50 meters/164 feet
75	75 meters/170 feet
65	55 meters/180 feet
55	62 meters/203 feet
45	71 meters/233 feet
35	88 meters/289 feet
25	119 meters/390 feet
15	200 meters/656 feet

Spill Reporting

Requirement to Report a Spill

The Northwest Territories Emergency Protection Act requires that the person who has charge, management or control of the substance at the time of a spill shall immediately report the release. This person is referred to as the Responsible Party.

The Northwest Territories has established a 24-hour Spill Report telephone number to receive such reports.

NWT Spill Report Telephone Number
Telephone: 1-867-920-8130 (24 hours)
Fax: 1-867-873-6924
Email: spills@gov.nt.ca

The Spill Report Centre will determine the Lead Agency and notify the Government department of the details of the event. The Lead Agency is a department within Government that is designated as having overall jurisdictional responsibility for a spill event. For spills within the Northwest Territories various Government Departments are designated Lead Agencies, depending on the location of the release. The various Lead Agencies are identified below:

Incident Location	Lead Agency
1. Spill on land outside Commissioner's Land	Indigenous and Northern Affairs Canada (INAC)
Except:	
a) Spills at Federal Facilities that are not authorized by a permit issued under Federal or Territorial legislation.	Environment and Climate Control Canada (ECCC)
b) Spills at oil and gas exploration and production facilities	Canada Energy Regulator (CER)
2. Spill on Commissioner's Land (i.e. Territorial highways, within communities)	Government of the Northwest Territories (GNWT/OROGO)
Except:	
a) Spills at Federal Facilities that are not authorized by a permit issued under Federal or Territorial legislation	Environment and Climate Control Canada (ECCC)
b) Spills at oil and gas exploration and production facilities	Canada Energy Regulator (CER)
c) Spills at facilities authorized by a permit issued under Federal legislation	Indigenous and Northern Affairs Canada (INAC)
d) Those sections of Territorial highways on ice surfaces	Indigenous and Northern Affairs Canada (INAC)
3. Spills on water	Canadian Coast Guard

Source: Northwest Territories-Nunavut Spills Working Agreement 2014.
https://www.enr.gov.nt.ca/sites/enr/files/nwt-nu_spills_working_agreement_2014_2_0.pdf

Definition of a Reportable Spill

Flammable or combustible liquids such as condensate, diesel or gasoline, or an inadvertent or accidental release of any quantity. When OROGO is identified as the Lead Agency; a quantity equal to or greater than 100 litres. Please reference the ***Northwest Territories Petroleum Industry Release Reporting Requirements*** chart at the end of this document.

Report Details

The Northwest Territories Environmental Protection Act requires that as much information as possible is supplied at the time of the spill report, however, a spill report should not be delayed for the lack of detailed information that may be supplied later.

The initial report should contain as much of the following information as possible. The italicized words are not included in the Environmental Protection Act requirements but experience has shown that this information can greatly assist responders and regulators:

a) Date and time of spill or discovery of spill.
b) Location of spill.
c) Direction spill is moving and an estimate of speed.
d) Name and phone number of a contact person close to the location of the spill plus any other ways to contact (cellular phone number, radio call sign, pager number).
e) Type of contaminant spilled and quantity released. If an estimate is provided ensure that the word “estimate” is included in the report.
f) Cause of spill if known. It is unwise to speculate.
g) Whether spill is continuing or has stopped.
h) Description of existing containment, if any.
i) Action taken to contain, recover, clean up and dispose of spilled contaminant.
j) Name, address and phone number of person reporting spill.
k) Name of owner or person who has charge, management or control of contaminants at time of spill.

Spill Report Form Location

A Spill Report Form is available to record the spill report or update details. A copy of the ***Spill Report Form*** is included at the end of this document. It may be photocopied and used or the inserted copy used and replaced at a later time.

The Spill Report Form may also be found on the Internet at:
https://www.enr.gov.nt.ca/sites/enr/files/128-spill_report_form_e_fillable_1.pdf

or

http://www.mackenziespillresponse.ca (MDSRC website)

Mutual Aid

Mackenzie Delta Spill Response Corporation (MDSRC)

MDSRC Office
Suite 33 - 2451 Dieppe Ave SW
Calgary, AB, T3E 7K1

MDSRC Manager
Tim Taylor
Email: info@mackenziespillresponse.ca
Tel.: 403-457-3661

MDSRC Response Advisor
Ian Lambton, Riverspill Response Canada Ltd.
172 West 48th Avenue
Vancouver, BC V5Y 2Y7
Email: riverspill@telus.net
Tel.: 604-434-0994
Cell: 604-317-0330

MDSRC Member Companies

Husky Energy Inc.
707 - 8 Ave SW
Calgary, AB T2P 3G7
Director: Laurie Henderson – NWT Project Specialist
Tel: 403-298-6343
Cell: 403-829-6106
Laurie.Henderson@huskyenergy.com
Alternate: Kevin Young – EMBC Consultant
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Cell: 403-554-0622
Kevin.R.Young@huskyenergy.com

Imperial Oil
505 Quarry Park Blvd. SE
Calgary, AB T2C 5N1
Director: Kent Pratt, Emergency Preparedness and Response Advisor
Tel: 587-476-4714
Cell: 403-852-1569
Kent.H.Pratt@esso.ca
Alternate: Jody Crawford, Conventional Operations Superintendent
Tel: 867-587-8014
Cell: 403-807-5634
Jody.A.Crawford@esso.ca

Government of Northwest Territories (GNWT)
Fuel Services Division, Department of Infrastructure
Director: Lorne Browne – Director of Fuel Services
Tel: 867-767-9044, Ext. 32101
Lorne_Browne@gov.nt.ca

Shell Canada Ltd.
400 - 4th Avenue SW
Calgary, Alberta T2P 2H5
Director: Lorenzo Fontana
Lorenzo.Fontana@shell.com

MGM Energy Corp. / Paramount Resources Ltd.
2800, 421 – 7th Avenue S.W.
Calgary, Alberta T2P 4K9
Director: Larry Yoon
Tel: 403-554-6702
Cell: 403-290-6242
Larry.Yoon@paramountres.com

TMAC Resources
181 University Avenue, Suite 300, PO Box 33
Toronto, ON M5H 3M7
Director: Oliver Curran
Oliver.Curran@tmacresources.com

MDSRC Inuvik and Norman Wells Spill Response Equipment Inventory

Note: This is a placeholder

An updated list of inventories will be obtained prior to operations for inclusion in the Field Level ERP, as this could change over time.

MGM/Paramount – SeaCans and Outdoor Storage Area

MGM/Paramount has spill response equipment stationed in Norman Wells to support their various field work activities for the entire Sahtu region.

Last known location: 65 16'56"N / 126 45'13"W (contact MGM prior to operations for an updated location)

SeaCans 232125 and 841112 are secured with combination locks. Combination number: 1963

SeaCans 7, 160772, 507409 and 291701 are secured with red locks. Key that opens all the red locks is in a sample bag hidden at the bottom left of container #841112. Travis Wright may have a spare key but not confirmed.

MGM/Paramount – SeaCans and Outdoor Storage Area Equipment Inventory

Note: This is a placeholder

An updated list of inventories will be obtained prior to operations for inclusion in the Field Level ERP, as this could change over time.

Classification of Dangerous Goods

The shipper (consignor) is responsible for classifying all dangerous goods that are shipped. Goods classified by the manufacturer should be verified by the shipper. Where the composition of the products has been changed (e.g., mixtures of hazardous waste), the products may need to be reclassified. The carrier is responsible to ensure that the documentation matches the package. All vehicles transporting dangerous goods into, or out of the site should have proper placarding on vehicles. Containers should also be labelled according to the requirements laid out by the TDG Act and Regulations. The shipper (consignor) is responsible for completing the shipping document. The carrier shall ensure that the documents match the package. Persons ordering and receiving dangerous goods shall ensure that shipping documents are sent by the suppliers where required by the TDG Act and Regulations and shall refuse shipments if not in compliance. Documents must be retained for at least two years.

A person that handles, offers for transport or transports dangerous goods must be adequately trained and have a training certificate or work under the direct supervision of an adequately trained person. Within each area or department that ships or receives dangerous goods, management shall identify individuals who require transportation of dangerous goods training. Retraining is required every three years. A training certificate must be requested for inspection.

Hazardous Waste Management

Hazardous waste must be stored in a safe and secure manner. In general, hazardous waste should be stored according to the following:

- Drainage is controlled to prevent spills or leaks from leaving the site and to prevent run-off from entering the site.
- Wastes are segregated by chemical compatibility to ensure safety of the public, workers and facility. The National Fire Code as well as TDGR can be referenced for segregation criteria.
- Hazardous wastes are stored in a secure area with controlled access. Only persons authorized to enter and trained in waste handling procedures should have access to the storage site.
- Regular inspections of stored hazardous wastes are performed and recorded. Containers are placed so that each container can be inspected for signs of leaks or deterioration. Leaking or deteriorated containers must be immediately removed and their contents transferred to a sound container.
- A record of the type and amount of waste in storage should be maintained.
- Hazardous waste containers must not be allowed to fill up with water when stored outdoors. Drums frequently accumulate water from rainfall and snowmelt, if stored upright, outside, without proper sealing.
- Empty containers need to be stored on their side to prevent water from entering.
- Storage sites must have emergency response equipment and material appropriate for the hazardous waste stored on site.
- Where the hazardous waste storage site is to be used for long term storage and the amount of waste in storage exceeds the quantity requirements set out in Schedule VI, the site needs to be registered in accordance with Section 2.5 of the Guideline for Hazardous Waste Management.

- Hazardous waste storage sites must meet all local by-law and zoning requirements. It is recommended that the local Fire Chief be advised of the storage facility and its contents for emergency planning and response purposes.

Waste management is intended to reduce or eliminate the effects of waste on the environment, to provide for public and worker safety and to maximize the efficient use of resources. Once hazardous waste has been created, the proper treatment and disposal can be expensive. While it is the responsibility of the waste generator to pay for all disposal costs, various waste management options are available to reduce the cost and volume of waste requiring treatment.

A more effective and proactive management practice is to eliminate or reduce the generation of the waste. This is referred to as pollution prevention.

"Minimizing or avoiding the creation of pollutants and waste can be more effective in protecting the environment than treating them, or cleaning them up after they have been created." – *Canadian Council of Ministers of the Environment.*

Waste management will be conducted in accordance with the NWT **Guideline for Hazardous Waste Management.**

Source: https://www.enr.gov.nt.ca/sites/enr/files/resources/128-hazardous_waste-interactive_web_0.pdf

Responding to Media Inquiries

The Incident Commander, CRMT Director and Legal need to review and approve all media statements before release.

Note: OROGO must be notified 24 hours in advance of any press release or conference held by Husky concerning any incident or near miss, except in an emergency in which case they should be notified right away. The CRMT Communications Officer will act as the company spokesperson for all planned communications to the media during an emergency.

In the absence of the CRMT Communications Officer, the Corporate Response Director will assume the role of company spokesperson.

Depending on the severity of an emergency, the media may attempt to contact company representatives in person at the incident site or in close proximity to the site. These representatives could include rovers, roadblock personnel, on-site personnel or other people the media deem credible to represent the company.

If you are approached by media:

- Be polite.
- Never use the phrase "No comment."
- If a more senior person is immediately available at your location, redirect the inquiry to that person.
- If you are the most senior person at your location, advise the media that you are not the Communications Officer.
- Gather the information on the Media Form, if possible.
- Advise the media that the Communications Officer will be in contact with them.
- Forward the Media Inquiry Form or any call back commitments to your supervisor as soon as possible. The media will be working to a deadline.
- The supervisor will pass the Media Inquiry Form or call back commitments to the Public Information Officer or Communications Officer for response.
- Be careful not to deny information or facts. Again, simply state that you are not the Communications Officer.
- Although a press release may indicate information about the number of people injured, **NEVER** disclose any information about the names of those injured or the extent of their injuries. Next-of-Kin notification must be completed before this information is released.

In cases where it is not possible to pass along the information to a more senior company representative, the following statement may be released:

Media Statement
“We are in the early stages of gathering information on this situation to determine our involvement and response. Of utmost priority is the safety and protection of the public and all responders. Company information will be available to you when we know more. Feel free to leave your contact number with me or call our Corporate Communications department in Calgary at 403-370-0488 for information”.

Training Program

Husky is committed to ensure all personnel involved in an emergency response fully understand their roles and the roles of others with whom they may interact during an incident. To meet this commitment and to ensure personnel respond effectively, training activities will include:

Orientation

- Provide employees and contractor management with an orientation to Husky's Emergency Response Plan and its applicable elements.
- Discuss and clarify bridging between contractors' emergency response procedures and this Husky ERP where applicable.
- Utilize summary wall charts outlining key responsibilities and lines of communication for quick reference purposes.
- Devote a portion of scheduled safety and/or staff meetings to the discussion of emergency response issues on an on-going basis.

Specialized Emergency Response Training

- Make available (through the Husky Safety Advisor) all required training.
- Ensure employees and contractor personnel comply with Husky's safety training requirements (e.g. First Aid/CPR, WHMIS, Transportation of Dangerous Goods, firefighting, etc).

Emergency Drills

- Employees and contractors should conduct drills on an on-going basis to ensure readiness, including, but not restricted to:
    - fire fighting
    - spill response
    - first aid
    - confined space entry
    - man down

External Orientation

- As appropriate, brief and familiarize all external groups or agencies having a role in this Emergency Response Plan with the overall plan and their specific responsibilities under the plan.

NORTHWEST TERRITORIES PETROLEUM INDUSTRY SPILL / RELEASE REPORTING REQUIREMENTS

All spills exceeding the spill/release quotas listed in the table below must be reported immediately to the appropriate regulatory agency.

Chemical Class	Substance / Example	T.D.G. Reporting Requirements Road, Rail or Marine	Northwest Territories Reporting Requirements
Spilled Liquid Substances	Crude Oil / Emulsion	Any quantity of Packing Group I or II More than 30 L or 30 kg of Packing Group III	More than 100 kg or 100 L For Sour Natural Gas: Uncontrolled release, or any sustained release of 10 minutes or more
	Salt Water	No TDG Reporting Requirements	
	Condensate	Any quantity of Packing Group I or II More than 30 L or 30 kg of Packing Group III	
Class 1 Explosives	Ammunition Nitro-glycerine	Any quantity of Packing Group II	Any amount
Class 2.1 Flammable Gases	H_2S Methane Propane Butane Natural Gas	Any quantity	Any amount of gas from containers with capacity greater than 100 L
Class 2.2 Non-Flammable Gases	Compressed Air O_2 N_2 CO_2		
Class 2.3 Toxic Gases (poisonous or corrosive)	H_2S SO_2 Hydrogen Cyanide Nitric Acid Anhydrous Ammonia		Any amount
Class 3 Flammable Liquids	Lube Oil	No TDG Reporting Requirements	More than 20 L when released on a frozen water body that is being used as a working surface or More than 100 L
	Gasoline Corrosion Inhibitor Diesel Methanol Demulsifiers Scale Inhibitors	Any quantity of Packing Group I or II More than 30 L or 30 kg of Packing Group III	
Class 4.1 Flammable Solids	Calcium Resinate Naphthalene Crude		More than 25 kg
Class 4.2 Spontaneously Combustible	Activated Carbon Potassium Sulphide Phosphorus		
Class 4.3 Dangerous when Wet	Molten Sulphur Calcium Carbide Sodium Activated Carbon		
Class 5.1 Oxidizing Substances	Calcium Nitrate Ammonium Nitrate Bleaches		More than 50 kg or 50 L
Class 5.2 Organic Peroxides	Methyl Ethyl Ketone Peroxide Succinic Acid Peroxide		More than 1 kg or 1 L
Class 6.1 Poisonous Toxic Substances	Arsenic Biocide Corrosion Inhibitor Lead Acetate Mercuric Oxide Toxic Pesticides		More than 5 kg or 5 L
Class 6.2 Infectious Substances	Infectious Substances affecting Humans / Animals	Any quantity of Category A or B	All releases
Class 7 Radioactive Substances	Uranium Plutonium Naturally Occurring Radioactive Materials (N.O.R.M.)	For packages being transported under exclusive use: (i) 10 mSv/h on the external surface (ii) 2 mSv/h on the surface of the conveyance, and (iii) 0.1 mSv/h at a distance of 2 m from the surface of the conveyance; and For packages not being transported under exclusive use: (i) 2 mSv/h on the external surface (ii) 0.1 mSv/h at a distance of 1m from the package, (iii) 2 mSv/h on the surface of the conveyance, and (iv) 0.1 mSv/h at a distance of 2m from the surface of the conveyance.	
Class 8 Corrosives	Acids Bases Batteries Caustic Amine Corrosion Inhibitor	Any quantity of Packing Group I or II 30 L or 30 kg of Packing Group III	More than 5 kg or 5 L
Class 9 Miscellaneous Products, Substances & Organisms, Environmentally Hazardous Substances	P.C.B. Asbestos Polystyrene Beads Gas Plant Filters Benzoic Acid Chromic Acetate Cupric Sulphate	30 L or 30 kg of Packing Group II or III, or without Packing Group	More than 5 kg or 5 L - ENR or More than 50 kg or 50 L
Class 9.1 Miscellaneous (except and with PCB mixtures)			PCB mixtures more than 5 ppm or More than 0.5 kg or 0.5 L
Class 9.2 Aquatic Toxic			More than 1 kg or 1 L
Class 9.3 Wastes (chronic toxic)			More than 5 kg or 5 L
Other			**Refined products follow TDG reporting requirements**

Note: Spills must be reported promptly to avoid possible prosecution.

NOTES:

The Office of the Regulator of Oil & Gas Operations (OROGO) and NWT Environment & Natural Resources (ENR) must be notified of:

All releases of harmful substances, regardless of quantity, if the release is:

- near or into a water body.
- is near or into a designated sensitive environment or sensitive wildlife habitat.
- poses imminent threat to human health or safety.
- poses imminent threat to a listed species at risk or its critical habitat.
- or is uncontrollable.

The NWT RCMP have asked that the local detachment be notified of spills (even on Husky project roads) as a courtesy call.

RCMP Norman Wells - 867-587-1111
RCMP Yellowknife - 867-765-3900

For all other reportable substances/quantities, please refer to company SDS sheets for more information.

Please refer to section 8.16 of the Transportation of Dangerous Goods Regulations (TDGR) for conditions under which a loss or theft report must be made.

Spills/Imminent Release during Transport

NWT Department of Transportation, OROGO, ENR, relevant authorities and local police.

*Report When

Release, or imminent release, associated with handling, failure of standardized container or transportation of a TDG regulated product and release volume exceeds those specified in the Transportation of Dangerous Goods Regulations.

All incidents and near misses

OROGO, ENR, relevant authorities and local police.

*Report When

All incidents and near misses as soon as the circumstances permit.

Does the release or anticipated release exceed the quantity in the table and endanger or could it endanger public safety?

No: No further action from a TDG perspective.

Yes: Emergency report by telephone must be made to local authorities responsible for responding to emergencies. Refer to Release or Anticipated Release Report - Road, Rail or Marine.

GENERAL SPILL REPORTING INFORMATION

Report Date & Time	
Occurrence Date & Time	
Land Use Permit # (LUP)	
Water Licence # (WL)	
Location Name or Distance & Direction from Named Location	
Region (NWT/Nunavut/ Adjacent Jurisdiction)	
Latitude/Longitude	
Responsible Party	
Responsible Party Address or Office Location	
Any Contractor Involved	
Contractor Address or Office Location	
Product Spilled	
Quantity (L/Kg/m³)	
U.N. Number	
Second Product Spilled (If Applicable)	
Quantity (L/Kg/m³)	
U.N. Number	
Spill Source/Spill Cause	
Area of Contamination in m²	
Factors Affecting Spill Recovery	
Describe Assistance Required	
Hazards to Persons, Property or Equipment	
Additional Information/Comments/ Actions Taken	
Reported to Spill Line by	
Any Alternate Contact	

Online Spill Form:
http://www.enr.gov.nt.ca/sites/enr/files/128-spill_report_form_e_fillable_1.pdf

REPORTING OF SPILLS / RELEASES IS REQUIRED TO THE FOLLOWING AGENCIES:

NORTHWEST TERRITORIES	
Office of the Regulator of Oil & Gas Operations (OROGO)	
24 Hour Incident Reporting	867-445-8551
NWT Environment & Natural Resources (ENR) - SPILL REPORTING LINE	
24 Hour Incident Reporting	867-920-8130
NWT Environment & Natural Resources (ENR)	
Norman Wells, NT	867-587-3500
NWT Department of Transportation	
Yellowknife, NT	867-767-9087
GNWT Department of Lands	
Norman Wells, NT	867-587-7200
CANADA	
CANUTEC	
All Provinces	888-CAN-UTEC (888-226-8832) 613-996-6666
Transportation Safety Board of Canada (TSB)	
Incident Reporting Line	819-997-7887

HUSKY EMERGENCY ON-CALL NUMBERS:

On-Call Deputy Director 24 Hour Number	403-801-8592
ERAC 24 Hour Number Husky Oil ERAP #: 2-0010-034 LPG Transportation by Rail and Road	800-265-0212
ERAC 24 Hour Number Husky Oil ERAP #: ERP2-1933-013 Class 3 - Flammable Liquids	

*** Report When:** The release or anticipated release: exceeds quantity in the table AND endangers, or could endanger, public safety.

Nunavut

Northwest Territories

August 2020

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

NT-NU 24-HOUR SPILL REPORT LINE
Tel: (867) 920-8130 ● Fax: (867) 873-6924 ● Email: spills@gov.nt.ca

REPORT LINE USE ONLY

A	Report Date: MM / DD / YY	Report Time:	☐ Original Spill Report **OR** ☐ Update # _____ to the Original Spill Report	**Report Number:**
B	Occurrence Date: MM / DD / YY	Occurrence Time:		
C	Land Use Permit Number (if applicable):		Water Licence Number (if applicable):	
D	Geographic Place Name or Distance and Direction from the Named Location:		Region: ☐ NT ☐ Nunavut ☐ Adjacent Jurisdiction or Ocean	
E	Latitude: _____ Degrees _____ Minutes _____ Seconds		Longitude: _____ Degrees _____ Minutes _____ Seconds	
F	Responsible Party or Vessel Name:		Responsible Party Address or Office Location:	
G	Any Contractor Involved:		Contractor Address or Office Location:	
H	Product Spilled: ☐ Potential Spill	Quantity in Litres, Kilograms or Cubic Metres:	U.N. Number:	
I	Spill Source:	Spill Cause:	Area of Contamination in Square Metres:	
J	Factors Affecting Spill or Recovery:	Describe Any Assistance Required:	Hazards to Persons, Property or Environment:	
K	Additional Information, Comments, Actions Proposed or Taken to Contain, Recover or Dispose of Spilled Product and Contaminated Materials:			

L	Reported to Spill Line by:	Position:	Employer:	Location Calling From:	Telephone:
M	Any Alternate Contact:	Position:	Employer:	Alternate Contact Location:	Alternate Telephone:

REPORT LINE USE ONLY

N	Received at Spill Line by:	Position:	Employer:	Location Called:	Report Line Number:

Lead Agency: ☐ EC ☐ CCG/TCMSS ☐ GNWT ☐ GN ☐ ILA ☐ AANDC ☐ NEB ☐ Other: _____

Significance: ☐ Minor ☐ Major ☐ Unknown

File Status: ☐ Open ☐ Closed

Agency:	**Contact Name:**	**Contact Time:**	**Remarks:**
Lead Agency:			
First Support Agency:			
Second Support Agency:			
Third Support Agency:			

Wildfire Smoke Exposure: Considerations for Limiting Exposure During Emergencies

Purpose

This document provides background information and guidance on assessing smoke conditions and associated health risks during a wildfire where personnel may be affected from short term-exposure. It is to be used by Husky Oil (Husky) personnel, and for the purpose of maintaining Husky's commitment to the protection of employees, contractors and the general public[1]

Scope

Information and guidelines contained within this document are for use by Husky employees and contractors (Husky personnel) during any wildfire situation where people are at risk of exposure to wildfire smoke. Note: guidelines presented within this document are not intended to supersede recommendations and/or direction provided by a government health authority.

Where related to Husky operations, the definition of wildfire smoke will include:

- Any form of smoke caused by the burning of vegetation, whether natural or man-made.
- Smoke caused by the burning of non-vegetative fuels, where the ignition of such fuels was directly caused by vegetative fuels.

1.0 Background

Husky operations in Northern BC and Alberta are located within densely forested areas, and are therefore at an increased risk of being affected by wildfire. Husky recognizes the risks not only to our operations but more importantly to the public, and our employees and contractors that work and live in these areas. This document provides valuable information and guidelines for those responding to, or preparing for a wildfire emergency. Recommended guidelines will enable responders to categorize the air quality, determine potential health risks, and to communicate recommended actions to ensure the health and safety of our workers and the public.

Wildfires can include the burning of both **vegetation** and **made-materials**; they are caused by accidents, lightning strikes and intentional human activities such as brush and waste burning. Regardless of the cause, all wildfires contain harmful chemicals, gases and particulate matter that may endanger human life.

Air quality refers to the state of air around us. The effect of air quality on our health is determined by the length of time exposed, how much air is breathed, personal health, and the concentration of **harmful gases** and **particulates** (pollutants) in the air.

[1] Derived from Husky: Safety & Environment Policy 1.04

2.0 Health Effects of Wildfire Smoke

Particulate matter exposure is the principle public health threat from short-term smoke exposure. The health effects of smoke from wildfires can range from eye, nose or throat irritation to serious problems such as reduced lung function, bronchitis, exacerbation of asthma and even a risk of death. **People at increased risk** of adverse health effects include: people with existing respiratory or cardiovascular conditions; infants and young children; pregnant women and the elderly; diabetics; and people such as responders and firefighters who breathe deeply and/or rapidly.

Depending on the fuel being burned and the specifics of the fire situation, health effects may be produced by gases such as carbon monoxide, and by various hydrocarbons and chemicals such as formaldehyde and acrolein. The **short and long term health effects** from wildfire smoke may increase as a result of **repetitive and elevated or prolonged exposures**.

3.0 Response

3.1 Assessing Risk - Smoke Conditions

It is important that a **Husky representative** be assigned to monitor the levels of smoke particulate, and to determine occupational exposure limits for any situation where people may be exposed to wildfire smoke. This is an important consideration as the information will be used to assess the health risks to both the public and frontline responders, thus aiding those charged with evacuation and shelter in place responsibilities. Note, evacuation should only be considered if it is **necessary** and **safe to do so**.

For operational areas that do not have a continuous means of monitoring air quality, a **visibility index** may be used as a quick and alternative way to **estimate levels of smoke particulate**. Using landmarks at known distances, an experienced observer can provide a reasonable estimate of particle concentration. **Note:** Smoke conditions can vary quickly within short distances.

When **visually estimating** smoke particulate concentrations, it is important to face away from the sun, and determine the limit of your visibility range by looking for **landmarks at known distances**. The visibility range is the point at which even high-contrast objects totally disappear (ex: a dark building viewed against the sky at noon). Once visibility has been determined in kilometres, use **Table 1** to estimate the **"Air Quality Category"**. The Air Quality Category (health risk) is then used in conjunction with **Table 2** to determine appropriate response actions. Table 2 provides suggested health messaging and potential actions that are based on the estimated Air Quality Category. **Note:** The visibility index is not effective at night or when humidity is high.

Table 1 Estimating Particulate Matter Concentrations from Visibility Assessment

Air Quality Category	**Equivalent approx. PM2.5 1- 3-hour average in µg/m3**	**Visibility in Km**
Good	0-40	15 kms and up
Moderate/Unhealthy for Sensitive Groups	41-175	5-14 kms
Unhealthy	176-300	2.5-4 kms
Very Unhealthy	301-500	1.5-2 kms
Hazardous	Over 500	Less than 1 km

3.2 Recommendations and Actions

The following table categorizes air quality based on the level of particulate matter and makes recommendations on potential health messages and health team actions for each category.

Table 2 Recommended Messages and Actions by Air Quality Category during Wildfires

Air Quality Category	Health Messages At-Risk (Sensitive*) Populations**	Health Messages General Population**	Actions for Health Team**
Good *Visibility: 15 kms and up* 1-3 hour average PM2.5 0-40 µg/m3	**Continue with normal** outdoor work and leisure activities.	**Ideal** air quality for outdoor work and leisure activities.	Be aware of the **forecast** (current, daily, tomorrow). Ensure that a Husky representative is assigned the responsibility for assessing wildfire smoke related health risks. **Maintain frequent communications with health authority.** Perform a hazard and risk assessment.
Moderate/ Unhealthy for Sensitive* Groups *Visibility: 5-14 kms* 1-3 hour average PM2.5 41-175 µg/m3	**Reduce** or reschedule prolonged strenuous work activities, and limit outdoor working times. Consider options for **assisting and/or advising** At-Risk or sensitive members of the public. **Consult** with local health authority and review health risks; document details and if it is safe to do so, follow recommendations and instructions.	**Be aware** of the health effects and symptoms of exposure to wildfire smoke. Consider evacuation or withdraw times when determining the health risk to frontline responders.	**Advise** workers of the health effects and related symptoms from exposure to wildfire smoke, and provide them with information on how to reduce exposure. If the smoke event is projected to be prolonged, identify and evaluate possible cleaner indoor (shelter in place) and outdoor air shelter sites. **Review** shelter in place, and evacuation plans and guidelines, and ensure that evacuation response resources are on **standby**. **Maintain frequent communications with health authority.** Perform a hazard and risk assessment.

Table 2 continued on next

Unhealthy *Visibility: 2.5-4 kms* 1-3 hour average PM2.5 176-300 µg/m3	**Avoid** prolonged and strenuous work activities, and stay indoors if possible. Consider shelter in place and evacuation options. Consider additional resource requirements where a response effort is likely to continue.	**Reduce** or reschedule prolonged strenuous activities outdoors, especially if you experience symptoms. Consider moving all but essential personnel to a cleaner air location.	Consider altering or canceling current and future work activities. Review shelter in place, and evacuation plans and guidelines, and ensure that evacuation response resources are on standby. **Maintain frequent communications with health authority.** Perform a hazard and risk assessment.
Very Unhealthy *Visibility: 1.5 -2 kms* 1-3 hour average PM2.5 301-500 µg/m3	**Avoid** all strenuous activities and stay indoors if possible. If required, initiate shelter in place and evacuation options.	**Avoid** prolonged strenuous activities and stay indoors if possible. If required, move all but essential personnel to a cleaner air environment	Consider having At-Risk populations go to cleaner air shelters within the facilities or camps. Consider assigning additional resources to monitor and assess **weather conditions.** **Evaluate level of preparedness** for shelter in place, and determine if shelter in place is possible. Consider mobilizing shelter in place and evacuation resources to staging area. **Maintain frequent communications with health authority.** Perform a hazard and risk assessment.
Hazardous *Visibility: < 1 km* 1-3 hour average PM2.5 >500 µg/m3	**Avoid** all strenuous activities and stay indoors. If required, initiate shelter in place and evacuation options. Consider evacuation options for all response personnel.	**Avoid** prolonged strenuous activities and stay indoors if possible. If required, **move** all but essential personnel to a cleaner air environment.	If smoke event is projected to be prolonged, consider evacuation of At-Risk populations. Consider assigning additional resources to monitor and assess **weather conditions.** **Maintain frequent communications with health authority.** Perform a hazard and risk assessment.

*Sensitive: People with existing respiratory and cardiovascular conditions, infants and young children, the elderly, pregnant women and possibly other groups (diabetics, smokers and people participating in sports or **strenuous work outdoors**).

** Higher advisory levels automatically incorporate all of the guidance/ recommended actions offered at lower levels of concern.

4.0 Preparedness

To ensure an appropriate level of preparedness, the following recommendations must be considered:

- Identify smoke monitor candidates prior to starting operations, and ensure that adequate training is provided
- Ensure that Table 1 and Table 2 are communicated and made available to monitoring personnel
- Identify and record visibility landmarks before they are needed
- When referring to Table 2, consider messages and actions for both the quality of air actually determined and the quality of air that could exist under worse or differing conditions