Inuvik Environmental Emergency Plan

Inuvik Liquefied Natural Gas and Diesel Power Generating Facility

Date Drafted: January 2020

NORTHWEST TERRITORIES POWER CORPORATION

Empowering Communities

AUTHORIZATION			
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	NTPC HSE Director		

NTPC Inuvik Environmental Emergency Plan Update and Revisions List

Date	Page/Chapter	Update/Revision	Prepared by
May 2021	All	Review / Update	T. Perkins
October 2022	All	Review / Update	T. Perkins

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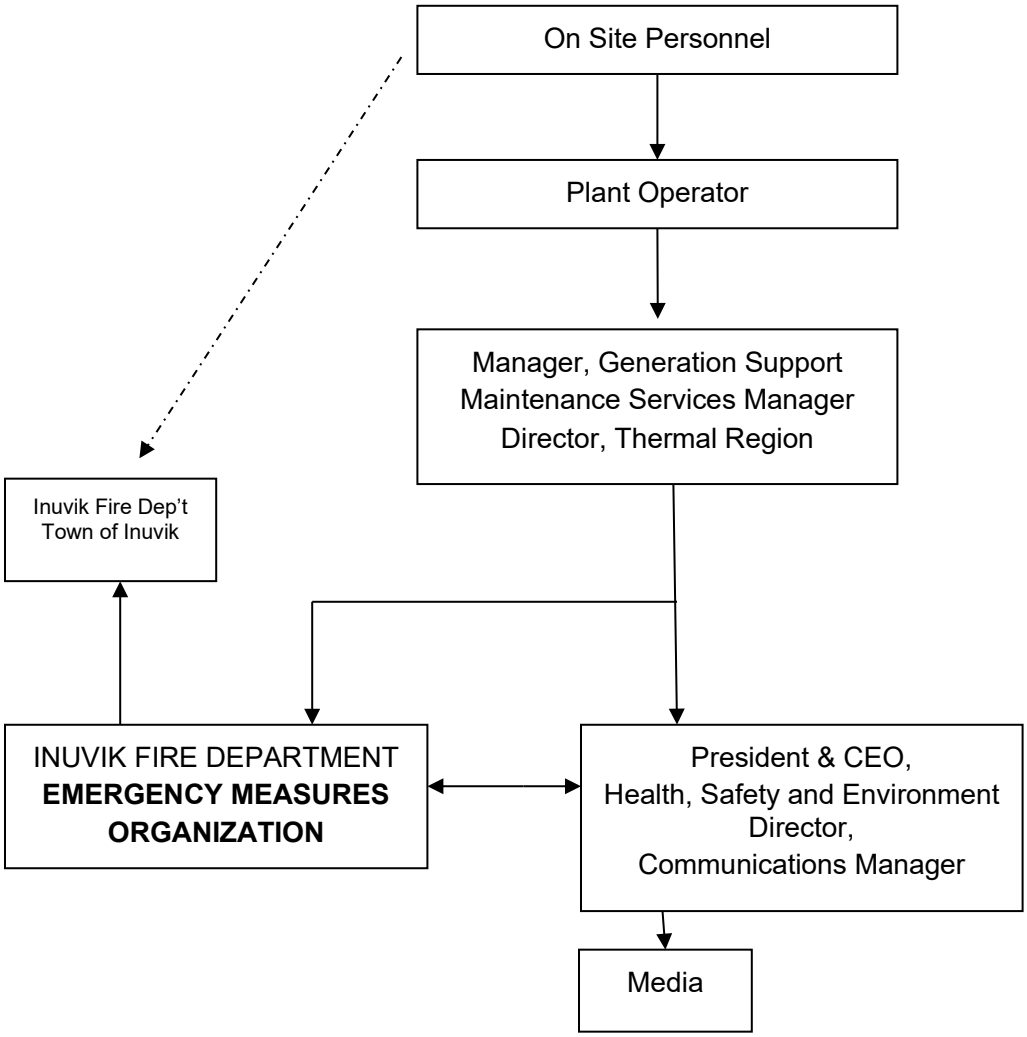


If any individual cannot contact the next person on the list that position should be skipped and immediately go to the next position.

Emergency Notification Information

On Site Personnel/Control Center Operator shall notify:

Director, Thermal Region
Mike Ocko
867-777-7711(work) 867-777-4535 (H) 867-445-6520 (cell)

Assistant Director, Thermal
(Vacant)

Manager, Maintenance Services
Tony McDonald
867-777-7738 (office), 867-620-1215 (cell)

Manager, Maintenance Services
Boyd Mallaley
867-695-7113 (office), 867-695-1595 (cell)

NTPC System Control
867-669-3370 (24 Hour Emergency Phone)

Regional Director shall notify:

President & CEO
Cory Strang
867-874-5217 (work), 867-876-2876 (cell)

Director, Health, Safety & Environment
Dave Dewar
867-874-5327 (work) 867-874-4534 (cell)

Local agencies (Inuvik):

Emergency	9-1-1
Fire and emergency measures phone number	867-777-2222
Inuvik Fire Department (chief's office)	867-777-8637
Ambulance	867-777-4444
Inuvik Regional Hospital	867-777-8000
RCMP	867-777-1111
Town of Inuvik	867-777-8600
Municipal Enforcement	867-777-8616 867-777-8624
Municipal Enforcement After Hours	867-678-2196
Utilidor After Hours	867-678-5384
Inuvik Gas After Hours	867-777-4427
Public Works After Hours Emergency	867-678-5384

Other important phone numbers:

GNWT Emergency Measure Organization	867-920-2303
Aboriginal Affairs and Northern Development Canada	867-777-8901
Fisheries and Oceans Canada	867-777-7500
24 Hour NWT Spill Report Line	867-920-8130
Coast Guard (Marine Pollution)	800-265-0237

Town of Inuvik
Emergency Contact Numbers

All Emergency Services
9-1-1

RCMP
867-777-1111

Fire
867-777-2222

Ambulance
867-777-4444

Inuvik Regional Hospital
867-777-8000

Municipal Enforcement
867-777-8616
867-777-8624

Municipal Enforcement
After Hours
867-678-2196

Utilidor After Hours
867-678-5384

Inuvik Gas
867-777-3422

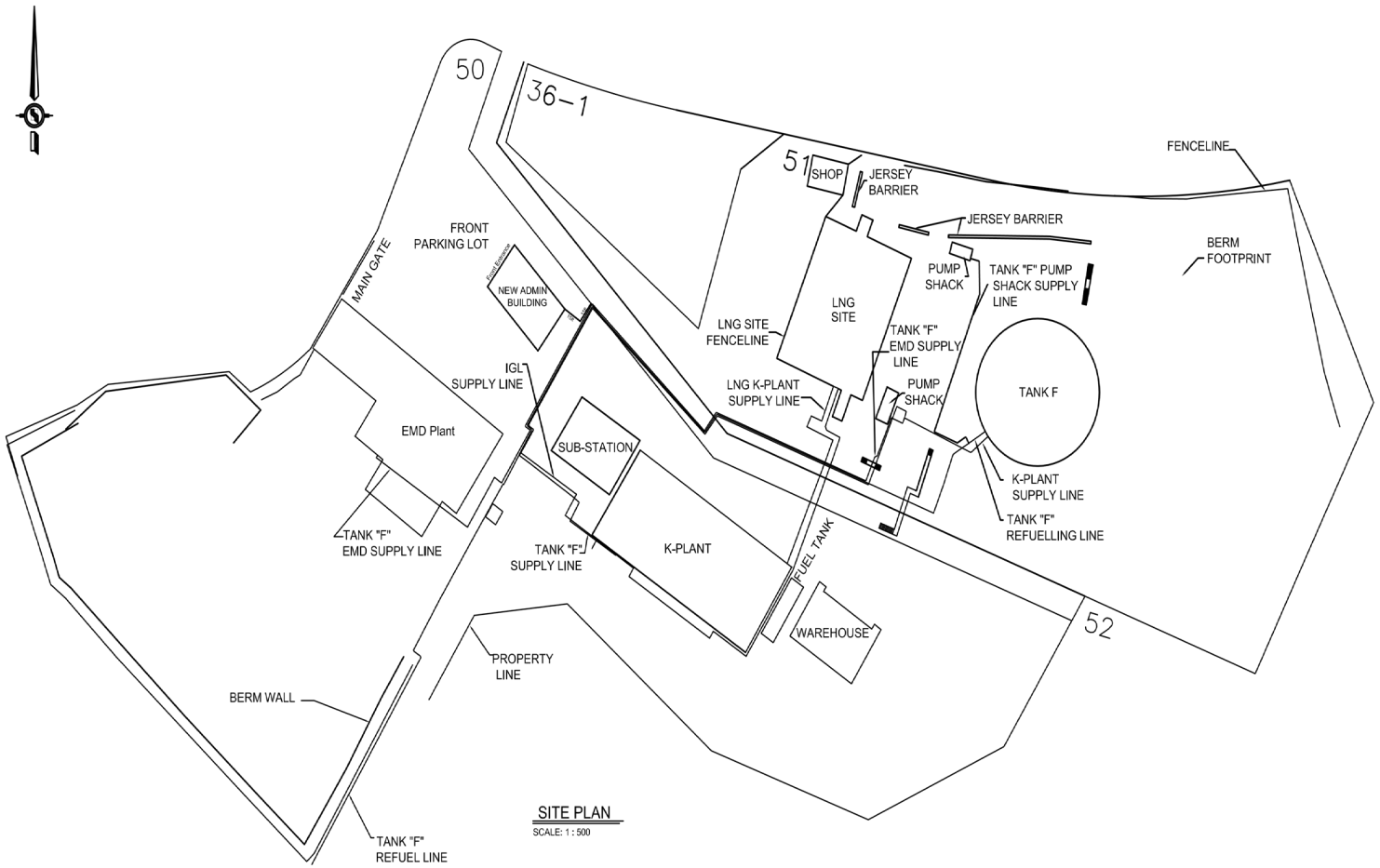
Inuvik Gas After Hours
867-777-4427

PUBLIC WORKS & SERVICES
INUVIK REGIONAL OFFICE
(867) 777-7146
AFTER HOURS
(867) 920-2359
WILDLIFE EMERGENCIES
(867) 873-7181

MUNICIPAL & COMMUNITY AFFAIRS
PUBLIC SAFETY
24 Hour Emergency Contact Fire Marshal/Emergency Measures
(867) 920-2303

INDUSTRY, TOURISM & INVESTMENT
Inuvik Region
Parks Enforcement-Emergency
(867) 920-3244

ENVIRONMENT & NATURAL RESOURCES
Inuvik Region Wildlife Emergency
(867) 777-1185



REFERENCE DRAWINGS		REVISION LETTER	REVISION	WORK ORDER	NAME	DATE	CHECKED BY	DESIGNED BY	STATUS OF DRAWING	DATE
					DRAWN BY					
		F	INUVIK SITE ASBUILT INFO FROM CORY. W		M.R.T.		B.H.		AS BUILT	10/2106
		E	FUEL STORAGE ASSESMENT & PLANING STUDY	-	M.R.T.	01/09	S.K.		AS BUILT	02/09
		D	REVISED FOR FUEL SYSTEM STUDY	901.6140	S.E.S.	02/07				
		C	P136 PLANT. PARTIAL DEMOLITION - REPLACED TITLEBLOCK	301-8488	S.E.S.	03/05			AS BUILT	02/07
		B	REVISED AS PER INFO. PROVIDED	301-5604	S.E.S.	08/00			AS BUILT	03/05
		A	REVISED FOR TENDER	301-5604	S.E.S.	03/99	W.T.		AS BUILT	08/00
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PROFESSIONAL STAMP

PERMIT STAMP

LOCATION
INUVIK, NT.

NORTHWEST TERRITORIES POWER CORPORATION

TITLE
INUVIK
SITE PLAN

SCALE	SHEET 1 OF 1	DRAWING NO.	REV.
1 : 500		P136-C1000	E

AUTOCAD FILE: P136-C1000.DWG

PLOT SCALE: 1 : 500

1 Introduction

This plan is written to meet Northwest Territories Power Corporation (NTPC) requirements for an Environmental Emergency Plan (EEP) for the Company's Inuvik Facility congruent with the 2019 Environmental Emergency Regulations as published in the Canada Gazette, Part II, Volume 153, Number 5. This plan was developed by combining the existing NTPC Emergency Response Plan for the Inuvik Liquid Natural Gas Power Project and the NTPC Inuvik Oil Pollution Emergency Plan.

This EEP covers the following key areas:

1. NTPC policy statement;
2. a description of the properties and characteristics of diesel and liquefied natural gas (LNG);
3. a description of the commercial processes involving the above substances;
4. a description of the facility and surrounding area;
5. pre-emergency planning and scenarios;
6. emergency response components and capacity;
7. personnel training and practice;
8. plan evaluation; and updates.

1.1 Company Policies and Procedures

NTPC handles several hazardous substances at its power generation facilities and has a responsibility to protect and conserve the environment. Prevention of spills is important for the protection of the health and safety of employees, the community, and the environment. Therefore, operating procedures are regularly updated, and personnel are trained to ensure safe and environmentally sound operations. Training is provided on the following NTPC policies, procedures, and information sources which are available at operating sites and/or on the Powerline (NTPC intranet).

- Inuvik Emergency Response Plan;
- Inuvik Oil Handling Facility Plan (OPPP/OPEP)
- Inuvik Spill Response Plan;
- NTPC Hazardous Waste Management Plan;
- Fuel Transfer Procedures;
- Operator Training Manual;

- Plant Operating Manual; and
- Safety Handbook.

1.1.1 NTPC Statement of Corporate Commitment – Environment & Safety

- Conduct operations in an environmentally sound manner which ensures compliance with all applicable national and local regulations.
- Assign accountability and responsibility for implementation of the environmental policy and make environmental performance an important factor in the management review process.
- Provide adequate resources, personnel, and training so that all employees are aware of and able to carry out their responsibilities in accordance with the environmental policy.
- Communicate openly with employees, regulatory agencies, and the public on environmental issues and address concerns pertaining to potential hazards and impacts.
- Work in cooperation with industry, the public, and government toward the development of responsible environmental policies, laws, and regulations.
- In locations where environmental regulations are absent apply the best management practices to achieve environmental protection consistent with industry standards.
- Implement operating practices which incorporate the efficient use of energy and materials and minimizes the use and production of hazardous substances.
- Establish and maintain appropriate emergency response plans for all activities and facilities.
- Maintain a self-monitoring program at each facility to ensure compliance.
- Conduct periodic environmental assessments at all NTPC facilities and develop and implement action plans to correct potential deficiencies in a timely manner.
- Encourage all employees to report to management any known or suspected departure from this policy or related procedures.

1.2 Purpose and Scope of the Environmental Emergency Plan

The purpose of this plan is to provide a practical source of information required to assess environmental risks, develop an effective contingency program, and respond in a safe and effective manner to environmental emergencies associated with power facility operation. The plan was specifically developed for operations at NTPC's Inuvik facility. Much of the material contained in the manual is in summary form for ease of use in emergency situations.

The level of detail required in the plan is dependent on the consequences of failure in terms of potential loss of life and property damage. An evaluation of these consequences is provided in Section 3.

1.2.1 General Contingency Plan Use and Distribution

The appropriate procedures in this plan are to be followed in the case of an emergency. The Director, Thermal Region will decide what further action is appropriate in each case.

All persons issued this manual must become familiar with its contents. Emergency response procedures are laid out in chart form for ease of reference. It is important to understand areas of responsibility and the appropriate actions to take in the case of an environmental emergency. Procedures that are not understood must be clarified with the Director, Thermal Region. The plan will be distributed as follows:

- Posted on the PowerLine (Health & Safety Management System section);
- Copies at the facility and in the Inuvik Office;
- Attach to email and provide notification of updates to thermal region.

1.2.2 Update Procedure and Schedule

This manual will be reviewed for accuracy and completeness annually by the Director, Thermal Region and the Director, Health, Safety & Environment. Changes to procedures will be incorporated as amendments to the manual. The internal contacts list will be updated annually, and the date of update noted on the contact list.

2 Facility Location

2.1 Community Information

The Inuvik Power Generation Facility is in the community of Inuvik (68° 21'N and 133° 43'W), NT. The community is located 1086 km northwest of Yellowknife on the east channel of the Mackenzie River delta. The community has a population of 3,243 (2016 Census).

Inuvik is accessible year-round by air. It is also accessible year-round by road, via the Dempster Highway, except during break-up and freeze-up. The community is within the taiga forest, just south of the tree line and west of the open tundra. The Arctic Ocean is only 97 km north and Arctic Circle is 200 km to the south.

2.2 Tank Farm Overview

The LNG facility and diesel tank are in NTPC's tank farm at:

105 Veteran's Way
Inuvik, NT
X0E 0T0

The tank farm is located within NTPC facilities on the west side of Inuvik near the east bank of the Mackenzie River and is surrounded with a chain-link fence. Access to the tank farm is through several vehicle gates around the property. The main gate is on the west side of the property between the office and the EMD plant.

The facility consists of the regional administration office and regional stores building in the northwest of the property. The EMD Plant is south of the office, and the K-Plant is east of the EMD Plant. A storage shed sits north of the K-Plant.

The upper tank farm consists of one tank "F" northeast of the K-Plant (Tank A and B were removed in 2007). There was once a lower tank farm "Tank C" southwest of the EMD Plant which was removed in 2015.

The Line Yard, a large storage compound for poles, transformers, and other materials, is located two kilometers southeast of the LNG Facility. This compound contains several wooden storage platforms and a garage used for line vehicles.

The tank farm includes both Tank "F" and the LNG facility and is within a lined earth berm. Topography surrounding the tank farm is gently sloping towards Duck Lake and the Mackenzie River.

Figure 1: Inuvik Plant Site

Figure 2: NTPC Inuvik Tank Farm Location

2.3 Facility Information

2.3.1 LNG Facility Overview

The LNG facility operated within the tank farm consists of the following:

- Three 68,000-liter (L) LNG storage tanks;
- LNG Vaporizer;
- Truck off-loading area;
- Odorizer;
- Mechanical shack;
- Mechanical equipment.

2.3.2 Diesel Storage Overview

The Inuvik Facility handles bulk volumes of diesel fuel and Liquefied Natural Gas for Electrical Generation.

Overall Facility fuel storage capacity is approximately 9,107,030 liters:

- Upper Tank Farm – steel tank with a secondary earth berm:
  - 1 vertical 9,100,000 L, diesel fuel aboveground storage tank (AST)
- Additional small operational storage tanks at the Facility (office building heated with residual heat)
  - 1 horizontal 2,000 L day tank, diesel fuel, inside EMD plant
  - 1 horizontal 757 L day tank, diesel fuel, inside EMD plant
  - 1 horizontal 2,000 L day tank, diesel fuel, inside K-Plant
  - 1 horizontal 2,273 L diesel fuel AST

2.3.3 Tank Farm Fuel Line Specifics

The fuel re-supply line to the upper tank farm consists of a 380 m long, 254 mm diameter manifold, owned by NTPC and operated by Government of the Northwest Territories Fuel Services Division (FSD). This line fills the tank in the upper tank farm only and is drained following refueling (Figure 4).

The line originates at the manifold on the shore of the river (across the road from the dock), is routed under the road, and travels underground to the south corner of the EMD plant. From this point the line runs along the utilidor to the point of entry into the upper tank farm.

Once inside the upper tank farm it is routed east and north to Tank “F”. There is also a resupply manifold located on the north side of the tank farm, just outside the berm. This manifold is used to resupply Tank “F” via fuel trucks.

The re-supply connection at Tank “F” consists of a flex, a ball valve, a check valve, and a gate.

2.3.4 Category of Oil Handing Facility

In August 2017 an Oil Pollution Emergency Plan was adopted for the NTPC Inuvik Facility which outlined steps to be taken if a spill resulted from a marine resupply. In 2020, the Inuvik Oil Handling Facility Plan (which combines the Oil Pollution Emergency Plan and the Oil Pollution Prevention Plan) was prepared.

This plan was designed to work in combination with NTPC's Inuvik Spill Response Plan and is drafted in compliance with existing regulations as contained in the following publications:

- Environmental Response Regulations SOR/2019-252;
- The Environmental Response Standards (TP 14909);
- Canada Shipping Act 2001 (CSA 2001), Part 8, Pollution Prevention and Response;
- Guidelines for Reporting Incidents Involving Dangerous Goods, Harmful Substances and/or Marine Pollutants (TP9834E 07/2009);
- Arctic Waters Oil Pollution Prevention Act, and associated regulations
- Arctic Waters Oil Transfer Guidelines, 1997 (TP 10783 E).
- Canadian Coast Guard – Marine Spill Contingency Plan;
- Delivery Tug and Barge SOPEPs; and

Based on the ship's fuel transfer particulars, in accordance with TP 12402 E the category of this Oil Handling Facility is a **Level 1**, with a Maximum Oil Transfer Rate not exceeding **150 m^3/h**.

2.3.5 Fuel Transfer Specifics

The Inuvik Oil Pollution Emergency Plan applies to the equipment and property used by the GNWT Fuel Services Division (FSD) on behalf of NTPC for their marine resupply operations, in the protection of any environmentally sensitive areas, animal pathways, or recipients that may be impacted by a fuel spill because of the resupply operations. The plan also outlines the equipment marine delivery contractors must have to supplement the response.

It should be noted that NTPC contracts fuel transfer operations to the Government of the Northwest Territories Fuel Services Division. NTPC has designated FSD to the manager of all aspects of the marine fuel transfer including spill response. A copy of the FSD standard operating procedures for fuel transfer operations can be found in Appendix A this document.

2.3.6 Sensitive Environmental Receptors

The Mackenzie River sits approximately 150 m southwest of the northern tank farm. A small pond known as Duck Lake sits approximately 100m south of the LNG Facility. The primary objective of the spill response is to stop spilled hazardous materials from reaching either water body, especially the Mackenzie River.

2.3.7 Spill Control

A spill at the facility which breached containment of the berm would flow south towards Duck Lake and the Mackenzie River. Although roads may not be enough to contain more than a small quantity of spilled product, they will provide a solid foundation for a dam system. Culverts will provide potential control points and must be blocked to prevent spilled product from bypassing the dam. Sorbent materials and trenching techniques should be used to intercept flowing product (see Section 7).

Figure 3: NTPC Inuvik

1. NTPC Tank Farm	2. K. Plant	3. Coastguard Warehouse
4. GNWT Warehouse	5. Parks Canada Warehouse	6. EMD Plant / NTPC Office
7. Municipal Affairs	8. Municipal Affairs	9. GNWT
10. Aurora College, Royal Canadian Legion,	11. NTPC Maintenance Shop	12. Home Hardware Building Centre
13. Northern Property Office, Storage Lockers	14. Mackenzie Hotel	15. Fuel Station
16. Lakeview Manor	17. RCMP, Alex Moses Greenland Building	18. Canada Post
19. Lauron Apartments	20. Our Lady of Victory Catholic Church	21. Canadian Coast Guard
22. Northern Industrial Sales	23. Downtown Inuvik	

Figure 4: NTPC Inuvik Facility Layout

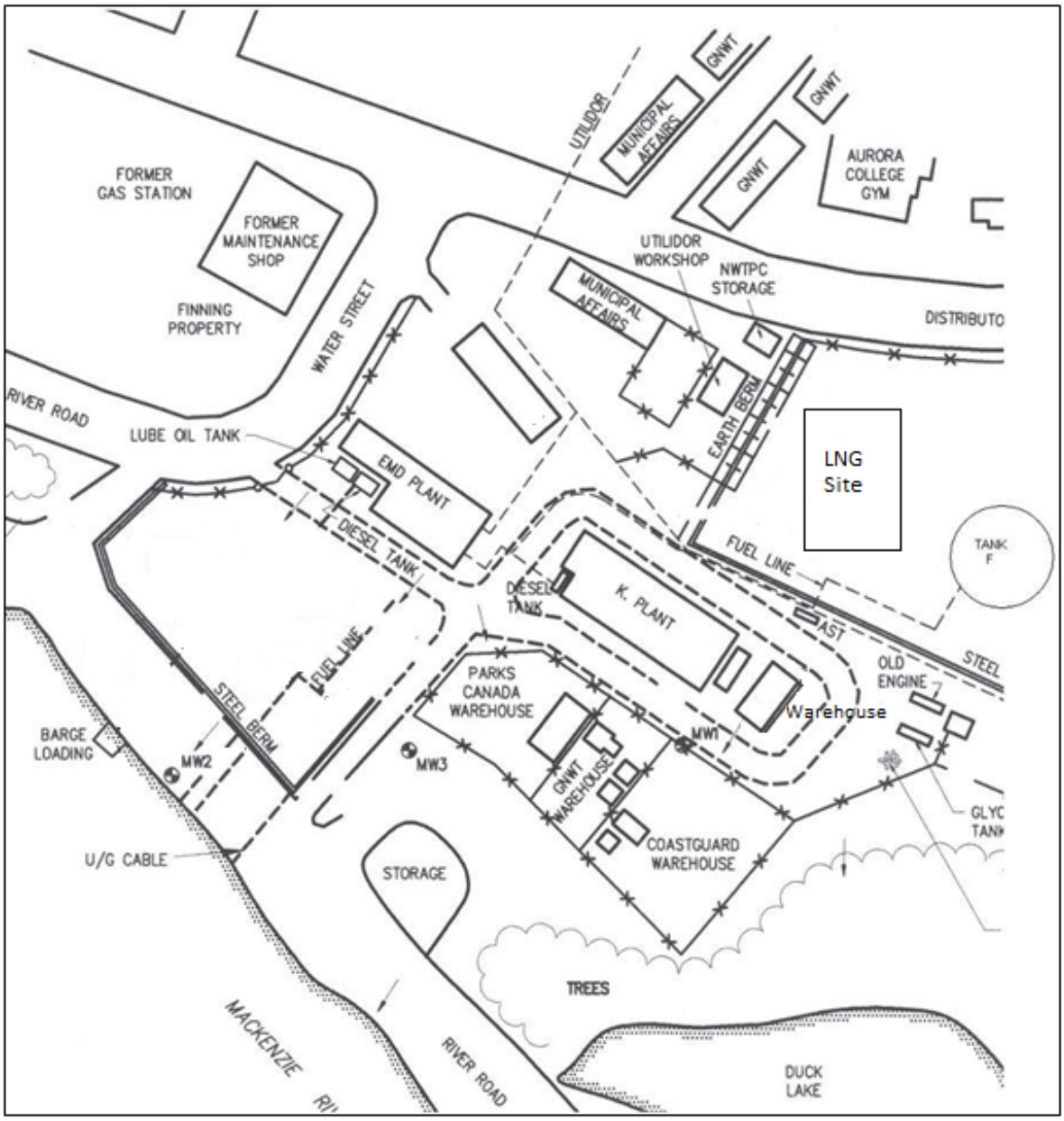
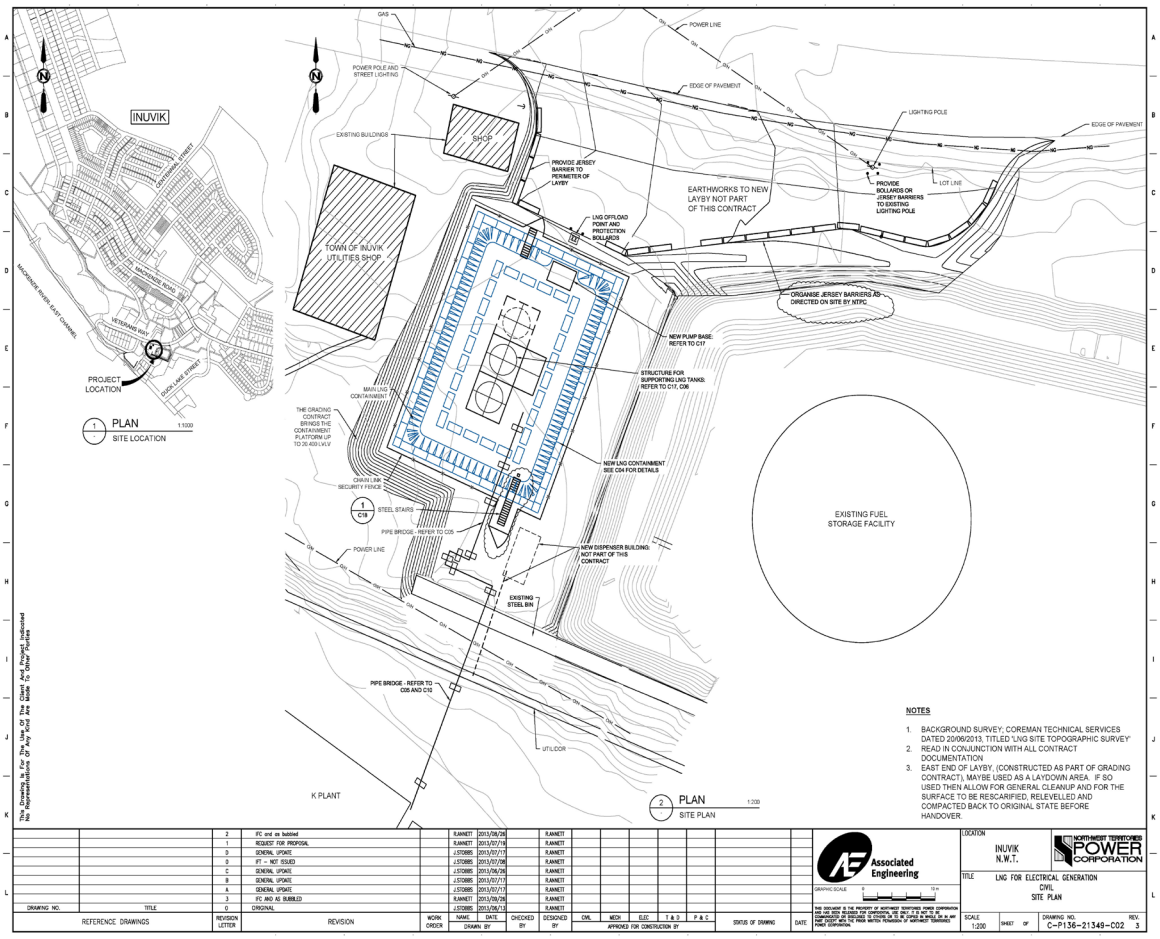


Figure 5: LNG Facility Site



2.4 Spill Kits and Available Resources

There are 4 overpack spill kits at the Facility (see Figure 6):

Figure 6: Facility Spill Kits

NTPC employs two types of sorbent for spill response.

- **Universal Sorbents**: These sorbents pick up most liquids including fuel, oil, glycol, and water. They are used for general spill cleanup on dry land and will sink if placed on water, as they adsorb the water (hydrophilic). For this reason, universal sorbents are not to be used on hydrocarbon spills into water.
- **Oil Only Sorbents**: These sorbents only pick up hydrocarbons, such as fuel or lube oil. These sorbents float, as they do not pick up water (hydrophobic) and are to be used for any hydrocarbon spill into water.

Higher quality sorbents will absorb, contain, and retain spilled product much faster and more effectively than low quality sorbent, due to a finer weave of material. Low quality sorbent pads are used around the Facility to clean up drips while higher quality sorbents, found in the spill kits, are used for larger spills.

All plants are equipped with universal sorbent pads for day to day use and the cleanup of spills. For any large or significant spills, spill kits are available for containment and cleanup. Spill kits can be stored both indoors and outdoors and are generally contained in one of the following (see Figure 7):

- **Overpack Drum**: A yellow plastic drum designed to contain a leaking drum or used/unused spill material.
- **Steel Salvage Drum**: A 205 L steel drum with removable top used to contain used/unused spill material, impacted soil or snow, etc.
- **Spill Kit Locker**: A plastic bin used for spill kit material storage.

Figure 7: Typical Spill Kit Examples

Spill kits generally contain the following spill response materials:

- **Sorbent Booms**: When a spill occurs into water, floating booms are placed around the spill perimeter to provide containment. Typically, a 5 or 8 inch diameter plastic net tube filled with sorbent material, booms prevent the spill from spreading and/or moving downstream to contaminate other areas (see Figure 8).

Figure 8: Sorbent Booms

Booms can be clipped together for extra length. The ends should be clipped together so that they overlap, leaving no space at the joint. This ensures that no spilled product leaks

out past the boom, and the boom effectively contains and adsorbs the spilled product (see Figure 9).

- **Sorbent Socks**: Socks are identical to booms in construction; however, they do not clip together. They are generally used for small scale, localized spills.
- **Sorbent Pads**: Individual pads used on drips or leaks.
- **Sorbent Rolls**: A continuous roll of sorbent pads.
- **Printed Disposal Bags**: Soiled absorbent material is put into printed disposal bags which are then tied off for disposal.
- **Instruction Book**: The spill kit instruction book provides information regarding spill kit equipment.
- **Personal Protective Equipment**: Used to augment Facility equipment and supplies. Includes rubber gloves, safety goggles, and protective coveralls.

Additional spill response equipment is also in storage at the Facility:

- Portable fuel storage (empty drums)
- Pumps and hoses
- Portable generator
- Hand tools (shovels, rakes)
- Chain saws
- Acetylene torch
- Sorbent materials
- Personal protective equipment

Figure 9: Boom Deployment

2.5 Heavy Equipment

Heavy equipment is available within the community for emergency spill cleanup. Contact information and equipment available is as follows:

Heavy Equipment Owners	**Phone Number**
Town of Inuvik	867-777-8600
Bob's Welding	867-777-4174
Allen Services	780-992-9555
	780-914-9300
Northwind Industries Ltd.	867-777-2426
KBL Environmental	867-873-5263
Heavy Equipment Available	**Location**
Front End Loader	NTPC site
Dump Truck	Contractor
Backhoe	Contractor
Bulldozer	Contractor
Grader	Contractor
Snowplow	Contractor
Vacuum Truck	Contractor
Fire Truck	Town of Inuvik
Water Truck	Contractor

2.6 Emergency Response Equipment (LNG)

2.6.1 Equipment Sources

Equipment will be stored at NTPC's facilities at the site. Equipment includes:

- A Fire Dry Riser for hook-up of Fire department equipment.
- Emergency shutdowns to immediately shut down all processes.
- Emergency shut down for the vaporizer only to shut down the vaporizer process.
- Fire extinguishers are present at both entrances to the containment area.

2.6.2 Emergency Power Source

The powerhouse has an emergency standby diesel generator in case of power failures.

2.6.3 Warning System

Upon the event of an emergency, the power plant operator would immediately call the Director, Thermal Region. In the event of a spill, the Operator would immediately call the Inuvik Fire Department and the Director, Thermal Region. If the spill poses a threat to the environment, Aboriginal Affairs and Northern Development, Environment Canada and Fisheries and Oceans would be notified.

In the event of a fire, the Operator would immediately call the Inuvik Fire Department and then notify the Director, Thermal Region who would notify the President of NTPC.

If a large spill or fire occurred, NTPC would immediately notify the Inuvik Fire Department and then the Town of Inuvik and GNWT Emergency Measures Organization.

3 Operation Overview

3.1 LNG Properties and Characteristics

LNG is natural gas that has been refrigerated to minus 160 degrees Celsius where it becomes a clear, colorless, and odorless liquid. As a liquid, LNG occupies one six-hundredth of its gaseous volume and can be transported with specially designed transport trucks.

LNG weighs slightly less than half as much as water, so it floats on water. However, when LNG encounters any warmer surface such as water or air, it evaporates very rapidly ("boil"), returning to its original, gaseous volume. As the LNG vaporizes, a vapor cloud resembling ground fog will form under relatively calm atmospheric conditions. The vapor cloud is initially heavier than air since it is so cold, but as it absorbs more heat, it becomes lighter than air, rises, and can be carried away, by the wind. An LNG vapor cloud cannot explode in the open atmosphere, but it could burn.

LNG is considered a hazardous material. The primary safety concerns are the potential consequences of an LNG spill. LNG hazards result from three of its properties:

- Cryogenic temperatures
- Dispersion
- Flammability characteristics

The extreme cold of LNG can directly cause injury or damage. Although momentary contact on the skin can be harmless, extended contact will cause severe freeze burns. On contact with certain metals, LNG can cause immediate cracking. Although not poisonous, exposure to the center of a vapor cloud could cause asphyxiation due to the absence of oxygen.

LNG vapor clouds can ignite within the portion of the cloud where the concentration of natural gas is between a five and a 15 percent (by volume) mixture with air. To catch fire, however, this portion of the vapor cloud must encounter an ignition source. Otherwise, the LNG vapor cloud will simply dissipate into the atmosphere.

LNG is comprised of methane, with amounts of ethane and propane. LNG is odorless, but NTPC will utilize an odorizer on the natural gas after it has been re-vaporized to help detect any potential leaks or spills. Release of cryogenic LNG due to spills, leaks or intentional draining can expose facility personnel to several hazards. These hazards include oxygen deficiency, freezing injuries, fire hazards and air/gas mixtures. LNG releases can occur from the following:

- leakage from various components, parts or equipment in the facility;
- leakage or spills during unloading of LNG from trucks;
- from accumulation of gas in a confined space; and
- because of vandalism or sabotage

LNG boils when the released cryogenic liquid contacts warmer surfaces like concrete or soil. The rate of boiling is rapid initially but decreases as the surfaces in contact with the liquid cool. The gas mixes with the surrounding air to form three types of mixtures:

- Near the surface of the liquid, the mixture of gas and air will be too rich in hydrocarbons to burn.
- A distance away from the liquid surface, the mixture of gas and air will be too dilute in hydrocarbons to burn.
- Between these two non-flammable mixtures, there is a flammable air-gas mixture. The flammable range of natural gas in air is approximately 5 to 15% by volume. Ignition of this mixture will result in a flame, which travels to the source of the gas.

LNG spills do not pose an explosion risk unless the spill occurs in an uncontrolled confined space. Natural gas has a low reactivity and low burning speed. Due to its narrow flammability range (e.g. 5-15 volume % in air), unconfined clouds of natural gas generated by an outdoor leak of an LNG spill present little danger of explosion. Natural gas is lighter than air and will quickly mix into the surrounding air, forming an air-gas mixture that is below its Lower Flammable Limit. If ignition from an external ignition source were to occur, burning will take place only along the air/gas interface where the mixture is above the Lower Flammable Limit. A flash or detonation is considered very unlikely.

LNG presents the greatest safety risk when natural gas leaks or LNG spills occur in confined areas. Confinement, such as in an enclosed building, can allow flammable vapor to accumulate and increases the possibility of ignition and the risk of localized damage. Once ignited, pressure will build in the enclosed area; however, flame speeds decelerate rapidly beyond the boundaries of the enclosed space and limit the extent of potential damage and injuries. Ventilation will allow the naturally rising natural gas to escape and dilute below its flammability range. Gas detection equipment is utilized at the facility to allow NTPC to detect any leakages or spills and prevent fires and explosions.

3.2 Diesel Properties and Characteristics

The Safety Data Sheets for Diesel found at the Inuvik Facility is attached as Appendix D.

Diesel fuel is described as a bright oily liquid, which is clear to yellow in color and has a petroleum odor. It can be died red for taxation purposes. It very low solubility to water and has a relative density of 0.8 – 0.88 so therefore floats on water. Diesel fuel is often transported via tank trucks identified under the UN 1202 placard. If released, it can travel overland and has the potential of absorbing into soils presenting an environmental hazard.

Diesel fuel is a Class 3 flammable liquid, meaning that it has a flash point between 37.8 and 60 degrees Celsius. Flash point is the minimum temperature at which a liquid gives off a vapor in enough concentration to present an ignitable mixture. Due to this, diesel fuel should be stored in a suitable contained vessel and used in an area with enough ventilation to not present a flammability hazard. Diesel is flammable in the presence of open flames, sparks, and heat.

Vapors are heavier than air and may travel considerable distances to sources of ignition, then flash back towards the vapor source. Further, diesel can accumulate static charge and ignite if discharged. Sparks originating from equipment buckets could cause fire and precautions should be taken when working with diesel fuel to not present an ignition source.

Diesel is considered a hazardous material. The primary safety concerns are the potential consequences of a diesel spill to workers and the environment. Diesel hazards result from the following properties:

- Flammable liquid (Category 3)
- Acute toxicity (Category 4)
- Skin irritant (Category 2)
- Carcinogenicity (Category 2)
- Specific target organ toxicity – Single exposure (Category 3 [Central nervous system])
- Specific target organ toxicity – Repeated exposure (Category 2 [Liver, thymus, bone])
- Aspiration hazard (Category 1)

Release of diesel due to spills, leaks or intentional draining can expose facility personnel to several hazards. Diesel releases can occur from the following:

- leakage from various components, parts or equipment in the facility;
- leakage or spills during unloading of diesel from trucks or ships;
- as a result of vandalism or sabotage.

Before handling diesel fuel special precautions should be taken relevant to the specific task. NTPC has a list of safe work procedures which are to be followed to ensure safe and reliable transfer of diesel. Diesel should be kept away from heat, hot surfaces, sparks, open flames, ignition sources and smoking areas. Storage tanks and equipment should be grounded, and non-sparking tools should be used in the immediate area. Appropriate PPE should be dawned before handing diesel fuel or responding to an emergency.

3.3 LNG Operations Summary

The Inuvik LNG Power Project is a new project that stores LNG and re-vaporizes it into natural gas to generate power using NTPC's existing natural gas generators at the K-Plant generating facility. The K-plant houses two Wartsilla natural gas generators which will use LNG to generate power. Offices, garages and warehouses are also located at the Inuvik generating facility.

The two LNG storage tanks have a capacity of 68,000 liters each and the LNG is transported to the site via LNG transport trucks. Trucks off-load their LNG cargo following strict protocols to minimize the risk of spills and potential harm to personnel from handling cryogenic materials.

LNG will be changed back to natural gas from its liquid state as it passes through the vaporizer. The gas will then be delivered to the generators in the K-plant via a piping system.

3.4 Diesel Operations Summary

The Inuvik Diesel Power Facility is a relatively old project that uses diesel fueled electrical generators for power generation. The Electro-Motive Diesel (EMD) plant is located on the northwest side of the property. Section 2.3.2 describes specific diesel storage capacities at the site.

Diesel tank “F” provides a bulk of the storage capacity (9,100,000 L), which is filled either via truck or transport ship. A header system distributes diesel to two day-tanks in the EMD plant, a day tank in the K-plant, and an aboveground storage tank. Diesel tank “F” is contained within an earthen berm which is capable of handling 110% of the tank’s maximum capacity.

4 Emergency Identification & Evaluation

4.1 Planning and Procedures

Under direction of Environment Canada, the Inuvik Liquid Natural Gas Power Project Emergency Response Plan was prepared for the NTPC LNG facility. The plan outlines Emergency Response scenarios for the LNG facility, including potential release conditions and appropriate responses, as outlined below.

Similarly, in preparation of the Inuvik Oil Handling Facility Plan (OPPP/OPEP) several spill scenarios were considered, and response strategies were outlined, as described below.

Spill scenarios have been developed considering the following factors:

A. the safety of the facility's personnel;
B. the safety of the facility;
C. the safety of the communities living adjacent to the facility;
D. the minimization of the pollution incident;
E. the environmental impact of the pollution incident; and
F. the requirements for cleaning up the pollution incident.

The Mackenzie River sits approximately 150 m from the northern tank farm and 100 m South of the LNG facility. The primary objective of the spill response is to stop spilled hazardous materials from reaching the Mackenzie River, or Duck Lake which sits 100 m south of the LNG facility.

4.2 LNG Emergency Identification

The following emergencies at the Inuvik LNG facility are considered in this plan:

- LNG spill during off-loading from transport truck to LNG storage tanks;
- LNG spill from storage tank loss of containment or failure; and
- Pressure build-up from tube rupture inside the vaporizer or other pipe containing LNG.

In the event of an emergency, NTPC staff will follow the NTPC Emergency Declaration Guidelines so that proper protocols are followed to ensure the safety of co-workers and the public, injured parties receive assistance (e.g. First Aid) and that the appropriate managers are contacted within NTPC.

4.3 LNG Emergency Evaluation

4.3.1 LNG Spill during Off-Loading from Transport Truck

When transport trucks are off-loading their LNG cargo, there is potential for a spill to occur if hose connections are not capped off if the protocols for off-loading are not followed properly or from tanker truck failure. A hose rupture during off-loading could also result in the entire tanker contents being spilled into the off-load area.

A large spill of LNG could result in a vapor cloud which could ignite within the portion of the cloud where the concentration of natural gas is between five and a 15 percent (by volume) mixture with air. To catch fire, however, this portion of the vapor cloud must encounter an ignition source. Otherwise, the LNG vapor cloud will simply dissipate into the atmosphere.

An ignited LNG vapor cloud is very dangerous, because of its tremendous radiant heat output. Furthermore, as a vapor cloud continues to burn, the flame could burn back toward the evaporating pool of spilled liquid, ultimately burning the quickly evaporating natural gas immediately above the pool. An ignited LNG vapor cloud could cause damage to the surrounding area.

4.3.2 LNG spill from Storage Tank

If storage tank filling valves stick open due to freezing or blockage or the storage tank fails, there is potential for spills to occur within the containment area at the off-loading area.

A large spill of LNG could result in a vapor cloud which can ignite within the portion of the cloud where the concentration of natural gas is between a five and 15 percent (by volume) mixture with air. To catch fire, however, this portion of the vapor cloud must encounter an ignition source. Otherwise, the LNG vapor cloud will simply dissipate into the atmosphere.

An ignited LNG vapor cloud is very dangerous, because of its tremendous radiant heat output. Furthermore, as a vapor cloud continues to burn, the flame could burn back toward the evaporating pool of spilled liquid, ultimately burning the quickly evaporating natural gas immediately above the pool. An ignited LNG vapor cloud could cause damage to the surrounding area.

4.3.3 Pressure Build-up in Vaporizer

There is potential for pressure build-up inside the vaporizer if a tube ruptures inside the vaporizer. Rapid vaporization of LNG as it mixes with hot water may cause pressure to build rapidly inside the vaporizer tank and water piping.

4.3.4 Fire at the K-Plant

A fire at the K-plant could result in disruption of power production. Such an emergency would have consequences for staff at the facility and NTPC customers and could affect nearby buildings. Bulk diesel fuel at the NTPC tank farm is stored in steel tanks. Gas detectors as well as conventional smoke and fire detectors, carbon dioxide system for control panels and fire suppression are installed in the generator switchgear rooms at the K plant. Fire alarm systems are monitored and set to automatic dial out to Local Fire Department. Fire extinguishers are in various locations within the plant.

4.4 Diesel Emergency Identification

The following emergencies at the Inuvik LNG facility are considered in this plan:

- Diesel spill during off-loading from transport truck or ship to storage tanks;
- Diesel spill from storage tank loss of containment or failure.

In the event of an emergency, NTPC staff will follow the NTPC Emergency Declaration Guidelines so that proper protocols are followed to ensure the safety of co-workers and the public, injured parties receive assistance (e.g. First Aid) and that the appropriate managers are contacted within NTPC.

4.5 Diesel Emergency Evaluation

4.5.1 Diesel Spill During Unloading

As described in Section 2.3.5, Northwest Territories Power Corporation contracts fuel transfer operations to the Government of Northwest Territories Fuel Services Division. NTPC has designated FSD to the manager of all aspects of the marine fuel transfer including spill response. Prior to any transfers the FSD Operations Officer will complete a written resupply plan and submit for approval to the Coordinator, Fuel Operations prior to being cleared to initiate the fuel transfer operation.

A release could be encountered if equipment malfunctions during offloading procedures. The most likely point of failure in this circumstance would be the connection point between the fuel transportation vessel and fuel line to the aboveground storage tanks. In the event of a spill, the release fluids could potentially reach the Mackenzie River in a short duration of time. Diesel is toxic to fish, aquatic invertebrates, algae and bacteria.

Diesel is a flammable liquid and vapor. It may be fatal if swallowed or enters the airways, can cause skin irritation, may cause drowsiness or dizziness or damage to organs, and is suspected of causing cancer.

4.5.2 Diesel Spill Due to Loss of Containment

A large overland release of diesel fuel could be disruptive to the environment and present a hazard to the community of Inuvik. Depending on the location of the release, a spill would travel down gradient towards the Mackenzie River (approximately 150 m from Tank “F”). A small pond known as Duck Lake sits approximately 100 m south of the facility. Other sensitive receptors could be neighboring public parks and boat launch accesses.

Diesel fuel is flammable in the presence of open flames, sparks, and heat. The flash point of diesel is above 40 degrees Celsius, and the auto-ignition temperature is 225 degrees Celsius. Diesel vapors are heavier than air and may travel considerable distances to ignition sources. Further, diesel can accumulate a static charge and ignite, so storage containers should be well grounded.

5 Emergency Scenarios and Responses

5.1 LNG Emergency Scenarios

In the event of an LNG release, the release response steps outlined in the following sections should be followed as appropriate. LNG release scenarios were identified in preparation of the LNG Emergency Response Plan as prepared by NT Energy.

5.1.1 LNG Spill during Off-Loading from Transport Truck (Alternative)

If a spill occurred during off-loading or from transport truck tank failure, the most likely scenario would be that the LNG would boil and vaporize into the atmosphere without causing any harm. If a large spill occurred, the Inuvik Fire Department and Town of Inuvik would be immediately notified, and the spill monitored to determine if there is any fire risk. NTPC's management would also be notified as described in Section 5.

If a fire were to break-out, action would be taken as required by the Fire Department. If any evacuation action would be required, the Town of Inuvik and the Municipal and Community Affairs Public Safety Offices would be immediately notified.

In the event of environmental damage from an LNG spill, Aboriginal Affairs and Northern Development, Environment Canada and Fisheries and Oceans would be notified, the damage would be assessed, and a report prepared with mitigation actions proposed and implemented.

5.1.2 LNG spill from Storage Tank (Alternative)

If storage tank filling valves stick open due to freezing or blockage or the storage tank fails, the most likely scenario would be that the LNG would boil and vaporize into the atmosphere without causing any harm. If a large spill occurred, the Inuvik Fire Department and Town of Inuvik would be immediately notified, and the spill monitored to determine if there is any fire risk. NTPC's management would also be notified as described in Section 5.

If a fire were to break-out, the action would be taken as required by the Fire Department. If any evacuation action would be required, the Town of Inuvik and the Municipal and Community Affairs Public Safety Offices would be immediately notified.

If any evacuation action would be required, the Town of Inuvik and the Municipal and Community Affairs Public Safety Offices would be immediately notified.

In the event of environmental damage from an LNG spill, Aboriginal Affairs and Northern Development, Environment Canada and Fisheries and Oceans would be notified, the damage would be assessed, and a report prepared with mitigation actions proposed and implemented.

5.1.3 Pressure Build-up in Vaporizer (Alternative)

If a tube ruptured inside the vaporizer rapid vaporization of LNG as it mixes with hot water may cause pressure to build rapidly inside the vaporizer tank and water piping, causing a pipe burst and leaking LNG into the atmosphere. If this were to occur, the most likely scenario would be

that the LNG would vaporize directly into the atmosphere without causing any harm. If a large leak occurred, the Inuvik Fire Department and Town of Inuvik would be immediately notified, and the leak monitored to determine if there is any fire risk. NTPC's management would also be notified as described in Section 6.

5.1.4 Fire at the K-Plant (Worst Case Scenario)

The immediate concern for fire at K-plant would be safety of site personnel, and then controlling the fire. Automated fire control devices would likely be deployed initially, except in the case of a small fire which would be controlled using fire extinguishers by site personnel. If the fire could not be contained by on-site firefighting equipment or automated fire suppression devices (a very low probability event), evacuation procedures would be implemented, and people moved away from danger. The Inuvik Fire Department would be immediately notified, and NTPC's management would also be notified as described in Section 6.

If any evacuation action would be required, the Town of Inuvik and the Municipal and Community Affairs Public Safety Offices would be immediately notified.

In the event of environmental damage from an LNG spill, Aboriginal Affairs and Northern Development, Environment Canada and Fisheries and Oceans would be notified, the damage would be assessed, and a report prepared with mitigation actions proposed and implemented.

5.2 Diesel Emergency Procedures

Potential spill scenarios were evaluated based on best practices regarding fuel handling and known causes of other spills across all NTPC facilities and throughout the history of the Inuvik Facility. NTPC follows best practices to reduce the likelihood of spills, and constantly tries to improve operations and identify and correct potential leak sources.

Since a loss of containment during routine operations or during fuel transfer could potentially have a wide variety of necessary response tactics, many of which overlap, for the response scenarios they will be treated as the same outcomes and each method of containment as an alternative scenario (overland, water, under ice, barrel). Section 7 outlines the steps to take and contacts to make in the event of a hazardous materials spill.

5.2.1 Diesel Spill During Unloading

In the event of a release during fuel transfer, FSD will be the primary spill responders and NTPC personal will assist accordingly. Following re-fueling procedures, FSD drains the fuel transfer line so as not to present a continuous potential for leaks.

5.2.2 Diesel Spill Due to Loss of Containment (Worst Case and Alternative Scenarios)

There are several ways in which diesel could lose containment at the Inuvik plant site. A failure in equipment such as valves, piping, or instrumentation could result in a release. Further, sabotage or vandalism could result in a fuel release. A loss of containment of the full capacity of tank would be contained within the earthen berm and be considered the worst-case scenario. Smaller, more isolated spills could occur at various locations throughout site and differing methods for containment and recovery could be more appropriate than others. Methods for containment and recovery of released fluids in various scenarios can be found in Section 7.

6 Spill Identification and Communication

6.1 Communication

The first action of NTPC staff would be to control the emergency. Notification would follow control actions. In general, the following notification procedures will be required:

- All on site NTPC staff shall be notified, accounted for and mustered to a safe location.
- Notification of the Director, Thermal Region.
- If danger to the public is a possibility, immediate notification (by NTPC personnel) of the Town of Inuvik and the Director of Public Services.
- Notification by NTPC personnel of AANDC, Fisheries and Oceans, and Environment Canada, Yellowknife.
- Notification of the Director, Health, Safety & Environment.
- Notification of other agencies and the general public as appropriate.

Refer to the first page of this plan for a list of phone numbers. Emergency phone numbers are also posted in the powerhouses, maintenance garage and trailer. A notification flow chart for emergency scenarios is on the first page of this Plan and as follows.

6.2 Communication Systems

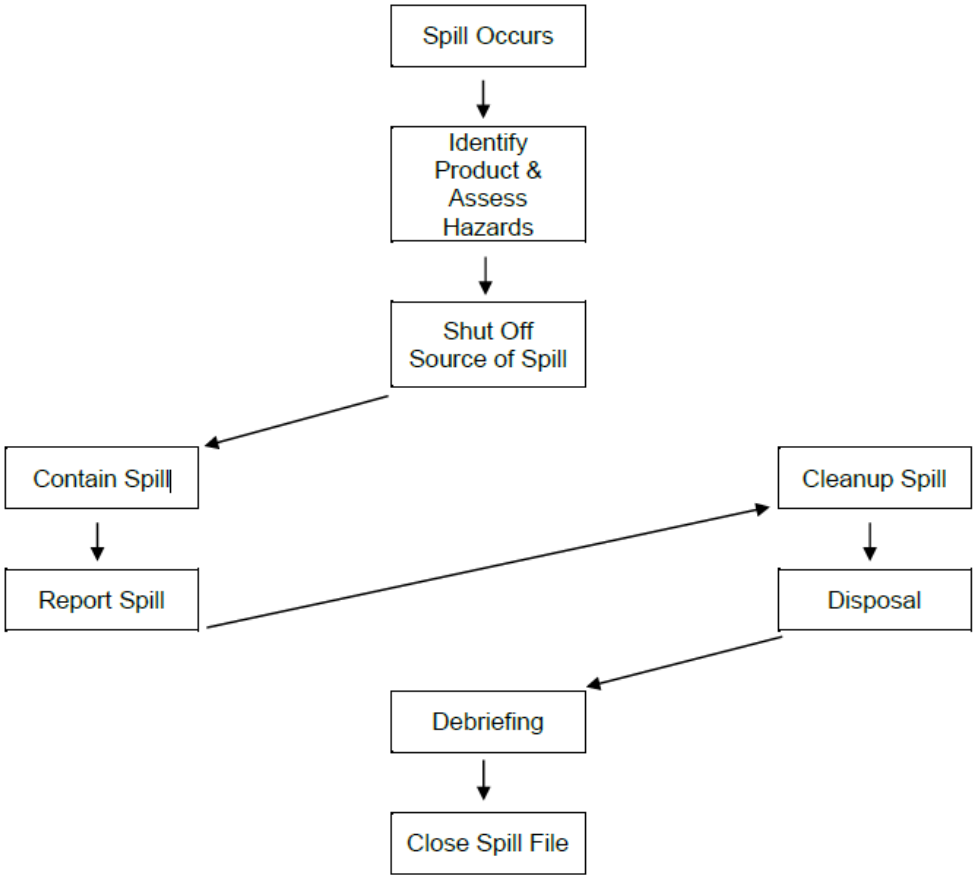
Communication from the Inuvik facility is by telephone. The Inuvik Power Plant Operator reports directly to the Director, Thermal Region who reports to the CEO of the NTPC.

Communications actions to be followed under this ERP are outlined in the NTPC Emergency Response Plan. In addition to communications protocols, the NTPC Emergency Response Plan also outlines emergency declaration levels that have specific actions that must followed in the event of an emergency, described below.

6.3 Initial Response Flowchart

Figure 10 outlines the steps to be taken in the event of a diesel release, a more detailed description of what is required at each step is outlined in the Initial Response Summary (Section 7).

Figure 10: Initial Response Flowchart



6.4 Initial Response Summary

Step 1 – Identify Release Fluid and Assess Hazards

- Identify the spilled product and evaluate hazards (consult SDS if necessary)
- Eliminate or control all sources of ignition.
- Alert all persons in the immediate area that a spill has occurred.
- Alert the appropriate first responders. Contact the local fire department, police, or municipal authority.

- Restrict site access to emergency personnel.
- Ensure all personnel involved in containment and recovery efforts are aware of any hazards involved.

  Note: Immediately contact the Regional Manager and/or Director of HSE if a spill response exceeds the abilities/capabilities of onsite personnel or equipment and/or if there is a high potential of adverse effects to offsite areas and/or sensitive ecological or human receptors.

Step 2 – Isolate Source of Spill

- Locate the source of the spill, and if it is safe to do so, isolate the source.
- If the product is being pumped, shut off the pump.
- If a spill occurs from in a vessel where it is not able to be isolated, attempt to move the contents of the vessel to another appropriate vessel.
- If a piping failure results in leakage, isolate the section of piping with control valves.

Step 3 – Contain Spill

- Determine the speed and direction release fluids are traveling, to determine an appropriate response.
- Assess the conditions which are influencing spill movement (wind, drainage, slope severity).
- Determine what could be affected by the spill if the appropriate actions are not taken, and which actions could reduce damage.
- Taking into consideration available labor and equipment capacities, determine whether the spill can be contained. If underequipped, alert the Regional Manager and/or Director of HSE. Take all reasonable and safe measures in order to prevent the spill from spreading to sensitive receptors.
- Prepare a contingency plan in case the spill gets out of control of present staff and equipment capacity.

Step 4 - Report Spill

- Complete a Spill Report Form (Available in Appendix C and on the PowerLine) and fax to:
  - 24 Hour Spill Line;
  - HSE Department; and
  - Regional Manager, Operations.
- For large fuel spills follow the Fuel Spill Calculations Procedures (Appendix D) to determine the spill volume.
- The following sections describe fill reporting in more detail.

Step 5 – Spill Cleanup and Disposal

- Prior to initiating cleanup and disposal procedures, the appropriate regulatory body and the Director, HSE must approve the procedures.
- Refer to Section 7 of this Environmental Emergency Plan for information on product recovery, storage, disposal, and site cleanup procedures.
- Upon completion of cleanup fill out a Spill Update Form (Available in Appendix C and on the PowerLine) and fax as directed on form.

Step 6 – Debriefing

- Conduct an internal review of the spill cause, effects, and EEP procedures.

Step 7 – Close Spill File

- The Director, HSE will follow up with the appropriate regulatory body to ensure that

6.5 Spill Reporting

It is required by law to immediately report hazardous materials spills to the appropriate government officials. It is NTPC policy to report all hazardous materials spills of 5 L or greater. The reporting procedures are as follows:

Fill out a Spill Report form as completely as possible (available in Appendix C and on the PowerLine).

1. Fax or phone in the Spill Report form immediately to the 24- Hour Spill Report Line:

Fax: (867) 873-6924
Phone: (867) 920-8130

2. Fax the Spill Report form to the HSE Department and the Regional Manage, Operations. See phone list (above immediately following the table of contents).

6.6 Communication Protocol

When a spill of any size is discovered, notify:

Director, Thermal Operations;
Mike Ocko
MOcko@ntpc.com
General Delivery, Inuvik, NT, X0E 0T0
867-777-7711 (w)
867-777-4535 (h)
867-777-6520 (c)

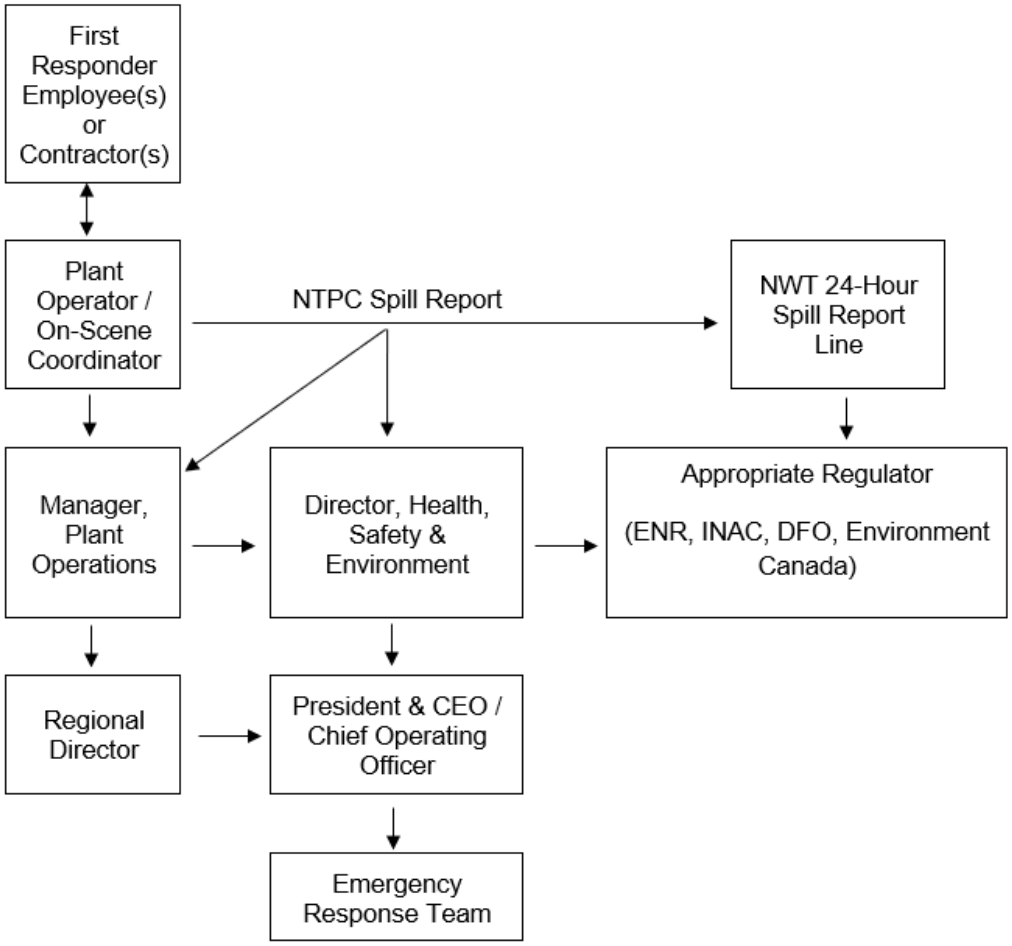
If the Regional Manager, Operations cannot be reached, contact **Central Control Room** in Yellowknife:

NTPC 24-Hour Central Control Room
Box 2250, Yellowknife, NT, X1A 2P7
867-920-4203 (24 Hour Emergency Phone)

If spill response requires assistance or is an emergency, Manager, Operations or Central Control Room must call the appropriate numbers:

The flowchart (see Figure 11 below) outlines the typical communication channels used when responding to spills. The seriousness of the spill will determine the individuals notified. For all potential spills to water over 20 L or land over 1000 L emergency declaration may be necessary. In this case, contact the Operations Manager and consult the *Form 11.4: NTPC Emergency Declaration Guidelines* (see PowerLine).

Figure 11: Organizational Communication Flowchart



It is the job of the Director, HSE to contact the appropriate regulator, when necessary; either the Government of the Northwest Territories (GNWT) Department of Environment and Natural Resources (ENR), Aboriginal Affairs and Northern Development Canada (AANDC), or Fisheries and Oceans Canada (DFO).

Table 1: NTPC Emergency Response Phone List

Position	Name	Phone (867)	Email
Director, Health, Safety & Environment	Dave Dewar	874-5327 (w) 874-4534 (c)	ddewar@ntpc.com
President & CEO	Cory Strang	874-5217 (w) 876-2876 (c)	cstrang@ntpc.com
Chief Financial Officer	Paul Grant	874-5254 (w) 874-0439 (c)	pgrant@ntpc.com
Director, Thermal Operations	Mike Ocko	777-7711 (w) 445-6520 (c)	mocko@ntpc.com
Manager, Maintenance Services	Boyd Mallaley	695-7113 (w) 695-1595 (c)	bmallaley@ntpc.com
Manager, Maintenance Services	Tony McDonald	777-7738 (w) 620-1215 (c)	tmcdonald@ntpc.com

Emergency Response Team: For spills that require emergency declaration refer to NTPC's *Form 11.2: Site Specific Emergency Response Plan* (see PowerLine) for roles and responsibilities for emergency levels I, II, and III.

Table 2: Core Emergency Response Team Phone List

Position	Name	Phone (867)
President & CEO	Cory Strang	874-5217 (w), 876-2876 (c)
Chief Financial Officer	Paul Grant	874-5254 (w), 874-0439 (c)
Director, Engineering	Vacant	
Director, IT	Tim Dressel	874-5273 (w), 876-0462 (c)
Manager, Human Resources	Erin Dean	874-5228 (w) 876-0336 (c)
Director, Hydro Region	Alex Love	669-3313 (w)
Director, Thermal Region	Mike Ocko	777-7711 (w), 445-6520 (c)
Director, Health, Safety & Env.	Dave Dewar	874-5327 (w), 874-4534 (c)
Communications Manager	Doug Pendergast	874-5202 (w), 876-1095 (c)
Director, Finance/Controller	Chuck Myles	874-5225 (w), 875-8103 (c)

Table 3: Local Agencies (in case of emergency only)

Contact	Phone
Fisheries and Oceans Canada (DFO)	1-800-889-8852
MACA Public Safety	867-767-9161 ext. 21021
Environment and Natural Resources (ENR)	867-920-8130
Public Works - Inuvik Region	867-777-1298
Mackenzie Valley Land and Water Board	867-669-0506
Wek'eezhii Land and Water Board	867-669-9590

6.7 General Policy on Public Relations

If questioned by the public or the media about a spill, refer them to the Communications Manager.

Environmental incidents such as spills often attract local interest and media attention. Employees should not make any statements on behalf of the Corporation to the media or to the public. It is the responsibility of the CEO and/or the NTPC Communications Manager to address the media and the public.

Respond fully to any request from local authorities or emergency workers that will help to control the spill and its damage; however, refer all other requests for information to the Communications Manager. This may include questions from reporters, environmental agencies, or people and property owners affected by a spill. When probing questions are asked, it is important that the response is polite and professional; for example:

> *"I'm sorry; I don't have the authority to answer that question. Please contact Doug Prendergast, Manager of Communications. His phone number is* 874-5202 (work), 876-1095 (cell)*."*

Employees should avoid guessing at an answer or making promises that are out of their control, as this can cause problems later for both the employee and the Corporation. No speculation should be made regarding who is at fault, why the spill occurred, spill volume, when cleanup will be completed, or any other issue.

7 General Cleanup

7.1 CONTAINMENT

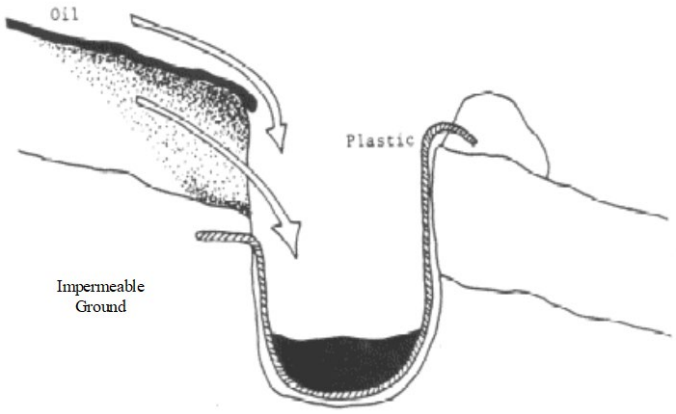
Spill containment may be categorized into land-based containment, water-based containment, and containment under ice. Sections 6.3 and 6.4 outline the steps to be followed during spill response activities.

7.1.1 Land-Based Containment

Trenches

Trenches are practical under summer conditions only. The trench must be dug to groundwater, bedrock, or impermeable ground. If water is present in the excavated trenches, it should be assumed that groundwater contamination may result and eventually be discharged into surface waters. A waterproof liner should be placed on the bottom and sides of the trench. Shallow trenches placed downslope of the spill will be effective in trapping fuel travelling both on the surface and below the surface (Figure 12). Sorbent pads, socks, and booms should be placed in the trench to collect spilled product. Materials and equipment that may be used for trench construction include backhoes, loaders, shovels, picks, and waterproof liners. Care must be given when working in or near trenches as fumes can build up, causing fire and respiratory hazards. Ensure proper PPE is worn and ignition sources are removed from the area.

Figure 12: Interceptor Trench



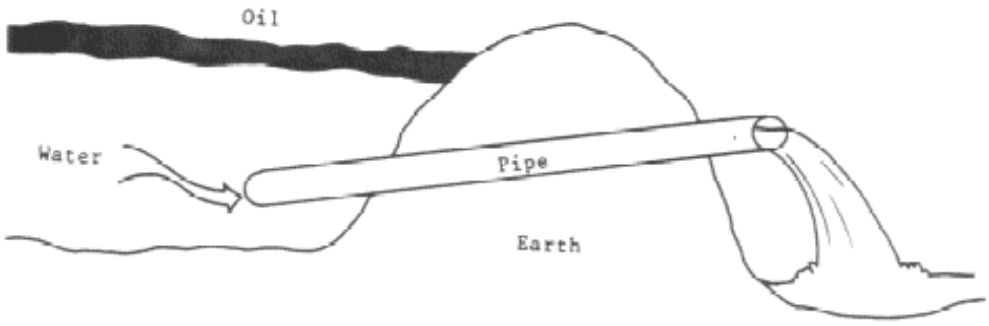
Dams

Dams constructed across ditches can be used to contain a spill and stop its flow. A dam may be built with earth, wood, sandbags, and/or snow. The dam should be lined with plastic sheeting to make it impermeable to the spilled product. In freezing conditions water may be sprayed on a dam to form ice, thereby making the dam impermeable.

Care should be taken to ensure that a dam is large enough to contain the entire spill; insufficient capacity may result in overtopping failure.

For ditches with flowing water or for small streams, it may be necessary to allow water flow to continue while retaining the lighter-than-water liquids (i.e.: hydrocarbons). This can be achieved by building water bypass dams: an earth dam is built stopping the flow of water and oil in the ditch; a pipe is then installed below the water level and passing through the dam. This allows the water to continue flowing while the dam retains the lighter-than-water products (Figure 13).

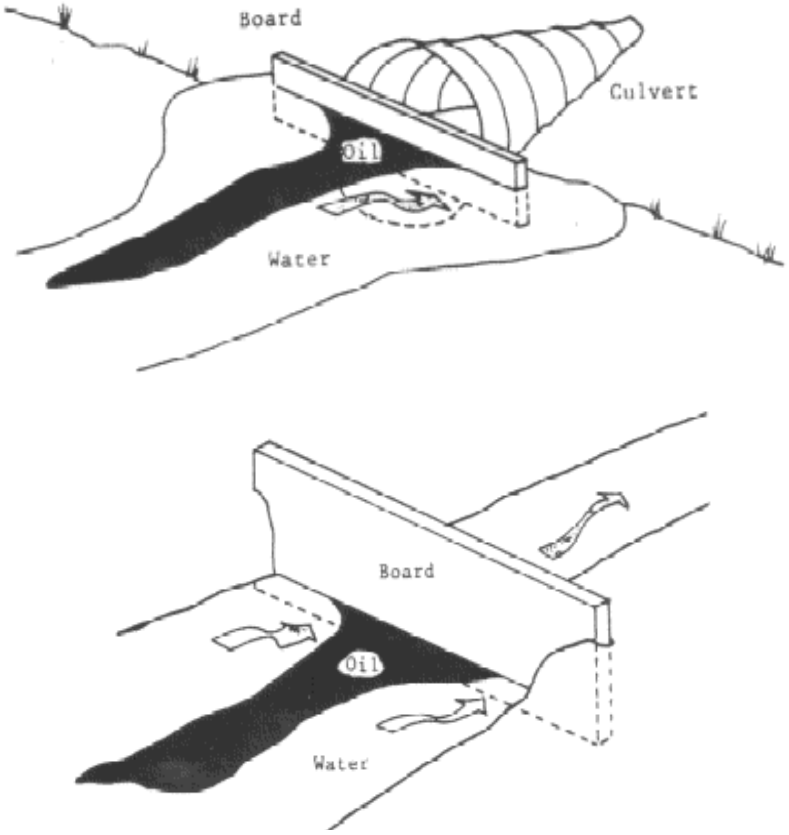
Figure 13: Water Bypass Dam



Weirs

Weirs may be used in ditches and at culvert entrances. Materials commonly used such as plywood, lumber, and sheet metal may be placed to completely or partially block culvert entrances. These barriers are effective on slow-moving streams. Water can flow under the weir, while product is retained on the surface of the water by the weir (Figure 14).

Figure 14: Weirs



7.1.2 Water-Based Containment

Water-based containment measures generally include the use of barriers or booms. Unless the entire flow of contaminated water can be stopped by damming, water-based methods are limited to the containment and recovery of materials that can be separated from water.

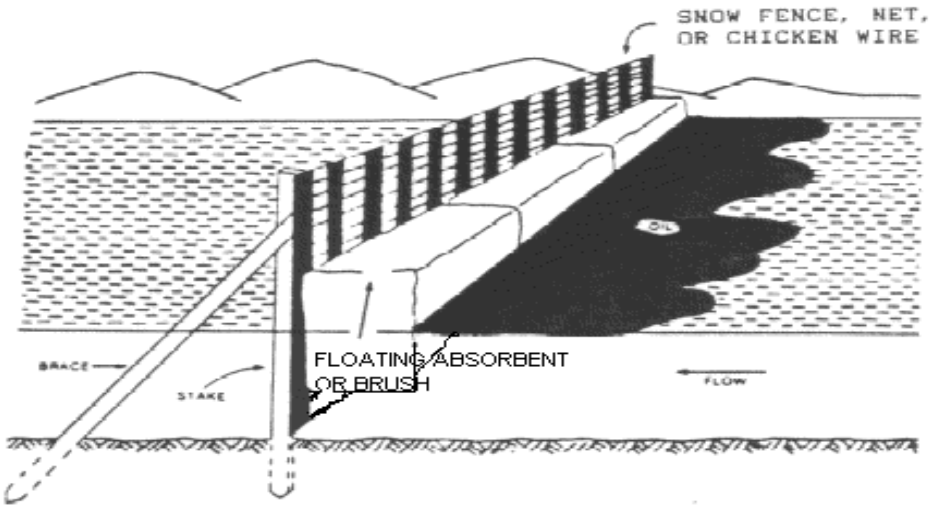
Certain materials such as gasoline and other volatile or flammable petroleum products have a high risk of fire or explosion. For these materials, containment and evaporation (without recovery) or burning may be the preferred approach.

Snow Fence and Sorbent Barrier

Snow fence and sorbent barriers may be used in streams (less than 1 m deep) with soft beds into which stakes can be driven. This method is limited to summer conditions. A snow fence barrier is installed to span the width of the stream, anchored at both ends, and stakes are driven into the stream bottom at 1 to 2 m intervals along the fence. Commercial sorbents are placed on the upstream side of the fence and are held against it by the current. Sorbents will float against the upstream side of the barrier but must be replaced before they become soaked with product and sink. The barrier should be angled against the current for shore side collection. Multiple snow fence barriers can provide backup against potential losses

from upstream barriers. Net or chicken wire barriers can be constructed in the same way, and are more practical for stronger currents, as water can flow through them more easily (Figure 15).

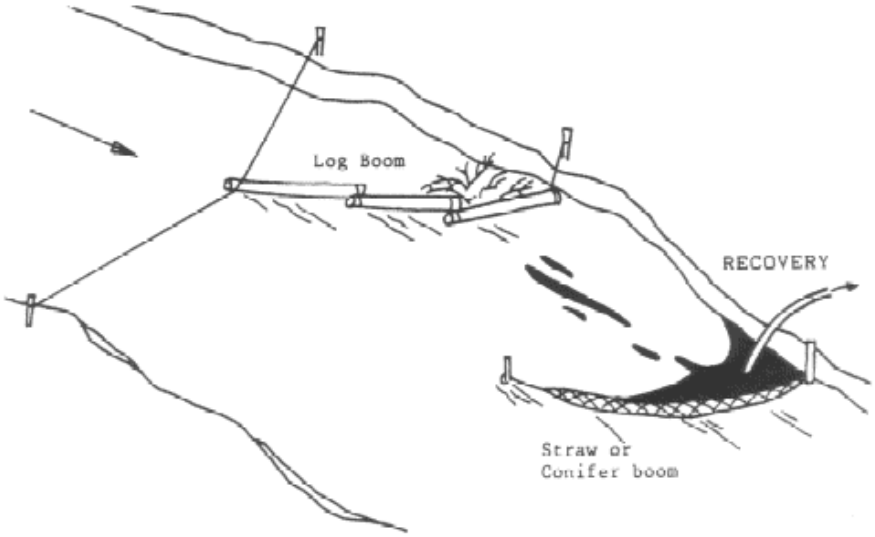
Figure 15: Barrier and Sorbent



Booms

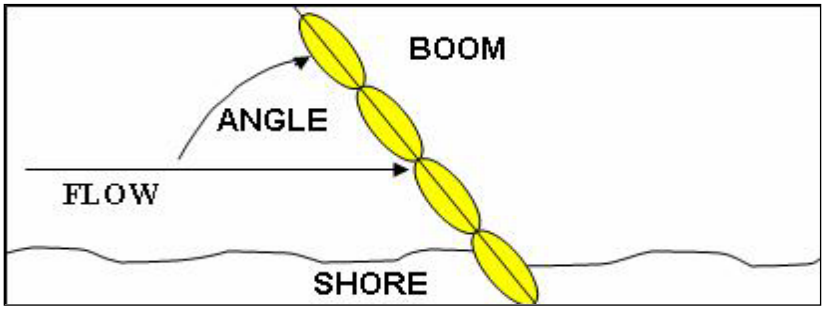
Booms are used to contain a spill of floating liquid or debris, to deflect or divert material to a defined area so that it may be recovered, and to protect sensitive areas from contamination (Figure 16).

Figure 16: Boom Usage



Boom deployment is important, as the angle of the boom in relation to the speed of the water affects how well the oil may be contained. The faster the stream, the more angled the boom must be (Figure 17).

Figure 17: Boom Deployment



Several booms arranged in parallel may be necessary to contain all the product. These should be spaced to allow product, which may escape the first boom, to float to the surface and be contained by the next boom. In addition, the use of several booms permits one boom to be removed at a time for cleaning.

Booms may be either commercially made or homemade. Commercially made booms are designed to float and keep product from escaping under the boom. Homemade booms may be constructed from logs, railroad ties, power poles, trees, lumber, inflated fire hose, or Styrofoam. These may be used to deflect floating material to shore or to keep floating material within a contained area. Individual sections are connected by rope, chain, or wire. A seal around the joints to prevent leakage can be made by wrapping with plastic sheets or burlap.

Wooden or other floating booms can be used to contain the spilled fluid itself or the sorbent containing the product. They can also be used upstream of sorbent booms to improve the efficiency and longevity of the sorbent material.

7.1.3 Containment Under Ice

Ice Slotting

Ice slotting may be used in rivers or streams when current speeds are slow (i.e. less than 0.5 m/s). A trench is cut into the ice using a chain saw or trenching machine at an angle to the current, to deflect and concentrate product that passes through the area (Figure 18, 19). Because of thick ice encountered during the winter, cutting and removal of ice blocks is often difficult. Loaders or backhoes may be needed to lift blocks out of the slot, or to push blocks down. Product that accumulates in the ice slot may be pumped out, adsorbed, or burned in place.

Figure 18: Ice Slot

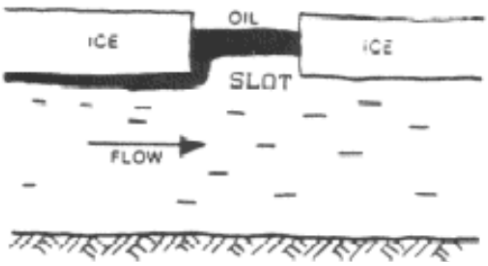
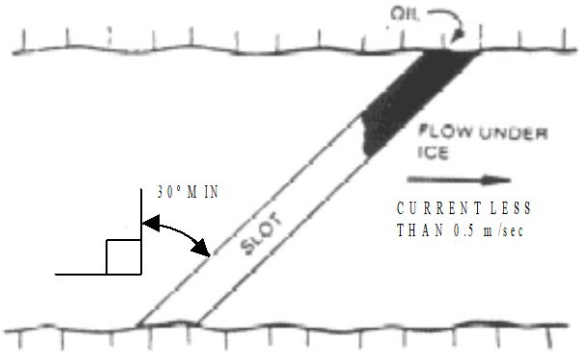


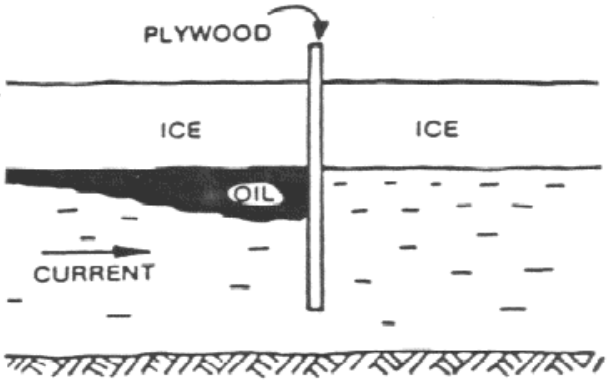
Figure 19: Angled Ice Slot



Vertical Barriers

Vertical barriers such as plywood may be used to deflect product under ice in deep, slow-moving waters (Figure 20). The ice must be strong enough to support the necessary personnel and equipment. Vertical barriers are put in place by cutting trenches in the ice at an angle to current flow, inserting the plywood barriers, and allowing them to freeze in place. The location of the spilled product may be monitored by drilling observation holes with an ice-auger.

Figure 20: Vertical Barriers



7.1.4 Barrel Containment

If liquid is leaking from a barrel and the leak cannot be plugged nor are there overpack drums on hand, the barrel can be rolled onto its side so that the leaking area is at the highest point and will therefore no longer leak. A leak may be plugged with wooden wedges wrapped with a cloth or heavy-duty tape, or by placing an inner tube around the barrel over top of the leak. The inner tube can be tightened by twisting it with a rod or stick. All these methods are to be used as temporary seals only. The liquid needs to be transferred into a new barrel or storage tank as soon as possible to prevent further contamination.

7.2 RECOVERY

Fuel recovery methods generally include direct suction, mechanical removal, and the use of sorbent material. A water spray mist may be used to herd the fuel to an area for collection.

7.2.1 Direct Suction Equipment and Techniques

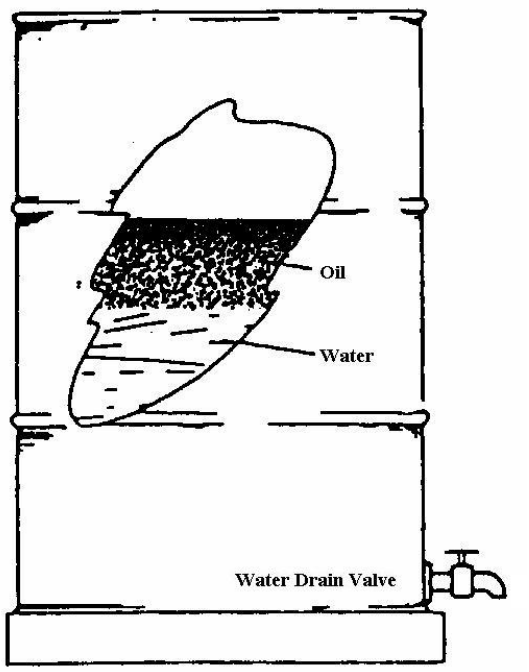
Direct suction methods include the use of vacuum trucks, portable pumps, or shop vacuums. Vacuum cleaners or portable pumps can be used to directly recover materials from damaged containers or from thick slicks on water.

Shop vacuums are suitable for small spills if a power source is available. Commercial skimmers are available for attachment to vacuum sources. These skimmers serve to skim floating product from the water surface while reducing the amount of water recovered. Suction screens may be required to prevent hose plugging by floating debris and to prevent pump damage.

Care should also be taken to prevent the uptake of water in order to minimize both the final volume of material that requires disposal and to prevent emulsification of oil and water. Once removed from the water body, however, water and oil can be separated using gravity separation. Valving on vacuum trucks can be used for water/oil separation, or a drum separator may be readily constructed using a 205-litre (45-gallon) drum and plumbing hardware (Figure 21).

***CAUTION**: All containers used for the recovery of fuel must be grounded due to the potential for static-electricity build-up and fire.*

Figure 21: Improvised Oil-Water Separator Drum



7.2.2 Manual and Mechanical Recovery

Manual recovery by use of hand tools (e.g. cans, buckets, shovels, rakes) is an effective means of recovering fuel from small spills or from areas that are inaccessible to larger equipment. This is often the only method available, and in some cases is preferred as it causes the least amount of damage to an area.

Mechanical recovery using heavy construction equipment can be used in some cases for recovery and loading of material for disposal. Caution must be used when operating such equipment around a spill site. In some instances, more damage can be caused from the operation of the equipment than from the spilled product. Escaping petroleum vapors may also be present and pose the danger of explosion and fire.

7.2.3 Sorbent Material

Sorbent materials are commonly used for final cleanup and recovery of small amounts of oil or to remove oil in places that are inaccessible to other means of recovery. They are effective in recovering thin as well as thick layers of oil, however large volumes of sorbent are often required.

Snow and soil can be used as effective sorbent materials. Once mixed, the oil in snow or soil mixture can be shoveled or picked up using construction equipment and taken to a suitable treatment site.

7.3 STORAGE

Storage is required:

- If a suitable location for disposal cannot be found;
- If climatic conditions do not permit disposal at the time of cleanup;
- If the selection of a disposal option requires further assessment; or
- If transportation to a treatment/disposal facility is dependent on the availability of a suitable transport vehicle.

Storage options generally consist of pails, drums, tanks, berms, or pits. The specific type of storage needed is dependent on the volume of recovered material, the degree of contamination of the water and/or soil, the properties of the spilled product, and the duration of storage required.

7.3.1 Vehicle Storage

Vehicles suited for the storage of recovered fuel are tank trucks, vacuum trucks, dump trucks, flatbed trucks, sled-mounted tanks, and transport trailers. Tank trucks may be used to separate oil and water by emptying the water from the bottom of the tank. Tank trucks typically hold up to 20 m^3, while vacuum trucks typically hold around 16 m^3.

Flatbed trucks and transport trailers are suitable for carrying tanks and drums braced on pallets.

7.3.2 Open-topped Tanks

Open-topped tanks like plastic-lined swimming pools with capacities up to 20 m^3 may be quickly assembled on firm, level ground. They may be fed by several hoses at once and can store both liquids and solids. These should be used only for short-term storage when storing fuel.

7.3.3 Drums

Tanks and drums, which are available in all communities, may be used for temporary storage of fuel.

7.4 DISPOSAL

Disposal or destruction of recovered fuel is needed to eliminate the risk of further contamination from the recovered fuel. **No decision, except under emergency conditions, should be made until approval has been obtained from the Director, Health, Safety & Environment and appropriate government agencies.** The 24-Hour Spill Report Line should be used to initiate such requests and a follow-up report should describe the disposal methods used.

7.4.1 Salvage and Recycle

Recovered diesel and lubricating oil may be reused directly as a low-grade heating fuel in waste oil furnaces.

7.4.2 Fuel Burning

Open burning of spilled oil products is not an acceptable disposal method. Open burning is prohibited except in the case of an extreme emergency. Only appropriate government regulators can authorize controlled or open burning of spilled products. This option will only be considered in extreme emergencies (i.e. when humans or environmental receptors are in grave danger of extensive contamination) and following consultations between the Director, Health, Safety & Environment and INAC.

7.5 FINAL CLEANUP AND RESTORATION

Final cleanup and restoration are considered completed when sampling confirms that excavation activities reached clean extents and no contaminated soil remains in place.

7.5.1 Natural Assimilation (Biodegradation) and Re-vegetation

Oil can be degraded naturally by microorganisms under proper temperature and nutrient conditions. Tilling the affected soil to increase exposure of the soil organisms and oil to oxygen can also be beneficial. The utilization of natural assimilation to treat, in whole or in part, soils affected by spilled oils requires the approval of government agencies.

7.5.2 Replacement of Soil

In some cases, it is necessary to replace contaminated soil with clean soil. This can include grass or sod on the upper layer of soil. Before contaminated material is removed, regulatory agencies must be contacted regarding acceptable disposal sites. Spills that take place on tundra receive special attention due to the presence of sensitive soils and plants. Replacing contaminated tundra may be more detrimental to the area than allowing the contamination to naturally degrade.

Shovels, front-end loaders, backhoes, and dozers may be used to excavate contaminated soil.

8 Maintenance and Testing of the Emergency Procedures

8.1 Plan Evaluation

Despite careful planning, it is highly probable that certain components of this plan will need to be modified. Therefore, the plan will be reviewed to pinpoint those components that need to be corrected, adjusted or upgraded. Emphasis will be for aspects of the plan affecting safety of employees of the facility and the general public. The operational aspects of the plan and any paperwork that deals with the plan will be reviewed as well.

Formal evaluations of the plan will be documented, deficiencies noted in the report and progress in addressing deficiencies tracked in writing. Responsibilities to address deficiencies and accountabilities will be assigned and deadlines for addressing required changes will be set.

Each year NTPC employees potentially involved in an Inuvik facility emergency response will have a response drill conducted with one of the identified potential emergency scenarios described in Section 5. The following year, a different scenario will be used until each of the potential scenarios are covered; at which point the cycle will restart. Every 5 years, a full-scale simulation exercise will be carried out. Any special problems encountered will be noted along with corrective actions recommendations and training will be documented.

REFERENCES

California Energy Commission Liquefied Natural Gas in California: History, Risks and Siting. July 2003. http://www.energy.ca.gov/reports/2003-07-17_700-03-005.PDF.

NTPC Element 11, Emergency Preparedness Plan, May 2014.

NTPC Guidelines for Emergency Declaration, June 2013.

NTPC Emergency Response Plan, Inuvik Liquid Natural Gas Power Project; Inuvik, Northwest Territories. August 2017.

NTPC Inuvik Emergency Response Plan. 2018.

NTPC Oil Pollution Emergency Plan, Inuvik, NT. August 2017.

NTPC Spill Response Plan, Inuvik Generating Facility, NT. Plant #136. June 2018.

Appendix A

Government of the Northwest Territories Fuel Services Division Standard

APPENDIX – 2.0 STANDARD OPERATING PROCEDURE 0880-20-001

NOTE: The Northwest Territories Power Corp contracts fuel transfer operations to the Government of the Northwest Territories Fuel Services Division.

Standard Operating Procedure (SOP) 0880-20-001 - Marine Resupply by Tug/Barge
Table of Contents

1.0 Purpose

Fuel Services Division (FSD) Operations Officers are trained and qualified to handle petroleum product annual resupplies. The following procedures must be followed during annual resupply fuel transfer operations. Safety is essential, and personnel responsible for product handling are required to identify and promptly report all dangerous situations and conditions, including equipment or facility failures or deficiencies.

2.0 Procedures

2.1 Equipment and Supplies

The Operations Officer will prepare all necessary equipment and supplies to complete the resupply tasks. All test equipment shall be calibrated every year before barge resupply season starts.

- Communication
  - Two intrinsically safe handheld radios compatible with shipboard frequencies
  - Spare batteries
  - Chargers

- Gauging Equipment
  - Gauge tapes equipped with grounding clamps
  - Thermometers
  - Water and fuel finding paste
- Sampling Equipment
  - Fuel sampler
  - Sample cans (minimum of 3)
  - Funnels
  - Sample shipping boxes and labels

    Ensure you have 3 spare fuel sample cans and shipping documents (TDG).
- Testing Equipment
  - Seta-flash unit
  - density meter
  - conductivity meter
  - thermometer
  - syringe(s)
- Cargo Hoses must meet the following criteria:
  - has a bursting pressure of not less than five times its maximum design pressure;
  - is clearly marked with its maximum design pressure; and
  - has successfully passed, during the year before its use, a hydrostatic test to a pressure equal to one and one-half times its maximum design pressure
  - If a transfer conduit used in a transfer operation is part of a vessel's equipment, the vessel's master must keep on board the test certificate for the hydrostatic test.
  - The owner of a transfer conduit (cargo hoses) that is used in a transfer operation must ensure that the conduit is used, maintained, tested and replaced in accordance with the manufacturer's specifications.
- Other Equipment
  - copy of Standard Operating Procedure (SOP) 0880-20-001
  - community tank farm keys
  - copy of community tank charts
  - copy of fuel temperature corrections charts
  - copy of the Oil Spill Emergency Plan (OHF Plan)
  - proper personal protective equipment (PPE)
  - life preservers (if required)
  - all TDG paperwork and shipping tags

- copy of Certificate of Quality for barge fuel
- intrinsically safe flashlights with extra batteries

2.2.1 Resupply Plan

The Operations Officer must complete a written resupply plan and submit for approval to the Coordinator, Fuel Operations (CFO). The CFO will provide marine resupply volumes and expected dates of arrival. The Operations Officer's resupply plan must state the volume and tank number of where the fuel is planned to be delivered. The plan must also detail pre-supply transfers and necessary community deliveries.

2.2.2 Port of Loading Fuel Quality

FSD's designated fuel supply and delivery contractor must guarantee that product quality meets the Government of the Northwest Territories (GNWT) specifications. They are contractually required to take samples of all products loaded to barge(s), have the samples tested for quality at an accredited laboratory, and submit a certificate of quality to the CFO. The CFO will forward results to the Operations Officer assigned to the fuel transfer operations as soon as possible. Discharge of fuel is not permitted until fuel results are received and approved by the CFO.

NO TEST RESULTS – NO OFFLOADING.

2.2.3 Pre-Discharge Procedure

As the Operations Officer, you are now on shore and preparing your tank farm facility to receive product. The following are required to be checked and established before receiving any product.

1. The following checklists must be completed prior to every transfer operation. Copies of these documents can be found at the end of this plan (Attachment-A).
    - Arctic General Checklist for All Transfers
    - Arctic Checklist for Barge Transfers
    - Arctic Ship to Shore Transfers
    - Arctic Transfer Particulars

Original copies of all documents are to be retained at site and copies of the documents (PDF or Fax) are to be sent to:

- by fax: (867) 873-0297
- by email: claudio_ardiles@gov.nt.ca

2. Obtain ONE 4L pre-resupply sample from each shore tank. Mark each can with the product type, tank number, date, and opening volume. Store this sample 6-12 months in our contractor's fuel testing facility. These samples are our proof of quality for fuel remaining in tanks pre-resupply.

3. Establish communication between the shore and the tug/bargeman. Go over hand-signals that you will use in the event of a communication failure.

4. Establish which product you will receive first, and your tank resupply sequence. Provide notice if you plan to change flow to another tank during the fuel transfer and will require the tug/bargeman to either reduce flow or stop the transfer.

5. Gauge and record temperature of all shore tanks with the carrier's representative. Dip each receiving tank a minimum of three (3) times and ensure you, the Operations Officer, and the carriers representative agree on dips. Have the carrier's representative initial your record of the tank dip and product temperature, and also sign in the designated box on the Resupply/Transfer Certificate.

6. With a carrier's representative, gauge each barge compartment. A clear and bright test must be done for each product to identify any possible water or sediment in the fuel. Obtain ONE 4L sample from two random barge compartments. Label each sample can with the community name, barge number, compartment number, product type, date, and compartment volume. Retain this sample in the community for one year.

7. Next, using the sample you collected, complete abbreviated testing (density test, seta-flash (Diesel), and conductivity test). Record test results on your Resupply/Transfer Certificate. Should any of the abbreviated testing fail to meet GNWT specification, contact the CFO immediately and advise the barge crew that discharge cannot commence due to the test results.

8. ** Ensure that no smoking signs and fire extinguishers are put in place.

9. Once you are satisfied that the carrier's discharge hose has been securely fitted to the marine discharge manifold, open all valves from the receiving tank to the resupply manifold.

2.3 Product Discharge Procedure

Ensure all pre-discharge requirements have been met before proceeding past this step. You are now ready to receive product.

1. Contact the barge pump man and inform him that you are ready. Ensure that the bargeman confirms that he is ready to discharge. Before beginning to pump, ensure the resupply valve at the manifold is in the open position. While standing by the marine resupply manifold, advise the tug/bargeman to proceed with discharge at a low rate of flow.

2. Check the carrier's hose connection at the marine resupply manifold for leaks. If there are no leaks at this location, proceed to walk the resupply pipeline to the receiving tank and check for leaks.

   If there are any leaks noticed at any time, notify the tug/bargeman as soon as possible to slow down or stop the operation to remove the pressure from the conduit or connection. Take prompt action to contain any fuel spilled as a result of the leak. The discharge cannot continue until the leak has been repaired. Restart must be in a manner that does not interfere with the immediate, effective and sustained response to the discharge;

   If there are no leaks noticed during the initial inspection during slow rate of flow, advise the tug/bargeman to proceed with slowly increasing the rate of flow to full rate of flow.

   The supervisor of a transfer operation at a handling facility must ensure that the manifold valves and the tank valves at the handling facility are not closed until the relevant pumps are stopped, if the closing of the valves would cause dangerous over-pressurization of the pumping system.

3. For the first 30 minutes of pumping, you should receive product at one half of your normal operating pressure. This will keep static discharge to a minimum. Walk the resupply line to check for fuel leaks 30 minutes. If after 30 minutes you

do not develop any leaks, request the pump man to increase the pressure to full operating pressure, and continue to walk the line. Rate of flow procedures are different based on product level in tank to start of discharge. For example, if product level is low or below manifold, rate must be slow so as to mitigate jet stream breaking surface. Gasoline is much more volatile than Jet A-1 and diesel for instance. Also, marine carriers would object to slow rate of flow for a one-hour period if filling tanks where product level is not low. 15 minutes should suffice in these circumstances.

As per Canadian Standards Association (CSA) B836-05, when filling empty storage tanks, ensure that a flow rate of 1 m/s (3 ft/s) is not exceeded until the end of the fill line is fully submerged in accordance with API RP 2003. This equates to the following:

a)	50	mm	(2 in) line flow rate restricted to	130 L/min	35	US gal/min);
b)	75	mm	(3 in) line flow rate restricted to	275 L/min	75	US gal/min);
c)	100	mm	(4 in) line flow rate restricted to	500 L/min	130	US gal/min);
d)	150	mm	(6 in) line flow rate restricted to	1090 L/min	290	US gal/min);
e)	200	mm	(8 in) line flow rate restricted to	1940 L/min	510	US gal/min);
f)	250	mm	(10 in) line flow rate restricted to	3030 L/min	800	US gal/min);
g)	300	mm	(12 in) line flow rate restricted to	4360 L/min	1150	US gal/min);

4. Once product flow is established, record the barge pressure gauges, and walk the resupply line every 30 minutes. Never leave the resupply operation unattended and maintain constant communication checks with the barge crew to ensure a smooth resupply operation. Once you have established product flow you can now calculate your product cut-off point. Calculations will include resupply hose quantities. Constantly recalculate your product cut-off time as the pumping rate slows with tank head pressure and volume.

5. Product cut-off may require two people – one person on the tank to gauge the cut- off, and the other to operate the valves. You should establish your cut off point well in advance with the pump man. Inform the ship to stop pumping once the initial cut-off is reached. It is a good idea to have the pump crew to “stand by” as you reach your cut-off point, inform the crew you are nearing completion.

6. Once the cut-off point has been reached and the barge crew has stopped pumping, shut the tank valve and proceed to the shore valve. Close and lock the shore valve.

7. Once the line has been cleared of product, attach hose to the next product valve. Unlock the valve and proceed to the tank farm to prepare to unlock your next tank.

8. Repeat all above steps until you receive the entire product order.

9. Once the pumping has stopped, lock your tank valve and proceed to the resupply shore valve. Make sure you close and lock all shore valves. Once the hose has been drained back to the barge, the barge crew will disconnect the hose from the resupply line. Also, cap all male camlock fittings.

2.4 Post-Resupply Procedure

1. Let the fuel in the tanks settle for a minimum of four (4) hours before the dipping is completed.

2. The tank gauging must be completed by the Operations Officer, the carrier's representative, and the fuel delivery contractor (if available). Each person must dip the tanks independently at least three times and the measurements must be reviewed and approved for accuracy before dip measurements are recorded on the Resupply/Transfer Certificate.

3. All parties are to sign the Resupply/Transfer Certificate confirming they dipped the tanks independently and agree on the final dips.

4. Ensure you have all the paperwork signed off.

5. Obtain one post resupply 4L composite sample for each product that was resupplied. If multiple tanks received the same product, take sample from the tank having received the most fuel. Label cans with the date sample taken, community, product type, tank number, tank volume, amount, and the words "post resupply sample".

6. Package all samples in accordance with the Transportation of Dangerous Goods Regulations for shipments by air.

7. Ship all samples on the next available flight to the address below and notify the CFO of the waybill number:

   Alberta Innovates and Technology Futures. 250 Karl Clark Road, Edmonton Alberta, 780-450-5111.

2.5 Emergency Procedure

Operations Officers should be fluent with the Oil Spill Contingency Plan (OSCP) for each community. The Operations Officer must have a valid copy of the OSCP on-hand and available to all personnel involved in the marine resupply. In the event of an oil spill, follow the procedures outlined in the OHF Plan.

In the event of a non-spill related emergency, refer to the emergency contact list in the OHF Plan, Appendix 4.

If working alone on the shore side, follow procedures outlined in the SOP0880-20-002 – Procedures for Working Alone.

Always have with you the telephone number of your manager, and the CFO. If at any time an issue arises where clarification or information is required, contact your manager or CFO.

2.5.1 Precautionary Statements

Shortly after the barges have arrived at the resupply community, several key tests have to be performed by the Operations Officer. **Only qualified personnel shall perform abbreviated tests.**

Note: It's very important to flush all sampling equipment with the product that you are about to sample. This will ensure that the sampler, cans and funnel are clean and will not cause product contamination.

Static charge is always an area of concern and should be dealt with common sense, always ground your gauging and sampling equipment. Allow ample time for static to dissipate.

Appendix B

Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND OTHER HAZARDOUS MATERIALS

Government of Northwest Territories | Nunavut | Canada | Inuvialuit Land Administration

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:			

Appendix C

Fuel Spill Calculations

FUEL SPILL RESPONSE PROCEDURE

In the even of a fuel spill the following steps must be taken:

1. Assess hazards
2. Shut off source of spill
3. Contain spill
4. Calculate amount of fuel spilled
5. Report Spill
6. Spill cleanup and disposal
7. Debriefing

FUEL SPILL CALCULATIONS

Once the source of the spill is shut off and the initial spill containment is underway it is essential to determine the exact amount of fuel spilled. To do so, the following information must be gathered:

1. Gauge the tank with the fuel spill and record the reading
2. Record the fuel temperature
3. Record the generator kWh readings for each engine in the plant
4. Obtain a copy of the last *Month End Thermal Generation Report* (Month End Report)

FUEL DIFFERENCE CALCULATION

1. Record last month's fuel storage volume (Month End Report pages 4-6, line 7)
   - e.g., 33,737 L

2. Add any fuel received between last month end and the fuel spill
   - e.g., no fuel was received (0 L)

3. Conduct a tank dip and record the depth of fuel
   - e.g., 98 cm

4. From the tank dip chart for that specific tank determine the volume of fuel in the tank
   - e.g., 22,708 L

5. Using the recorded fuel temperature obtain the multiplier from the Temperature Compensation Chart
   - e.g., -28^0C = 1.0383

6. Obtain the amount of temperature compensated fuel in storage
   - e.g., (22,708 L x 1.0383) = 23,578 L

7. Subtract temperature compensated fuel volume from last month end volume to calculate **Fuel Used Since Last Month End**
   - e.g., (33,737 L – 23,578 L) = 10,159 L
   - This means that the fuel used and spilled since last month end totals 10,159 L

FUEL USED IN GENERATION (Table 1 below corresponds with the following steps)

1. Take the present kWh meter readings for each generator from the kWh meter in the generator switchgear
   - e.g.,G1 (17,748,000 kWh), G2 (10,110 kWh), G3 (10,820 kWh)

2. Record the previous meter readings from each generator from Month End Report
   - e.g., G1 (17,735,465 kWh), G2 (10,087 kWh), G3 (10,809 kWh)

3. Subtract the difference between present and last month end readings for each generator
   - e.g., G1 (12,535 kWh), G2 (23 kWh), G3 (11 kWh)

4. Obtain meter multipliers from the meters or the Month End Report
   - e.g., G1(x 1), G2(x 600), and G3 (x 600).

5. Obtain actual kWh generated by each unit in the plant using the multiplier
   - e.g., G1 (12,535), G2 (13,800), G3 (6,600)

6. Add the actual generation for all units to get the total generation from end of last month to present
   - e.g., 32,935 kWh

7. Obtain the fuel efficiency from the Month End Report
   - e.g., 3.47 kWh/L

8. Calculate fuel used to generate 32,935 kWh by applying fuel efficiency to total generation
   - e.g., (32,935 kWh / 3.47 kWh/L) = 9,491 L

9. Calculate the **Actual Spill Volume** (fuel used since last month end minus fuel used to generate during this period)
   - e.g., (10,159 L – 9,491 L) = 668 L

Table 1: Calculation Example – Fuel Used in Generation

Unit	G1	G2	G3
1. Present meter reading (kWh)	17,748,000	10,110	10,820
2. Previous meter reading (kWh)	17,735,465	10,087	10,809
3. Difference (kWh)	12,535	23	11
4. Multiplier	1	600	600
5. Actual kWh per generator	12,535	13,800	6,600
6. Total kWh generated	G1 +G2 + G3		32,935
7. Fuel efficiency (kWh/L)			3.47
8. Fuel used in generation (L)	32,935 kWh / 3.47 kWh/L		9,491 L
9. Total fuel spilled (L)	10,159 L – 9491 L		668 L

Appendix D
Safety Data Sheets

SECTION 1. IDENTIFICATION

Product name	:	DIESEL FUEL
Synonyms	:	Seasonal Diesel, #2 Diesel, #1 Diesel, #2 Heating Oil, #1 Heating Oil, OSX, D50, Arctic Diesel, Farm Diesel, Marine Diesel, Low Sulphur Diesel, LSD, Ultra Low Sulphur Diesel, ULSD, Mining Diesel, Naval Distillate, Dyed Diesel, Marked Diesel, Coloured Diesel, Furnace special, Biodiesel blend, B1, B2, B5, Diesel Low Cloud (LC), Marine Gas Oil, Marine Gas Oil Dyed.
Product code	:	103193, 103178, 103136, 103135, 103134, 103133, 103132, 103131, 101799, 102907, 102762, 102763, 102755, 102302, 102744, 101801, 100678, 100677, 101802, 100107, 100668, 100658, 100911, 100663, 100652, 100460, 100065, 101796, 101793, 101795, 101792, 101794, 101791, 100768, 100643, 100642, 100103, 101798, 101800, 101797, 101788, 101789, 101787, 102531, 100734, 100733, 100640, 100997, 100995, 100732, 100731, 100994
Manufacturer or supplier's details		Petro-Canada P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		CHEMTREC: 1-800-424-9300 (toll free) or +1 703-527-3887; Suncor Energy: +1 403-296-3000

Recommended use of the chemical and restrictions on use

Recommended use	:	Diesel fuels are distillate fuels suitable for use in high and medium speed internal combustion engines of the compression ignition type. Mining diesels, marine diesels, MDO and naval distillates may have a higher flash point requirement.
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	Bright oily liquid.
Colour	Clear to yellow (This product may be dyed red for taxation purposes)
Odour	Mild petroleum oil like.

GHS Classification

Flammable liquids : Category 3

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Acute toxicity (Inhalation)	:	Category 4
Skin irritation	:	Category 2
Carcinogenicity	:	Category 2
Specific target organ toxicity - single exposure	:	Category 3 (Central nervous system)
Specific target organ toxicity - repeated exposure	:	Category 2 (Liver, thymus, Bone)
Aspiration hazard	:	Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Flammable liquid and vapour.
May be fatal if swallowed and enters airways.
Causes skin irritation.
Harmful if inhaled.
May cause drowsiness or dizziness.
Suspected of causing cancer.
May cause damage to organs (Liver, thymus, Bone) through prolonged or repeated exposure.

Precautionary statements : **Prevention:**
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Keep container tightly closed.
Ground and bond container and receiving equipment.
Use explosion-proof electrical/ ventilating/ lighting equipment.
Use non-sparking tools.
Take action to prevent static discharges.
Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
IF SWALLOWED: Immediately call a POISON CENTER/doctor.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
IF exposed or concerned: Get medical advice/ attention.
Do NOT induce vomiting.

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If skin irritation occurs: Get medical advice/ attention.
Take off contaminated clothing and wash it before reuse.
In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
Storage:
Store in a well-ventilated place. Keep container tightly closed.
Store in a well-ventilated place. Keep cool.
Store locked up.
Disposal:
Dispose of contents/ container to an approved waste disposal plant.

Potential Health Effects

Primary Routes of Entry : Eye contact
Ingestion
Inhalation
Skin contact

Aggravated Medical Condition : None known.

Other hazards

None known.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical name	CAS-No.	Concentration
Kerosine (petroleum), hydrodesulfurized; Kerosine — unspecified	64742-81-0	70 - 100 %
Kerosine (petroleum); Straight run kerosine	8008-20-6	
Fuels, diesel; Gasoil — unspecified	68334-30-5	
Alkanes, C10-20-branched and linear	928771-01-1	0 - 30 %
Fatty acids, C16-18 and C18-unsatd., Me esters	67762-38-3	0 - 20 %

All above concentrations are in percent by weight.

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.
Seek medical advice.

In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash skin thoroughly with soap and water or use recognized skin cleanser.
Wash clothing before reuse.
Seek medical advice.

In case of eye contact : Remove contact lenses.
Rinse immediately with plenty of water, also under the eyelids,

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		for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	Harmful if inhaled. Respiratory, skin and eye irritation; nausea; cancer.
Notes to physician	:	Treat symptomatically. For specialist advice physicians should contact the Poisons Information Service.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Carbon dioxide (CO2) Water fog. Foam
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	For personal protection see section 8. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8.

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		Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid spark promoters. Ground/bond container and equipment. These alone may be insufficient to remove static electricity. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight. Ensure the storage containers are grounded/bonded.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
Kerosine (petroleum), hydrodesulfurized; Kerosine — unspecified	64742-81-0	TWA	200 mg/m3 (As total hydrocarbon vapour)	ACGIH
		TWA	200 mg/m3 (total hydrocarbon vapor)	CA AB OEL
		TWA	525 mg/m3	CA ON OEL
		TWA	200 mg/m3 (As total hydrocarbon vapour)	ACGIH
		TWA	200 mg/m3 (total hydrocarbon vapor)	ACGIH
Kerosine (petroleum); Straight run kerosine	8008-20-6	TWA	200 mg/m3 (total hydrocarbon vapor)	CA BC OEL
		TWA	200 mg/m3 (total hydrocarbon vapor)	CA AB OEL
		TWA	200 mg/m3 (total hydrocarbon vapor)	ACGIH
Fuels, diesel; Gasoil — unspecified	68334-30-5	TWA	100 mg/m3 (total hydrocarbons)	CA AB OEL
		TWA (Vapour and	100 mg/m3 (total hydrocar-	CA BC OEL

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		inhalable aerosols)	bons)	
		TWA (Inhal-able fraction and vapor)	100 mg/m3 (total hydrocar-bons)	ACGIH

Engineering measures : Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Use only in well-ventilated areas.
Ensure that eyewash station and safety shower are proximal to the work-station location.

Personal protective equipment

Respiratory protection : Concentration in air determines protection needed.
Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hand protection

Material : neoprene, nitrile, polyvinyl alcohol (PVA), Viton(R). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Remarks : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Wear face-shield and protective suit for abnormal processing problems.

Skin and body protection : Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Protective measures : Wash contaminated clothing before re-use.

Hygiene measures : Remove and wash contaminated clothing and gloves, including the inside, before re-use.
Wash face, hands and any exposed skin thoroughly after handling.

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SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Bright oily liquid.
Colour	:	Clear to yellow (This product may be dyed red for taxation purposes)
Odour	:	Mild petroleum oil like.
Odour Threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Boiling point/boiling range	:	150 - 371 °C (302 - 700 °F)
Decomposition temperature		No data available
Flash point	:	> 40 °C (104 °F) Method: closed cup
Auto-Ignition Temperature	:	225 °C (437 °F)
Evaporation rate	:	No data available
Flammability	:	Flammable in presence of open flames, sparks and heat. Vapours are heavier than air and may travel considerable distance to sources of ignition and flash back. This product can accumulate static charge and ignite.
Upper explosion limit	:	6 %(V)
Lower explosion limit	:	0.7 %(V)
Vapour pressure	:	7.5 mmHg (20 °C / 68 °F)
Relative vapour density	:	4.5
Relative density	:	0.8 - 0.88
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	No data available
Viscosity		
Viscosity, kinematic	:	1.3 - 4.1 cSt (40 °C / 104 °F)

SECTION 10. STABILITY AND REACTIVITY

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Reactivity	:	Stable at normal ambient temperature and pressure.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	Hazardous polymerisation does not occur.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents and acids.
Hazardous decomposition products	:	May release COx, NOx, SOx, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure
Eye contact
Ingestion
Inhalation
Skin contact

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: Based on available data, the classification criteria are not met.
Acute inhalation toxicity	:	Acute toxicity estimate: 1.2 mg/l Exposure time: 4 h Test atmosphere: dust/mist Method: Calculation method Remarks: Harmful if inhaled.
Acute dermal toxicity	:	Remarks: Based on available data, the classification criteria are not met.

Components:

Kerosine (petroleum), hydrodesulfurized; Kerosine — unspecified:

Acute oral toxicity	:	LD50 (Rat): > 5,000 mg/kg,
Acute inhalation toxicity	:	LC50 (Rat): > 5.2 mg/l Exposure time: 4 hrs Test atmosphere: dust/mist
Acute dermal toxicity	:	LD50 (Rabbit): > 2,000 mg/kg,

Kerosine (petroleum); Straight run kerosine:

Acute oral toxicity	:	LD50 (Rat): > 5,000 mg/kg,
Acute inhalation toxicity	:	LC50 (Rat): > 5 mg/l Exposure time: 4 h Test atmosphere: dust/mist
Acute dermal toxicity	:	LD50 (Rabbit): > 2,000 mg/kg,

Fuels, diesel; Gasoil — unspecified:

Acute oral toxicity	:	LD50 (Rat): 7,500 mg/kg,

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Acute inhalation toxicity	:	LC50 (Rat): 4.1 mg/l Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 (Mouse): 24,500 mg/kg,

Skin corrosion/irritation

Product:

Remarks: Causes skin irritation.

Serious eye damage/eye irritation

Product:

Remarks: Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation

Product:

Remarks: Based on available data, the classification criteria are not met.

Germ cell mutagenicity

Product:

Germ cell mutagenicity- Assessment	Based on available data, the classification criteria are not met.

Carcinogenicity

Product:

Carcinogenicity - Assessment	Suspected of causing cancer.

Reproductive toxicity

Product:

Reproductive toxicity - Assessment	Based on available data, the classification criteria are not met.

STOT - single exposure

Product:

Target Organs: Central nervous system
Remarks: May cause drowsiness or dizziness.

STOT - repeated exposure

Product:

Target Organs: Liver, thymus, Bone

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Remarks: May cause damage to organs through prolonged or repeated exposure.

No data available

Aspiration toxicity

Product:

May be fatal if swallowed and enters airways.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

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SECTION 14. TRANSPORT INFORMATION

International Regulations

IATA-DGR

UN/ID No.	:	UN 1202
Proper shipping name	:	Diesel fuel
Class	:	3
Packing group	:	III
Labels	:	Class 3 - Flammable Liquid
Packing instruction (cargo aircraft)	:	366

IMDG-Code

UN number	:	UN 1202
Proper shipping name	:	DIESEL FUEL
Class	:	3
Packing group	:	III
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

National Regulations

TDG

UN number	:	UN 1202
Proper shipping name	:	DIESEL FUEL
Class	:	3
Packing group	:	III
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

SECTION 15. REGULATORY INFORMATION

This product has been classified according to the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all of the information required by the HPR.

The components of this product are reported in the following inventories:

DSL On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

For Copy of SDS	:	Internet: www.petro-canada.ca/msds Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228 For Product Safety Information: 1 905-804-4752

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Prepared by : Product Safety: +1 905-804-4752

Revision Date : 2020/10/06

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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MATERIAL SAFETY DATA SHEET – LIQUEFIED NATURAL GAS (MSDS #582)

Revision Date: April 7, 2014
Supersedes Date: April 7, 2011

Section 1: PRODUCT AND COMPANY IDENTIFICATION

FortisBC
16705 Fraser Highway
Surrey, BC
V3S 2X7

Company Phone Number: (604) 576-7000
Emergency Phone Number: (604) 946-4818

Product Name: Liquefied Natural Gas
Material Use: Various

Manufacturer:
FortisBC LNG Plant
7651 Hopcott Rd
Delta, BC
V4G 1B7

Supplier:
FortisBC LNG Plant
7651 Hopcott Rd
Delta, BC
V4G 1B7

WHMIS Class: A – Compressed Gas;
B1 – Flammable and Combustible Material – Division 1 Flammable Gases
UN/PIN Number: 1972
TDG Classification: Class 2.1 Flammable Gases

Chemical Family: Hydrocarbon Liquid
Chemical Formula: CH_4 (methane)
Molecular Weight: 16.04 (methane)
CAS Number: 74-82-8
Trade Names / Synonyms: Liquefied Methane / LNG

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Appearance/Odour: Odourless, colourless liquid. This product is not odourized.
Flammable: Very flammable after vapourization to gaseous phase.
Potential Health Effects: See Section 11 for more information
Potential Environmental Effects: See Section 12 for more information.
Likely Routes of Exposure: Eye and skin contact, acute inhalation

Acute - Eye, Skin and Inhalation: Liquid or cold gas contact with skin or eyes could cause freezing or severe cryogenic burns. After vapourization, contact with burning gas may cause burns. CNS depression and cardiac sensitization may occur at high gaseous concentrations approaching the lower flammability limit.
Chronic- Inhalation None
Ingestion: None
Skin Adsorption: None

Section 3: FIRST AID MEASURES

Skin Contact: Cryogenic burns. Remove constricting clothing. Do not thaw too rapidly. Transport to hospital immediately.
Eye contact: Immediately and briefly flush eyes with warm gentle flowing water. Do not attempt to re-warm. Get medical attention immediately.
Inhalation: Move to fresh air. Give artificial respiration if breathing has stopped. Call a physician.

Ingestion: Unlikely route of exposure as this is a gas at normal room temperature and pressure.
General Advise: Use extreme care in handling due to high flammability and risk of cryogenic burns.

Section 4: COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS #	% by Wt.	Exposure Limits [NOTE 1]
Methane	74-82-8	95	Simple asphyxiant
Ethane	74-84-0	3	Simple asphyxiant
Propane	74-98-6	1	Simple asphyxiant
Nitrogen	7727-37-9	1	Simple asphyxiant

NOTE 1. See Section 8 for additional exposure limit information for C_1 to C_3 Aliphatic Hydrocarbon Gases (i.e., methane, ethane, propane).

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable gas
Suitable Extinguishing Media: Dry Chemical (Purple-K). To suppress or contain, use water fog or high expansion foam.
Unsuitable Extinguishing Media: Do not direct water spray directly at LNG pool; this will only increase rate of vapourization. Cold vapour is heavier than air and will not readily disperse until warmed up. High expansion foam may be used to help control the vapourization rate.
Products of Combustion: Carbon dioxide and carbon monoxide
Protection of Firefighters: Very flammable after vapourization to gaseous phase. Firefighters should wear self-contained breathing apparatus (SCBA) in case of oxygen deficient atmosphere. Use Combustible Gas Indicator to determine the extent of vapour cloud.
Sensitivity to Static Discharge: Ignitable by static
Sensitivity to Mechanical Impact: None
Explosive Power: Not known

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions: Use personal protection recommended in Section 8.
Environmental Precautions: Not applicable
Methods for Containment: Evacuate area for 2000 foot (600 m) radius. Stay out of vapour cloud.
Methods for Clean-Up: Wear all protective equipment recommended in Section 8. Eliminate source of ignition.
Other Information: Allow to vapourize and disperse to atmosphere.

In case of an emergency and no response at LNG plant, call SERVICE CENTER: 1 (800) 663-9911.

Section 7: HANDLING AND STORAGE

Handling: To be handled by trained personnel only, using equipment specifically designed for LNG, and following approved operating procedures.
Storage: Store only in vessels designed for LNG storage, and follow approved operating procedures. Store in a cool, dry, well ventilated place, out of direct sunlight, and away from heat, sparks and ignition sources.

Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits: Simple asphyxiant - Maintain a minimum 19.5% oxygen (O_2) content (below 19.5% O_2 is considered to be O_2 deficient).

Constituent	ACGIH (8-hour TWA)	WorkSafeBC (8-hour TWA)
Methane	Minimum O_2 content	1000 ppm
Ethane	Minimum O_2 content	1000 ppm
Propane	Minimum O_2 content	1000 ppm
Nitrogen	Simple asphyxiant	Simple asphyxiant

Personal Protection Equipment: Ensure use of proper PPE at all times when handling this product.

Eye/face: Face shield with other eye protection (safety glasses with side shields)

Skin: Insulated gloves, safety work boots, protective coveralls / clothing (e.g., Nomex coveralls).

Respiratory: Supplied air respiratory protection to be used (airline or self-contained breathing apparatus) in cases of oxygen deficient atmospheres

Other Considerations: Use extreme care in handling due to high flammability and risk of cryogenic burns.

Engineering Controls: Provide electrical ground for all parts of handling system. Provide adequate ventilation to maintain oxygen greater than 19.5%, and methane less than 1% (which is approximately less than 20% of the methane lower explosive limit). Use of CGI is mandatory since product is odourless.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Colour: Colourless.
Odour: Odourless
Odour Threshold (ppm): Not available
Physical State: Liquid.
pH: Not applicable
Freezing Point (°C): -182.5
Boiling Point (°C): -161.5
Flash Point (°C): -187.8
Evaporation Rate: Rapid
Flammability (solid, gas): Flammable gas
Lower Explosion Limit: 5% (by volume, gas phase)
Upper Explosion Limit: 15% (by volume, gas phase)
Vapour Pressure: 466,000 mm Hg @ 25°C
Vapour Density: >1 @-112 degrees C (Air = 1)
Specific Gravity: 0.45 (water = 1)
Solubility in water (20°C): 24.4 parts per million (wt)
Partition Coefficient: Octanol/water - 1.09 $LogK_{ow}$
Auto-ignition Temperature: 537 °C (Gas Phase)
Percent Volatile (by volume): 99%
Density (g/ml): 0.45 at boiling point

Section 10: STABILITY AND REACTIVITY

Chemical Stability: Yes
Compatible Materials: Strong oxidizers (e.g., peroxides, perchlorates), halogens (e.g., chlorine, bromine)
Hazardous Decomposition Products: None known
Reactivity (and Under What Conditions): None known
Conditions to Avoid: Static discharge, sparks, open flames/other ignition sources

Section 11: TOXICOLOGICAL INFORMATION

LD50: Not available
LC50: Not available
Acute Effects: Liquid or cold gas contact with skin or eyes could cause freezing or severe cryogenic burns. After vapourization, contact with burning gas may cause burns.

	Inhalation produces weak depressant effects on the CNS at high gaseous concentrations approaching the lower flammability limit.
Chronic Effects:	Not available
Carcinogenicity:	Not considered carcinogenic by IARC, NTP, ACGIH or OSHA.
Reproductive Effects:	Not available
Teratogenicity:	Not available
Mutagenicity:	Not available
Irritant:	Not available
Sensitizer:	Not available
Synergistic Effects:	Not available

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity:	Not applicable
Persistence/ Degradability:	Not applicable
Bioaccumulation/ Accumulation:	Not applicable

Section 13: DISPOSAL CONSIDERATIONS

Disposal: Allow to vapourize and disperse to the atmosphere.

Section 14: TRANSPORTATION INFORMATION

TDG Classification:	2.1 Flammable Gases
UN/PIN Number:	1972
Shipping Name:	Methane, Refrigerated Liquid, or Natural Gas, Refrigerated Liquid with high methane content
Special Shipping Information:	Transport only in shipping container designed for LNG and follow approved operating procedures.

Section 15: REGULATORY INFORMATION

DSL (Canada):	This product is on the DSL list.
WHMIS Class:	A – Compressed Gas; B1 – Flammable and Combustible Material – Division 1 Flammable Gases

Section 16: OTHER INFORMATION

National Fire Protection Association (NFPA 704) Ratings:

Health	2	LEGEND	0 = minimal hazard
Flammability	4		1 = slight hazard
Instability	0		2 = moderate hazard
(For methane from NFPA 325)			3 = severe hazard
			4 = extreme hazard

Prepared by:	AMEC Environment & Infrastructure Occupational Hygiene and Safety Group	**Phone Number:** **Preparation Date:**	(604) 294-3811 April 7, 2014

Additional Information and Comments: This MSDS has been revised and updated from the last revision date of April 7, 2011. All sections and the order that which they appear have been documented as per American National Standard – *For Hazardous Industrial Chemicals – Material Safety Data Sheets Preparation* (ANSI Z400.1-2004).
The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for their own particular use.

Information Sources: Various

Revision Date: April 02, 2019
Supersedes Date: January 31, 2019

SAFETY DATA SHEET - NATURAL GAS

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

ATCO Gas 10035 – 105 Street Edmonton, Alberta T5J 2V6 1-800-511-3447 (toll-free) for information	**Emergency Telephone : (24 –hr)** CANUTEC: 1-613-996-6666 (Call Collect) or (*666 on a cellular phone)

PRODUCT IDENTIFICATION

Manufacturer	Various Suppliers, Pipeline/Distribution quality
Trade Name	Natural Gas
Chemical Name	Methane
Synonyms	Natural Gas/high Methane content
Chemical Family	Alkanes
Molecular Formula	CH_4 (Methane)
Product Use	Natural Gas is used primarily for space and water heating and for industrial processing applications
Method of Transport	Pipeline (under pressure) or high pressure cylinders attached to mobile vehicles

Transportation of Dangerous Goods Regulations

UN 1971; Class 2.1	**Shipping Name and Description: METHANE, COMPRESSED**
WHMIS Classification	**Compressed Gas (Class A)** **Flammable Gas (Class B1)**

SECTION 2. HAZARDOUS IDENTIFICATION

2.1 Classification of the Substance or Mixture

Simple Asphyxiant	Simple Asphyxiants – Category 1; A gas that is a simple asphyxiant
Gases Under Pressure	Gases under pressure / Compressed gas
Flam Gas 1	Flammable gases - Category 1
H220	Extremely flammable gas
H280	Contains gas under pressure; may explode if heated

2.2 Label Elements **Hazard Pictograms** :

Signal Word : Danger

Hazard Statements : H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.
H380 - May displace oxygen and cause rapid suffocation.

Precautionary Statements : P210 - Keep away from heat, sparks, open flames, hot surfaces. No smoking.
P377 - Leaking gas fire: Do not extinguish unless leak can be stopped safely.
P381 - Eliminate all ignition sources if safe to do so.
P403 - Store in a well-ventilated place.
P410+P403 - Protect from sunlight. Store in a well-ventilated place.

2.3 Other Hazards

Exposure may aggravate those with pre-existing eye, skin, or respiratory conditions. Asphyxiant gas, can be fatal. May cause damage to the blood, central nervous system, and cardiovascular system. High concentrations of gas can cause unconsciousness and death. Mercaptan is added (rotten egg odour) to the gas, however this smell should not be relied on as a good indicator of the presence of gas as olfactory fatigue (loss of smell) occurs rapidly. Being under the influence of alcohol may enhance the effects of this product.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Composition			
Hazardous Ingredients	**Common Name/Synonyms**	**CAS No.**	**% Vol./Vol.**
Natural Gas	**N/A**	**8006-14-2**	**100**
Methane	**N/A**	**74-82-8**	**90-99**
Ethane	**N/A**	**74-84-0**	**0-6**
Propane	**N/A**	**74-98-6**	**0-3**
Butane	**N/A**	**106-97-8**	**0-3**
Propane, 2-methyl-	**Isobutane**	**75-28-5**	**0-3**
Pentane	**N/A**	**109-66-0**	**0-3**
Butane, 2-methyl-	**Isopentane**	**78-78-4**	**0-3**
Nitrogen	**N/A**	**7727-37-9**	**0-3**
Carbon dioxide	**N/A**	**124-38-9**	**0-3**
Helium	**N/A**	**744-59-7**	**0-3**

*typically contains <5 ppm mercaptans

SECTION 4. FIRST AID

Skin Contact: First aid is not normally required

Eye Contact: If irritation/redness develops, move victim away from exposure into fresh air
And flush eyes with clean water.

Inhalation: Do not enter a contaminated area unless properly protected (refer to Section 8)
Move victim to uncontaminated area to fresh air
Perform artificial respiration if necessary

	Seek medical assistance
Note to Physicians:	Symptoms may not appear immediately

5. FIRE AND EXPLOSION HAZARD DATA (See Note, Section 11)

Flammability	In the presence of oxygen and in the presence of an ignition source
Flammability Limits (percent in air)	4% - 15%
Fire Extinguishing Media	Dry Chemical (most effective) or carbon dioxide (CO_2) or Halon
Special Procedures:	Shut off flow of gas from a safe location. (if properly trained). Use full protective equipment and Self -contained breathing apparatus (SCBA). Do not extinguise flame until gas flow is shut off. Use gas detectors in confined spaces.
Ignition Temperature	Approximately 630°C (varies with temperature pressure and oxygen concentration)
Auto Ignition Temperature in Air	Range 482°C - 649°C
Upper Explosive Limit	15% gas in air (approximately)
Product of Combustion:	Carbon dioxide and carbon Monoxide
Protection of Firefighters:	Firefighters should wear SCBA in case of oxygen deficient atmostphere. Do not extinguish unless leak can be stopped safety. In case of leakage, eliminate all ignition sources.
Sensitivity to Static Discharge:	Flammable

Section 6. ACCIDENTAL RELEASE MEASURES

Personal Precations:	Use personal protection recommended in Section 8
Enviromental Precautions:	None
Leak and Spill Procedures:	Evacuate area
Leak/Line Break Occurs	Contact emergency number (refer to Section 1) Attempt to keep area clear Do not activate any sorce of ignition such as electrical switches, vehicles, telephones, cellular phone, two way radios or door bells. Eliminate ignition sources such as open flame or sparks.
Methods for Containment	Stay away and upwind of spill/release
Waste Disposal	Vent to outside atmosphere
Other information	Allow to vapourize and dispense to atmosphere

Section 7. HANDLING AND STORAGE

Handling	Observe handling regulations for compressed gases and flammable materials. To be handled by trained personnel only and followed with approved operating procedures.
Storage:	Comply with storage regulations for compressed gases and flammable materials. No smoking or open flames in storage area.
Precautions to be Taken	Avoid personal body contact (skin/eye contact, etc.) with high pressure gas stream
Other Precautions	Avoid all possible sources of accidental ignition (i.e., static electricity or any other explosive source) Test for hazardous concentrations prior to entering meter stations

Section 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines
Component

Natural gas [CAS No. 8006-14-2]
ACGIH: Simple asphyxiant; Explosion hazard
OSHA: No PEL established.

Methane [CAS No. 74-82-8]
ACGIH: Simple asphyxiant; Explosion hazard
OSHA: No PEL established.

Ethane [CAS No. 74-84-0]
ACGIH: Simple asphyxiant; Explosion hazard
OSHA: No PEL established.

Propane [CAS No. 74-98-6]
ACGIH: Simple asphyxiant; Explosion hazard
OSHA: 1000 ppm (TWA), 1800 mg/m^3 (TWA);

Butane [CAS No. 106-97-8]
ACGIH: 1000 ppm (STEL); Explosion hazard (2012)
OSHA: 800 ppm (TWA) [Vacated];

Isobutane [CAS No. 75-28-5]
ACGIH: 1000 ppm (STEL); Explosion hazard (2012)
OSHA: No PEL established.

Pentane [CAS No. 109-66-0]
ACGIH: 1000 ppm (TWA); (2013)
OSHA: 1000 ppm (TWA), 2950 mg/m^3 (TWA);
600 ppm (TWA); 750 ppm (STEL) [Vacated];

Isopentane [CAS No. 78-78-4]
ACGIH: 1000 ppm (TWA); (2013)
OSHA: No PEL established.

Nitrogen [CAS No. 7727-37-9]
ACGIH: Simple asphyxiant
OSHA: No PEL established.

Carbon dioxide [CAS No. 124-38-9]
ACGIH: 5000 ppm (TWA); 30000 ppm (STEL); (1983)
OSHA: 5000 ppm (TWA), 9000 mg/m^3 (TWA);

Helium [CAS No. 7440-59-7]
ACGIH: Simple asphyxiant
OSHA: No PEL established.

PEL: Permissible Exposure Limit
TLV: Threshold Limit Value
TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit

Engineering Controls:
Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Wear safety glasses. Use equipment for eye protection that meets the standards referenced by CSA Standard CAN/CSA-Z94.3-92 and OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.
Hand Protection:	Wear protective gloves. Wear cold insulating gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator that meets the requirements of CSA Standard CAN/CSA-Z94.4-11, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
Engineering Controls:	All installations (i.e., mechanical ventilation) must conform to code requirements. Provide adequate ventilation to maintain below exposure limits and explosive

FLAMMABILITY AND EXPLOSION INFORMATION

Extremely flammable gas. Contains gas under pressure; may explode if heated. Will be easily ignited by heat, sparks or flames. Will form explosive mixtures with air. Vapors from liquefied gas are initially heavier than air and spread along ground. Methane is lighter than air and will rise. Vapors may travel to source of ignition and flash back. Cylinders exposed to fire may vent and release flammable gas through pressure relief devices. Containers may explode when heated. Ruptured cylinders may rocket. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED.
If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

Fire involving Tanks: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Do not direct water at source of leak or safety devices; icing may occur. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge:	This material is sensitive to static discharge.

MEANS OF EXTINCTION

Suitable Extinguishing Media:	Small Fire: Dry chemical or CO2. Large Fire: Water spray or fog. Move containers from fire area if you can do it without risk.
Unsuitable Extinguishing Media:	Not available.

Products of Combustion:	Oxides of carbon.
Protection of Firefighters:	Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. Vapors may cause dizziness or asphyxiation without warning. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Fire may produce irritating and/or toxic gases. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Gas
Colour:	Colourless
Odour:	Naturally odourless, although Mercaptan is added to all distribution systems and some transmission systems to give a “rotten egg” sulfur odour.
Specific	Gravity (Water = 1): Not applicable
Odour Threshold (**ppm**):	Less than 10,000 ppm in air
Vapour Pressure (mm Hg):	Gaseous state at normal conditions
Vapour Density (**Air = 1):**	0.6 (Air+1) at 20 °**C** (68 °F) (Methane)
Evaporation Rate (**nButAC = 1):**	Not applicable (gas at room temperature)
Boiling Point (°C):	-161.5°C (as Methane)
Freezing Point (°C):	-182.5°C
Solubility in water:	0.0022% (as Methane)
Percent Volatile (**by volume**):	100%
pH:	Not available
Density (**g/ml**):	N/A
Partition Coefficient (**water/oil**):	Not available
Flash Point (°C):	-188 °C
Flammability (solid, **gas):**	Flammable gas
Lower Explosion Limit (%):	4 (Methane)
Upper Explosion Limit (%):	15 (Methane)
Auto-ignition Temperature (°**C**):	537

SECTION 10. STABILITY AND REACTIVITY

Stability	Natural Gas/Methane is stable under normal storage conditions
Conditions to Avoid	Uncontrolled explosive mixtures Open flame and spark source High heat Strong oxidants Sources of ignition
Incompatibility	Natural Gas readily mixes with air when released and creates a combustible atmosphere. Some other strong oxidizing agents with which it can burn or explode in confined areas are: chlorine, bromine pentafluoride, oxygen difluoride and nitrogen trifluoride. It will ignite spontaneously when mixed with chlorine dioxide.
Hazardous Polymerization	May not occur
Hazardous Decomposition Products	CO_2, trace amounts of oxides of sulphur and nitrogen (SO_2 and NO_X) CO if starved of oxygen during combustion
Unusual Fire and Explosion Hazards	Could be potentially hazardous if uncontrolled in a confined space
Hazardous Combustion Products:	Carbon Monoxide, Carbon Dioxide, Nitrogen Oxides, Sulphur Dioxide, Aldehydes

Sensitivity to Static Discharge: Yes

NOTE: Natural Gas is lighter than air and will dissipate to atmosphere. Natural Gas **without sufficient** or **with too much** air will not burn or explode. A hazard from re-ignition or explosion exists if the flame is extinguished without stopping the flow of gas and/or cooling surroundings and eliminating ignition sources. Water spray can be used to cool the surroundings.

SECTION 11. TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Product Toxicity

Oral: Not available.
Dermal: Not available.
Inhalation: Not available

Component Toxitcity

Component	CAS NO.	LD50 Oral	LD50 dermal	LC50
Natural gas	8006-14-2	N/A	N/A	N/A
Methane	74-82-8	N/A	N/A	N/A
Ethane	74-84-0	N/A	N/A	N/A
Propane	74-98-6	N/A	N/A	N/A
Butane	106-97-8	N/A	N/A	658000mg/m ^{3} (rat); 4H
Isobutane	75-28-5	N/A	N/A	570000 ppm (rat); 15M
Pentane	109-66-0	400mg/kg (rat)	N/A	364000 mg/m ^{3} (rat); 4H
Isopentane	78-78-4	N/A	N/A	N/A
Nitrogen	7727-37-9	N/A	N/A	N/A
Carbon Dioxide	124-38-9	N/A	N/A	N/A
Helium	7440-59-7	N/A	N/A	N/A

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation.
Target Organs: Skin. Eyes. Respiratory system. Cardiovascular system. Bone marrow. Liver. Kidneys. Central nervous system.

Symptoms (including delayed and immediate effects)

Inhalation: May displace oxygen and cause rapid suffocation. Central nervous system depression can occur if product is present in concentrations that will reduce the oxygen content of air below 18 % (vol). Symptoms may include headache, lightheadedness, drowsiness, disorientation, vomiting and seizures. Unconsciousness and death may occur with severe oxygen deprivation. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

Eye: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result.

Skin: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

Ingestion:	Not a normal route of exposure.
Skin Sensitization:	Not available.
Respiratory Sensitization:	Not available.
Medical Conditions Aggravated By Exposure	Not available.

EFFECTS OF CHRONIC EXPOSURE (from short and long-term exposure)

Target Organs:	Skin. Eyes. Respiratory system. Cardiovascular system. Bone marrow. Liver. Kidneys. Central nervous system.
Chronic Effects:	Prolonged exposure to Natural gas can lead to hypoxia, bluish colouration to the skin, numbness, damage to the nervous system, heart sensitization, reduced consciousness and death. Prolonged or repeated inhalation of Isopentane may cause dizziness, weakness, weight loss, anemia, nervousness, pains in the limbs and peripheral numbness.
Carcinogenicity	This product does not contain any carcinogens or potential carcinogens as listed by ACGIH, IARC, OSHA, or NTP.
Mutagenicity:	Not available.
Reproductive Effects:	Not available.
Developmental Effect Teratogenicity:	Not available.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity:	Not available
Persistence/ Degradability:	Not available
Bioaccumulation/ Accumulation:	Not available There is no information available on the ecotoxicological effects of natural gas. Because of the high volatility of natural gas, it is unlikely to cause ground or water pollution. Natural gas released into the environment will disperse rapidly into the atmosphere and undergo photochemical degradation.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal:	Allow to dissipate to the atmosphere (if permitted by federal/provincial/municipal requirements). Dispose in a safe location, preferably by burning with a flare. If disposal of natural gas cannot be flared, care must be taken to ensure complete dissipation of the gas to a concentration below its flammable limits.

SECTION 14. TRANSPORT INFORMATION

TDG Classification:	Class 2.1 Flammable Gases
UN/PIN Number:	1971
TDG Shipping Description:	Natural gas, compressed with high methane content
Special Shipping Information:	Handle as extremely flammable gas. Precaution should be taken to minimize inhalation of natural gas.

SECTION 15. REGULATORY INFORMATION

15.1 Canadian Regulations

Natural Gas (8006-14-2)

WHMIS 2015 Classification	Simple Asphyxiant Flammable Gas – Category 1 Gas Under Pressure	

SECTION 16: Other information, including date of preparation or last revision

Last Revision Date: April 2, 2019

Prepared by: Gas Specification Management

NOTE: The physical and hazard data provided is specific to the typical natural gas composition that has been provided. As a naturally occurring product, natural gas samples may have compositions that vary slightly from the typical composition. If required, the exact gas sample composition can be determined by gas chromatography analysis. For more information, contact ATCO Gas, Gas Specification Management at (403) 245-7591.