Spill Contingency Plan
Tundra Ecosystem Research Station
Daring Lake, NT

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Version 4

August 2023

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1.0 General

This Spill Contingency Plan (the Plan) has been developed for the Tundra Ecosystem Research Station (TERS), located on Daring Lake, at 64°52'N, and 111° 35'W. TERS is operated by the Department of Environment and Climate Change (ECC), Government of the Northwest Territories (GNWT). This version of the Plan is effective as of September 2016.

Additional copies of the fuel contingency plan are available onsite. Copies are also kept in the Wildlife Management Division, ECC, in Yellowknife.

Contact information contained in this document is **updated annually**.

1.1 Project Description

The TERS functions as a base for both short (1 yr) to long (15+ yr) ecosystem research and monitoring. The station was originally set up to serve as a control site for studies examining the effects of the Ekati Diamond mine on the environment. Since its inception, it has grown to provide support for University, intra, and inter-governmental research in addition to continuing monitoring programs associated with the Ekati and Diavik diamond mines. TERS also provides educational programs, including the annual Tundra Science and Culture Camp (TSCC). The TSCC is a ten-day cross-cultural science camp for 14-17 year old students from communities throughout the North and South Slave regions. The TSCC has a joint focus of scientific instruction, and traditional knowledge studies with participation from the surrounding Tłı̨chǫ communities. Research at TERS involves measuring ecological and climate related changes on a pristine sub-arctic ecosystem. As such, TERS endeavors to have minimal environmental impact.

1.2 Site Description

The TERS camp is located approximately 300 km north of Yellowknife. It encompasses an area of approximately 0.5 hectares on the shores of Daring Lake, NT (64° 52'N, 111°35'W). The camp is located on a flat area on the south side of an esker. There are 10 Weatherhaven tents (2 bunk tents, 1 kitchen tent, 2 labs, 1 wash house, 3 storage, 1

office). Other structures include a fuel/tool storage shed, 2 latrines, an incinerating toilet building, a dock, and boardwalks throughout. The entire living area (including all structures except the dock) is enclosed by a solar-powered electric bear fence. See Appendix A for site drawing.

1.3 Potential Ecological Impacts

1.3.1 Barren ground caribou

TERS is located within the range (migration route) of the Bathurst caribou herd. Caribou are frequently sighted by camp residents during the spring (May) and late summer (August onwards) months. There are no activities at the research station that may potentially disrupt caribou activities. Air traffic to and from the camp consists of approximately 0-2 flights per week, pilots maintain safe flying altitudes (500m) when and if large groups of caribou (>200 animals) are sighted in the area. There is a strict no-hunting policy followed by all researchers using the camp.

1.3.2 Species at Risk, COSEWIC Assessed Species

There are several species listed as "Special Concern" that may occur in the Daring Lake area. These include:

- Short eared owl
- Wolverine
- Grizzly bear
- Peregrine falcon

Monitoring programs ongoing at TERS collect data on all of these species. In addition, every precaution is taken to limit any impact the presence of TERS has on these species, and their habitat.

1.3.3 Archaeological Sites

There are a number of archaeological sites located in the vicinity of TERS. These have been identified and inventoried by staff from the Prince of Wales Northern Heritage Centre, in Yellowknife. The location of the camp itself does not infringe on any archaeological sites.

2.0 Fuel Spill Contingency Plan Purpose and Scope

The purpose of the TERS Fuel Spill Contingency Plan is to provide a plan of action for potential spills that may occur at the research station. The Plan is intended to provide a clear course of action for TERS residents should a fuel spill occur, thus minimizing environmental damage and ensuring maximum safety for camp users. The Plan also clearly describes the chain of responsibility should a spill occur. Communication and reporting procedures are clearly outlined. Both management and field staff should be familiar with the Plan. In addition, it is to be located onsite and accessible, as a reference document.

2.1 Existing Preventative Measures

Proper storage and handling of fuels and hazardous materials is the first line of defense for preventing spills and potential impacts to people and the environment. The On and Off-site Camp Managers are required to have up-to-date training in Workplace Hazardous Materials Information System (WHMIS), fuel spill response, and wilderness first aid. A fully equipped Fuel Spill Response Kit is kept on-site in a re-sealable drum adjacent to the fuel shed and near the back gate access to the fuel cache. Contents of the kit are described in section 5.0 Resources and Training.

2.1.1 Fuel Transport and Storage

Fuel required for TERS is transported to the station via fixed wing aircraft. Drums are moved to a fuel cache behind the camp, at the base of an esker. Two Insta-Berm portable fuel berms (http://www.sei-ind.com/products/insta-berm) approximately 10' X 20' X 12" in size provide secondary containment in the event of leakage. The camp is situated on a small peninsula and the fuel cache is situated at the farthest possible point from the Daring Lake high water mark (approximately 50m). Secondary containment was installed in 2015 and 2016 and is maintained throughout the operating season by ensuring any accumulated water / debris is removed, material is intact and side L-brackets are properly situated.

Fuel used in camp equipment is transferred from drums to plastic gas cans using a

manual pump. When the manual pump is used, absorbent pads are strategically placed so that a minimal amount of fuel escapes into the environment. In addition, absorbent pads are placed underneath the manual pumps when they are in storage to catch any excess fuel that may leak out of the pump apparatus.

Propane is used for the incinerating toilet, cook stove, hot water heater and fridge. Propane tanks are generally not cached, instead are shipped in when needed on available flights, and placed in the location where they will be utilized.

2.1.2 Chemical Use and Storage

Only a few litres of cleaning supplies are kept onsite. These include household cleaning agents such as dish and laundry detergent, soaps, paint thinner, etc. None of these chemicals present a serious environmental threat should they escape into the environment.

In summary, TERS is designed to have minimal risk to the environment. As such, the following preventative measures are in place:

- The area where fuel is cached has secondary containment through the use of two Insta-Berms and located as far away as possible from the lake shore;
- Drip trays are placed below pumps when stored;
- Spill kits are located where ever fuel (or motor vehicles) is stored;
- Absorbent pads are used whenever refueling motorized vehicles to catch any drips;
- Fuel drums are inspected on a regular basis by the On-site Camp Manager; and,
- Absorbent pads are wrapped around pipe joints between heating fuel tanks and valves.

3.0 Risk Assessment

3.1 Fuel handling and storage

The following potential risks have been identified. The probability of spills due to the identified risks is unlikely due to regular inspection of stored fuel, and equipment associated with fuel transfer.

- Leaking fuel drums (bung seals);
- Leaking valves between fuel drums and heaters;

- Leaks, or spills occurring during fuel transfer between storage drums and snowmobiles, aircraft, ATV, pumps, boats, generators, and/or jerry can;
    - this could include broken supply pipes, hoses, pumps and associated equipment; and,
- Leakage of propane due to faulty valves.

3.2 Hazardous Materials Stored Onsite

Very little hazardous materials is stored onsite, however the fuel cache is located in close proximity of the camp. The volume and location of the fuel cache is included in Table 1. Material Safety Data Sheets (MSDS) for fuels stored onsite are provided in Appendix D.

Table 1. List of hazardous materials found on site, including the storage container type and volume, the volume normally onsite, the maximum volume on site, and its storage location and intended uses.

Material	Storage Container	Normally onsite	Maximum onsite	Storage location and uses
Heating Oil	**200L drums**	**1200L (6 drums)**	**2000L (10 drums)**	**Drums stored in fuel cache area. Used for heating buildings.**
Jet A/ B Fuel	**200L drums**	**2000L (10 drums)**	**2400L (12 drums)**	**Located in the fuel cache area. Fuel used for air support to field programs.**
Av-Gas	**200L drums**	**1200L (6 drums)**	**2000L (10 drums)**	**Located in fuel cache area. Fuel used for air support to field programs.**
Gasoline	**200L drums**	**1200L (6 drums)**	**1600L (8 drums)**	**Stored in the fuel cache area. Some stored in the fuel shed in 5 gallon gerry cans. Used in vehicles such as snowmobiles, ATV, and outboard motors.**
Propane	**45kg cylinders**	**450kg (10 cylinders)**	**630kg (14 cylinders)**	**Stored near buildings where used. For use in kitchen - stove, fridge, water heater.**

3.3 Potential spill sizes and sources

Table 2 outlines all of the potential spill materials, potential discharge volumes, potential worst-case scenarios, and the probable direction of discharge.

Table 2. List of hazardous materials on site, potential discharge events, potential discharge volumes (worst case scenario in brackets), and direction of potential discharge.

Material (sources)	Potential Discharge Event	Discharge volume (worst case)	Direction of potential discharge
Jet A/B (aircraft)	1. overfilling of aircraft 2. slow leak from storage drums 3. large puncture, fast leaking drum 4. leak from hose	Likely under 200L Maximum of 2400L (very unlikely)	From fuel storage area, underground seepage into Daring Lake. From on the water refueling, spill could go directly into Daring Lake.
Av-Gas	1. overfilling of aircraft 2. slow leak from drums 3. large puncture, fast leaking drum 4. leak from hose while filling	Likely under 200L Maximum of 2000L (very unlikely)	From fuel storage area, underground seepage into Daring Lake. From on the water refueling, spill could go directly into Daring Lake.
Heating Oil	1. overfilling of the oil tanks 2. slow leak from storage drums 3. large puncture, fast leaking drum 4. leak from hose	Likely under 200L Maximum of 2000 (very unlikely)	From fuel storage area or camp area, underground seepage into Daring Lake.
Propane (cooking, heating, refrigeration, incinerating toilet)	1. slow leak from valve 2. puncture of tank (fast leak) 3. all drums punctured and leaking at once 4. leak while connecting	Likely under 45kg, maximum of 630kg (very unlikely)	In camp near buildings, release into the air (inside or outside depending where the leak is).
Gasoline (snowmobiles, boat motors, ATV)	1. overfilling gas tanks 2. slow leak from storage drums 3. puncture, fast leaking drum 4. leak from hose	Likely under 200L Maximum 1600L (very unlikely)	In camp or in fuel storage area, underground seepage to Daring Lake.

3.4 Potential Environmental Impacts of a spill (including the worst case scenario)

The risk presented by the hazardous materials on site is low. During the winter months it is decreased because snow will act as a natural absorbent, and the ice will act as a barrier between the spill material, the ground and Daring Lake. Table 3 provides an assessment of environmental impacts from a spill of hazardous materials including worst- case

scenarios.

Table 3. Potential environmental impacts of a spill.

Material	Environmental impacts	Worst Case Scenario
Aircraft Fuel (Jet A/B)	**If contact is made, Jet A and B are harmful to wildlife and aquatic life. If released into the environment, it has the potential to bioaccumulate, and is slow to biodegrade.**	**All drums are punctured and fuel is released into the environment, including Daring Lake. Wildlife and aquatic life that comes in contact with spilled fuel are at risk to suffer negative health effects and/or die.**
Aircraft Fuel (Av-Gas/100 LL)	**When released into the environment, Av-gas has a negative effect on wildlife and aquatic life. It is volatile, and may disperse quickly, but release into water is hazardous to environmental health and safety.**	**All drums are punctured and all fuel is released into the environment. All fuel makes its way into Daring Lake.**
Gasoline	**When released into the environment, gasoline has a negative effect on wildlife and aquatic life. It is volatile, and may disperse quickly, but release into water is hazardous to environmental health and safety.**	**All drums are punctured and all fuel is released into the environment. All fuel makes its way into Daring Lake.**
Propane	**Propane has the potential to bio-accumulate when released into the environment. It is extremely flammable, therefore its release into the air may be potentially very hazardous.**	**All cylinders are punctured and all propane is released into the air and environment.**
Heating Oil	**Release of heating oil into the environment has potential to cause harm to wildlife and aquatic life. It can be persistent unless cleaned up. It also has the potential to bioaccumulate in the environment.**	**All drums are punctured and all fuel is released into the environment. All fuel makes its way into Daring Lake.**

4.0 Spill Response

The key personnel involved in spill response include:

Onsite Camp Manager: Colin Modeste-Burgin (867) 446-5995 (cell)

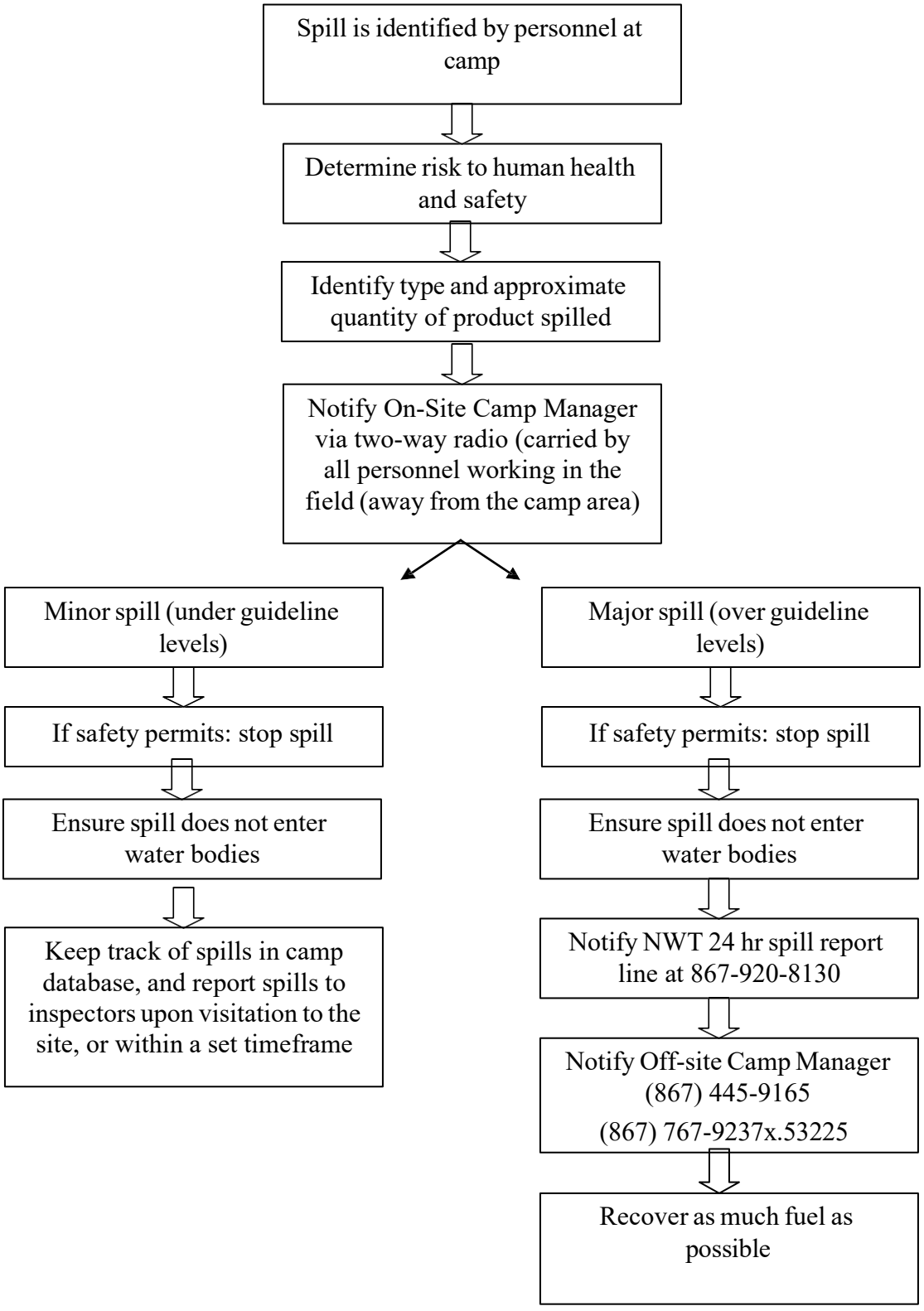
Offsite Camp Manager: Karin Clark (867) 445-9165 (cell);
(867) 767-9237 ext 53225 (office)

There is one on-site satellite phone available for use in case of an emergency located in the kitchen tent; Wi fi calling to the on-site Manager is also enabled. In the event of an accidental spill that may cause risk to human health and safety, or may cause serious damage to the environment, notifications will be made via Sat phone or cell. In addition, when any TERS users are in the field, they are required to carry two-way radios in case of an emergency.

Following the identification or reporting of a spill to the On-site Camp Manager, the next action will be to report the spill to the 24-hour NWT Spill Hotline. The On-site Camp Manager will inform the Off-site Camp Manager (located in Yellowknife) who will notify the requisite inspectors as necessary.

All public or media enquiries are to be made to the Off-site Camp Manager, Wildlife Management Division, Department of Environment and Climate Change, GNWT, Yellowknife.

4.1 Spill Response Flow Chart



4.2 Spill Response Procedures

Fuel spill response equipment is contained a re-sealable metal drum adjacent to the fuel shed and back gate access to the fuel cache (contents listed in s. 5.0 Resources and Training). Additional absorbent fuel spill pads are stored in the fuel shed.

See Spill Response Flow Chart (s 4.1) for process to follow if and when a spill occurs. Detail actions are provided below:

4.2.1 Spills on Land

Steps to follow if a spill on land is identified:

- identify the source of the leak or spill;
- contain the spill at the source if possible;
- stop a leak from a barrel;
- cease filling operations if leaking vessel is receiving fuel;
- check valves and seals, and ceasing use of these valves, if leaking;
- transfer all fuels from leaking barrels; and,
- place plastic sheeting at the foot of the leak to minimize seepage of the spilled material to the environment.

Spills on land can be contained and cleaned up by the following methods:

- place a soil berm down slope of the running or seeping fuel;
- place plastic tarps at the foot of and over the berm to permit the fuel to pool on the plastic for easy capture. Berms can be made of snow and lined with plastic in the winter;
- use absorbent mats to soak up the fuel. The fuel can be squeezed from the mats into re-sealable metal drums or plastic pails, and the pads can then be re-used;
- Larger pools of fuel can be pumped into empty drums. It is especially important to prevent fuel from entering a body of water where it will have a greater environmental impact;
- place a light covering of Sphag Sorb or alternate absorbent material onto soil or vegetation to absorb films of petroleum products; and,

- place contaminated absorbent mats, used Sphag Sorb, vegetation and/or soil into a metal re-sealable drum or plastic container for transport off-site and disposal at an appropriate facility.

4.2.2 Spills on Water

Implementing the following steps can control spills of petroleum products on water:

- deploy floating boom(s) to contain the floating product;
- use a skimmer once a boom has been secured to capture the spilled product, and then pump it through hoses to empty fuel drums; and,
- use absorbent mats or similar materials to capture small spills on water.

4.2.3 Spills on Snow and Ice

Spills on snow and/or ice can be contained and cleaned up by the following methods:

- construct a snow berm, lined with plastic sheeting, around the edge of the spill; and
- shovel and scrape contaminated snow and ice and placing them into re-sealable metal drums or on plastic and within plastic lined berms on land.

4.2.4 Chemical Spills

The effects of chemical spills can be reduced by the following methods:

- apply absorbents to soak up liquids;
- place plastic sheeting over solid chemicals, such as dusts and powders, to prevent their disbursement by wind or investigation by birds or other wildlife; and
- neutralize acids or caustics by placing spilled material and contaminated cleanup supplies in an empty refuge drum and seal for disposal.

4.2.5 Disposal

Any contaminated soil and/or vegetation and fuel-soaked absorbent materials will be

placed in bags or re-sealable metal drums (at least 3 onsite at any one time) and shipped off-site for disposal at an appropriate facility.

4.3 Spill Reporting Chain of Responsibility

4.3.1 The responsibilities of the On-site Camp Manager

- Assume authority over the spill area and personnel involved;
- Initiate the Spill Contingency Plan;
- Evaluate and assess the magnitude of the spill (see Appendix B for reporting requirements related to spill size);
- If necessary, report the spill to the **NWT 24-hour Spill Report Line at (867) 920-8130;**
    - Provide information such as:
        - location of the spill;
        - direction of flow (if any);
        - type and volume of material spilled;
        - cause of spill;
        - date and time of spill; and,
        - any perceived threat to human health and/or the environment.
- Develop an overall plan of action; and,
- Report to the Off-site Camp Manager and provide recommendations on resource requirements (additional manpower, equipment, material, etc.) to complete the cleanup effort.

4.3.2 The responsibilities of the Off-site Camp Manager

- If needed, organize additional spill response, and clean-up resources;
- If needed, act as liaison with other government agencies as well as the public and the media;
- Ensure that the correct documentation of the spill, and the cause of the spill the cause of the spill is properly documented (see Appendix C for NWT Spill Form), monitor the effectiveness of the cleanup effort, and oversee the implementation of appropriate measures to prevent a recurrence of the spill;
- ensure that follow-up documentation required by appropriate

regulators is prepared and submitted; and,

- ensure that the spill is cleaned up and all follow-up communication and reports are filed with Environment Division, ECC, GNWT in Yellowknife.

4.3.3 Spill Response Team Contact List

Brad Woodworth – TERS Off-site Camp Manager	(867) 767-9237 ext, 53226 office
Heather Sayine-Crawford – Director, Wildlife Division, ECC, GNWT	(867) 767-9237 ext. 53230
NWT Spill Hotline	(867) 920-8130

5.0 Resources and Training

A Fuel Spill Response Kit is located adjacent to the fuel shed by the back access gate to the fuel cache site. The contents of the Kit include:

- 1 Safety goggles
- 1 Danger "no smoking" sign
- 1 coverall suit (Size 3XL)
- 1 Pair polyvinyl chloride gloves
- 1 tube composite sealant
- 2 Lrg orange Heavy Duty bags (to store used materials)
- 2, 10 ft absorbing boom/pads/for use on water
- 8, 4 ft absorbing sock pads (white – repels water)
- Approximately ~ 200 absorbing pads (white – repels water))

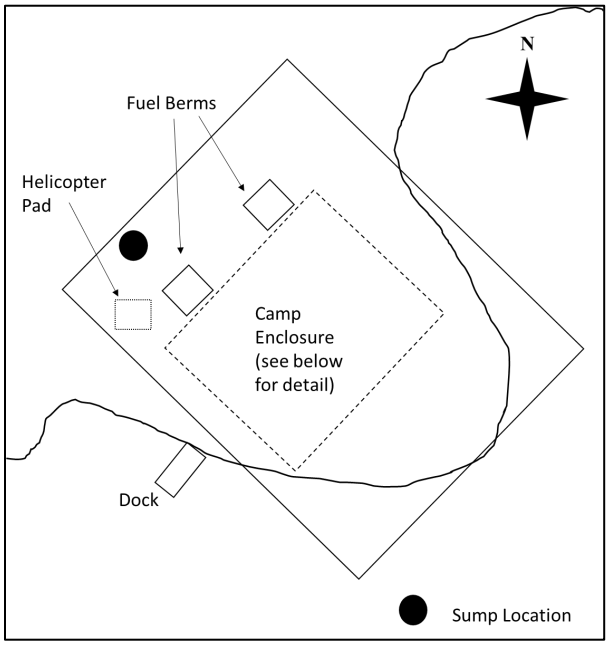
The following training is required for On and Off-site Camp Managers:

- WHMIS certification which meets the Canadian Occupational Health and Safety Regulations (available online https://worksitesafety.ca/product-category/online-training/?fwp_product_cat_facet=canada-online-training)
- Wilderness First Aid certification
- Fuel Spill Response

The latter two courses are most often taken through a local company in Yellowknife, Arctic Response, which provides workplace training courses in a variety of areas.

APPENDIX A – Diagrams of Site and Fuel Cache

a)



b)

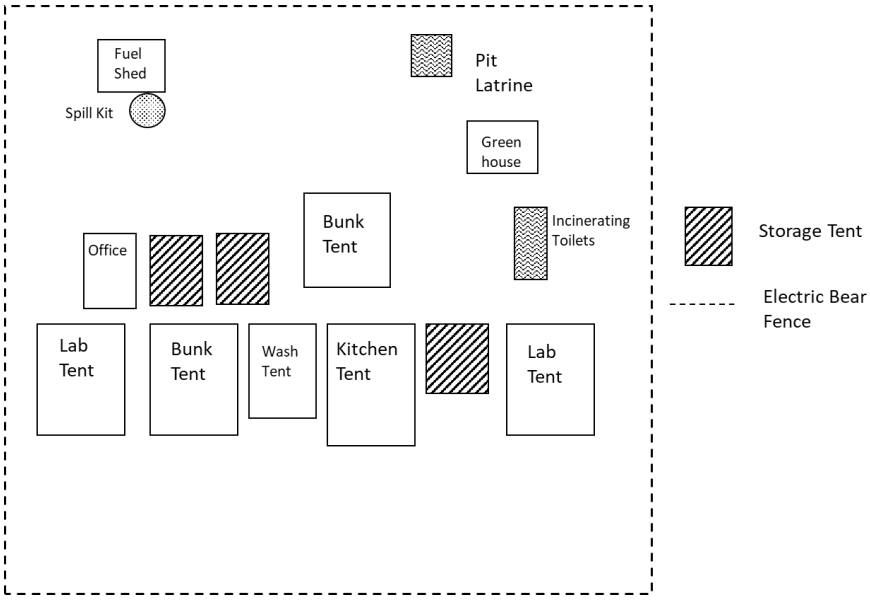


Figure 1 - Drawing depicting a) the placement of the land use permit area, camp and fuel cache, as well as b) detail of the camp layout. Not drawn to scale.

APPENDIX B – Fuel Spill Volumes that trigger NWT Spill Hotline reporting

Note: L = litre; kg = kilogram; PCB = Polychlorinated Biphenyls; ppm = parts per million

Substance	Reportable Quantity	TDG Class
Explosives Compressed gas (toxic/corrosive) Infectious substances Sewage and Wastewater (unless otherwise authorized) Radioactive materials Unknown substance	Any amount	1.0 2.3/2.4 6.2 6.2 7.0 None
Compressed gas (Flammable) Compressed gas (Non-corrosive, non-flammable)	Any amount of gas from containers with a capacity grater than 100L	2.1 2.2
Flammable liquid	≥100 L	3.1/3.2/3.3
Flammable solid Substances liable to spontaneous combustion Water reactant substances	≥ 25 kg	4.1 4.2 4.3
Oxidizing substances	≥ 50 L or 50 kg	5.1
Organic peroxides Environmentally hazardous substances intended for disposal	≥1 L or 1 kg	5.2 9.0
Toxic substances	≥ 5 L or 5 kg	6.1
Corrosive substances Miscellaneous products, substances or organisms		8.0 9.0
PCB mixtures of 5 or more ppm	≥ 0.5 L or 0.5 kg	9.0
Other contaminants--for example, crude oil, drilling fluid, produced water, waste or spent chemicals, used or waste oil, vehicle fluids, wastewater.	≥ 100 L or 100 kg	None
Sour natural gas (i.e., contains H_2S) Sweet natural gas	Uncontrolled release or sustained flow of 10 minutes or more	None
Flammable liquid Vehicle fluid	≥ 20 L When released on a frozen water body that is being used as a working surface	3.1/3.2/3.3 None
Reported releases or potential releases of any size that: are near or in an open water body; are near or in a designated sensitive environment or habitat; Pose an imminent threat to human health or safety; or Pose an imminent threat to a listed species at risk or its critical habitat		

APPENDIX C – NWT Spill Report Form

NT-NU SPILL REPORT

OIL, GASOLINE, CHEMICALS AND
OTHER HAZARDOUS MATERIALS

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

REPORT LINE USE ONLY

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

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

REPORT LINE USE ONLY

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

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

Significance: ☐ Minor ☐ Major ☐ Unknown

File Status: ☐ Open ☐ Closed

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

APPENDIX D – Material Safety Data Sheets

PETRO-CANADA

Material Safety Data Sheet

NFPA	HMIS (U.S.A.)		Rating	Protective Clothing	DOT (pictograms)
Health 2, Fire Hazard 3, Reactivity 0, Specific hazard	Health Hazard	2*	0 Insignificant		Not evaluated for transport Not evaluated for transport
	Fire Hazard	3	1 Slight		
	Reactivity	0	2 Moderate		
	Personal Protection	H	3 High		
			4 Extreme		

Section I. Chemical Product and Company Identification

Product Name	**GASOLINE, UNLEADED**	**Code**	W102E, SAP: 102 to 117
		DSL	See Section 15
Synonym	Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or cyed gasoline, Super Premium (94 RO), TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending	**TSCA**	See Section 15
Manufacturer	PETRO-CANADA P.O. Box 2844 150 – 6th Avenue South-West Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.		

Section II. Composition and Information on Ingredients

Name	CAS #	% (W/W)	Exposure Limits (ACGIH) TLV-TWA(8 h)	STEL	CEILING
Gasoline	86290-81-5	85-100	300 ppm	500 ppm	Not established
Benzene	71-43-2	<1.5	0.5 ppm	2.5 ppm	Not established

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section III. Hazards Identification.

Potential Health Effects	Flammable liquid. Exercise caution when handling this material. May cause cancer. May cause heritable genetic effects (mutagenicity). This product contains an ingredient or ingredients, which have been shown to cause chronic toxic effects. Contact with this product may cause skin irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. For more information refer to Section 11 of this MSDS.

Section IV. First Aid Measures

Eye Contact	Avoid direct contact. Quickly and gently blot or brush chemical off the face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 5 minutes, while holding the eyelid(s) open. Obtain medical advice.
Skin Contact	Avoid direct contact. Wear chemical protective clothing if necessary. As quickly as possible, remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts, etc.). Quickly and gently, blot or brush away excess chemical. Immediately wash with lukewarm, gently flowing water and non-abrasive soap for 15-20 minutes. Immediately obtain medical attention. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, immediately start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED). Quickly transport victim to an emergency care facility.

Continued on Next Page *Internet: www.petro-canada.ca/msds* *Available in French*

PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	**B-3, D-2B, (D-2A)* (See Section 15)**		

Section 1. Chemical Product and Company Identification

Product Name	**JET A/A-1 AVIATION TURBINE FUEL**	**Code**	W213, SAP: 149
Synonym	Jet A-1; Jet A-1-DI; Aviation Turbine Kerosene (ATK); JP-8; NATO F-34; Jet F-34; Turbine Fuel, Aviation, Kerosene Type (CAN/CGSB-3.32)	**Validated on**	6/15/2007.
Manufacturer	PETRO-CANADA P.O. Box 2844 150 – 6th Avenue South-West Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Used as aviation turbine fuel. May contain a fuel system icing inhibitor. In the arctic, Jet A-1 may also be used as diesel fuel and heating oil.		

Section 2. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (V/V)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Complex mixture of petroleum hydrocarbons (C9-C16)**(Kerosene) **Aromatic content is 25% maximum (benzene: nil).	8008-20-6	99.9	200 mg/m³ (***)	Not established	Not established
Fuel System Icing Inhibitor (FSII) (if added*): Diethylene Glycol Monomethyl Ether	111-77-3	0.1-1	Not established	Not established	Not established
Anti-static, antioxidant and metal deactivator additives. *Please note that Jet A-1-DI, JP-8, Jet F-34 and NATO F-34 all contain Fuel System Icing Inhibitor.	Not applicable	<0.1	Not applicable	Not applicable	Not applicable

Manufacturer Recommendation	***Application of this TLV is restricted to conditions in which there are negligible aerosol exposures.
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Combustible liquid. Exercise caution when handling this material. May cause teratogenicity/embryotoxicity. Contact with this product may cause skin irritation. Prolonged or repeated contact may defat and dry skin, and cause dermatitis. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Aspiration of liquid drops into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	Avoid direct contact. Quickly and gently blot or brush chemical off the face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay irrigation or attempt to remove the lens. Take care not to rinse contaminated water into the unaffected eye or onto the face. Immediately obtain medical attention.
Skin Contact	As quickly as possible, remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts, etc.). Avoid direct contact. Wear chemical resistant protective clothing if necessary. Quickly and gently, blot or brush away excess chemical. Immediately wash with lukewarm, gently flowing water and non-abrasive soap for 15-20 minutes. Immediately obtain medical attention. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, immediately start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED). Quickly transport victim to an emergency care facility.

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PETRO-CANADA

Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	B-2, D-2A, D-2B		

Section 1. Chemical Product and Company Identification

Product Name	**JET B AVIATION TURBINE FUEL**	**Code**	W219 SAP: 150, 151, 152
Synonym	Jet B; Jet B DI; JP-4; Jet F-40; NATO F-40; Turbine Fuel, Aviation, Wide Cut Type (Can/CGSB-3.22).	**Validated on**	9/28/2007.
Manufacturer	PETRO-CANADA P.O. Box 2844 150 – 6th Avenue South-West Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Used as aviation turbine fuel. May contain a fuel system icing inhibitor.		

Section 2. Composition and Information on Ingredients

Name	CAS #	% (W/W)	Exposure Limits (ACGIH) TLV-TWA(8 h)	STEL	CEILING
Complex mixture of petroleum hydrocarbons (C6-C14).	64741-41-9	60-100	Not established	Not established	Not established
Benzene	71-43-2	0.1-0.5	0.5 ppm	2.5 ppm	Not established
Fuel System Icing Inhibitor (FSII) (if added*): Diethylene Glycol Monomethyl Ether	111-77-3	0.1-0.15	Not established	Not established	Not established
Anti-static, antioxidant, corrosion inhibitor and metal deactivator additives.	Not applicable	<0.1	Not applicable	Not applicable	Not applicable

* Please note that Jet B DI, JP-4, Jet F-40 and NATO F-40 all contain Fuel System Icing Inhibitor (FSII).corrosion inhibitor

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section 3. Hazards Identification.

Potential Health Effects	Flammable liquid. Exercise caution when handling this material. May cause cancer. May cause teratogenicity/embryotoxicity. Contact with this product may cause skin irritation. Inhalation of vapours can cause irritation of the respiratory tract and CNS depression with symptoms of nausea, headaches, vomiting, dizziness, fatigue, light-headedness, reduced coordination, unconciousness and possibly death. Aspiration into the lungs may produce potentially fatal chemical pneumonitis (fluid in the lungs), severe lung damage, or respiratory failure. For more information refer to Section 11 of this MSDS.

Section 4. First Aid Measures

Eye Contact	Avoid direct contact. Quickly and gently blot or brush chemical off the face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 15-20 minutes, while holding the eyelid(s) open. If a contact lens is present, DO NOT delay irrigation or attempt to remove the lens. Take care not to rinse contaminated water into the unaffected eye or onto the face. Immediately obtain medical attention.
Skin Contact	As quickly as possible, remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts, etc.). Avoid direct contact. Wear chemical protective clothing if necessary. Quickly and gently, blot or brush away excess chemical. Immediately wash with lukewarm, gently flowing water and non-abrasive soap for 15-20 minutes. Immediately obtain medical attention. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, immediately start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED). Quickly transport victim to an emergency care facility.

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PETRO-CANADA

Material Safety Data Sheet

NFPA	HMIS (U.S.A.)	Rating	Protective Clothing	DOT (pictograms)
Health 2 / Fire Hazard 3 / Reactivity 0 / Specific hazard	Health Hazard 2*	0 Insignificant		Not evaluated for transport
	Fire Hazard 3	1 Slight		Not evaluated for transport
	Reactivity 0	2 Moderate		
	Personal Protection H	3 High		
		4 Extreme		

Section I. Chemical Product and Company Identification

Product Name	**GASOLINE, UNLEADED**	**Code**	W102E, SAP: 102 to 117
		DSL	See Section 15
Synonym	Regular, Unleaded Gasoline (US Grade), Mid-Grade, Plus, Super, WinterGas, SummerGas, Supreme, SuperClean WinterGas, RegularClean, PlusClean, Premium, marked or dyed gasoline, Super Premium (94 RO), TQRUL, transitional quality regular unleaded, BOB, Blendstock for Oxygenate Blending	**TSCA**	See Section 15
Manufacturer	PETRO-CANADA P.O. Box 2844 150 – 6th Avenue South-West Calgary, Alberta T2P 3E3	**In case of Emergency**	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).
Material Uses	Unleaded gasoline is used in spark ignition engines including motor vehicles, inboard and outboard boat engines, small engines such as chain saws and lawn mowers, and recreational vehicles.		

Section II. Composition and Information on Ingredients

			Exposure Limits (ACGIH)		
Name	**CAS #**	**% (W/W)**	**TLV-TWA(8 h)**	**STEL**	**CEILING**
Gasoline	86290-81-5	85-100	300 ppm	500 ppm	Not established
Benzene	71-43-2	<1.5	0.5 ppm	2.5 ppm	Not established

Manufacturer Recommendation	Not applicable
Other Exposure Limits	Consult local, state, provincial or territory authorities for acceptable exposure limits.

Section III. Hazards Identification.

Potential Health Effects	Flammable liquid. Exercise caution when handling this material. May cause cancer. May cause heritable genetic effects (mutagenicity). This product contains an ingredient or ingredients, which have been shown to cause chronic toxic effects. Contact with this product may cause skin irritation. Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death. Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract. For more information refer to Section 11 of this MSDS.

Section IV. First Aid Measures

Eye Contact	Avoid direct contact. Quickly and gently blot or brush chemical off the face. Immediately flush the contaminated eye(s) with lukewarm, gently flowing water for 5 minutes, while holding the eyelid(s) open. Obtain medical advice.
Skin Contact	Avoid direct contact. Wear chemical protective clothing if necessary. As quickly as possible, remove contaminated clothing, shoes and leather goods (e.g., watchbands, belts, etc.). Quickly and gently, blot or brush away excess chemical. Immediately wash with lukewarm, gently flowing water and non-abrasive soap for 15-20 minutes. Immediately obtain medical attention. Completely decontaminate clothing, shoes and leather goods before reuse or discard.
Inhalation	Take proper precautions to ensure your own safety before attempting rescue (e.g. wear appropriate protective equipment). If breathing has stopped, trained personnel should begin artificial respiration (AR) or, if the heart has stopped, immediately start cardiopulmonary resuscitation (CPR) or automated external defibrillation (AED). Quickly transport victim to an emergency care facility.

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Material Safety Data Sheet

STOVE OIL

PETRO-CANADA

1. Product and company identification

Product name	:	STOVE OIL
Synonym	:	Type 1 Heating Oil, #1 Heating Oil, #1 Furnace Oil, #1 Diesel Fuel, Switch Heater Fuel, Tobacco Curing Oil, Seasonal Furnace Oil, ThermaClean, Economy Diesel, Farm Diesel.
Code	:	W107; SAP: 154
Material uses	:	Stove Oils are distillate fuels suitable for use in liquid fuel burning equipment without preheating.
Manufacturer	:	PETRO-CANADA P.O. Box 2844 150 – 6th Avenue South-West Calgary, Alberta T2P 3E3
In case of emergency	:	Petro-Canada: 403-296-3000 Canutec Transportation: 613-996-6666 Poison Control Centre: Consult local telephone directory for emergency number(s).

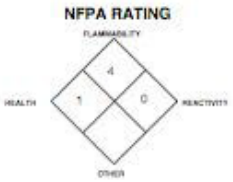
2. Hazards identification

Physical state	:	Bright oily liquid.
Odor	:	Mild petroleum oil like.
WHMIS (Canada)	:	Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F). Class D-2B: Material causing other toxic effects (Toxic).
OSHA/HCS status	:	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	:	WARNING! COMBUSTIBLE LIQUID AND VAPOR. CAUSES EYE AND SKIN IRRITATION. Combustible liquid. Severely irritating to the skin. Irritating to eyes. Keep away from heat, sparks and flame. Do not get in eyes. Avoid breathing vapor or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Wash thoroughly after handling.
Routes of entry	:	Dermal contact. Eye contact. Inhalation. Ingestion.
Potential acute health effects		
Inhalation	:	Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.
Ingestion	:	Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract.
Skin	:	Severely irritating to the skin.
Eyes	:	Irritating to eyes.
Potential chronic health effects		
Chronic effects	:	No known significant effects or critical hazards.
Carcinogenicity	:	No known significant effects or critical hazards.
Mutagenicity	:	No known significant effects or critical hazards.
Teratogenicity	:	No known significant effects or critical hazards.
Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	No known significant effects or critical hazards.
Medical conditions aggravated by over-exposure	:	Repeated skin exposure can produce local skin destruction or dermatitis.

Airgas

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards



PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

CHEMICAL NAME; CLASS:	**PROPANE - C_3H_8** Document Number: 001045
PRODUCT USE:	For general analytical/synthetic chemical uses.
SUPPLIER/MANUFACTURER'S NAME:	AIRGAS INC.
ADDRESS:	259 N. Radnor-Chester Road Suite 100 Radnor, PA 19087-5283
BUSINESS PHONE:	1-610-687-5253
EMERGENCY PHONE:	1-800-949-7937 International: 423-479-0293
DATE OF PREPARATION:	May 12, 1996
REVISION DATE:	February 16, 2001

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	mole %	EXPOSURE LIMITS IN AIR					
			ACGIH		OSHA			
			TLV ppm	STEL ppm	PEL ppm	STEL ppm	IDLH ppm	OTHER
Propane	74-98-6	> 96.0	Simple Asphyxiant	NE	1000	NE	2200 (Based on LEL)	NIOSH REL: 1000 ppm DFG MAK: 1000 ppm
Maximum Impurities		<4.0	None of the trace impurities in this mixture contribute significantly to the hazards associated with the product. All hazard information pertinent to this product has been provided in this Material Safety Data Sheet, per the requirements of the OSHA Hazard Communication Standard (29 CFR 1910.1200) and State equivalent standards.					

NE = Not Established C = Ceiling Limit See Section 16 for Definitions of Terms Used

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1993 format.