

Appendix “F”

◆ Drill Mud MSDS Sheets



WESTCOAST DRILLING SUPPLIES LTD.

#6 - 2351 SIMPSON ROAD
RICHMOND, B.C. V6X 2R2

TEL: (604) 278-4954
FAX: (604) 278-4914

Serving the Drilling Industry

EMERGENCY PHONE NO. (604) 278-4954

MATERIAL SAFETY DATA SHEET

SECTION I: IDENTIFICATION OF PRODUCT

PRODUCT NAME: X-TRA GEL

CHEMICAL FAMILY: Sodium Montmorillonite

WHMIS CLASSIFICATION: Class D-2(A)

WORK PLACE HAZARD: Potential Carcinogen; contains free silica

TRANSPORTATION OF DANGEROUS GOODS (TDGR)

CLASSIFICATION: Not Dangerous Goods

PACKAGE GROUP: Not Applicable

PRODUCT IDENTIFICATION NUMBER (PIN): Not Applicable

SECTION II: HAZARDOUS INGREDIENTS

<u>INGREDIENT</u>	<u>PERCENTAGE</u>	<u>CAS NUMBER</u>	<u>OSAH PEL</u>	<u>ACGIH TLV</u>
Bentonite		1302-78-9	5 mg/M	Not Applicable
Quartz (Silica)		14808-60-7	10 mg/M	0.1 mg/M
Cynstobalite		14464-46-1	10 mg/M	0.05 mg/M
Tridymite		15468-32-3	10 mg/M	0.05 mg/M

SECTION III: TOXICOLOGICAL PROPERTIES

ROUTE OF ENTRY:

[] skin, [] eye contact, [xxx] inhalation, [] ingestion

ACUTE - SHORT TERM EXPOSURE: Cough if exposed to dust at levels higher than TLV's.

CHRONIC - LONG TERM EXPOSURE: May lead to development of silicosis or other respiratory problems if consistently exposed to free silica containing airborne bentonite.

SECTION IV: FIRST AID MEASURES

No first aid measures are suggested for Chronic (long term exposure). For acute (short term exposure) remove patient from dusty environment.

SECTION V: PHYSICAL DATA

APPEARANCE AND ODOUR:	Pale grey to buff powder or granules; odourless
DENSITY (SPECIFIC GRAVITY):	2.35
BOILING POINT:	Not Applicable
MELTING POINT:	788°C
WATER SOLUBILITY:	Insoluble; forms colloidal suspension
% VOLATILE BY VOLUME:	Not Applicable
EVAPORATION RATE:	Not Applicable
VAPOUR PRESSURE: (MM Hg)	Not Applicable
VAPOUR DENSITY: (Air = 1)	Not Applicable
Ph:	7 - 6

SECTION VI: FIRE AND EXPLOSION HAZARD DATA

FLASH POINT: Not Applicable FLAMMABLE LIMIT: Not Applicable

EXTINGUISHING MEDIA: Not Applicable

SPECIAL FIRE FIGHTING PROCEDURES: Not Applicable

UNUSUAL FIRE AND EXPLOSION HAZARDS: Not Applicable

SECTION VII: REACTIVITY DATA

STABLE [xxx] INSTABLE: []

INCOMPATIBILITY (CONDITIONS TO AVOID): None

HAZARDOUS DECOMPOSITION PRODUCTS: None

HAZARDOUS POLYMERIZATION: Will not occur [xxx] May occur []

SECTION VIII: PREVENTATIVE MEASURES

RESPIRATORY PROTECTION: NIOSH/MSHA approved respirators for silica bearing dust.

VENTILATION: Yes if particular; Personal air supply may be useful.

PROTECTIVE GLOVES: None required.

EYE PROTECTION: Suggest goggles.

OTHER PROTECTIVE EQUIPMENT: None required.

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE

Avoid breathing dust; wear an approved respirator. Practice reasonable caution and personal cleanliness. Avoid eye contact.

STEPS TO BE TAKEN IN CASE OF SPILL OR LEAK

Vacuum or sweep up if dry. Avoid flushing with water as material may become extremely slippery.

WASTE DISPOSAL METHOD

Dispose of material in a manner to prevent generating dust.

SECTION IX: PREPARATION

The information contained herein is given in good faith, but no warranty, expressed or implied is made.

Date issued: November 10, 1988

Date Revised: March 1, 1992

By: Product Safety Committee

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Post-it™ Fax Note		78718	8
To / À	From / De		
D. K. KELTON		KELLY WHITTLE	
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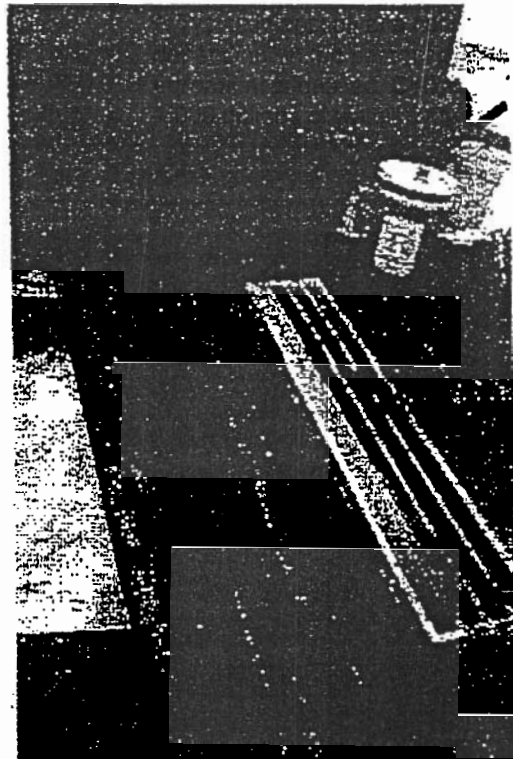
POLY-DRILL O.B.X. AND 133X

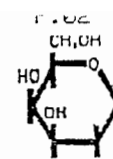
Overburden and Core Drilling Fluid System

Poly-Drill O.B.X. & 133X are a second generation polymer drilling system that overcomes the shearing problems of emulsion polymers such as Easy Mud, 120L and Matex 1200. They act as cross-linked liquid viscosifiers used for cutting removal in drilling applications.

- * Non-shearing clay stabilizing and core recovery system that maintains viscosity under shear.
- * Includes a lubricate that reduces rod vibration and improves tube filling in broken ground.
- * Maintains hole stability and hole cleaning for overburden as well as sand seams.
- * Films metal surfaces to provide excellent lubrication of down hole equipment, water swivels, pressure pumps and mixing equipment.
- * Assists in bore hole stabilization.
- * Helps alleviate solids accumulation within drilling fluids by aiding an Enviro-Pak filtration system.
- * Safe for the environment.

- * Mix 1 quart of O.B.X. per 150 gallons of water while mixing tank is filling for over burden and sand, when tank is near full, then add equal amount of 133X.
- * Greater viscosity can be achieved by increasing each product.
- * The O.B.X. must be added to the mixing tank first.
- * This cross-linked system can achieve a funnel viscosity of 45 to 50 seconds.
- * Packaged in 5 gallon plastic pails. (20 Liters).



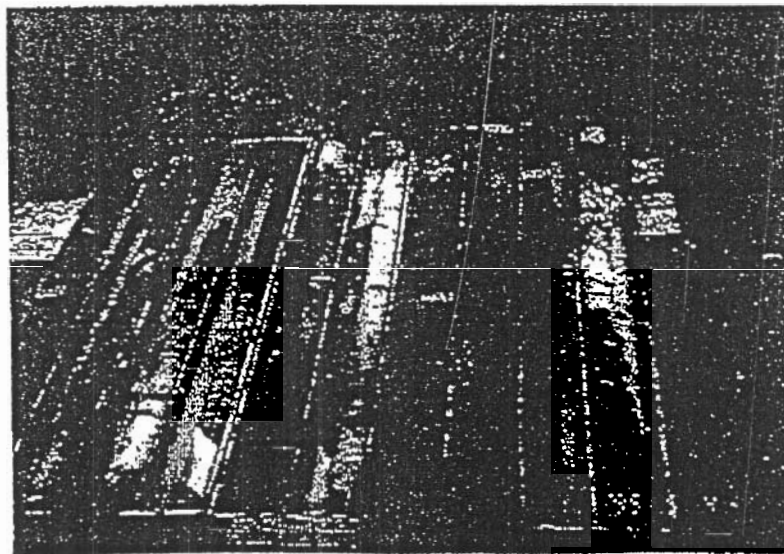


Poly-Drill Drilling
Systems

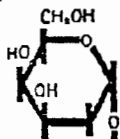
POLY-DRILL CLAY TREAT II

Poly-Drill Clay Treat II is a specialized product designed specifically for use as a replacement for bagged potassium chloride (KcL). Clay Treat II does not contain potassium, but is composed of a sophisticated mildly cationic complex that functions much like KcL to control shale and clay activity. A 2% KcL solution contains 9,700 ppm of chloride ions, while the equivalent of Clay Treat II contains only 165 ppm of chloride ions. This significantly reduces chloride concentration and greatly lessens the environmental risks associated with the use of KcL fluids.

- * Provides excellent shale and clay control without the mixing problems associated with large volumes of bagged KcL.
- * Compatible with all polymer systems and cross-linked gels such as Poly-Drill 1330, 133X, O.B.X., and maybe used in water, brine or acid systems.
- * Will not affect pH and being a non-surface active it does not adversely affect formation.
- * Can be easily utilized in "on the fly systems" to eliminate pre-mixing and leftover brine disposal problems.
- * Highly effective in preventing wellbore shale erosion.
- * Typically applied at a concentration of 0.5 to 10 gallons per 1,000 gallons of fluid (GPT) depending on the percent of KcL being replaced, where 2 % potassium chloride functional equivalent is desired, Clay Treat II is added to fresh water at a concentration of 2 gallons per 1,000 gallons of water.



Clay Treat II has been very successful in continuous coring of kimberlite diamond samples, uranium deposits and fault seams



Poly-Drill Drilling Systems

1824 - 104 Avenue, S.W.
Calgary, Alberta, Canada
T2W-0A8
(403) 259-5112 FAX (403) 255-7185

MATERIAL SAFETY DATA SHEET / FICHE SIGNALERIQUE

Section 1—PRODUCT IDENTIFICATION

PRODUCT TRADE NAME(S): Poly Drill 133X/1330

PRODUCT DESCRIPTION: Latex
polyelectrolyte

SECTION 2—COMPOSITION

A liquid polymer: Evaluation of the ingredient(s) has found no ingredient(s) hazardous as per WHMIS regulations.

SECTION 3—PHYSICAL DATA

Boiling Point: Not available

Solubility in Water: Solubility limited by solution viscosity.

Density (g/ml): 1.08 at 25° C

Appearance and Odor: Blue. Odor slight.

Specific Gravity (@ 25 Deg.C.): 1.09

pH: 8.1 (1.0% solution)

Physical State: Liquid

SECTION 4—FIRE AND EXPLOSION DATA

Flash Point (method used): (PMCC) >100 C

Conditions of flammability: Intense heat, open flame.

Hazardous combustion products: Products of incomplete hydrocarbon combustion.

Upper and Lower flammable limits: Not available

Extinguishing media: Use water spray, foam, dry chemical, or carbon dioxide.

SECTION 5—REACTIVITY

Chemical stability: Stable under normal conditions.

Hazardous Polymerization: Will not occur

Incompatible substances: Avoid strong oxidizing and reducing agents.

Hazardous decomposition products: Carbon monoxide, carbon dioxide, and products of incomplete hydrocarbon combustion.

SECTION 6—HEALTH HAZARD DATA

TOXICITY RATING: Practically non-harmful.

Routes of Exposure and Effects:

SKIN: Slight irritant: prolonged contact may cause skin irritation or dermatitis in some individuals

EYE: No effects of exposure expected with the exception of possible irritation.

INHALATION: If misted, no effects of exposure are expected.

Exposure limits: TLV-TWA: Mineral oil, mist 5 mg/m³

Carcinogenicity: None of the components of this product are listed as carcinogens by IARC and ACGIH

Sensitization of product: Not suspected to be a sensitizer.

Teratogenicity: Not available.

Mutagenicity: Not available.

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SECTION 7—EMERGENCY AND FIRST AID PROCEDURES

SKIN: Wash exposed area with soap and water. If irritation or abnormalities persist, call a physician.

EYE: Immediately flush eyes with water for 15 minutes, if irritation or abnormalities persist, call a physician.

INHALATION: Remove to fresh air. If breathing becomes difficult, give oxygen and call a physician.

INGESTION: Do not induce vomiting: Call a physician immediately.

SECTION 8—HANDLING AND USE PRECTIONS

Storage requirements: keep container closed when no in use. Store in a cool dry location away from oxidizing and reducing agents.

Waste Disposal: product should be disposed of in accordance with applicable local, Provincial and Federal regulations.

Steps must be taken if product is released or spilled: clean spill areas thoroughly to avoid hazardous slippery conditions.

SECTION 9—INDUSTRIAL HYGIENE CONTROL MEASURES

Respiratory Protection: None normally required.

Ventilation: If mist and/or vapors are present, use air purifying respirator or self-contained breathing apparatus, but this is rarely required.

Eye Protection: Safety glasses, if personally preferred

Gloves: Generally not necessary. Personal preference.

SECTION 10—TOXICOLOGICAL PROPERTIES

Environmental Effects: Not known to be harmful to aquatic life at low concentrations.

Freshwater aquatic toxicity rating: 96 hour LC50 Rainbow Trout = 160 mg/L

96 hour LC50 Salmon = 160 mg/L

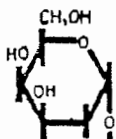
SECTION 11—DEPARTMENT OF TRANSPORTATION INFORMATION

Shipping Name: Drilling Mud

Hazard Class: Not hazardous

Hazardous Substances: None

Cautionary Labeling: None required



Poly-Drill Drilling Systems

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MATERIAL SAFETY DATA SHEET / LE SIGNALÉTIQUE

Section 1—PRODUCT IDENTIFICATION

PRODUCT TRADE NAME(S): Poly Drill O.B.X.
TDG Classification: Non dangerous goods

WHMIS CLASSIFICATION: Non-regulated

SECTION 2—COMPOSITION

A liquid polymer: Evaluation of the ingredient(s) has found no ingredient(s) hazardous as per WHMIS regulations.

SECTION 3—PHYSICAL DATA

Boiling Point: Not available

Solubility in Water: disperses in water (forms viscous, slippery solution).

Density (g/ml): Not available

Appearance and Odor: Brown. Odor slight.

Specific Gravity: 0.9 g/cm

pH: 3.8 (1% concentration)

Physical State: Liquid

SECTION 4—FIRE AND EXPLOSION DATA

Flash Point (method used): (PMCC) greater than 100 C.

Conditions of flammability: Very low risk.

Hazardous combustion products: None known.

Upper and Lower flammable limits: Not available.

Extinguishing media: Carbon dioxide, dry chemicals, foam, in preference to water spray

SECTION 5—REACTIVITY

Chemical stability: Stable under normal conditions.

Hazardous Polymerization: Will not occur.

Incompatible substances: Avoid strong oxidants such as liquid chlorine, concentrated oxygen, sodium or calcium hypochloride.

Hazardous decomposition products: None known

SECTION 6—HEALTH HAZARD DATA

TOXICITY RATING: Practically non-harmful.

Routes of Exposure and Effects:

SKIN: Slight irritant: prolonged contact may cause skin irritation or dermatitis in some individuals

EYE: No effects of exposure expected with the exception of possible irritation.

INHALATION: Due to low volatility of mineral distillates a small inhalation hazard exists.

INGESTION: can cause nausea, vomiting, cramps, diarrhea

Chronic exposure limits: None

Sensitization of product: Not suspected to be a sensitizer.

Teratogenicity: Not available.

Mutagenicity: Not available.

Carcinogenicity: None of the components of this product are listed as carcinogens by IARC and ACGIH

SECTION 7—EMERGENCY AND FIRST AID PROCEDURES

SKIN: Wash exposed area with soap and water. If irritation or abnormalities persist, call a physician.

EYE: Immediately flush eyes with water for 15 minutes, if irritation or abnormalities persist, call a physician.

INHALATION: Remove to fresh air. If breathing becomes difficult, give oxygen and call a physician.

INGESTION: Do not induce vomiting. Call a physician immediately.

SECTION 8—HANDLING AND USE PRECTIONS

Storage requirements: keep container closed when not in use. Store in a cool dry location away from oxidizing and reducing agents.

Waste Disposal: product should be disposed of in accordance with applicable local, Provincial and Federal regulations.

Steps must be taken if product is released or spilled: clean spill areas thoroughly to avoid hazardous slippery conditions.

SECTION 9—INDUSTRIAL HYGIENE CONTROL MEASURES

Respiratory Protection: None normally required.

Ventilation: If mist and/or vapors are present, use air purifying respirator or self-contained breathing apparatus, but this is rarely required.

Eye Protection: Safety glasses, if personally preferred

Gloves: Generally not necessary. Personal preference.

SECTION 10—TOXICOLOGICAL PROPERTIES

Environmental Effects: Not known to be harmful to aquatic life at low concentrations.

Freshwater aquatic toxicity rating: 96 hour LC50 Rainbow Trout = 160 mg/L

96 hour LC50 Salmon = 160 mg/L

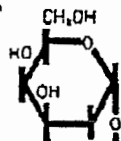
SECTION 11—DEPARTMENT OF TRANSPORTATION INFORMATION

Shipping Name: Drilling Mud

Hazard Class: Not hazardous

Hazardous Substances: None

Cautionary Labeling: None required



Poly-Drill Drilling Systems

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(403) 259-5112 FAX (403) 255-7185

MATERIAL SAFETY DATA SHEET / FICHE SIGNALÉTIQUE

Section 1—PRODUCT IDENTIFICATION

PRODUCT TRADE NAME(S): Poly Drill CLAY TREAT II

SECTION 2—COMPOSITION

SECTION 3—PHYSICAL DATA

Boiling Point: 100 C
Solubility in Water: Soluble
Density (g/ml): 1.1
Appearance and Odor: Red. Characteristic slight odor.

Specific Gravity (@ 25 Deg.C.): 1.09
pH: 5.0 - 7.0 (1.0% solution)
Physical State: Liquid

SECTION 4—FIRE AND EXPLOSION DATA

Flash Point: >93.3 C
Conditions of flammability: Will burn after drying
Hazardous combustion products: Oxides of carbon and nitrogen and products of incomplete combustion.
Upper and Lower flammable limits: Not available
Extinguishing media: Use water spray, foam, dry chemical, or carbon dioxide.

SECTION 5—REACTIVITY

Chemical stability: Stable under normal conditions.
Hazardous Polymerization: Will not occur.
Incompatible substances: Avoid strong oxidizing and reducing agents.
Hazardous decomposition products: Not available.

SECTION 6—HEALTH HAZARD DATA

TOXICITY RATING: Practically non-harmful.
Routes of Exposure and Effects:
SKIN: Slight irritant: prolonged contact may cause skin irritation or dermatitis in some individuals
EYE: No effects of exposure expected with the exception of possible irritation.
INHALATION: If misted, no effects of exposure are expected.
Exposure limits: Contains trace acrylamide (SKIN). Exposure limit, TWAEV=0.03 mg/m(ONT. Reg. 654/86).
Contains traces of isopropanol. Exposure limit, TWAEV=400ppm, STEV=500ppm(ONT. Reg. 654/86).
Carcinogenicity: This product contains traces of acrylamide. Acrylamide is listed by IARC(Group 2B) and ACGIH(Group A2) as a possible human carcinogen.
Teratogenicity: Not available.
Mutagenicity: Not available.

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SECTION 7—EMERGENCY AND FIRST AID PROCEDURES

SKIN: Wash exposed area with soap and water. If irritation or abnormalities persist, call a physician.

EYE: Immediately flush eyes with water for 15 minutes, if irritation or abnormalities persist, call a physician.

INHALATION: Remove to fresh air. If breathing becomes difficult, give oxygen and call a physician.

INGESTION: Do not induce vomiting: Call a physician immediately.

SECTION 8—HANDLING AND USE PRECTIONS

Storage requirements: keep container closed when no in use. Store in a cool dry location away from oxidizing and reducing agents.

Waste Disposal: product should be disposed of in accordance with applicable local, Provincial and Federal regulations.

Steps must be taken if product is released or spilled: clean spill areas thoroughly to avoid hazardous slippery conditions.

SECTION 9—INDUSTRIAL HYGIENE CONTROL MEASURES

Respiratory Protection: None normally required.

Ventilation: If mist and/or vapors are present, use air purifying respirator or self-contained breathing apparatus, but this is rarely required.

Eye Protection: Safety glasses, if personally preferred

Gloves: Generally not necessary. Personal preference.

SECTION 11—DEPARTMENT OF TRANSPORTATION INFORMATION

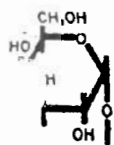
Shipping Name: Drilling Mud

Hazard Class: Not hazardous

Hazardous Substances: None

Cautionary Labeling: None required

Material Safety Data/Fiche signalétique



POLY-DRILL DRILLING

1824 - 104 AVENUE, S.W.

CALGARY, ALBERTA, CANADA T2W OA8

TEL. (403) 259-5112 FAX (403) 255-7185

EMERGENCY (403) 259-5112

I. PRODUCT IDENTIFICATION

Trade Name(s): Clay Treat II

WHMIS CLASSIFICATION: Non regulated

TDG Classification: Non dangerous goods TDG label N.R.

Manufacturer: Poly-Drill Drilling

II. PHYSICAL DATA

Boiling Point: 100 C

Solubility in Water: Soluble

Density(g/ml): 1.1

Appearance and Odor: Red with characteristically slight odor.

Specific Gravity(@25 Deg. C.): 1.1

pH: 5.0-7.0 (1.0% solution)

Physical state: Liquid

III. FIRE AND EXPLOSION DATA

Flash Point: >93.3 C

Conditions of flammability: Will burn after drying

Hazardous combustion products: Oxides of carbon and nitrogen and products of incomplete combustion.

Upper and Lower flammable limits: Not applicable

Extinguishing media: Use water spray, foam, dry chemical, or carbon dioxide.

IV. REACTIVITY

Stability: Stable under normal conditions

Hazardous Polymerization: Will not occur

Incompatible substances: Avoid strong oxidizing and reducing agents.

Hazardous decomposition products: Not available.

V. HEALTH HAZARD DATA

TOXICITY RATING: Practically non-harmful

Routes of Exposure and Effects:

SKIN: Slight irritant. Prolonged contact may cause skin irritation or dermatitis in some individuals.

EYE: No effects of exposure expected with the exception of possible irritation.

INHALATION: If misted, no effects of exposure expected.

Exposure limits: Contains trace acrylamide (SKIN). Exposure limit, TWAEV=0.03mg/m(ONT. Reg. 654/86).

Contains traces of isopropanol. Exposure limit, TWAEV=400ppm, STEV=500ppm(ONT. Reg 654/86).

Carcinogenicity: Product contains traces of acrylamide. Acrylamide is listed by IARC(Group 2B) and ACGIH(Group A2) as a possible human carcinogen.

VI. EMERGENCY AND FIRST AID PROCEDURES

SKIN: Wash exposed area with soap and water. If irritation or abnormalities persist, call a physician.
EYE: Immediately flush eyes with water for 15 minutes, if irritation or abnormalities persist, call a physician.
INHALATION: Remove to fresh air. If breathing is difficult, give oxygen and call a physician.
INGESTION: Do not induce vomiting. Call a physician immediately.

VII. HANDLING AND USE PRECAUTIONS

Storage requirements: Keep container closed when not in use. Store in a cool dry location away from oxidizing and reducing agents.

Waste Disposal: Product should be disposed of in accordance with applicable local, Provincial, and Federal regulations. Steps must be taken if product is released or spilled. Clean spill areas thoroughly to avoid hazardous slippery conditions.

VII. INDUSTRIAL HYGIENE CONTROL MEASURES

Respiratory Protection: None normally required.

Ventilation: If mist and/or vapors are present, use air-purifying respirator or self-contained breathing apparatus, but rarely required.

Eye Protection: Safety glasses if personally preferred.

Gloves: Generally not necessary. Personal preference.

DEPARTMENT OF TRANSPORTATION INFORMATION

Shipping Name: Drilling Mud

Hazard Class: Not hazardous

Hazardous Substances: None

Cautionary Labeling: None required.

CLA/TREAT
PG#2

Appendix “G”

◆ Fuel MSDS Sheets

REGULAR SULPHUR DIESEL FUEL

322-110

Revision Number: 1

**Shell Canada Limited****Material Safety Data Sheet**

Effective Date: 19980901



Class B3 Combustible Class D2B Other Toxic
Liquid Effects - Skin Irritant

1. PRODUCT AND COMPANY IDENTIFICATION**PRODUCT:** REGULAR SULPHUR DIESEL FUEL**SYNONYMS:** Diesel
Automotive Gas Oil**PRODUCT USE:** Fuel Solvent**MSDS Number:** 322-110**MANUFACTURER**
Shell Canada Limited
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5**TELEPHONE NUMBERS**
Shell Emergency Number 1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER 613-996-6666
For general information: 1-800-661-1600
For MSDS information: 403-691-3982
(From 7:30 to 4:30 Mountain Time) 403-691-2220

This MSDS was prepared by the Toxicology and Material Safety Section of Shell Canada Limited.

*A star in the product name designates a trade-mark(s) of Shell Canada Limited. Used under license by Shell Canada Products Limited.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled	CBI Claim No. CBI Date
REGULAR SULPHUR DIESEL FUEL	68476-34-6	100	Yes	

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION**Physical Description:** Liquid Lightly Coloured Hydrocarbon Odour

REGULAR SULPHUR DIESEL FUEL

322-110
Revision Number: 1

Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.

Hazards:
Combustible Liquid.
Irritating to skin.
Vapours are moderately irritating to the eyes.
Vapours are moderately irritating to the respiratory passages. The liquid when accidentally aspirated into the lungs can cause a severe inflammation of the lung.

Handling:
Eliminate all ignition sources.
Avoid prolonged exposure to vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID

Eyes	Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.
Skin	Flush affected skin with gently flowing lukewarm water for at least 20 minutes and remove contaminated clothing while rinsing. Wash contaminated skin with mild soap and water for 15 minutes. If irritation occurs and persists, obtain medical attention.
Ingestion	DO NOT INDUCE VOMITING! OBTAIN MEDICAL ATTENTION IMMEDIATELY. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.
Inhalation	Remove victim from further exposure and restore breathing, if required. Obtain medical attention.
Notes to Physician	The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. If more than 2.0 mL/kg has been ingested, vomiting should be induced with supervision. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered.

5. FIRE FIGHTING MEASURES

Extinguishing Media	Dry Chemical Carbon Dioxide Foam Water Fog
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REGULAR SULPHUR DIESEL FUEL

322-110

Revision Number: 1

Firefighting Instructions

Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Vapours may travel along ground and flashback along vapour trail may occur. Do not use water except as a fog. Product will float and can be reignited on surface of water. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup which could result in container rupture. Container areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure. Caution - Combustible. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus.

Hazardous Combustion Products

A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Combustible". Eliminate all ignition sources. Isolate hazard area and restrict access. Handling equipment must be grounded. Try to work upwind of spill. Avoid direct contact with material. Wear appropriate breathing apparatus (if applicable) and protective clothing. Stop leak only if safe to do so. Dike and contain land spills; contain water spills by booming. Use water fog to knock down vapours; contain runoff. Absorb residue or small spills with absorbent material and remove to non-leaking containers for disposal. Recommended materials: Clay or Sand Flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations. Notify appropriate environmental agency(ies).

7. HANDLING AND STORAGE

Handling: Combustible. Avoid excessive heat, sparks, open flames and all other sources of ignition. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours are heavier than air and will settle and collect in low areas and pits, displacing breathing air. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapours are gone. Vapours may accumulate and travel to distant ignition sources and flashback. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not pressurize drum containers to empty them. Never siphon by mouth. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse. Use good personal hygiene.

Storage: Use explosion-proof ventilation to prevent vapour accumulation. Keep container tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

THE FOLLOWING INFORMATION, WHILE APPROPRIATE FOR THIS PRODUCT, IS GENERAL IN NATURE. THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT WILL VARY DEPENDING ON THE CONDITIONS OF USE.

REGULAR SULPHUR DIESEL FUEL

322-110

Revision Number: 1

Occupational Exposure Limits (1998) : North American exposure limits have not been established for the product. Consult local authorities for acceptable provincial values.
 Oil mist (mineral): 5 mg/m³ (TLV/TWA) ACGIH
 10 mg/m³ (TLV/STEL) ACGIH
 Recommend SHELL guideline of 125 mg/m³ for vapours (8 hour shift).

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below lower explosive limit at all times or below the recommended threshold limit value if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Provide an eyewash station in the area.

Skin Protection: Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Safety showers should be available for emergency use.

Respiratory Protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges or use a NIOSH-approved supplied-air respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.

9. PHYSICAL DATA

Physical State:	Liquid
Appearance:	Lightly Coloured
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Freezing/Pour Point:	Not available
Boiling Point:	246 - 388 degrees C
Density:	<876 kg/m ³ @ 15 degrees C
Vapour Density (Air = 1):	Not available
Vapour Pressure:	Not available
pH:	Not applicable
Flash Point:	Method Pensky-Martens CC >40 degrees C
Lower Explosion Limit:	1 % (vol.)
Upper Explosion Limit:	6 % (vol.)
Autoignition Temperature:	250 degrees C
Viscosity:	1.3 - 4.1 cSt @ 40 degrees C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (K_{ow}):	Not available
Water Solubility:	Insoluble

Other Solvents: Hydrocarbon Solvents
Formula: C10 to C22 Hydrocarbons

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	Thermal decomposition products are highly dependent on combustion conditions.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, open flames and all ignition sources.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
REGULAR SULPHUR DIESEL FUEL	LD50 Oral Rat >5000 mg/kg LD50 Dermal Rabbit >2000 mg/kg

Routes of Exposure:	Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.
Irritancy:	This product is expected to be irritating to skin but is not predicted to be a skin sensitizer.
Chronic Effects:	Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne.
Pre-existing Conditions:	Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.
Carcinogenicity and Mutagenicity:	The International Agency for Research on Cancer (IARC) considers that this product is not classifiable as to its carcinogenicity to humans. Middle distillates have caused skin cancers in laboratory animals when applied repeatedly and left in place between applications. This effect is believed to be caused by the continuous irritation of the skin. Good personal hygiene should be maintained to avoid this risk.

12. ECOLOGICAL INFORMATION

Environmental Effects	Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities. May cause physical fouling of aquatic organisms.
Biodegradability	Not readily biodegradable. Potential for bioaccumulation.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery (cement kilns, thermal power generation), 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority.

14. TRANSPORTATION INFORMATION**Canadian Road and Rail Shipping Classification:**

UN/NA Number	UN1202
Proper Shipping Name	FUEL OIL
Hazard Class	Class 3 Flammable Liquid
Packing Group	PG III
Shipping Description	FUEL OIL Class 3 UN1202 PG III

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and the MSDS contains all the information required by the *Controlled Products Regulations*.

WHMIS Class:	Class B3 Combustible Liquid Class D2B Other Toxic Effects - Skin Irritant
DSL/NDL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	No Canadian federal standards.

16. ADDITIONAL INFORMATION**LABEL STATEMENTS**

Hazard Statement :	Combustible Liquid. Irritating to skin.
Handling Statement:	Eliminate all ignition sources. Avoid prolonged exposure to vapours. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.

REGULAR SULPHUR DIESEL FUEL

322-110

Revision Number: 1

Revisions:

This MSDS has been reissued in the ANSI Z400.1 standard format.

SHELL JET B

141-012
Revision Number: 5

Shell Canada Limited

Material Safety Data Sheet

Effective Date: 19971203

Class B2 Flammable
LiquidClass D2B Other Toxic
Effects - Skin IrritantClass D2A Other Toxic
Effects - Carcinogen

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT: SHELL JET B
 SYNONYMS: WIDE BOILING RANGE AVIATION TURBINE FUEL
 PRODUCT USE: Fuel
 MSDS Number: 141-012

MANUFACTURER
 Shell Canada Limited
 P.O. Box 100, Station M
 400-4th Ave. S.W.
 Calgary, AB Canada
 T2P 2H5

TELEPHONE NUMBERS
 Shell Emergency Number 1-800-661-7378
 CANUTEC 24 HOUR EMERGENCY NUMBER 613-996-6666
 For general information: 1-800-661-1600
 For MSDS Information: 403-691-3982
 (From 7:30 to 4:30 Mountain Time) 403-691-2220

This MSDS was prepared by the Toxicology and Material Safety Section of Shell Canada Limited.

*A star in the product name designates a trade-mark(s) of Shell Canada Limited. Used under license by Shell Canada Products Limited.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled	CBI Claim No. CBI Date
Naphtha (Petroleum), Full-range Reformed	68919-37-9	>95	Yes	
Benzene	71-43-2	0.5 - 1.5	Yes	

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

SHELL JET B

141-012

Revision Number: 5

Physical Description: Liquid Bright Clear Typical Gasoline Odour**Routes of Exposure:** Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.**Hazards:**

Flammable Liquid.
Irritating to skin.
Contains Benzene.
May cause cancer.
Vapours are moderately irritating to the eyes.
Vapours are moderately irritating to the respiratory passages. The liquid when accidentally aspirated into the lungs can cause a severe inflammation of the lung. Excessive exposure to benzene may cause leukemia in man.

Handling:

Eliminate all ignition sources.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Avoid prolonged exposure to vapours.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID

Eyes	Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.
Skin	Wash contaminated skin with mild soap and water for 15 minutes. If irritation occurs and persists, obtain medical attention.
Ingestion	DO NOT INDUCE VOMITING! OBTAIN MEDICAL ATTENTION IMMEDIATELY. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously keep head below hips to prevent aspiration of liquid into the lungs.
Inhalation	Remove victim from further exposure and restore breathing, if required. Obtain medical attention.
Notes to Physician	The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis. If more than 2.0 mL/kg has been ingested, vomiting should be induced with supervision. If symptoms such as loss of gag reflex, convulsions or unconsciousness occur before vomiting, gastric lavage with a cuffed endotracheal tube should be considered.

5. FIRE FIGHTING MEASURES

Extinguishing Media	Dry Chemical Carbon Dioxide Foam Water Fog
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Firefighting Instructions

Extremely flammable. Vapour forms a flammable/explosive mixture with air between upper and lower flammable limits. Vapours may travel along ground and flashback along vapour trail may occur. Do not use water except as a fog. Use water to cool fire exposed containers. Product will float and can be reignited on surface of water. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup which could result in container rupture. Container areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure. Always stay away from ends of containers due to explosive potential. Fight fire from maximum distance. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus.

Hazardous Combustion Products

A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon dioxide, carbon monoxide and unidentified organic compounds may be formed upon combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". Eliminate all ignition sources. Handling equipment must be grounded. Isolate hazard area and restrict access. Try to work upwind of spill. Avoid direct contact with material. Saturated clothing should be immediately removed to avoid flammability hazard. Wear appropriate breathing apparatus (if applicable) and protective clothing. Stop leak only if safe to do so. Dike and contain land spills; contain water spills by booming. Use water fog to knock down vapours; contain runoff. For large spills remove by mechanical means and place in containers. Absorb residue or small spills with absorbent material and remove to non-leaking containers for disposal. Recommended materials: Clay or Sand Flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations. Notify appropriate environmental agency(ies).

7. HANDLING AND STORAGE

Handling:

Extremely flammable. Avoid excessive heat, sparks, open flames and all other sources of ignition. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Vapours are heavier than air and will settle and collect in low areas and pits, displacing breathing air. Extinguish pilot lights, cigarettes and turn off other sources of ignition prior to use and until all vapours are gone. Vapours may accumulate and travel to distant ignition sources and flashback. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Do not pressurize drum containers to empty them. Never siphon by mouth. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Launder contaminated clothing prior to reuse. Use good personal hygiene.

Storage:

Use explosion-proof ventilation to prevent vapour accumulation. Keep container tightly closed.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

SHELL JET B

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THE FOLLOWING INFORMATION, WHILE APPROPRIATE FOR THIS PRODUCT, IS GENERAL IN NATURE. THE SELECTION OF PERSONAL PROTECTIVE EQUIPMENT WILL VARY DEPENDING ON THE CONDITIONS OF USE.

Occupational Exposure Limits (1998) : North American exposure limits have not been established for the product. Consult local authorities for acceptable provincial values.

Gasoline: 300 ppm, 890 mg/m³ (TLV/TWA) ACGIH
500 ppm, 1480 mg/m³ (TLV/STEL) ACGIH
Benzene (skin) : 0.5 ppm, 1.6 mg/m³ (TLV/TWA)
2.5 ppm (STEL) ACGIH

Mechanical Ventilation: Make up air should always be supplied to balance air exhausted (either generally or locally). Concentrations in air should be maintained below lower explosive limit at all times or below the recommended threshold limit value if unprotected personnel are involved. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere. Use explosion-proof ventilation as required to control vapour concentrations.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes. Provide an eyewash station in the area.

Skin Protection: Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Safety showers should be available for emergency use.

Respiratory Protection: If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Use a NIOSH-approved chemical cartridge respirator with organic vapour cartridges or use a NIOSH-approved supplied-air respirator. For high airborne concentrations, use a NIOSH-approved supplied-air respirator, either self-contained or airline breathing apparatus, operated in positive pressure mode.

9. PHYSICAL DATA

Physical State:	Liquid
Appearance:	Bright Clear
Odour:	Typical Gasoline Odour
Odour Threshold:	Not available
Freezing/Pour Point:	<-51 degrees C
Boiling Point:	60 - 260 degrees C
Density:	750 - 801 kg/m ³ @ 15 degrees C
Vapour Density (Air = 1):	Not available
Vapour Pressure:	>42 mm Hg @ 38 degrees C
Specific Gravity (Water = 1):	0
pH:	Not applicable
Flash Point:	Method Tag Closed Cup = -23 - 1 degrees C
Lower Explosion Limit:	1.4 % (vol.)
Upper Explosion Limit:	7.6 % (vol.)

SHELL JET B

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Autoignition Temperature: Not available
 Viscosity: Not available @
 Evaporation Rate (n-BuAc = 1): Not available
 Partition Coefficient (K_{OW}): Not available
 Water Solubility: Insoluble
 Other Solvents: Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable: Yes
 Hazardous Polymerization: No
 Sensitive to Mechanical Impact: No
 Sensitive to Static Discharge: Yes
 Hazardous Decomposition Products: Thermal decomposition products are highly dependent on combustion conditions.
 Incompatible Materials: Avoid contact with strong oxidizing agents and acids.
 Conditions of Reactivity: Avoid excessive heat, open flames and all ignition sources.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Naphtha (Petroleum), Full-range Reformed	LD50 Oral Rat >28 mL/kg
Benzene	LD50 Oral Rat = 930 - 5600 mg/kg LC50 Inhalation Rat = 13700 ppm for 4 hours

Routes of Exposure: Exposure may occur via inhalation, ingestion, skin absorption and skin or eye contact.
Irritancy: This product is expected to be irritating to skin but is not predicted to be a skin sensitizer.
Chronic Effects: Prolonged and repeated contact with skin can cause defatting and drying of the skin resulting in skin irritation and dermatitis. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Prolonged and repeated exposure may cause serious injury to blood forming organs, resulting in anemia and similar conditions.
Pre-existing Conditions: Pre-existing eye, skin and respiratory disorders may be aggravated by exposure to this product.
Carcinogenicity and Mutagenicity: This product contains benzene. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes. Carcinogenic hazard.

12. ECOLOGICAL INFORMATION

SHELL JET B

141-012
Revision Number: 5

Environmental Effects	Do not allow product or runoff from fire control to enter storm or sanitary sewers, lakes, rivers, streams, or public waterways. Block off drains and ditches. Provincial regulations require and federal regulations may require that environmental and/or other agencies be notified of a spill incident. Spill area must be cleaned and restored to original condition or to the satisfaction of authorities. May be harmful to aquatic life. May cause physical fouling of aquatic organisms.
Biodegradability	Not readily biodegradable. Potential for bioaccumulation.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery (cement kilns, thermal power generation), 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority.

14. TRANSPORTATION INFORMATION

Canadian Road and Rail Shipping Classification:

UN/NA Number	UN1863
Proper Shipping Name	FUEL, AVIATION, TURBINE ENGINE
Hazard Class	Class 3 Flammable Liquid
Packing Group	PG II
Shipping Description	FUEL, AVIATION, TURBINE ENGINE Class 3 UN1863 PG II

15. REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and the MSDS contains all the information required by the *Controlled Products Regulations*.

WHMIS Class:	Class B2 Flammable Liquid Class D2B Other Toxic Effects - Skin Irritant Class D2A Other Toxic Effects - Carcinogen
DSL/NDL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	No Canadian federal standards.

16. ADDITIONAL INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Irritating to skin.
Contains Benzene.
May cause cancer.

SHELL JET B

141-012

Revision Number: 5

Handling Statement:	Eliminate all ignition sources. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Avoid prolonged exposure to vapours. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This MSDS has been reissued in the ANSI Z400.1 standard format.



Material Safety Data Sheet

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing	TDG (pictograms)
	A, B-1		

Section 1. Chemical Product and Company Identification

Product Name	PROPANE		
Synonym	Propane HD-5, Propane commercial, Dimethylmethane, Propyl hydride, Liquefied Petroleum Gas (LPG), Alkane, C3H8		
Supplier	ICG PROPANE Suite 200, 19433 96th Avenue Surrey, BC V4N 4C4		<u>In case of emergency:</u> ICG Propane Inc. 1-800-424-8807
Material Uses	Propane is used as a fuel gas, refrigerant and as a raw material for organic synthesis. The grade determines the propane content. It is supplied as pressurized liquid in tanks and cylinders.		

Section 2. Composition and Information on Ingredients

Name	CAS #	% (V/V)	Exposure Limits (ACGIH)		
			TLV-TWA (8 h)	STEL	CEILING
Propane	74-98-6	>90	4508 mg / m ³ . (2500 PPM - 1998 Occupational Exposure Limit)	Not applicable	Not applicable
Propylene **	115-07-1	<5	Simple asphyxiant	Not applicable	Not applicable
Butane	108-97-8	<3	800 ppm	Not applicable	Not applicable
Ethane	74-84-0	0-5	Simple asphyxiant	Not applicable	Not applicable
Ethyl mercaptan	75-08-1	<50 ppm	0.5ppm	Not applicable	Not applicable
*Propane commercial contains more propylene					
**Propylene may not be present					
Supplier Recommendation	Recommends a maximum exposure level of 2500 ppm (4508 mg/m ³) for 8 hours time weighted average when handling propane based on 1996 ACGIH notice of intended change for propane. Consult local authorities for acceptable exposure limits.				
Other Exposure Limits	Consult local, provincial or territory authorities for acceptable exposure limits.				

Section 3. Hazards Identification

Potential Health Effects	The health effects caused by exposure to propane are much less serious than its fire and explosion risk. Propane is essentially nontoxic in concentrations less than the lower explosive limit, but at very high concentrations it is a simple asphyxiant and displaces oxygen from the breathing atmosphere. Lack of oxygen may cause dizziness, headaches, diminished awareness, faulty judgement, increasing fatigue, impaired muscular coordination progressing to convulsions, coma and death. A person working around propane in an enclosed space or in close proximity to a propane source (filling cylinders, purging lines and lighting / adjusting pilot lights, etc.) who feels "light-headed", "dizzy", "drunken" or a little intoxicated should realize this effect may be due to a dangerously high level of propane vapours (in the explosive range) and go immediately into fresh air. Direct contact with escaping gas or liquefied gas can result in freezing burns or frost bite to skin and eyes. For more information, refer to Section 11.
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Section 4. First Aid Measures

Eye Contact	If the eye tissue is frozen, seek medical attention immediately; if tissue is not frozen, immediately and thoroughly flush the eyes with running water for at least 15 minutes, keeping eyelids open. If irritation, pain, swelling, or crying has occurred, get medical attention.
Skin Contact	Exposure to rapidly expanding gas or vaporizing liquid may cause frostbite (cold burns). If frostbite has occurred, do not rub the affected areas or flush them with water, but thaw frosted parts by soaking in water. In order to prevent further tissue damage, do not attempt to remove frozen clothing from frostbitten areas. If frostbite has not occurred, immediately and thoroughly wash contaminated skin with soap and water.
Inhalation	Evacuate the victim to fresh air at once. If the victim is not breathing, perform mouth-to-mouth resuscitation. Administer oxygen if available. Keep the victim warm and at rest. Seek medical attention as soon as possible.
Ingestion	Since the product is a gas and that it is mostly probable that it will be inhaled more than ingested, please consider to look first at the preventive measures in case of inhalation.
Note to Physician	Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for respiratory tract irritation, bronchitis, or pneumonitis. Monitor blood gases to assure adequate ventilation. If vital signs become abnormal or symptoms develop obtain a chest x-ray.

PROPANE

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Section 5. Fire-fighting Measures

Flammability	Class I - flammable gas (NFPA).	Flammable Limits	LOWER: 2.4%, UPPER: 9.5%, (B149.2M95).
Flash Points	CLOSED CUP: -104.4°C (-156°F) (NFPA).	Auto-Ignition Temperature	493 - 549°C (920 - 1020°F). (B149.2M95).
Fire Hazards in Presence of Various Substances	Extremely 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. Rapid escape of vapour may generate static charge causing ignition.	Explosion Hazards in Presence of Various Substances	Can react vigorously with oxidizing materials. Severe explosion hazard when exposed to chlorine dioxide. Vapour explosion hazard indoors, outdoors or in sewers. Do not cut, weld, heat, drill or pressurize empty container.
Products of Combustion	Burns with a luminous, smoky flame. Carbon oxides (CO, CO ₂), smoke and irritating fumes as products of incomplete combustion.		
Fire Fighting Media and Instructions	CAUTION This product has a low flash point. Use of water spray when fire may be inefficient. Cool containing vessels with water spray, do not use jet spray, in an effort to prevent pressure build up, auto ignition, or explosion. Small fire use dry chemical, CO ₂ , water spray or foam. Large fire, use water spray, fog, or foam. 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. Allow gas to burn if it cannot be shut off safely. If this is impossible, withdraw from area & let fire burn under controlled conditions. Withdraw immediately in case of rising sound from venting safety relief valve. For small outdoor fires, portable fire extinguishers may be used and Self Contained Breathing Apparatus may not be required. For all indoor fires, and any significant outdoor fires, SCBA is required. Respiratory and eye protection are required for fire fighting personnel. Handle damaged cylinders with extreme care.		

Section 6. Accidental Release Measures

Material Release or Spill	NAERG96, GUIDE 115, Flammable Gas. ELIMINATE ALL IGNITION SOURCES. Ventilate closed spaces. Avoid contact. Stop leak if without risk. By forced ventilation, maintain concentration of gas below the range of explosive mixture. Remove the tank or cylinder to an open area. Leave to bleed off in the atmosphere. Use water spray to reduce vapours. Isolate area until gas has disappeared. Check with applicable jurisdiction for specific disposal requirements of spilled material and empty containers. Notify the appropriate authorities immediately.
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Section 7. Handling and Storage

Handling	Keep away from heat, spark, open flames and other sources of ignition. Empty container may contain flammable/explosive residues or vapours. DO NOT reuse empty containers without commercial cleaning or reconditioning. Ground/bond line and equipment during pumping or transfer to avoid accumulation of static charge. Keep away from incompatibles such as oxidizing agents (peroxides, chlorine). Avoid inhalation of vapours and skin or eye contact with liquid. Practice good personal hygiene. Wash hands after handling and before eating. Launder work clothes frequently. Discard saturated leather goods SPECIAL PRECAUTIONS: Sludges and tank scale from propane storage tanks, trucks, rail cars, and filters/screens may contain naturally occurring radioactive material ("NORM") in the form of lead, 210. Similarly, equipment used for the transfer of propane such as product pipelines, pumps and compressors, may have detectable levels of radioactive lead 210 on inner surfaces. Workers involved in cleaning, repair or other maintenance on inner surfaces of such equipment should avoid breathing dust generated from such activities. Suitable codes of practice should be developed for these activities, detailing appropriate occupational hygiene and disposal practices.
Storage	Transport and store cylinders and tanks secured in an upright position in a ventilated space. Cylinders that are not in use must have the valves in closed position and be equipped with a protective cap or collar. Do not store with oxidizing agents, oxygen or chlorine cylinders. Transport, handle and store according to applicable Federal and Provincial regulations (i.e. CAN/CGA B149.2 Propane Installation Code and TDG regulations.)

Section 8. Exposure Controls/Personal Protection

Engineering Controls	For normal outdoor application, special ventilation is not necessary. For indoor or confined spaces, provide explosion-proof local exhaust ventilation (as per the CAN/CGA B149.2 Propane Installation Code), adequate oxygen (at least 18% by volume), and flame-proof electrical switches and lighting system. Make-up air should always be supplied to balance air removed by exhaust ventilation.
Personal Protection	
Eyes	Face shield, safety glasses or chemical splash goggles in case of splashing.
Body	Wear appropriate loose clothing with closed neck and long sleeves to prevent the skin from becoming frozen from contact with the liquid or from contact with vessels containing the liquid.
Respiratory	When exposure is likely to exceed recommended exposure limit (see section #2), use NIOSH approved respirator. Respirator should be selected based on the form and concentration of containment in air (refer to NIOSH Pocket Guide for Chemical Hazard for respirator selection). In order to determine the concentration of the containment, air sampling is recommended and should be performed by a health and safety specialist (as per the NIOSH Manual of analytical methods for method of measurement). If air sampling is not practical and concentration is unknown, use SCBA.
Hands	Wear insulated gloves to prevent frostbite.
Feet	Safety boots or shoes.

PROPANE

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Section 9. Physical and Chemical Properties

Physical State & Appearance	Gas at room temperature; liquid when stored under pressure.	Viscosity	Not applicable.
Colour	Colourless.	Pour Point	Not applicable.
Odour	Odourless gas in natural state at any concentration. Propane sold for fuel purposes under pressure usually has an odourant added to it. This odourant is usually a mercaptan, which has an odour similar to "rotten eggs" or "skunk". The odourant level is such that it is noticeable below the Lower Exposure Limit (LEL) of the propane. WARNING: Studies have shown that not all persons are sensitive to the skunky smell and may not be able to detect this warning device!	Softening Point	Not applicable.
Odour Threshold	Odour is not an adequate warning to prevent overexposure to propane. Prolonged exposure to mercaptans can cause olfactory desensitization.	Dropping Point	Not applicable.
Boiling Point	-42°C (-44°F).	Penetration	Not applicable.
Density	0.51 Kg/L @ 15°C (Water = 1).	Oil/Water Dist. Coeff	Log Kow: 2.36; mobile.
Vapour Density	1.56 @ 0°C (32°F), 1.8 @ 20°C (68°F) Air = 1.	Ionicity (in water)	Not applicable.
Vapour Pressure	<10763 mmHg @ 100°F (<1435 kPa @ 38°C).	Dispersion Properties	Not available.
Volatility	Volatile	Solubility	62ppm in water at 25°C (77°F), slightly soluble in acetone. Soluble in benzene, ether, alcohols, chloroform.

Section 10. Stability and Reactivity

Corrosivity	Non-corrosive		
Stability	The product is stable under normal handling and storage conditions.	Hazardous Polymerization	Will not occur under normal conditions.
Incompatible Substances/ Conditions to Avoid	Highly reactive with oxidizing agents (peroxides, chlorine).	Decomposition Products	Releases of Co., smoke and irritating fumes when heated to decomposition

Section 11. Toxicological Information

Routes of Entry	Inhalation, skin contact and eye contact.
Acute Lethality	Simple asphyxiant. LC50 (Inhalation/human): no effect for 10,000 ppm (1%) break exposure; slight dizziness in a few minutes at 100,000 ppm (10%).
Chronic or Other Toxic Effects	
Dermal Route:	Low dermal penetration. Skin irritation has not been shown even with twice daily application for 12 weeks in human volunteers.
Inhalation Route:	Subchronic inhalation studies in monkeys show no evidence of organs toxicity or abnormalities.
Oral Route:	No studies were found.
Eye Irritation/Inflammation.	None.
Immunotoxicity.	No studies were found.
Skin Sensitization:	No studies were found.
Respiratory Tract Sensitization:	No studies were found.
Mutagenic:	Not mutagenic in the Salmonella typhimurium/microsome assay (Ames test).
Reproductive Toxicity:	No studies were found.
Teratogenicity/Embryotoxicity:	No studies were found.
Carcinogenicity (ACGIH)	Simple asphyxiant.
Carcinogenicity (IARC)	No studies were found.
Carcinogenicity (NTP)	No studies were found.
Carcinogenicity (IRIS)	No studies were found.
Carcinogenicity (OSHA)	No studies were found.

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Other Considerations	Acts as a simple asphyxiant – inert gas or vapour. The narcotic or intoxicated effect of a simple asphyxiant may impair a person's judgement, but it is temporary and will rapidly disappear in fresh air. Persons with anemia or other conditions of reduced oxygen-carrying capacity may be more sensitive. Propane producers and distributors may, from time to time, add small amounts of methanol to the propane to overcome water and freezing problems. Methanol may accumulate in liquid residues in propane piping and storage vessels. Please refer to a methanol Material Safety Data Sheet (MSDS) for further details concerning methanol.		
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Section 12. Ecological Information

Environmental Fate	Volatilizes and disperses rapidly. Volatilization is expected to be the dominant fate process.	Persistence/Bioaccumulation Potential	Propane is readily biodegraded by soil bacteria (<i>Microbacterium vaccae</i>). The degradation of propane is similar to the degradation of fatty acids.
BOD5 & COD	Not available.	Products of Biodegradation	Not available.
Additional Remarks	Henry's Law constants for propane has been calculated to be 7.07×10^{-1} atm-m ³ /mole @ 25°C. These mean that propane may rapidly volatilize from water and moist soil to the atmosphere. The estimated half-life for evaporation of propane from a model river (1m deep flowing 1m/s with a wind speed of 3 m/s) and a model pond are 1.9 hrs. and 2.3 hrs., respectively.		

Section 13. Disposal Considerations

Waste Disposal	Preferred waste management priorities are: (1) incineration with energy recovery; (2) evaporation; (3) disposal at licensed waste disposal facility. Ensure that disposal or reprocessing is in compliance with government requirements and local disposal regulations.
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Section 14. Transport Information

TDG Classification	Shipping name: Propane or Liquefied Petroleum Gas; UN1978 or UN 1075, Class 2.1; Label required: Flammable Gas.	Special Provisions for Transport	102 Add "SPECIAL COMMODITY" to document if in car load, container load by rail. Acceptable modes of transportation, air (cargo only), rail, road and water. Not acceptable for transport by passenger aircraft.
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Section 15. Regulatory Information

Other Regulations	All components of this formulation are listed in the Domestic Substances List (DSL-Canadian) and in the Toxic Substances Control Act Inventory (TSCA-U.S.). This product is not known to contain any of the carcinogens required to be listed under OSHA hazard communication standard, 29 CFR 1910.1200 (U.S.). Not listed in EPCRA or SARA Title III, Section 313. Toxic Chemicals (40 CFR 355). Not listed in CERCLA (40 CFR 302.40). Please note that the chemical identity of some or all of the ingredients that may be listed herein is confidential business information and is being withheld as permitted by 29 CFR 1910.1200 and various State Right to Know Laws.		
DSD/DPD (Europe)	2- Risk of explosion by shock, friction, fire or other sources of ignition. 13- Extremely flammable liquefied gas. 16- Explosive when mixed with oxidizing substances. 20/21- Harmful by inhalation and in contact with skin. 35- Causes severe burns.		

COT (U.S.A.)
(Pictograms)



HMIS (U.S.A.)

Health Hazard	①
Fire Hazard	④
Reactivity	①
Personal Protection	④

NFPA (U.S.A.)



Rating

0 Insignificant
1 Slight
2 Moderate
3 High
4 Extreme

Section 16. Other Information

References	Available upon request.
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Glossary

ACGIH - American Conference of Governmental Industrial Hygienists
ASTM - American Society for Testing and Materials
BOD5 - Biological Oxygen Demand in 5 days
CAN/CGA B149.2 - Propane Installation Code
CAS - Chemical Abstract Services
CEPA - Canadian Environmental Protection Act
CERCLA - Comprehensive Environmental Response, Compensation and Liability Act
CFR - Code of Federal Regulations
CHIP - Chemical Hazard Information and Packaging Approved Supply List
COD - Chemical Oxygen Demand
CPR - Controlled Products Regulation
DOT - Department of Transportation
DSC - Dangerous Substances Classification and Labeling (Europe)

DSD/DPD - Dangerous Substance or Dangerous Preparations Directives (Europe)

DSL - Domestic Substance List

EEC/EU - European Economic Community/European Union

EINECS - European Inventory of Existing Commercial Chemical Substances

EPCRA - Emergency Planning and Community Right-to-Know Act

FDA - Food and Drug Administration

FIFRA - Federal Insecticide, Fungicide, and Rodenticide Act

HCS - Hazardous Communication System

HMIS - Hazardous Material Information System

IARC - International Agency for Research on Cancer

IRIS - Integrated Risk Information System

LD50/LC50 - Lethal Dose/Concentration kill 50%

LDLo/LCLo - Lowest Published Lethal Dose/Concentration

NAERG'96 - North American Emergency Response Guide Book (1996)

NFPA - National Fire Prevention Association

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NIOSH - National Institute for Occupational Safety & Health
NPRI - National Pollutant Release Inventory
NTP - National Toxicology Program
OSHA - Occupational Safety & Health Administration
PEL - Permissible Exposure Limit
RCRA - Resource Conservation and Recovery Act
SARA - Superfund Amendments and Reorganization Act
SD - Single Dose
STEL - Short Term Exposure Limit (15 minutes)

TDG - Transportation Dangerous Goods (Canada)
TDLo/TCLo - Lowest Published Toxic Dose/Concentration
TLV-TWA - Threshold Limit Value - Time Weighted Average
TSCA - Toxic Substances Control Act
USEPA - United States Environmental Protection Agency
USP - United States Pharmacopoeia
WHMIS - Workplace Hazardous Material Information System

Information Contact ICG Propane Inc. 1-800-424-8807

Prepared by: Williams 99/12/09

Data entry by: Data Business Forms

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein. Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.