

APPENDIX P

Crude Oil Material Safety Data Sheets

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Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Dilbit
Synonyms: Diluted Bitumen; AWB – Access Western Blend; Pipeline Sales Oil.
Product Use: Base product for Petroleum Refining.
Manufacturer/Supplier: MEG Energy Corp.
 Christina Lake Regional Project
 P.O Box 21008
 Fort McMurray, AB
 T9H 5B2
Phone Number: 403-770-5596
Emergency Phone: MEG Emergency Number: 1-800-575-1400
 FOR EMERGENCIES INVOLVING DANGEROUS GOODS Call CANUTEC's
 24-hr Number: 613-996-6666
Date of Preparation: August 31, 2011

Section 2: HAZARDS IDENTIFICATION
EMERGENCY OVERVIEW

DANGER
 HARMFUL OR FATAL IF SWALLOWED. CAN ENTER
 LUNGS AND CAUSE DAMAGE. CANCER HAZARD – CAN
 CAUSE CANCER. IRRITATING TO EYES AND SKIN.

Colour: Light to dark brown.
Physical State: Liquid.
Odour: Hydrocarbon.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

Likely Routes of Exposure: Eye contact. Skin contact. Inhalation. Ingestion. Skin absorption.

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H₂S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Hydrogen sulphide

may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Chronic Effects: See Section 11 for more information.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Reproductive system. Nervous system.

Potential Environmental Effects: See Section 12 for more information.

This material is considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Component	CAS No.	Wt. %
Petroleum	8002-05-9	60 - 100
Hexane	110-54-3	5 - 10
Benzene	71-43-2	1 - 5
Toluene	108-88-3	1 - 5
Xylenes	1330-20-7	0.5 - 1.5
Benzene, ethyl-	100-41-4	0.1 - 1
Hydrogen sulfide (H ₂ S)	7783-06-4	< 0.1

Section 4: FIRST AID MEASURES

- Eye Contact:** Flush eyes with plenty of water for at least 15 minutes. If signs/symptoms persist, get medical attention.
- Skin Contact:** Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. If signs/symptoms develop, get medical attention.
- Ingestion:** Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.
- Inhalation:** Remove person to fresh air. If breathing has stopped apply artificial respiration. If signs/symptoms develop, get medical attention.
- General Advice:** In case of accident or if you feel unwell, seek medical advice immediately (show the label or MSDS where possible).
- Note to Physicians:** Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Flammable liquid by OSHA criteria. Released vapours may form flammable/explosive mixtures. Vapours may travel considerable distances to ignition sources and cause a flash fire. Cool containing vessels with water jet in order to prevent pressure build-up, auto-ignition or explosion.

Means of Extinction

Suitable Extinguishing Media: Dry chemical, foam, water fog, carbon dioxide.

Unsuitable Extinguishing Media:	Do not use water except as a fog.
Products of Combustion:	Oxides of carbon. Oxides of sulphur. Aldehydes.
Protection of Firefighters:	Keep upwind of fire. Wear full fire fighting turn-out gear (full Bunker gear) and respiratory protection (SCBA). Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces.
Explosion Data	
Sensitivity to Mechanical Impact:	This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge:	This material is sensitive to static discharge at temperatures above the flash point.

Section 6: ACCIDENTAL RELEASE MEASURES

Personal Precautions:	Evacuate all unnecessary personnel. Stay upwind. Eliminate all ignition sources. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Don full-face, positive pressure, self-contained breathing apparatus.
Environmental Precautions:	Keep out of drains, sewers, ditches, and waterways.
Methods for Containment:	Stop leak if without risk. Contain spill and absorb with inert absorbent. Large pools may be covered with foam to prevent vapour evolution. Do not flush to sewer or allow to enter waterways.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material. Large spills should be removed with explosion proof vacuum equipment.
Other Information:	Dispose of in accordance with all federal, provincial and local regulations. Comply with federal, provincial, and local requirements for spill and/or release notification.

Section 7: HANDLING AND STORAGE

Handling:

Do not swallow. Do not get in eyes, or on skin. All equipment used when handling the product must be grounded. Handle and open container with care. When using do not eat or drink. Wash hands before eating, drinking, or smoking. Harmful concentrations of hydrogen sulfide (H₂S) gas can accumulate in excavations and low-lying areas as well as the vapour space of storage and bulk transport compartments. See Section 8 for information on Personal Protective Equipment.

Storage:

Store in cool, dry, well-ventilated area away from incompatible materials, heat, and sources of ignition. All storage containers and pumping equipment should be grounded. Keep out of the reach of children. Head spaces in storage containers may contain toxic hydrogen sulphide gas. Structural materials and lighting and ventilation systems should be corrosion resistant.

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION**Exposure Guidelines****Component****Petroleum**

- (8002-05-9) **ACGIH:** Exposure by all routes should be carefully controlled to levels as low as possible (2009); For Mineral oil, excluding metal working fluids; Poorly and mildly refined
- (8002-05-9) **OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA);
400 ppm (TWA) [Vacated]

Hexane

- (110-54-3) **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)
- (110-54-3) **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin.
50 ppm (TWA) [Vacated]

Benzene

- (71-43-2) **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)
- (71-43-2) **OSHA:** 1 ppm (TWA); 5 ppm (STEL);

Toluene

- (108-88-3) **ACGIH:** 20 ppm (TWA); A4; BEI (2006)
- (108-88-3) **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated]

Xylenes

- (1330-20-7) **ACGIH:** 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)
- (1330-20-7) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);
150 ppm (STEL) [Vacated]

Benzene, ethyl-

- (100-41-4) **ACGIH:** 20 ppm (TWA); A3; BEI (2010)
- (100-41-4) **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);
125 ppm (STEL) [Vacated]

Hydrogen sulfide (H₂S)

- (7783-06-4) **ACGIH:** 1 ppm (TWA); 5 ppm (STEL); (2009)
- (7783-06-4) **OSHA:** 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.)
10 ppm (TWA); 15 ppm (STEL) [Vacated]

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

Engineering Controls:

Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof ventilation equipment.

Personal Protective Equipment**Eye/Face Protection:**

Wear safety glasses. Ensure that eyewash stations are close to the workstation location.

Hand Protection:	Wear impervious gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear suitable protective clothing. Flame resistant clothing such as Nomex ® is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Viscous liquid.
Colour:	Light to dark brown.
Odour:	Hydrocarbon.
Odour Threshold:	0.00047 ppm, (H ₂ S)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	60.7 cSt @ 40 °C
Melting Point:	Not available.
Boiling Point:	34.9 °C to 720 °C
Flash Point:	Not available.
Evaporation Rate:	Not available.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	> 1 (Air = 1)
Specific Gravity:	0.9178 (Water = 1) @ 15 °C
Density:	917.0 kg/m ³ @ 15 °C
Solubility in Water:	Insoluble.
Coefficient of Water/Oil Distribution:	Not measurable. Product is more soluble in oil.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	Non-volatile.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

- Stability:** Stable under normal storage conditions.
- Conditions of Reactivity:** Contact with incompatible materials. Sources of ignition. Exposure to heat.
- Incompatible Materials:** Strong oxidizers.
- Hazardous Decomposition Products:** Not available.
- Possibility of Hazardous Reactions:** None known.

Section 11: TOXICOLOGICAL INFORMATION
EFFECTS OF ACUTE EXPOSURE
Component Toxicity

Component	CAS No.	LD ₅₀ oral	LD ₅₀ dermal	LC ₅₀
Petroleum	8002-05-9	4300 mg/kg, (rat)	Not available.	Not available.
Hexane	110-54-3	25000 mg/kg, (rat)	Not available.	48000 ppm, (rat), 4H
Benzene	71-43-2	930 mg/kg, (rat)	>9400 µl/kg, (rabbit)	10000 ppm, (rat), 7H
Toluene	108-88-3	600 mg/kg, (rat)	14.1 mL/kg, (rabbit)	49000 mg/m ³ , 4H, (rat)
Xylenes	1330-20-7	>1700 mg/kg, (rat)	4300 mg/kg, (rabbit)	5000 ppm, (rat), 4H
Benzene, ethyl-	100-41-4	3500 mg/kg, (rat)	17800 µl/kg, (rabbit)	Not available.
Hydrogen sulfide (H ₂ S)	7783-06-4	Not available.	Not available.	444 ppm, (rat),

Eye: Irritating to eyes. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision. Hydrogen sulphide may cause eye irritation at 1-20 ppm and acute conjunctivitis at higher concentrations. Above 50 ppm H₂S, eye irritation may include symptoms of redness, severe swelling, tearing, sensitivity to light and the appearance of 'Halos' around lights.

Skin: Irritating to skin. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Harmful or fatal: may cause lung damage if swallowed. Swallowing the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. May cause headache, dizziness, confusion, loss of appetite and loss of consciousness. Inhalation of Toluene may result in peculiar skin sensations (e. g. pins and needles) or numbness. Hydrogen sulphide may cause symptoms such as digestive upset and loss of appetite, loss of sense of smell and pulmonary edema. At 500-1000 ppm Hydrogen sulphide may cause respiratory paralysis, collapse and death without rescue.

Skin Sensitization: Not hazardous by OSHA/WHMIS criteria.

Respiratory Sensitization: Not hazardous by OSHA/WHMIS criteria.

EFFECTS OF CHRONIC EXPOSURE

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Kidneys. Reproductive system. Nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effects. Long term inhalation of Benzene, Toluene or Xylene vapours can result in bone marrow abnormalities with damage to blood forming tissues and may cause anemia and other blood cell abnormalities. Immunodepressive effects have also been reported. Repeated exposure of the eyes to high concentrations of Xylenes vapour may cause reversible eye damage. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation; damage to cardiovascular system.

Carcinogenicity: Hazardous by OSHA/WHMIS criteria. May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Petroleum	A2	Group 3	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Xylenes	A4	Group 3	Not listed.	Not listed.	Not listed.
Benzene, ethyl-	A3	Group 2B	Not listed.	OSHA Carcinogen	Listed.
Hydrogen sulfide (H ₂ S)	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.

Mutagenicity: Hazardous by OSHA/WHMIS criteria. May cause heritable genetic damage.

Reproductive Effects: Possible risk of impaired fertility. Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Not hazardous by OSHA/WHMIS criteria.

Embryotoxicity: Hazardous by OSHA/WHMIS criteria. Possible risk of harm to the unborn child. Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumours. Benzene and Xylene have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity:	21 and 41 mg/l, 96 hr., Rainbow trout; 2.7 and 4.1 mg/l, 96 hr., Mysid; 122 and 528 ml/kg, 96 hr., Algae.
Persistence / Degradability:	Not available.
Bioaccumulation / Accumulation:	Not available.
Mobility in Environment:	Not available.

Section 13: DISPOSAL CONSIDERATIONS

Disposal Instructions: Disposal should be in accordance with applicable regional, national and local laws and regulations. Local regulations may be more stringent than regional or national requirements.

Section 14: TRANSPORTATION INFORMATION**CFR**

Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, I
Class: 3
UN Number: 1267
Packing Group: I
Label Code:

**TDG**

Proper Shipping Name: PETROLEUM CRUDE OIL, 3, UN 1267, I
Class: 3
UN Number: 1267
Packing Group: I
Label Code:

**Section 15: REGULATORY INFORMATION****Chemical Inventories****US (TSCA)**

The components of this product are in compliance with the chemical notification requirements of TSCA.

Canada (DSL)

The components of this product are in compliance with the chemical notification requirements of the NSN Regulations under CEPA, 1999.

Federal Regulations
Canada

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 Classification:

- Class B2 - Flammable Liquids.
- Class D2A - Carcinogenicity.
- Class D2A - Embryotoxicity.
- Class D2A - Mutagenicity.
- Class D2A - Chronic toxic effects.
- Class D2B - Skin irritant.
- Class D2B - Eye irritant.

Hazard Symbols:

United States

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Petroleum	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Hexane	Not listed.	Not listed.	5000	313 & X	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Xylenes	Not listed.	Not listed.	100	313	U239	Not listed.
Benzene, ethyl-	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Hydrogen sulfide (H2S)	500	100	100	313s	U135	10000

State Regulations
Massachusetts

US Massachusetts Commonwealth's Right-to-Know Law (Appendix A to 105 Code of Massachusetts Regulations Section 670.000)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	E
Toluene	108-88-3	Listed.
Xylenes	1330-20-7	Listed.
Benzene, ethyl-	100-41-4	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E

Note: E = Extraordinarily Hazardous Substance

New Jersey

US New Jersey Worker and Community Right-to-Know Act (New Jersey Statute Annotated Section 34:5A-5)

Component	CAS No.	RTK List
Petroleum	8002-05-9	SHHS
Hexane	110-54-3	SHHS
Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Xylenes	1330-20-7	SHHS
Benzene, ethyl-	100-41-4	SHHS
Hydrogen sulfide (H ₂ S)	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

US Pennsylvania Worker and Community Right-to-Know Law (34 Pa. Code Chap. 301-323)

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	ES
Toluene	108-88-3	E
Xylenes	1330-20-7	E
Benzene, ethyl-	100-41-4	E
Hydrogen sulfide (H ₂ S)	7783-06-4	E

Note: E = Environmental Hazard; S = Special Hazardous Substance

California
California Prop 65: WARNING: This product contains chemicals known to the State of California to cause cancer, birth defects or other reproductive harm.

Component	Type of Toxicity
Benzene	developmental, male & cancer
Toluene	developmental & female
Benzene, ethyl-	cancer
Polycyclic Aromatic Hydrocarbons	cancer
Nickel	cancer

Section 16: OTHER INFORMATION
Disclaimer:

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his own particular use.

Expiry Date: August 30, 2014

Version: 1.0

MSDS Prepared by: Deerfoot Consulting Inc.

Phone: (403) 720-3700

Nebraska Department of Environmental Quality 20.0---AMENDED

Reference: Nebraska Supplement Environmental Report

ER Section: Appendix N, Crude Oil Fact Sheets

Comment:

A wide range of percentages is presented for xylene in Appendix N.

Requested Information:

Verify the range of values presented in Appendix N for percentage of xylene in light and heavy crude oils.

Response: AMENDED RESPONSE:

The Fact Sheet data has been reviewed and subsequently revised to show a xylene range of 0.1% to a maximum of 1.5% for both light and heavy crude oils. A copy of the revised Fact Sheets is attached.

TransCanada Keystone Pipeline LP Light Oil MSDS



1. Product and Company Identification

Product Name: Typical Light Oil
Synonyms: Not Available
Intended Use: Chemical feedstock
Chemical Family: Blend of Medium Crude and Synthetic Crude
Supplier: TransCanada Keystone Pipeline LP
450 – First Street S.W.,
P.O. Box 1000, Station M Calgary, Alberta, CANADA, T2P 4K6
Emergency Phone: 1-800-982-7222 (24 Hour)

2. Composition/Information on Ingredients

Hazardous Ingredients:

Name	CAS#	TWA (ppm)	TWA (Mg/M ³)	Exposure Limits STEL (ppm)	STEL (Mg/M ³)	CEIL (ppm)	CEIL (Mg/M ³)	% by Weight
Crude Oil (Hydrocarbon C5 and C6 Rich)	8002-05-09	100	n/av	n/av	n/av	n/av	n/av	100
Hydrogen Sulfide	7783-06-04	10	14	15	21	20	28	<0.5
Benzene	71-43-2		3.2		16			0.1-1.0
Toluene	108-88-3	50	188					1-5
Xylene	1330-20-7							0.1-1.5

Toxicity values of the hazardous ingredients

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide (H₂S) LC50 Inhalation Mouse = 673 ppm 1 hour. LC50 Inhalation Rat = 444 ppm for 4 hours

Benzene. LD50 Oral rat = 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat = 4300 mg/Kg. LC50 Inhalation rat = 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat = 5000 mg/Kg. LC50 Inhalation rat = 8000 ppm for n4 hrs. LD50 Dermal rabbit = 14000 mg/Kg.

3. First Aid Measures

Eye: Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.

Skin: Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention if irritation develops.

Inhalation (Breathing): Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.

Ingestion (Swallowing): If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

4. Protective Clothing

Respiratory: Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H₂S may be present.

Skin: Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

Eye: Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

Other: As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.

5. Physical Data

Appearance:	Amber to Black
Physical State:	Liquid
Odour:	Petroleum Odor
Vapor Pressure (mm Hg):	155 - 620
Vapor Density:	>1
Boiling Point/Range:	-90°C - 1100°C
Freezing/Melting Point:	Not Available
Solubility in Water:	Not Available
Specific Gravity:	0.82-0.90 (Water =1)
Percent Volatile:	100 vol.%
pH (1% soln/water)	Not Applicable
Odor Threshold	0.13 ppm H ₂ S
Freezing Point	Not Available
Molecular Weight	Not Applicable
Melting Point	Not available
Density (kg/m³)	820-900
Evaporation Rate (nButAc=1):	Not Available

6. Stability and Reactivity

Stability: This product is stable

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.

Hazardous Polymerization: Will not occur

Materials to Avoid (Incompatible Materials): Strong acids, strong oxidizers, chlorine.

7. Toxicological Information

Routes of entry: Ingestion, inhalation, eye contact, skin contact.

TLV: TLV-TWA 100 PPM (525 mg/m³) for stoddard solvent from ACGIH.

Hydrogen Sulfide:

TWA: 10ppm, 14 mg/m³ ACGIH

STEL: 2.5 ppm STEL ACGIH

CEILING: 20 ppm, 28 mg/m³ Alberta OEL

Consult local authorities for acceptable exposure limits. Consult local authorities for acceptable exposure limits.

Benzene. TWA: (1ppm 3.2 mg/m³) STEL: 5.0 ppm (16 mg/m³) from Alberta OEL's SKIN

ACGIH (TLV) (United States) TWA 0.5 ppm. STEL 2.5 ppm (SKIN)

Toxicity to animals: Hydrocarbons C5 and C6 Rich

LD50: Not available

LC50: Not available

Hydrogen Sulphide (H₂S)

LC50 Inhalation Mouse = 673 ppm 1 hour

LC50 Inhalation RAT = 444ppm for 4 hours

Remark: No additional remark

Chronic effects: This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficient evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has fetotoxic effects in animal studies. This product contains small quantities of polycyclic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.

Remark: No additional remark

Acute effects: Sensitizing Capability: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.

Ingestion: Pulmonary aspiration hazard if swallowed and vomiting occurs.

Skin: Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.

Eyes: Eye contact with product or product vapours may result in eye irritation.

Inhalation: May cause headache, dizziness, loss of appetite and loss of consciousness. Product vapours are irritating to the respiratory tract.

Remark: This product contains small quantities of hydrogen sulphide (H₂S) gas which may collect in confined spaces. Acute effects vary with concentration of H₂S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

Synergistic: Not available

8. Fire and Explosion

Auto-ignition temperature: Not available

Flash points: CLOSED CUP: -40°C (-40°F)

Flammable Limits: Not available

Extinguishing Media: Use DRY chemicals, CO₂, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool contained vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special fire fighting procedures: Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.

Flammability: Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

Risks of explosion: This material is sensitive to static discharge. This product is not sensitive to mechanical impact.

9. Preventative Measures

Waste Disposal: Dispose of in accordance with all federal, provincial and local regulations.

Storage: Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.

Ventilation: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

Spill and Leak: Evacuate unnecessary personnel. Eliminate all ignition sources. Be alert to the potential for the presence of hydrogen sulphide gas and don appropriate protective equipment. Stop leak if safe to do so. Contain spill and absorb with inert absorbent. Large spills should be removed with explosion proof vacuum equipment. Large pools may be covered with foam to prevent vapour evolution. Comply with federal, provincial, and local requirements for spill notification.

10. Classification/Regulatory Information

TDG road/rail: TDG CLASS 3: Flammable liquid with a flash point less than or equal to 60.5°C (140.9°F). Closed cup test method.



PIN: 1267 - PETROLEUM CRUDE OIL

WHMIS: WHMIS CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

WHMIS CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

WHMIS CLASS D-2B: Material causing other toxic effects (TOXIC).



Other: This product is on the Domestic Substances List (DSL). TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.

Refer to federal, state, and local legislation for further requirements.

TransCanada Keystone Pipeline LP Heavy Oil MSDS



1. Product and Company Identification

Product Name: Typical Heavy Oil
Synonyms: Not Available
Intended Use: Chemical feedstock
Chemical Family: Blend of Heavy Petroleum Crude, Medium Crude and Synthetic Crude
Supplier: TransCanada Keystone Pipeline LP
450 – First Street S.W.,
P.O. Box 1000, Station M Calgary, Alberta, CANADA, T2P 4K6
Emergency Phone: 1-800-982-7222 (24 Hour)

2. Composition/Information on Ingredients

Hazardous Ingredients:

Name	CAS#	TWA (ppm)	TWA (Mg/M ³)	Exposure Limits STEL (ppm)	STEL (Mg/M ³)	CEIL (ppm)	CEIL (Mg/M ³)	% by Weight
Crude Oil (Hydrocarbon C5 and C6 Rich)	8002-05-09	100	n/av	n/av	n/av	n/av	n/av	100
Hydrogen Sulfide	7783-06-04	10	14	15	21	20	28	<0.5
Benzene	71-43-2		3.2		16			0.05-1.0
Toluene	108-88-3	50	188					1-5
Xylene	1330-20-7							0.1-1.5

Toxicity values of the hazardous ingredients

Crude oil (Hydrocarbons C5 and C6 Rich) LD50:4,300 mg/Kg (Rat). LC50: Not available.

Hydrogen Sulphide (H₂S) LC50 Inhalation Mouse = 673 ppm 1 hour. LC50 Inhalation Rat = 444 ppm for 4 hours

Benzene. LD50 Oral rat = 930-5600 mg/Kg. LC50 Inhalation rat = 13,700 ppm for 4 hrs.

Xylene. LD50 Oral rat = 4300 mg/Kg. LC50 Inhalation rat = 6700 ppm for 4 hrs. LD50 Dermal rabbit >2000 mg/Kg.

Toluene. LD50 Oral rat = 5000 mg/Kg. LC50 Inhalation rat = 8000 ppm for n4 hrs. LD50 Dermal rabbit = 14000 mg/Kg.

3. First Aid Measures

Eye: Flush eyes for at least 15 minutes with clean water. Patch lightly, allowing drainage. Seek medical attention.

Skin: Remove contaminated clothing. Wash skin thoroughly with soap and water. Seek medical attention if irritation develops.

Inhalation (Breathing): Protect rescuer. Move exposed person to fresh air. If breathing has stopped apply artificial respiration. Seek medical attention.

Ingestion (Swallowing): If swallowed, do not induce vomiting or give liquids. Seek immediate medical attention.

4. Protective Clothing

Respiratory: Respiratory protection may be required in poorly ventilated areas. Properly fitted air purifying masks equipped with organic vapour filters will provide protection at low concentrations. Air supplied respirators or positive pressure self contained breathing apparatus is required when atmospheric concentrations of hydrocarbon vapours are likely to exceed 10X the occupational exposure limit or when high concentrations of H₂S may be present.

Skin: Impervious gloves and clothing should be worn as appropriate to protect against skin contact. Neoprene or nitrile material is suggested.

Eye: Non-vented chemical goggles to prevent eye irritation from the solvent vapours.

Other: As required by the situation according to your companies policies and procedures. Contact your supervisor for direction.

5. Physical Data

Appearance:	Black Brown
Physical State:	Liquid
Odour:	Petroleum Odor
Vapor Pressure (mm Hg):	155 - 520
Vapor Density:	2.5 - 5.0
Boiling Point/Range:	10°C - 1000°C
Freezing/Melting Point:	Not Available
Solubility in Water:	Not Available
Specific Gravity:	0.92-0.94 (Water =1)
Percent Volatile:	100 vol.%
pH (1% soln/water)	Not Applicable
Odor Threshold	0.13 ppm H ₂ S
Freezing Point	Not Available
Molecular Weight	Not Applicable
Melting Point	Not available
Density (kg/m³)	920-940
Evaporation Rate (nButAc=1):	Not Available

6. Stability and Reactivity

Stability: This product is stable

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide and irritant fumes and gases including sulphur oxides, nitrogen oxides and aldehydes.

Hazardous Polymerization: Will not occur

Materials to Avoid (Incompatible Materials): Strong acids, strong oxidizers, chlorine.

7. Toxicological Information

Routes of entry: Ingestion, inhalation, eye contact, skin contact.

TLV: TLV-TWA 100 PPM (525 mg/m³) for stoddard solvent from ACGIH.

Hydrogen Sulfide:

TWA: 10ppm, 14 g/m³ ACGIH

STEL: 2.5 ppm STEL ACGIH

CEILING: 20 ppm, 28 mg/m³ Alberta OEL

Consult local authorities for acceptable exposure limits. Consult local authorities for acceptable exposure limits.

Benzene. TWA: (1ppm 3.2 mg/m³) STEL: 5.0 ppm (16 mg/m³) from Alberta OEL's SKIN

ACGIH (TLV) (United States) TWA 0.5 ppm. STEL 2.5 ppm (SKIN)

Toxicity to animals: Hydrocarbons C5 and C6 Rich

LD50: Not available

LC50: Not available

Hydrogen Sulphide (H₂S)

LC50 Inhalation Mouse = 673 ppm 1 hour

LC50 Inhalation RAT = 444ppm for 4 hours

Remark: No additional remark

Chronic effects: This product may contain benzene. Benzene has been classified by the international agency for research on cancer as a group 1 product indicating sufficient evidence of carcinogenicity. Studies exist which report a link to crude oil and reproductive effects including fetal tumors and menstrual disorders. This product contains small quantities of xylene. High exposure to xylene has fetotoxic effects in animal studies. This product contains small quantities of polycyclic aromatic hydrocarbons. Prolonged contact with these compounds has been associated with the induction of skin and lung tumours.

Remark: No additional remark

Acute effects: Sensitizing Capability: No effects known. Irritancy: Skin, eye and upper respiratory tract irritant.

Ingestion: Pulmonary aspiration hazard if swallowed and vomiting occurs.

Skin: Prolonged skin contact can cause defatting of the skin resulting in dry cracked skin and dermatitis.

Eyes: Eye contact with product or product vapours may result in eye irritation.

Inhalation: May cause headache, dizziness, loss of appetite and loss of consciousness. Product vapours are irritating to the respiratory tract.

Remark: This product contains small quantities of hydrogen sulphide (H₂S) gas which may collect in confined spaces. Acute effects vary with concentration of H₂S released from mild eye, nose and throat irritation at approximately 100 ppm to sudden unconsciousness or death at 500 ppm.

Synergistic: Not available

8. Fire and Explosion

Auto-ignition temperature: Not available

Flash points: CLOSED CUP: -40°C (-40°F)

Flammable Limits: Not available

Extinguishing Media: Use DRY chemicals, CO₂, or foam to extinguish fire. Water may not be an effective medium to extinguish fire. Cool contained vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special fire fighting procedures: Use supplied air or self contained breathing apparatus (SCBA) for large fires or for fires in enclosed areas.

Flammability: Highly flammable liquid. Released vapours may form flammable/explosive mixtures at or above the flash point. Vapours may travel considerable distances to ignition sources and cause a flash fire. All storage containers and pumping equipment must be grounded.

Risks of explosion: This material is sensitive to static discharge. This product is not sensitive to mechanical impact.

9. Preventative Measures

Waste Disposal: Dispose of in accordance with all federal, provincial and local regulations.

Storage: Keep away from all ignition sources. Maintain temperature below the flash point. Head spaces in storage containers may contain hydrocarbon vapours and toxic hydrogen sulphide gas.

Ventilation: Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value.

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