Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name: Fuel Gas

Synonyms: Fuel gases, refinery (CAS No. 68308-27-0).

Product Use: Intermediate stream.

Manufacturer/Supplier: Husky Lloydminster Upgrader
HWY 16 East
Lloydminster, Sask
S9V 0Z8

Phone Number: 306-825-1764

Emergency Phone: 877-262-2111

Date of Preparation: December 6, 2013

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER
FLAMMABLE GAS, MAY CAUSE FLASH FIRE.
REDUCES OXYGEN AVAILABLE FOR BREATHING.
GAS UNDER PRESSURE. MAY CAUSE FROSTBITE.
CANCER HAZARD – CAN CAUSE CANCER.
IRRITATING TO EYES AND SKIN.

Colour: Colourless.
Physical State: Gas.
Odour: Rotten eggs.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

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

Inhalation: May displace oxygen and cause rapid suffocation. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. This product contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. 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. This product contains approximately 2000 ppm mercaptans. Inhalation of high concentrations may result in nausea, headache, and unconsiousness. Memory loss, damage to the central and peripheral nervous system, tremor, convulsions and coma may result.

Eye: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result. Causes eye irritation. 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: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside. Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Not a normal route of exposure.

Medical Conditions Aggravated By Exposure: Not available.

Target Organs: Skin. Eyes. Respiratory system. Lungs. Blood. Cardiovascular system. Bone marrow. Liver. Kidneys. 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

Hazardous Ingredient(s)	CAS No.	% vol./vol.
Methane	74-82-8	15 - 40
Hydrogen	1333-74-0	15 - 40
Hydrocarbons (C2-C6)	Various	15 - 40
Hydrogen sulfide (H2S)	7783-06-4	< 0.05
Methyl mercaptan	74-93-1	< 0.2
Ethyl mercaptan	75-08-1	< 0.2

Section 4: FIRST AID MEASURES

Inhalation: If inhaled: Call a poison center or doctor if you feel unwell.

Eye Contact: If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.

Skin Contact: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. If on skin: Wash with plenty of water. Get immediate medical advice/attention. Do not rub affected area. Flush immediately with warm water. Remove non-adhering contaminated clothing. Do not remove adherent material or clothing.

Ingestion: Not a normal route of exposure.

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 gas by OSHA/WHMIS criteria. Will be easily ignited by heat, sparks or flames. Will form explosive mixtures with air. Vapors from liquefied gas are initially heavier than air and spread along ground. Vapors may travel to source of ignition and flash back. Cylinders exposed to fire may vent and release flammable gas through pressure relief devices. Containers may explode when heated. Ruptured cylinders may rocket. DO NOT EXTINGUISH A LEAKING GAS FIRE UNLESS LEAK CAN BE STOPPED. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

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

Means of Extinction

Suitable Extinguishing Media: Small Fire: Dry chemical or CO2.

Large Fire: Water spray or fog. Move containers from fire area if you can do it without risk.

Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of carbon. Oxides of sulphur.

Protection of Firefighters: Vapors may cause dizziness or asphyxiation without warning. Some may be irritating if inhaled at high concentrations. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Fire may produce irritating and/or toxic gases. Hydrogen sulphide is heavier than air and may collect in low lying areas and confined spaces. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

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.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Many gases are heavier than air and will spread along ground and collect in low or

	confined areas (sewers, basements, tanks). Keep out of low areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.
Personal Precautions:	Do not touch or walk through spilled material. Use personal protection recommended in Section 8.Don full-face, positive pressure, self-contained breathing apparatus.
Environmental Precautions:	Not normally required.
Methods for Containment:	Stop leak if you can do it without risk. If possible, turn leaking containers so that gas escapes rather than liquid. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. Do not direct water at spill or source of leak.
Methods for Clean-Up:	Prevent spreading of vapors through sewers, ventilation systems and confined areas. Isolate area until gas has dispersed. CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning. DO NOT use concentrated bleach.
Other Information:	See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:
Do not breathe gas. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, and hot surfaces. – No smoking. Pressurized container: Do not pierce or burn, even after use. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in a well-ventilated place. Store locked up. Protect from sunlight. Store away from incompatible materials. See Section 10 for information on Incompatible Materials. 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

Fuel gases, refinery [CAS No. 68308-27-0]

ACGIH: No TLV established.

OSHA: No PEL established.

Methane [CAS No. 74-82-8]

ACGIH: 1000 ppm (TWA); (2001)

OSHA: No PEL established.

Hydrogen [CAS No. 1333-74-0]

ACGIH: Simple asphyxiant (1990)

OSHA: No PEL established.

Hydrocarbons (C2-C6) [CAS No. Various]

ACGIH: No TLV established.

OSHA: No PEL established.

Hydrogen sulfide (H2S) [CAS No. 7783-06-4]

ACGIH: 1 ppm (TWA); 5 ppm (STEL); (2009);

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];

Benzene [CAS No. 71-43-2]

ACGIH: 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)

OSHA: 1 ppm (TWA); 5 ppm (STEL);

Hexane [CAS No. 110-54-3]

ACGIH: 50 ppm (TWA); Skin, BEI (1996)

OSHA: 500 ppm (TWA), 1800 mg/m³ (TWA); Skin.
50 ppm (TWA) [Vacated];

Butane [CAS No. 106-97-8]

ACGIH: 1000 ppm (TWA); (2001)

OSHA: 800 ppm (TWA) [Vacated];

Methyl mercaptan [CAS No. 74-93-1]

ACGIH: 0.5 ppm (TWA); (2003)

OSHA: 10 ppm (C), 20 mg/m³ (C);
0.5 ppm (TWA) [Vacated];

Ethyl mercaptan [CAS No. 75-08-1]

ACGIH: 0.5 ppm (TWA); (2003)

OSHA: 10 ppm (C), 25 mg/m³ (C);
0.5 ppm (TWA) [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.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection: Wear safety glasses. Ensure that eyewash stations are close to the workstation location. Use equipment for eye

	protection that meets the standards referenced by OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.
Hand Protection:	Wear protective gloves. Wear cold insulating gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear protective clothing.
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 must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Transparent.
Colour:	Colourless.
Odour:	Rotten eggs.
Odour Threshold:	0.0047 ppm, (Hydrogen sulphide)
Physical State:	Gas.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	Not available.
Boiling Point:	Not available.
Flash Point:	< -18 °C (-0.4 °F) (Closed Cup)
Evaporation Rate:	Much greater than 1. (Water = 1)
Lower Flammability Limit:	4 % (Hydrogen)
Upper Flammability Limit:	76 % (Hydrogen)
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Specific Gravity:	Not available.
Density:	Not available.
Solubility in Water:	Slightly soluble in water.
Coefficient of Water/Oil Distribution:	Not available.

Auto-ignition Temperature: Not available.

Percent Volatile, wt. %: 100

VOC content, wt. %: Not available.

Section 10: STABILITY AND REACTIVITY

Stability: Stable under normal storage conditions.

Conditions of Reactivity: Contact with incompatible materials. Exposure to heat.

Incompatible Materials: Oxidizers. Halogens. Metals.

Hazardous Decomposition Products: Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.

Possibility of Hazardous Reactions: Methyl mercaptan reacts with water, steam or acids to produce toxic vapours. Ethyl mercaptan reacts violently with Calcium hypochlorite.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Fuel gases, refinery	68308-27-0	Not available.	Not available.	Not available.
Methane	74-82-8	Not available.	Not available.	Not available.
Hydrogen	1333-74-0	Not available.	Not available.	Not available.
Hydrogen sulfide	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H
Benzene	71-43-2	930 mg/kg (rat)	> 9400 µl/kg (rabbit)	10000 ppm (rat); 7H
Hexane	110-54-3	25000 mg/kg (rat)	Not available.	48000 ppm (rat); 4H
Butane	106-97-8	Not available.	Not available.	658000 mg/m³ (rat); 4H
Methyl mercaptan	74-93-1	Not available.	Not available.	675 ppm (rat); 4H
Ethyl mercaptan	75-08-1	682 mg/kg (rat)	Not available.	2770 ppm (mouse); 4H

Inhalation: May displace oxygen and cause rapid suffocation. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. This product contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. 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. This product contains approximately 2000 ppm mercaptans. Inhalation of high concentrations may result in nausea, headache, and unconsiousness. Memory loss, damage to the central and peripheral nervous system, tremor, convulsions and coma may result.

Eye: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result. Causes eye irritation. 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: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside. Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: Not a normal route of exposure.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

EFFECTS OF CHRONIC EXPOSURE

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

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. 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. Long term inhalation of Benzene 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. Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effects.

Carcinogenicity: May cause cancer. 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
Benzene	A1	Group 1	List 1	OSHA Carcinogen.	Listed.

Mutagenicity: May cause heritable genetic damage. Methyl mercaptan has been shown to cause genetic changes in experimental assays on animals.

Reproductive Effects: Not available.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Benzene has caused adverse fetal effects in laboratory animals.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

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: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT)

Proper Shipping Name: UN1964, HYDROCARBON GAS MIXTURE, COMPRESSED, N.O.S. (Methane, Hydrogen), 2.1

Class: 2.1

UN Number: UN1964

Packing Group: Not applicable.

Label Code:

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN1964, HYDROCARBON GAS MIXTURE, COMPRESSED, N.O.S. (Methane, Hydrogen), 2.1

Class: 2.1

UN Number: UN1964

Packing Group: Not applicable.

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 A - Compressed Gas.
Class B1 - Flammable Gases.
Class D2A - Carcinogenicity.
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.)
Methane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Hydrogen	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Hydrogen sulfide	500	100	100	313s	U135	10000
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Hexane	Not listed.	Not listed.	5000	313	Not listed.	Not listed.
Butane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Methyl mercaptan	500	100	100	313s	U153	10000
Ethyl mercaptan	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	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
Methane	74-82-8	Listed.
Hydrogen	1333-74-0	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E
Benzene	71-43-2	E
Hexane	110-54-3	Listed.
Butane	106-97-8	Listed.
Methyl mercaptan	74-93-1	E
Ethyl mercaptan	75-08-1	Listed.

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
Methane	74-82-8	SHHS
Hydrogen	1333-74-0	SHHS
Hydrogen sulfide (H2S)	7783-06-4	SHHS
Benzene	71-43-2	SHHS
Hexane	110-54-3	SHHS
Butane	106-97-8	SHHS
Methyl mercaptan	74-93-1	SHHS
Ethyl mercaptan	75-08-1	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
Methane	74-82-8	Listed.
Hydrogen	1333-74-0	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E
Benzene	71-43-2	ES
Hexane	110-54-3	Listed.
Butane	106-97-8	Listed.
Methyl mercaptan	74-93-1	E
Ethyl mercaptan	75-08-1	Listed.

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	cancer; developmental, male

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 their own particular use.

MSDS Expiry Date (Canada): December 5, 2016

Version: 2.0

MSDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700