Safety Data Sheet
Crude Oil, Sweet or Sour
J.P. Morgan Ventures Energy Corp.
JP Morgan Commodities Canada Corp.

1. PRODUCT AND COMPANY IDENTIFICATION

**Product Name:** Crude Oil, Sweet or Sour

**Synonyms:** Sweet Crude Oil, Sour Crude Oil, Heavy Crude Oil (Sweet or Sour), Synthetic Crude Oil (Sweet or Sour), Crude Oil Blend (Sweet or Sour), Petroleum Crude (Sweet or Sour), Field Crude (Sweet or Sour), Desalted Crude (Sweet or Sour)

**Chemical Family:** Petroleum Hydrocarbon

**Intended Use:** Refinery Feedstock

**MARPOL Annex I Category:** Crude Oils

**Supplier:**
- J.P. Morgan Ventures Energy Corp.
  383 Madison Avenue, 10th Floor
  New York, NY 10017
- JP Morgan Commodities Canada Corp.
  Suite 600, Vintage Towers II, 326 11th Avenue SW
  Calgary, Alberta
  T2R 0C5

**24 Hour Emergency Numbers:**
- Chemtrec: 800-424-9300
- JP Morgan Technical Information: 212-834-5788 (USA), 403-532-2000 (Canada)
- California Poison Control: 800-356-3219

2. HAZARDS IDENTIFICATION

**GHS Classification**
- H224 Flammable liquid – Category 1
- H304 May be fatal if swallowed and enters airways – Category 1
- H319 Eye damage/irritation – Category 2
- H335 May cause respiratory irritation – Category 3
- H336 Specific target organ toxicity (single exposure) – Category 3
- H350 Carcinogenicity – Category 1B
- H373 Specific target organ toxicity (repeated exposure) - Category 2 (bone marrow, liver, thymus)
- H411 Hazardous to the aquatic environment, chronic toxicity – Category 2

**Hazards Not Otherwise Classified**
- May contain or release poisonous hydrogen sulfide gas

**Label Elements**

**Signal Words**
- Danger

**GHS Hazard Statements**
- H225 Highly flammable liquid and vapor
- H350 May cause cancer
- H304 May be fatal if swallowed and enters airways
- H319 Causes serious eye irritation
- H336 May cause drowsiness or dizziness
- H373 May cause damage to organs through prolonged or repeated exposure
- H316 Causes mild skin irritation
- H402 Harmful to aquatic life
- H412 Harmful to aquatic life with long lasting effects

**GHS Precautionary Statements**
- P201 Obtain special instructions before use
- P202 Do not handle until all safety precautions have been read and understood
- P210 Keep away from heat/sparks/open flames/hot surfaces – no smoking
2. HAZARDS IDENTIFICATION

- **P233** Keep container tightly closed
- **P240** Ground/bond container and receiving equipment
- **P241** Use explosion-proof electrical/ventilating/lighting equipment
- **P242** Use only non-sparking tools
- **P243** Take precautionary measures against static discharge
- **P261** Avoid breathing dust/fume/gas/mist/vapours/spray
- **P264** Wash vigorously after handling
- **P271** Use only outdoors or in a well-ventilated area
- **P273** Avoid release to the environment
- **P280** Wear protective gloves/protective clothing/eye protection/face protection
- **P361, P352, P362** If on skin or hair: Remove/take off immediately all contaminated clothing. Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse.
- **P305, P351, P338** If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
- **P313** If eye irritation persists, get medical advice/attention
- **P304, P310** If swallowed: Immediately call a POISON CENTER or doctor/physician
- **P331** Do NOT induce vomiting
- **P304, P340** If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing
- **P312** Call a POISON CENTER or doctor/physician if you feel unwell
- **P370, P378** In case of fire: Use dry chemical, carbon dioxide, or foam for extinction
- **P391** Collect spillage
- **P405** Store locked up
- **P403, P233, P235** Store in a well-ventilated place. Keep container tightly closed, keep cool
- **P501** Dispose of contents/container to approved facility

3. COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS Registration No.</th>
<th>Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil</td>
<td>8002-05-9</td>
<td>100</td>
</tr>
<tr>
<td>Benzene</td>
<td>71-43-2</td>
<td>0.1 - 5</td>
</tr>
<tr>
<td>n-Butane</td>
<td>106-97-8</td>
<td>1 - 7</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>110-82-7</td>
<td>&lt; 1 - 4</td>
</tr>
<tr>
<td>Cyclopentane</td>
<td>287-82-3</td>
<td>&lt; 1 - 2</td>
</tr>
<tr>
<td>Ethyl Benzene</td>
<td>100-41-4</td>
<td>&lt; 1 - 3</td>
</tr>
<tr>
<td>n-Heptane</td>
<td>142-82-5</td>
<td>1 - 5</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>110-54-3</td>
<td>1 - 5</td>
</tr>
<tr>
<td>Hexane (all isomers)</td>
<td>mixture</td>
<td>2 - 8</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>7783-06-4</td>
<td>&lt; 0.1 - 3</td>
</tr>
<tr>
<td>Methylcyclohexane</td>
<td>108-87-2</td>
<td>1 - 4</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>&lt; 2</td>
</tr>
<tr>
<td>n-Nonane</td>
<td>111-84-2</td>
<td>1 - 4</td>
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<tr>
<td>n-Octane</td>
<td>111-65-9</td>
<td>1 - 5</td>
</tr>
<tr>
<td>n-Pentane</td>
<td>109-66-0</td>
<td>1 - 6</td>
</tr>
<tr>
<td>Polynuclear Aromatic Hydrocarbons (PAH)</td>
<td>mixture</td>
<td>&lt; 1 - 10</td>
</tr>
<tr>
<td>n-Propane</td>
<td>74-98-6</td>
<td>1 - 4</td>
</tr>
<tr>
<td>Toluene</td>
<td>108-88-3</td>
<td>&lt; 1 - 2</td>
</tr>
<tr>
<td>1,2,4 Trimethyl Benzene</td>
<td>95-63-6</td>
<td>&lt; 1 - 2</td>
</tr>
<tr>
<td>Xylene, all isomers</td>
<td>1330-20-7</td>
<td>&lt; 1 - 3</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

**Inhalation (Breathing)**
Move the exposed person to fresh air. If not breathing, clear airways and give artificial respiration. If breathing is difficult, humidified oxygen should be administered by qualified personnel. Seek medical attention if breathing difficulties continue.

**Eye Contact**
Flush eyes with water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye. Remove contact lenses, if worn, after initial flushing. Do not use eye ointment. Seek medical attention.

**Skin Contact**
Remove contaminated shoes and clothing, and flush affected areas with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists. Launder or discard contaminated clothing.

**Ingestion (Swallowing)**
Aspiration hazard. Do not induce vomiting or give anything by mouth because the material can enter the lungs and cause severe lung damage. If spontaneous vomiting is about to occur, place victim’s head below knees. If victim is drowsy or unconscious, place on the left side with head down. Do not leave victim unattended and observe closely for adequacy of breathing. Seek medical attention.

**Most Important Symptoms and Effects**

**Acute:** Headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue

**Delayed:** Dry skin and possible irritation with repeated or prolonged exposure

**Potential Acute Health Effects**

**Inhalation:** Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness or unconsciousness. This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. Hydrogen sulfide and other hazardous vapors may evolve and collect in the headspace of storage tanks or other enclosed vessels. The smell disappears rapidly because of olfactory fatigue so odor may not be a reliable indicator of exposure. Effects of overexposure include irritation of the eyes, nose, throat and respiratory tract, blurred vision, photophobia (light sensitivity) and pulmonary edema (fluid accumulation in lungs). Severe exposures can result in nausea, vomiting, muscle weakness or convulsions, respiratory failure and death.

**Eye Contact:** This product can cause eye irritation from short-term contact with liquid, mists or vapors. Symptoms include stinging, watering, redness and swelling. Effects may be more serious with repeated or prolonged contact. Hydrogen sulfide vapors may cause moderate to severe eye irritation and photophobia (light sensitivity).

**Skin Contact:** This product is a skin irritant. Contact may cause redness, itching, burning and skin damage. This material may contain polynuclear aromatic hydrocarbons that have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to an exaggerated sunburn, and is temporary in duration if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples) and possible skin cancers.

**Ingestion:** Ingestion may result in nausea, vomiting, diarrhea and restlessness. Aspiration (inadvertent suction) of liquid into the lungs must be avoided as even small quantities in the lungs can produce chemical pneumonitis, pulmonary edema or hemorrhage and even death.

**Potential Chronic Health Effects**

Chronic effects of overexposure are similar to acute effects including central nervous system (CNS) effects and CNS depression. Effects may also include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting and skin dermatitis.
4. FIRST AID MEASURES

**Notes to Physician**

This material may contain or liberate hydrogen sulfide. In high doses, hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis. The first priority in treatment should be providing adequate ventilation and administering 100% oxygen. If unresponsive to supportive care, nitrites (amyl nitrite by inhalation or sodium nitrite by i.v.) may be an effective antidote, if delivered within the first few minutes of exposure. For adults, the dose is 10 ml of a 3NaNO₂ solution (0.5 gm NaNO₂ in 15 ml water) IV over 2 to 4 minutes. The dosage should be adjusted in children or in the presence of anemia and methemoglobin levels, arterial blood gases, and electrolyties should be monitored.

Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of hydrocarbon solvents (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

Ingestion of this product or subsequent vomiting may result in aspiration of light hydrocarbon liquid, which may cause pneumonitis. Inhalation overexposure can produce toxic effects, monitor for respiratory distress. If cough or breathing difficulties develop, evaluate for upper respiratory tract inflammation, bronchitis and pneumonitis.

Skin contact may aggravate an existing dermatitis. High pressure injection injuries may cause necrosis of underlying tissue regardless of superficial appearance.

Federal regulations (29 CFR 1910.1028) specify medical surveillance programs for certain exposures to benzene above the action level or PEL (specified in Section (i)(1)(i) of the Standard). In addition, employees exposed in an emergency situation shall, as described in Section (i)(4)(i), provide a urine sample at the end of the shift for measurement of urine phenol.

5. FIRE FIGHTING MEASURES

**Flammability Classification**

OSHA Classification (29 CFR 1910.1200): Flammable Liquid

NFPA Class-1B Flammable Liquid

NFPA Ratings: Health: 3, Flammability: 3, Reactivity: 0

**Flash Point**

< 38°C, < 100°F (ASTM D-56)

**Flammable Limits**

Lower Limit: 1.1%

Upper Limit: 6.0%

**Autoignition Temperature**

310°C, 590°F

**Combustion Products**

Highly dependent on combustion conditions. Fume, smoke, carbon monoxide, carbon dioxide, sulfur and nitrogen oxides, aldehydes and unburned hydrocarbons.

**Fire and Explosion Hazards**

This material is extremely flammable and can be ignited by heat, sparks, flames or other sources of ignition (e.g., static electricity, pilot lights, mechanical/electrical equipment and electronic devices such as cell phones, computers, calculators and pagers which have not been certified as intrinsically safe). Vapors are heavier than air and can accumulate in low areas. May create vapor/air explosion hazard indoors, in confined
5. **FIRE FIGHTING MEASURES**

Spaces, outdoors or in sewers. Vapors may travel considerable distances to a remote source of ignition where they can ignite, flash back or explode. Product can accumulate a static charge that may cause a fire or explosion. A product container, if not properly cooled, can rupture in the heat of a fire.

**Extinguishing Media**

Dry chemical, carbon dioxide or foam is recommended. Water spray is recommended to cool or protect exposed materials or structures. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced fire fighters.

**Fire Fighting**

Long duration fires involving crude or residual oil stored in tanks may result in a boilover. The contents of the tank may be expelled beyond the containment dikes or ditches. All personnel should be kept back a safe distance when a boilover is anticipated. Use water spray to cool fire-exposed containers and to protect personnel. Isolate immediate hazard area and keep unauthorized personnel out. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water. Avoid spreading burning liquid with water used for cooling. For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, or when explicitly required by regulations, a self-contained breathing apparatus should be worn. Wear other appropriate protective equipment as conditions warrant.

6. **ACCIDENTAL RELEASE MEASURES**

**Personal Precautions**

Extremely Flammable. Spillage of liquid product will create a fire hazard and may form an explosive atmosphere. Keep all sources of ignition and hot metal surfaces away from spill/release. The use of explosion-proof electrical equipment is recommended. Product may contain or release poisonous hydrogen sulfide gas. If the presence of dangerous amounts of H₂S around the spilled product is suspected, additional or special actions may be warranted including access restrictions and the use of protective equipment. Stay upwind and away from spill/release. Isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment as conditions warrant per Exposure Controls/Personal Protection guidelines.

**Environmental Precautions**

Stop the leak if it can be done without risk. Prevent spilled material from entering waterways, sewers, basements or confined areas. Contain release to prevent further contamination of soils, surface water or groundwater. Clean up spill as soon as possible using appropriate techniques such as applying non-combustible absorbent materials or pumping. All equipment used when handling the product must be grounded. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Where feasible and appropriate, remove contaminated soil.

**Methods for Containment and Clean Up**

Immediate cleanup of any spill is recommended. Build dike far ahead of spill for containment and later recovery or disposal of spilled material. Absorb spill with inert material such as sand or vermiculite and place in suitable container for disposal. If spilled on water, remove with appropriate equipment like skimmers, booms or absorbents. In case of soil contamination, remove contaminated soil for remediation or disposal in accordance with applicable regulations.

**Reporting**

Report spills/releases as required, to appropriate local, state and federal authorities. US
6. ACCIDENTAL RELEASE MEASURES

Coast Guard and Environmental Protection Agency regulations require immediate reporting of spills/release that could reach any waterway including intermittent dry creeks. Report spill/release to the National Response Center at (800) 424-8802. In case of accident or road spill, notify Chemtrec at (800) 424-9300.

7. HANDLING AND STORAGE

Precautions for Safe Handling

Extremely flammable. May vaporize easily at ambient temperatures. The vapor is heavier than air and may create an explosive mixture of vapor and air. Beware of accumulation in confined spaces and low lying areas.

Use non-sparking tools and explosion-proof equipment. Open container slowly to relieve any pressure. Bond and ground all equipment when transferring from one vessel to another. Can accumulate static charge by flow or agitation. Can be ignited by static discharge. Explosion-proof electrical equipment is recommended and may be required by fire codes.

Warning! Use of this material in spaces without adequate ventilation may result in the generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

To prevent and minimize fire or explosion risk from static accumulation and discharge, effectively bond and/or ground product transfer system. Do not use electronic devices (such as cellular phones, computers, calculators, pagers, etc.) in or around any fueling operation or storage area unless the devices are certified as intrinsically safe. Electrical equipment and fittings should comply with local fire codes.

Precautions for Safe Storage

Use and store this material in cool, dry, well-ventilated areas away from heat, direct sunlight, hot metal surfaces and all sources of ignition. Post area warnings: 'No Smoking or Open Flame'. Keep away from incompatible material. Outdoor or detached storage of portable containers is preferred. Indoor storage should meet OSHA standards and appropriate fire codes.

In a tank, barge or other closed container, the vapor space above materials containing hydrogen sulfide may result in concentrations of H₂S immediately dangerous to life or health. Check atmosphere for oxygen content, H₂S and flammability prior to entry.

Portable containers should never be filled while they are in or on a motor vehicle or marine craft. Static electricity may ignite vapors when filling non-grounded containers or vehicles on trailers. To avoid static buildup, do not use a nozzle lock open device. Use only approved containers. Keep containers tightly closed. Place the container on the ground before filling. Keep the nozzle in contact with the container during filling.

Empty containers retain liquid and vapor residues and can be dangerous. Do NOT pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat, flame, sparks, static electricity or other sources of ignition; they may explode and cause injury or death. Do not attempt to refill or clean containers since residue is difficult to remove. Empty drums should be completely drained, properly closed and returned to the supplier or a qualified drum reconditioner. All containers should be disposed of in an environmentally safe manner in accordance with government regulations.
## 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH Exposure Limits</th>
<th>OSHA Exposure Limits</th>
<th>NIOSH Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude Oil</td>
<td>5 mg/m³ TWA 10 mg/m³ STEL</td>
<td>5 mg/m³ TWA</td>
<td>2500 mg/m³ IDLH</td>
</tr>
<tr>
<td>Benzene</td>
<td>0.5 ppm TWA 2.5 ppm STEL Skin</td>
<td>1 ppm TWA 5 ppm STEL Skin</td>
<td>0.5 ppm TWA 1 ppm STEL Skin 500 ppm IDLH</td>
</tr>
<tr>
<td>n-Butane</td>
<td>800 ppm TWA</td>
<td>800 ppm TWA</td>
<td>800 ppm TWA</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>100 ppm TWA</td>
<td>300 ppm TWA</td>
<td>300 ppm TWA 1300 ppm IDLH</td>
</tr>
<tr>
<td>Cyclopentane</td>
<td>600 ppm TWA</td>
<td></td>
<td>600 ppm TWA</td>
</tr>
<tr>
<td>Ethyl Benzene</td>
<td>100 ppm TWA 125 ppm STEL</td>
<td>100 ppm TWA 125 ppm STEL</td>
<td>100 ppm TWA 125 ppm STEL 800 ppm IDLH</td>
</tr>
<tr>
<td>n-Heptane</td>
<td>400 ppm TWA 500 ppm STEL</td>
<td>500 ppm TWA</td>
<td>85 ppm TWA 440 ppm Ceiling 750 ppm IDLH</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>50 ppm TWA Skin</td>
<td>500 ppm TWA</td>
<td>50 ppm TWA 1100 ppm IDLH</td>
</tr>
<tr>
<td>Hexane (all isomers)</td>
<td>500 ppm TWA 1000 ppm STEL Skin</td>
<td></td>
<td>100 ppm TWA 510 ppm IDLH Ceiling</td>
</tr>
<tr>
<td>Hydrogen Sulfide</td>
<td>1 ppm TWA 15 ppm STEL</td>
<td>20 ppm Ceiling 50 ppm Peak</td>
<td>5 ppm TWA 10 ppm Ceiling 100 ppm IDLH</td>
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<tr>
<td>Methylcyclohexane</td>
<td>400 ppm TWA</td>
<td>500 ppm TWA</td>
<td>400 ppm TWA 1200 ppm IDLH</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>10 ppm TWA 15 ppm STEL Skin</td>
<td>10 ppm TWA</td>
<td>10 ppm TWA 15 ppm STEL Skin 250 ppm IDLH</td>
</tr>
<tr>
<td>n-Nonane</td>
<td>200 ppm TWA</td>
<td></td>
<td>200 ppm TWA</td>
</tr>
<tr>
<td>n-Octane</td>
<td>300 ppm TWA</td>
<td>500 ppm TWA</td>
<td>75 ppm TWA 385 ppm Ceiling 1000 ppm IDLH</td>
</tr>
<tr>
<td>n-Pentane</td>
<td>600 ppm TWA</td>
<td>1000 ppm TWA</td>
<td>120 ppm TWA 610 ppm Ceiling 1500 ppm IDLH</td>
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<tr>
<td>Polynuclear Aromatic Hydrocarbons (PAH)</td>
<td>0.2 mg/m³ TWA</td>
<td>0.2 mg/m³ TWA</td>
<td>80 mg/m³ IDLH</td>
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<tr>
<td>n-Propane</td>
<td>1000 ppm TWA</td>
<td>1000 ppm TWA</td>
<td>1000 ppm TWA 2100 ppm IDLH</td>
</tr>
<tr>
<td>Toluene</td>
<td>50 ppm TWA Skin</td>
<td>200 ppm TWA 300 ppm Ceiling 500 ppm Peak-10 min</td>
<td>100 ppm TWA 150 ppm STEL 500 ppm IDLH</td>
</tr>
<tr>
<td>1,2,4 Trimethyl Benzene</td>
<td>25 ppm TWA</td>
<td>25 ppm TWA</td>
<td>25 ppm TWA</td>
</tr>
<tr>
<td>Xylene, all isomers</td>
<td>100 ppm TWA 150 ppm STEL</td>
<td>100 ppm TWA 150 ppm STEL</td>
<td>900 ppm IDLH</td>
</tr>
</tbody>
</table>

**Note:** State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional for further information.
8. **EXPOSURE CONTROLS / PERSONAL PROTECTION**

<table>
<thead>
<tr>
<th>Component</th>
<th>ACGIH Exposure Limits</th>
<th>OSHA Exposure Limits</th>
<th>NIOSH Exposure Limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH - American Conference of Government Industrial Hygienists, OSHA - Occupational Safety and Health Administration, NIOSH - National Institute for Industrial Safety and Health, TWA - Time Weighted Average (8 hour average for ACGIH and OSHA, 10 hour average for NIOSH), STEL - 15 Minute Short Term Exposure Level, Skin - indicates potential for cutaneous absorption of liquid or vapor through the eyes or mucous membranes, Ceiling - Ceiling Level, Peak - Acceptable peak over the ceiling concentration for a specified number of minutes, IDLH - Immediately Dangerous to Life and Health</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Personal Protective Equipment**

**General Considerations**

Consider the potential hazards of this material, applicable exposure limits, job activities and other substances in the work place when designing engineering controls and selecting personal protective equipment.

**Engineering Controls**

Use process enclosures, local exhaust ventilation or other engineering controls to maintain airborne levels below the recommended exposure limits. An emergency eye wash station and safety shower should be located near the work station.

**Personal Protective Equipment**

If engineering controls or work practices are not adequate to prevent exposure to harmful levels of this material, personal protective equipment (PPE) is recommended. A hazard assessment of the work should be conducted by a qualified professional to determine what PPE is required.

**Respiratory Protection**

A respiratory protection program that meets or exceeds OSHA 29 CFR 1910.134 and ANSI Z.88.2 should be followed whenever workplace conditions warrant the use of a respirator. When airborne concentrations are expected to exceed the established exposure limits given in Section 8, use a NIOSH approved air purifying respirator equipped with organic vapor cartridges/canisters. Use a full-face positive-pressure supplied air respirator in circumstances where air-purifying respirators may not provide adequate protection or where there may be the potential for airborne exposure above the exposure limits. If exposure concentration is unknown, IDLH conditions exist or there is a potential for exposure to hydrogen sulfide above exposure limits, use a NIOSH approved self contained breathing apparatus (SCBA) or equivalent operated in a pressure demand or other positive pressure mode.

**Eye Protection**

Eye protection that meets or exceeds ANSI Z.87.1 is recommended if there is a potential for liquid contact to the eyes. Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing or spraying of this material. A face shield may be necessary depending on conditions of use.

**Skin and Body Protection**

Avoid skin contact. Wear long-sleeved fire-retardant garments while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, arm covers, impervious gloves, boots and additional facial protection.

**Hand Protection**

Avoid skin contact. Use impervious gloves (e.g., PVC, neoprene, nitrile rubber). Check with glove suppliers to confirm the breakthrough performance of gloves. PVC and neoprene may be suitable for incidental contact. Nitrile rubber should be used for longer term protection when prolonged or frequent contact may occur. Gloves should be worn on clean hands and hands should be washed after removing gloves. Also wash hands with plenty of mild soap and water before eating, drinking, smoking, using toilet facilities or leaving work.
Personal Protective Equipment

Special Considerations  Workplace monitoring plans should consider the possibility that heavy metals such as mercury may concentrate in process vessels and equipment presenting the possibility of exposure during sampling and maintenance operations. Mercury and other heavy metals may be present in trace quantities in crude oil, raw natural gas and condensates. Storage and processing of these materials can result in these metals, including elemental mercury, accumulating in enclosed vessels and piping, typically at the low point of the processing equipment. Mercury may also concentrate in sludges, sands, scales, waxes and filter media.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Amber to black liquid</th>
<th>Physical Form</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Odor</td>
<td>Strong hydrocarbon, sulfurous odor possible</td>
<td>Odor Threshold</td>
<td>Not established</td>
</tr>
<tr>
<td>pH</td>
<td>Neutral</td>
<td>Vapor Pressure</td>
<td>0.6 - 10 psi (Reid RVP)</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>&gt;1 (air = 1)</td>
<td>Boiling Point/Range</td>
<td>0-1000°F/-17-538°C</td>
</tr>
<tr>
<td>Percent Volatile</td>
<td>&gt;50%</td>
<td>Partition Coefficient</td>
<td>2 - 6</td>
</tr>
<tr>
<td>Specific Gravity</td>
<td>0.7 - 1.03 @ 60°F</td>
<td>Density</td>
<td>5.8 - 8.6 lb/gal @ 60°F</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>Not determined</td>
<td>Evaporation Rate</td>
<td>Not established</td>
</tr>
<tr>
<td>Flash Point</td>
<td>&lt;100°F/-38°C</td>
<td>Test Method</td>
<td>ASTM D-56</td>
</tr>
<tr>
<td>Explosive Limits</td>
<td>1.1% LEL, 6.0% UEL</td>
<td>Autoignition Temperature</td>
<td>590°F/310°C</td>
</tr>
<tr>
<td>Solubility in Water</td>
<td>Slightly soluble in water</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

Stability  Stable under normal anticipated storage and handling temperatures and pressures. Extremely flammable liquid and vapor. Vapor can cause flash fire.

Conditions to Avoid  Avoid high temperatures and all possible sources of ignition. Prevent vapor accumulation.

Incompatibility (Materials to Avoid)  Avoid contact with strong oxidizing agents such as strong acids, alkalies, chlorine and other halogens, dichromates or permanganates, which can cause fire or explosion.

Hazardous Decomposition Products  Hazardous decomposition products are not expected to form curing normal storage. The use of hydrocarbon fuel in an area without adequate ventilation may result in hazardous levels of combustion products (e.g., oxides of carbon, sulfur and nitrogen, benzene and other hydrocarbons) and/or dangerously low oxygen levels.

Hazardous Polymerization  Not known to occur

11. TOXICOLOGICAL INFORMATION

Overview  This product is an amber to black liquid with a strong hydrocarbon odor, it may also have a sulfurous or rotten egg odor. Hydrogen sulfide, an extremely flammable and very toxic gas may be present. This product is a volatile and extremely flammable liquid that may cause flash fires. Keep away from heat, sparks and flames and other sources of ignition. This product contains benzene, which may cause cancer or be toxic to blood forming organs. It contains polynuclear aromatic hydrocarbons
11. TOXICOLOGICAL INFORMATION

that are confirmed human carcinogens. It contains material that has caused cancer based on animal data. Never siphon this product by mouth. If swallowed, this product may be aspirated into the lungs and cause lung damage or death.

This material may contain benzene, ethyl benzene, naphthalene and polynuclear aromatic hydrocarbons (PAH) at concentrations above 0.1%. Benzene and PAH are considered to be known human carcinogens by OSHA, IARC and NTP. IARC has identified several individual PAH as probably carcinogenic to humans (Group 2A) and ethyl benzene, naphthalene and several individual PAH as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies.

Toxicological Information of the Material

Acute Toxicity

Dermal: Low Toxicity: LD50 > 2000 mg/kg (rabbit)
Causes mild skin irritation. Repeated exposure may cause skin dryness or cracking that can lead to dermatitis.

Inhalation: Hydrogen Sulfide is Extremely Toxic: LC100 = 600 ppm(v), 30 min (man)
Product expected to have low degree of toxicity by inhalation: LC 50 > 5 mg/l (vapor)
Effect of overexposure may include irritation of the digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of central nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued inhalation may result in unconsciousness and/or death.

Ingestion: Product expected to have low degree of toxicity by ingestion: Oral LD50 > 5 g/kg (rat), > 10 g/kg (mice)
Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

Eye Damage / Irritation

Causes serious eye irritation.

Sensitization

Skin: Not expected to be a skin sensitizer
Respiratory: Not expected to be a respiratory sensitizer

Specific Target Organ Toxicity

Single Exposure: High concentrations may cause irritation of the skin, eyes, digestive tract, irritation of the respiratory tract, nausea, vomiting, diarrhea and signs of central nervous system depression (e.g., headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue). Continued inhalation may result in unconsciousness and/or death.

Repeated Exposure: May cause damage to organs or organ systems through prolonged or repeated exposure. Laboratory animal studies of dermal and inhalation exposure routes have demonstrated toxicity to the liver, bone marrow, blood, spleen and thymus.

Conditions Aggravated by Overexposure

Disorders of the organs or organ systems that may be aggravated by significant exposure to this material or its components include the skin, respiratory system, liver, kidneys, CNS, cardiovascular system and blood-forming system.
11. TOXICOLOGICAL INFORMATION

Carcinogenicity

May cause cancer.

Causes cancer in laboratory animals. Chronic application of crude oil to mouse skin resulted in an increased incidence of skin tumors.

The International Agency for Research on Cancer (IARC) concluded in its Crude Oil Monograph that there is limited evidence of carcinogenicity in animals, and that crude oil is not classifiable as to its carcinogenicity in humans (Group 3). It has not been listed as a carcinogen by NTP or OSHA.

Germ Cell Mutagenicity

Inadequate information available, not expected to be mutagenic.

Reproductive and Developmental Toxicity

Inadequate information available. Dermal exposure to crude oil during pregnancy resulted in limited evidence of developmental toxicity in laboratory animals. Decreased fetal weight and increased resorptions were noted at maternally toxic doses. No significant effects on pup growth or other developmental landmarks were observed postnatally.

Additional Information

**Hydrogen Sulfide (H₂S).** This material may contain or liberate H₂S, a poisonous gas with the smell of rotten eggs. Odor is not a reliable indicator of exposure because olfactory fatigue causes the smell to disappear. H₂S has a broad range of effects depending on the airborne concentration and length of exposure:

- 10 ppm: eye and respiratory tract irritation
- 100 ppm: coughing, headache, dizziness, nausea, eye irritation, loss of sense of smell in minutes
- 200 ppm: potential for pulmonary edema after 20 minutes
- 500 ppm: loss of consciousness after short exposures, potential for respiratory arrest
- 1000 ppm: Immediate loss of consciousness may lead rapidly to death, prompt cardiopulmonary resuscitation may be required.

**Polycyclic Aromatic Compounds (PAHs):** This material may contain varying concentrations of PAHs that have been known to produce a phototoxic reaction when contaminated skin is exposed to sunlight. The effect is similar in appearance to a sunburn and is temporary if exposure is discontinued. Continued exposure to sunlight can result in more serious skin problems including pigmentation (discoloration), skin eruptions (pimples) and possible skin cancers.

Toxicological Information of Components

**Benzene 71-43-2**

**Acute Data:**
- Dermal LD₅₀ > 9400 mg/kg (Rabbit), (Guinea Pig)
- LC₅₀ = 9980 ppm (Mouse); 10 000 ppm/7hr (Rat)
- Oral LD₅₀ = 4700 mg/kg (Mouse); 930 mg/kg (Rat); 5700 mg/kg (Mammal)

**Carcinogenicity:** Benzene is an animal carcinogen and is known to produce acute myelogenous leukemia (a form of cancer) in humans. Benzene has been identified as a human carcinogen by NTP, IARC and OSHA.

**Target Organs:** Prolonged or repeated exposures to benzene vapors has been linked to bone marrow toxicity which can result in blood disorders such as leukopenia, thrombocytopenia, and aplastic anemia. All of these diseases can be fatal.

**Developmental:** Exposure to benzene during pregnancy demonstrated limited evidence of developmental toxicity in laboratory animals. The effects seen include decreased body eight and increased skeletal variations in rodents. Alterations in hematopoeisis have been observed in the fetuses and offspring of pregnant mice.
11. **TOXICOLOGICAL INFORMATION**

**Mutagenicity:** Benzene exposure has resulted in chromosomal aberrations in human lymphocytes and animal bone marrow cells, and DNA damage in mammalian cells in vitro.

**Cyclohexane 110-82-7**

**Acute Toxicity:**
- Dermal LD50 \( \geq 2 \) g/kg (Rabbit)
- LC50 \( > 4,044 \) ppm (4-hr, Rat)
- Oral LD50 \( > 2 \) g/kg (Rat)

**Target Organs:** Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.

**Developmental:** Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane was reported in the 1980's. However, a careful reevaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

**Ethyl Benzene 100-41-4**

**Acute Toxicity:**
- Dermal LD50 = 17800 mg/kg (Rabbit)
- LC50 = 4000 ppm/4 hr; 13367 ppm (Rat)
- Oral LD50 = 3500 mg/kg (Rat)

**Carcinogenicity:** Rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethyl benzene has been listed as a possible human carcinogen by IARC. Ethyl benzene has not been listed as a carcinogen by NTP or OSHA.

**Target Organs:** In rats and mice exposed to 0, 75, 250, or 750 ppm ethyl benzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilic foci, hypertrophy, necrosis), thyroid (hyperplasia) and pituitary (hyperplasia).

**n-Hexane 110-54-3**

**Acute Toxicity:**
- Dermal LD50 = \( >2,000 \) mg/kg (Rabbit)
- LC50 = 3,367 ppm (4 hr, Rat)
- Oral LD50 = 5,000 mg/kg (Rat)

**Target Organs:** Excessive exposure to n-hexane can result in peripheral neuropathies. The initial symptoms are symmetrical sensory numbness and paresthesias of distal portions of the extremities. Motor weakness is typically observed in muscles of the toes and fingers but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. The neurotoxic properties of n-hexane are potentiated by exposure to methyl ethyl ketone and methyl isobutyl ketone. Prolonged exposure to high concentrations of n-hexane (>1,000 ppm) has resulted in decreased sperm count and degenerative changes in the testes of rats but not those of mice.

**Hydrogen Sulfide 7783-06-4**

**Acute Toxicity:**
- Dermal - No data
- LC50= 600 ppm, 30 min (Human)

Hydrogen sulfide concentrations will vary significantly depending on the source and sulfur content of the crude. Sweet crudes (<0.5% sulfur) may contain toxicologically significant levels of hydrogen.
11. TOXICOLOGICAL INFORMATION

sulfide in the vapor spaces of bulk storage tanks and transport compartments. Concentrations of H₂S as low as 10 ppm over an 8 hour workshift may cause eye or throat irritation. Prolonged breathing of 50-100 ppm H₂S vapors can produce significant eye and respiratory irritation. Sour crudes commonly contain extremely high concentrations of H₂S (500-70,000 ppm) in the vapor spaces of bulk storage vessels. Exposure to 250-600 ppm for 15-30 minutes can produce headache, dizziness, nervousness, staggering gait, nausea and pulmonary edema or bronchial pneumonia. Concentrations >1,000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H₂S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H₂S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H₂S, respectively. Over the years a number of acute cases of H₂S poisonings have been reported. Complete and rapid recovery is the general rule. However, if the exposure was sufficiently intense and sustained causing cerebral hypoxia (lack of oxygen to the brain), neurologic effects such as amnesia, intention tremors or brain damage are possible.

Naphthalene 91-20-3
Acute Toxicity:
Dermal LD₅₀ = >2.5 g/kg (rat)
LC₅₀ = >340 mg/m⁳/1H (rat)
Oral LD₅₀ = 490 mg/kg; 2.6 g/kg (rat)
Carcinogenicity: Naphthalene has been evaluated in two year inhalation studies in both rats and rice. The National Toxicology Program (NTP) concluded that there is clear evidence of carcinogenicity in male and female rats based on increased incidences of respiratory epithelial adenomas and olfactory epithelial neuroblastomas of the nose. NTP found some evidence of carcinogenicity in female mice (alveolar adenomas) and no evidence of carcinogenicity in male mice. Naphthalene has been identified as a carcinogen by IARC and NTP.

Toluene 108-88-3
Acute Toxicity:
Dermal LD₅₀ = 14 g/kg (Rabbit)
LC₅₀ = 8,000 ppm (4-hr, Rat)
Oral LD₅₀ = 2.5 - 7.9 g/kg (Rat)
Target Organs: Epidemiology studies suggest that chronic occupational overexposure to toluene may damage color vision. Subchronic and chronic inhalation studies with toluene produced kidney and liver damage, hearing loss and central nervous system (brain) damage in laboratory animals. Intentional misuse by deliberate inhalation of high concentrations of toluene has been shown to cause liver, kidney, and central nervous system damage, including hearing loss and visual disturbances.
Developmental: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. The effects seen include decreased fetal body weight and increased skeletal variations in both inhalation and oral studies.

1,2,4 Trimethyl Benzene 95-63-6
Acute Toxicity:
Dermal LD₅₀ = No data available
LC₅₀ = 18 gm/m³/4hr (Rat)
Oral LD₅₀ = 3-6 g/kg (Rat)

Xylenes 1330-20-7
11. TOXICOLOGICAL INFORMATION

Acute Toxicity:
Dermal LD50 >3.16 ml/kg (Rabbit)
LC50= 5000 ppm/4 hr. (Rat)
Oral LD50 = 4300 mg/kg (Rat)
Target Organs: A six week inhalation study with xylene produced hearing loss in rats.
Developmental: Both mixed xylenes and the individual isomers produced limited evidence of developmental toxicity in laboratory animals. Inhalation and oral administration of xylene resulted in decreased fetal weight, increased incidences of delayed ossification, skeletal variations and resorptions.

12. ECOLOGICAL INFORMATION

Toxicity
This material is expected to be toxic to aquatic organisms. A range of measurements of aquatic toxicity has been obtained in laboratory studies of crude oils. Variability in results may be related in part to the source of the crude oil, or it may reflect different approaches to testing. However, those studies using dispersions of whole oil, employing water soluble fractions, and water accommodated fractions have generally given LC50 or EC50 values in the range 10 to 100 mg/l or greater when expressed in terms of oil loading rate. These values are consistent with the predicted aquatic toxicity of these substances based on their hydrocarbon compositions.
Classification H411, Chronic Category 2
LL/EL/IL50 – 10 to 100 mg/l (fish, aquatic invertebrates, algae, microorganisms)
Coating action of oil can kill birds, plankton, aquatic life, algae and fish.

Persistence and Degradability
Most crude oils are not regarded as readily biodegradable. Most of the nonvolatile constituents are inherently biodegradable. Some of the highest molecular weight components are persistent in water. The individual hydrocarbon components of this material are differentially soluble in water with aromatic hydrocarbons tending to be more water soluble than aliphatic hydrocarbons. If spilled, the lighter components of crude oil will generally evaporate but depending on local environmental conditions (temperature, wind, soil type, mixing or wave action in water, etc), photo-oxidation and biodegradation, the remainder may become dispersed in the water column or absorbed to soil or sediment. Because of their differential solubility, the occurrence of hydrocarbons in groundwater will be at different proportions than the parent material. Under anaerobic conditions, such as in anoxic sediments, rates of biodegradation are negligible.

Persistence per IOPC Fund Definition
Persistent

Bioaccumulative Potential
Contains components with the potential to bioaccumulate. The octanol water coefficient values measured for the hydrocarbon components of this material range from less than 2 to greater than 6, and therefore would be considered as having the potential to bioaccumulate. Based upon spill investigation analysis, oils containing polynuclear aromatic hydrocarbon compounds similar to this material were shown to bioaccumulate in tissues of various aquatic organisms.

Mobility
Air: Contains volatile components. Lighter components will volatilize in the air. In air, the volatile hydrocarbons undergo photodegradation by reaction with hydroxyl radicals with half lives varying from 0.5 days for n-dodecane to 6.5 days for benzene.
Water: Spreads on a film on the surface of water. Significant proportion of spill will remain after one day. Lower molecular weight aromatic hydrocarbons and some polar compounds have low but significant water solubility. Some higher molecular weight
12. ECOLOGICAL INFORMATION

Compounds are removed by emulsification and these also slowly biodegrade while others adsorb to sediment and sink. Heavier fractions agglomerate to form tars, some of which sink.

**Soil:** Some constituents may be mobile and contaminate groundwater.

**Other Adverse Effects**

Films form on water and may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Recover or recycle if possible. It is the responsibility of the generator to determine the toxicity and physical properties of the material generated so as to properly classify the waste and ensure disposal methods comply with applicable regulations.

This material, if discarded as produced, is not a RCRA “listed” hazardous waste. However, it should be fully characterized for ignitability (D001), reactivity (D003) and benzene (D018) prior to disposal (40 CFR 261). Use which results in chemical or physical change or contamination may subject it to regulation as a hazardous waste. Along with properly characterizing all waste materials, consult state and local regulations regarding the proper disposal of this material.

Do not dispose of tank water bottoms by draining onto the ground. This will result in soil and groundwater contamination. Waste arising from spillage or tank cleaning should be disposed of in accordance with applicable regulations.

Container contents should be completely used and containers should be emptied prior to discard. Container rinsate could be considered a RCRA hazardous waste and must be disposed of with care and in full compliance with federal, state and local regulations. Larger empty containers, such as drums, should be returned to the distributor or to a qualified drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

14. TRANSPORTATION INFORMATION

**United States Department of Transportation (US DOT)**

**Shipping Description:** Petroleum Crude Oil, 3, UN1267, I or II  
**Shipping Name:** Petroleum Crude Oil  
**Hazard Class and Division:** 3  
**ID Number:** UN1267  
**Packing Group:** I or II  
**Label:** Flammable Liquid  
**Placard:** Flammable / 1267  
**Reportable Quantity:** None established for this material  
**Emergency Response Guide:** 128

**Transportation of Dangerous Goods (TDG) Canada**

**Shipping Description:** Petroleum Crude Oil, 3, UN1267, I or II  
**Shipping Name:** Petroleum Crude Oil  
**Hazard Class and Division:** 3  
**UN Number:** 1267  
**Label:** Flammable Liquid  
**EMS Guide:** F-E, S-E  
Not a DOT Marine Pollutant per 49 CFR 71.8

**International Maritime Dangerous Goods Code (IMDG)**

**Shipping Description:** Petroleum Crude Oil, 3, UN1267, I or II  
**Shipping Name:** Petroleum Crude Oil  
**Hazard Class and Division:** 3  
**UN Number:** 1267  
**Label:** Flammable Liquid  
**EMS Guide:** F-E, S-E  
Not a DOT Marine Pollutant per 49 CFR 71.8
14. TRANSPORTATION INFORMATION

European Agreements Concerning the International Carriage by Rail (RID) and by Road (ADR)

Shipping Name: Petroleum Crude Oil
Hazard Class: 3
Packing Group: I or II
Label: Flammable Liquid
Danger Number: 33
UN Number: 1267

International Civil Aviation Organization (ICAO) / International Air Transport Association (IATA)

Shipping Name: Petroleum Crude Oil
UN/ID Number: UN1267
Hazard Class/Division: 3
Packing Group: I or II
Labels: Flammable
Emergency Response Guide: 3H

15. REGULATORY INFORMATION

United States Federal Regulatory Information

EPA TSCA Inventory
This product and/or its components are listed on the Toxic Substances Control Act (TSCA) Inventory

EPA SARA 302/304 Emergency Planning and Notification
This material contains the following chemicals subject to reporting under the Superfund Amendments and Reauthorization Act of 1986 (SARA): Material contains hydrogen sulfide, considered an extremely hazardous substance. TPQ = 500 lb, EPCRA RQ = 100 lb

EPA SARA 311/312 (Title III Hazard Categories)
Acute Health: Yes
Chronic Health: Yes
Fire Hazard: Yes
Pressure Hazard: No
Reactive Hazard: No

EPA SARA Toxic Chemical Notification and Release Reporting (40 CFR 372) and CERCLA Reportable Quantities (40 CFR 302.4)

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS Number</th>
<th>Concentration</th>
<th>RQ</th>
</tr>
</thead>
<tbody>
<tr>
<td>Benzene</td>
<td>71-43-2</td>
<td>&lt; 5 %</td>
<td>10 lb</td>
</tr>
<tr>
<td>Cyclohexane</td>
<td>110-82-7</td>
<td>&lt; 4 %</td>
<td>1000 lb</td>
</tr>
<tr>
<td>Ethyl Benzene</td>
<td>100-41-4</td>
<td>&lt; 3 %</td>
<td>1000 lb</td>
</tr>
<tr>
<td>n-Hexane</td>
<td>110-54-3</td>
<td>&lt; 5 %</td>
<td>5000 lb</td>
</tr>
<tr>
<td>Naphthalene</td>
<td>91-20-3</td>
<td>&lt; 2 %</td>
<td>100 lb</td>
</tr>
<tr>
<td>Polynuclear Aromatic Hydrocarbons</td>
<td>mixtures</td>
<td>0.1 %</td>
<td>1 lb</td>
</tr>
<tr>
<td>Toluene</td>
<td>108-88-3</td>
<td>&lt; 2 %</td>
<td>1000 lb</td>
</tr>
<tr>
<td>1,2,4 Trimethyl Benzene</td>
<td>95-63-6</td>
<td>&lt; 2 %</td>
<td>not listed</td>
</tr>
<tr>
<td>Xylene, all isomers</td>
<td>1330-20-7</td>
<td>&lt; 3 %</td>
<td>100 lb</td>
</tr>
</tbody>
</table>

CERCLA Section 101(14) excludes crude oil and crude oil fractions, including hazardous constituents of petroleum, from the definition of hazardous substances. The petroleum exclusion applies to this product.

EPA CWA and OPA
This product is classified as an oil under Section 311 of the Clean Water Act (CWA) and Oil Pollution Act of 1990 (OPA), subject to spill reporting requirements.
15. REGULATORY INFORMATION

Canadian Regulatory Information

DSL/NDSL Inventory
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the SDS contains all the information required by the Regulations.

Workplace Hazardous Materials Information System (WHMIS)

Hazard Class
B2 - Flammable Liquid
D1A – Material Causing Immediate and Serious Toxic Effects - Very Toxic Material
D2A: Material Causing Other Toxic Effects - Very Toxic
D2B - Material Causing Other Toxic Effects - Toxic Material

European Union Regulatory Information

Labeling
Product is dangerous as defined by the European Union Dangerous Substances / Preparations Directives
Contains: Benzene

Symbol
F+ Extremely Flammable
T Toxic

Risk Phrases
R12-45--65-52/53
Extremely flammable. May cause cancer. Irritating to skin. Harmful: may cause lung damage if swallowed. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases
S23-36-28-53-62
Do not breathe vapor. Wear suitable protective clothing. After contact with skin, wash immediately. Avoid exposure - obtain special instructions before use. If swallowed, do not induce vomiting: seek medical advice immediately and show this container or label.

California Proposition 65
This product may contain detectable quantities of the following chemicals, known to the State of California to cause cancer, birth defects, or other reproductive harm and which may be subject to the warning requirements of California Proposition 65. Chemicals known to the State of California to cause cancer, birth defects or other reproductive harm are created by the combustion of this product.

Carcinogens: Benzene, Ethyl Benzene, Naphthalene, various Polynuclear Aromatic Hydrocarbons

Developmental Toxicity: Benzene, Toluene

Male Reproductive Toxicity: Benzene

Carcinogen Identification by International Agency for Research on Cancer

<table>
<thead>
<tr>
<th>Group</th>
<th>Carcinogenicity</th>
<th>Substance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group 1</td>
<td>Carcinogenic to Humans</td>
<td>Benzene, Coal Tar Pitch Volatiles (per 29 CFR 1910.1200.1002, OSHA has defined coat tar pitch volatiles to include the fused polycyclic hydrocarbons which volatize from the distillation residues of coal, petroleum (excluding asphalt), wood and other organic matter)</td>
</tr>
<tr>
<td>Group 2A</td>
<td>Probably Carcinogenic to Humans</td>
<td>Several Individual Polynuclear Aromatic Hydrocarbons</td>
</tr>
<tr>
<td>Group 2B</td>
<td>Possibly Carcinogenic to Humans</td>
<td>Ethyl Benzene, Naphthalene, Several Individual Polynuclear Aromatic Hydrocarbons</td>
</tr>
<tr>
<td>Group 3</td>
<td>Not Classifiable</td>
<td>Crude Oil, Toluene, Xylenes</td>
</tr>
</tbody>
</table>

16. OTHER INFORMATION

Prepared By: J.P. Morgan Ventures Energy Corp. JP Morgan Commodities Canada Corp.
The information presented in this Material Safety Data Sheet is based on data believed to be accurate as of the date this Material Safety Data Sheet was prepared. HOWEVER, NO WARRANTY OF MERCHANTABILITY, FITNESS FOR ANY PARTICULAR PURPOSE, OR ANY OTHER WARRANTY IS EXPRESSED OR IS TO BE IMPLIED REGARDING THE ACCURACY OR COMPLETENESS OF THE INFORMATION PROVIDED ABOVE, THE RESULTS TO BE OBTAINED FROM THE USE OF THIS INFORMATION OR THE PRODUCT, THE SAFETY OF THIS PRODUCT, OR THE HAZARDS RELATED TO ITS USE. No responsibility is assumed for any damage or injury resulting from abnormal use or from any failure to adhere to recommended practices. The information provided above, and the product, are furnished on the condition that the person receiving them shall make their own determination as to the suitability of the product for their particular purpose and on the condition that they assume the risk of their use. In addition, no authorization is given nor implied to practice any patented invention without a license.