Section 1: IDENTIFICATION

Product Name: Produced Water
Synonyms: Not available.
Product Use: Waste stream.
Restrictions on Use: Not available.
Manufacturer/Supplier: Pengrowth Energy Corporation
2100, 222 – 3rd Avenue S.W.
Calgary, AB T2P 0B4
Phone Number: (403) 233-0224
Emergency Phone: CANUTEC (613) 996-6666
Date of Preparation of SDS: August 30, 2013

Section 2: HAZARD(S) IDENTIFICATION

GHS INFORMATION
Classification: Not hazardous according to OSHA criteria (29 CFR 1910.1200).

LABEL ELEMENTS
Hazard: None.
Pictogram(s): None.
Signal Word: None.
Hazard Statements: Not applicable.
Precautionary Statements
Prevention: Not applicable.
Response: Not applicable.
Storage: Not applicable.
Disposal: Not applicable.

Hazards Not Otherwise Classified: Not applicable.
Ingredients with Unknown Toxicity: None.
This material is not considered hazardous by the OSHA Hazard Communication Standard, (29 CFR 1910.1200).

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient(s)</th>
<th>Common name / Synonyms</th>
<th>CAS No.</th>
<th>% wt./wt.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>Not available.</td>
<td>7732-18-5</td>
<td>80 - 95</td>
</tr>
<tr>
<td>Hydrogen sulfide (H2S)</td>
<td>Not available.</td>
<td>7783-06-4</td>
<td>&lt; 0.7</td>
</tr>
<tr>
<td>Petroleum</td>
<td>Not available.</td>
<td>8002-05-9</td>
<td>0.1 - 0.3</td>
</tr>
</tbody>
</table>
Section 4: FIRST-AID MEASURES

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

**Acute and delayed symptoms and effects:** May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. This product may contain 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.

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

**Acute and delayed symptoms and effects:** May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.

Skin Contact: If on skin: Wash with plenty of soap and water. Call a poison center or doctor if you feel unwell.

**Acute and delayed symptoms and effects:** May cause skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: If swallowed: Call a poison center or doctor if you feel unwell. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person.

**Acute and delayed symptoms and effects:** May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

General Advice: In case of accident or if you feel unwell, seek medical advice immediately (show the label or SDS where possible).

Note to Physicians: Symptoms may not appear immediately. For inhalation of Hydrogen Sulphide, consider oxygen.

Section 5: FIRE-FIGHTING MEASURES

**FLAMMABILITY AND EXPLOSION INFORMATION**

Not flammable or combustible by OSHA/WHMIS criteria. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

**Sensitivity to Mechanical Impact:** This material is not sensitive to mechanical impact.

**Sensitivity to Static Discharge:** This material is not sensitive to static discharge.

**MEANS OF EXTINCTION**

**Suitable Extinguishing Media:**

- Small Fire: Dry chemical, CO2, water spray or regular foam.
- Large Fire: Water spray, fog or regular foam. Move containers from fire area if you can do it without risk.
Produced Water

SAFETY DATA SHEET / MATERIAL SAFETY DATA SHEET
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Unsuitable Extinguishing Media: Not available.


Protection of Firefighters: Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may cause pollution. 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.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area).

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: Keep out of drains, sewers, ditches, and waterways.

Methods for Containment: Stop leak if without risk. 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.

Other Information: See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling: Do not swallow. 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 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
Water [CAS No. 7732-18-5]

ACGIH: No TLV established.
OSHA: No PEL established.
Produced Water

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Hydrogen sulphide [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]

Crude oil [CAS No. 8002-05-9]

**ACGIH:** A2; 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

**OSHA:** 500 ppm (TWA), 2000 mg/m³ (TWA);
400 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:** Safety glasses are recommended. 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. 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

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Dirty coloured liquid.</td>
</tr>
<tr>
<td>Colour</td>
<td>Grey to black.</td>
</tr>
<tr>
<td>Odour</td>
<td>“Rotten egg” smell when dissolved hydrogen sulphide gas is present.</td>
</tr>
<tr>
<td>Odour Threshold</td>
<td>Not available.</td>
</tr>
<tr>
<td>Physical State</td>
<td>Liquid.</td>
</tr>
<tr>
<td>pH (as supplied)</td>
<td>4.9</td>
</tr>
<tr>
<td>Melting Point / Freezing Point</td>
<td>0 °C (32 °F)</td>
</tr>
<tr>
<td>Initial Boiling Point</td>
<td>Not available.</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>100 °C (212 °F)</td>
</tr>
<tr>
<td>Flash Point</td>
<td>Not available.</td>
</tr>
<tr>
<td>Evaporation Rate</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Lower Flammability Limit</td>
<td>Not available.</td>
</tr>
<tr>
<td>Upper Flammability Limit</td>
<td>Not available.</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>6.13 kPa at 24 °C (75.2 °F)</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>Not available.</td>
</tr>
<tr>
<td>Relative Density</td>
<td>1 to 1.2 (Water = 1) at 15 °C (59 °F)</td>
</tr>
<tr>
<td>Solubilities</td>
<td>Soluble in water.</td>
</tr>
<tr>
<td>Partition Coefficient: n-Octanol/Water</td>
<td>Not available.</td>
</tr>
<tr>
<td>Auto-ignition Temperature</td>
<td>Not available.</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>Not available.</td>
</tr>
<tr>
<td>Viscosity</td>
<td>Not available.</td>
</tr>
<tr>
<td>Percent Volatile, wt. %</td>
<td>70 to 100</td>
</tr>
<tr>
<td>VOC content, wt. %</td>
<td>Not available.</td>
</tr>
<tr>
<td>Density</td>
<td>Not available.</td>
</tr>
<tr>
<td>Coefficient of Water/Oil Distribution</td>
<td>&gt; 1</td>
</tr>
</tbody>
</table>
Section 10: STABILITY AND REACTIVITY

Reactivity: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Chemical Stability: Stable under normal storage conditions.

Possibility of Hazardous Reactions: None known.

Conditions to Avoid: Contact with incompatible materials. Sources of ignition. Exposure to heat.

Incompatible Materials: Strong oxidizers.

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

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Product Toxicity

Oral: Not available.

Dermal: Not available.

Inhalation: Not available.

Component Toxicity

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS No.</th>
<th>LD$_{50}$ oral</th>
<th>LD$_{50}$ dermal</th>
<th>LC$_{50}$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>Not available.</td>
<td>Not available.</td>
<td>&gt; 90000 µl/kg (rat); 4H</td>
</tr>
<tr>
<td>Hydrogen sulphide</td>
<td>7783-06-4</td>
<td>Not available.</td>
<td>Not available.</td>
<td>444 ppm (rat); 4H</td>
</tr>
<tr>
<td>Crude oil</td>
<td>8002-05-9</td>
<td>4300 mg/kg (rat)</td>
<td>Not available.</td>
<td>Not available.</td>
</tr>
</tbody>
</table>

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


Symptoms (including delayed and immediate effects)

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. This product may contain 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.

Eye: May cause eye irritation. Signs/symptoms may include redness, swelling, pain, tearing, and blurred or hazy vision.
Skin: May cause skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

Medical Conditions Aggravated By Exposure: Not available.

EFFECTS OF CHRONIC EXPOSURE (from short and long-term exposure)


Chronic Effects: Prolonged or repeated contact may dry skin and cause irritation. 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. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow.

Carcinogenicity: Product is not classified as a carcinogen. See Component Carcinogenicity table below for information on individual components. 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.

<table>
<thead>
<tr>
<th>Component Carcinogenicity</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
<th>Prop 65</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude oil</td>
<td>A2</td>
<td>Group 3</td>
<td>List 1</td>
<td>OSHA Carcinogen.</td>
<td>Listed.</td>
</tr>
</tbody>
</table>

Mutagenicity: Not available.

Reproductive Effects: Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Repeated dermal application of crude oils to pregnant rats produced maternal toxicity and fetal developmental toxicity and fetal tumours.

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.
Other Adverse Effects: 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: Not regulated.
- Class: Not applicable.
- UN Number: Not applicable.
- Packing Group: Not applicable.
- Label Code: Not applicable.

Canada Transportation of Dangerous Goods (TDG)
- Proper Shipping Name: Not regulated.
- Class: Not applicable.
- UN Number: Not applicable.
- Packing Group: Not applicable.
- Label Code: Not applicable.

### 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: Not a controlled product.
Hazard Symbols: None.
Produced Water

SAFETY DATA SHEET / MATERIAL SAFETY DATA SHEET

Date of Preparation: August 30, 2013

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

SARA Title III

<table>
<thead>
<tr>
<th>Component</th>
<th>Section 302 (EHS) TPQ (lbs.)</th>
<th>Section 304 EHS RQ (lbs.)</th>
<th>CERCLA RQ (lbs.)</th>
<th>Section 313</th>
<th>RCRA CODE</th>
<th>CAA 112(r) TQ (lbs.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen sulphide</td>
<td>500</td>
<td>100</td>
<td>100</td>
<td>313s</td>
<td>U135</td>
<td>10000</td>
</tr>
</tbody>
</table>

State Regulations

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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS No.</th>
<th>RTK List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen sulphide</td>
<td>7783-06-4</td>
<td>E</td>
</tr>
<tr>
<td>Crude oil</td>
<td>8002-05-9</td>
<td>Listed.</td>
</tr>
</tbody>
</table>

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)

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS No.</th>
<th>RTK List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydrogen sulphide</td>
<td>7783-06-4</td>
<td>SHHS</td>
</tr>
<tr>
<td>Crude oil</td>
<td>8002-05-9</td>
<td>SHHS</td>
</tr>
</tbody>
</table>

Note: SHHS = Special Health Hazard Substance

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

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS No.</th>
<th>RTK List</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>Not listed.</td>
</tr>
<tr>
<td>Hydrogen sulphide</td>
<td>7783-06-4</td>
<td>E</td>
</tr>
<tr>
<td>Crude oil</td>
<td>8002-05-9</td>
<td>Listed.</td>
</tr>
</tbody>
</table>

Note: E = Environmental Hazard

California

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

<table>
<thead>
<tr>
<th>Component</th>
<th>Type of Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crude oil</td>
<td>Cancer</td>
</tr>
</tbody>
</table>
### 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.

<table>
<thead>
<tr>
<th>Description</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Date of Preparation of SDS:</strong></td>
<td>August 30, 2013</td>
</tr>
<tr>
<td><strong>SDS Expiry Date (Canada):</strong></td>
<td>August 29, 2016</td>
</tr>
<tr>
<td><strong>Version:</strong></td>
<td>1.0</td>
</tr>
<tr>
<td><strong>GHS SDS Prepared by:</strong></td>
<td>Deerfoot Consulting Inc.</td>
</tr>
<tr>
<td><strong>Phone:</strong></td>
<td>(403) 720-3700</td>
</tr>
</tbody>
</table>