a Genesee & Wyoming Company

June 5, 2014

Ms. Lori Gifford , SERC/LEPC Coordinator
Washington Military Department
Mitigation and Recovery Section
Building 20, MS: TA-20
Camp Murray, WA 98430

Via Certified Mail

Dear Ms. Gifford,

The Portland and Western Railroad (PNWR) is providing you with the following information in accordance with Department of Transportation Docket Number DOT-OST-2014-0067.

General Information

- The PNWR operates crude oil trains through Washington, traversing the following counties:
  - *Clark*
- Based on current traffic volumes and projected traffic levels we anticipate the number of trains that will travel through these counties each week to be as follows:
  - *Clark 3 trains per week*
- The anticipated route of these trains is:
  - *Vancouver into the State of Oregon*
- The origin of these crude oil trains is:
  - *Berthold, Dore, Eland, and Epping ND.*
- The crude oil has a UN Code of:
  - *1267. Sample shipping papers and a material safety data sheet are attached.*

PNWR Emergency Response Plan

The following outlines relevant portions of the PNWR emergency response plan, including initial procedures, fire plan and crude oil plan. The risk of fire or explosion of this commodity has been deemed to be high.

- **Initial Actions**

Initial Actions – All Hazards

The primary concern of the initial person arriving at the site of an incident must be safety. The FIRST priority is always the protection of life, and the prevention of injuries. Railroad employees must always cooperate and work closely with local, State and Federal emergency response groups to achieve this goal.

Railroad Emergency Coordinator and Train Dispatch Initial Actions

The Railroad Emergency Coordinator will make an early evaluation of the emergency with information supplied by the Train Dispatcher and will verify what response personnel are needed. The Train Dispatcher should have already started the process of calling emergency services (if necessary) as soon as first reports of incident are received.

The Chief / Train Dispatcher Actions

- Ensure that all personnel are accounted for and isolated from danger
- Arrange for emergency services for any injured personnel
- Notify the required PNWR "Go Team"
- Notify all railroad response personnel - *This process can be given to a railroad manager to complete.*
- Notify CHEMTREC when necessary
- Notify Federal and State Agencies
- Notify Heavy Equipment and Emergency Response contractors when called for by the Railroad Emergency Coordinator

Railroad Emergency Coordinator Actions

- Go to the scene to conduct an initial detailed survey
- Ensure the safety of employees and the public
- Determine the identity, hazards and status of the cars and materials involved in the emergency
- Assess the possible hazards to human health or the environment
- Consider both direct and indirect effects of any release
- Cooperate with local responder groups to take measures to ensure that fire, explosions or releases do not occur or spread to other hazardous material cars

- Determine Response Management Team requirement
- Ensure that contractors and on-site response groups will monitor for leaks, pressure buildups, gas generation, or cracks developing in tank cars
- Monitor cleanup efforts, and ensure that the recovered material or contaminated material is properly treated, stored, or disposed of in accordance with Corporate Environmental Policies & Guidelines.
- Ensure that cleanup procedures are completed.
- Conduct a follow-up detailed survey.

First On-Scene Personnel (Train crew, fire, police, etc.)

In the event of an incident, the following actions should be taken by those first on the scene, ***BUT ONLY IF SAFE TO DO SO:***

HAZARD IDENTIFICATION:

Before attempting any response actions, it is important to identify the materials involved and their associated hazards. This vital action is the first and most important aspect of conducting an initial survey of the scene.

The three primary means by which hazardous materials can be identified are:

- Shipping papers including waybills.
- Placards and/or labels.
- Name of commodity stenciled on the car.

Shipping papers provide the best and most reliable source of identification of the materials involved. These are legal documents, which are in the custody of the Train Conductor, and are required to accompany all rail shipments. Those first on the scene of an incident should locate the Train Conductor and examine the shipping papers prior to attempting to mitigate the incident. If unable to locate the Train Conductor or the Train Conductor is incapacitated, contact the ***Train Dispatcher*** to obtain the "train list". This document contains a list of all cars in the train and the location of cars containing Hazardous Materials relative to the lead car.

Placards may also be used to identify the presence of hazardous materials; however, it is extremely important to recognize the limitations of the placarding system. The required placard represents only the most severe hazard established by the Department of Transportation. It does not, however, indicate if the material has multiple hazards. For example, a chemical classified as a flammable liquid by its primary hazard is placarded flammable; however, that same chemical may also be extremely toxic by inhalation or skin absorption.

Placards alone should never be used to identify hazardous materials. Always refer to the Emergency Response Guidebook provided to the train crews, the AAR's Emergency Handling of Hazardous Materials in Surface Transportation book, or CHEMTREC.

In addition, placards are frequently torn off or destroyed in incidents, and therefore may not be available as a source of identification. NEVER attempt to read a placard when fire is impinging on a car or a vapor cloud or odor is detected.

RESCUE THE INJURED:

Rescue the injured if possible, remove them to a safe area, and administer first aid. If there is evidence of smoke, fire, vapor clouds, or leakage of hazardous materials, protective clothing and appropriate respiratory protection must be worn as well as all other necessary personal protective equipment.

All rescue operations should be conducted as quickly as possible from the upwind side. Always plan an escape route prior to entering the immediate area. Personnel should never be unnecessarily exposed to smoke or fumes, and lives should NEVER be risked to save property or the environment.

EVACUATE THREATENED PERSONNEL:

If a large vapor cloud is observed, or there is fire involving a tank car, or car contains hazardous materials, it may be necessary to evacuate personnel to a safe area, one-half mile or more, with consideration given to wind speed and direction.

SECURE THE PERIMETER TO PREVENT UNAUTHORIZED ACCESS:

Set up roadblocks on the perimeter to prevent sightseers, evacuees, the news media, and all other non-essential personnel from entering a potentially dangerous environment. Personnel not directly involved with emergency response or rescue operations must be kept away from the hazard area.

PERSONAL PROTECTIVE EQUIPMENT:

Levels of Protection (A-D), from OSHA regulation (29 CFR 1910.120, Appendix B) are summarized in Table 4-1. Response personnel involved in oil spill cleanup operations will comply with all Federal, State and Company safety regulations and policies. All response personnel will use an acceptable level of PPE for their working environment based on the chemical or physical properties of the hazards present.

Table 4-1 Personal Protective Equipment / Levels of Protection: A-D

PERSONAL PROTECTION EQUIPMENT / LEVELS OF PROTECTION: A-D ---FROM OSHA REGULATIONS: 29 CFR 1910.120, APPENDIX B---	
CONDITIONS FOR USE	**EQUIPMENT (PPE)**
LEVEL A: Greatest level of protection for skin, respiratory, and eyes. SHOULD BE USED WHEN: 1. Hazardous substances identified for highest level of protection. * High concentration of atmospheric vapors, gases or particles. * Work functions potential for splash, immersion, or exposure. 2. Substances with a high degree of hazard to skin. 3. Operations being conducted in confined, poorly ventilated area, and not yet determined to de-escalate from Level A.	a. Positive-pressure, full face-piece SCBA. b. Totally encapsulating chemical protective suit. c. Gloves: inner and outer chemical resistant. d. Boots: chemical resistant with steel toe, and shank. * OPTIONAL, as applicable: Coveralls, long underwear, hard hat under suit.
LEVEL B: Highest level of respiratory protection but lesser level for skin protection SHOULD BE USED WHEN: 1. Type and atmospheric concentration identified. 2. Atmosphere contains less than 19.5% oxygen. 3. Presence of incompletely identified substance is indicated by organic vapor detection instrument, but are not suspected of containing high levels of chemicals harmful to skin or easily absorbed.	a. Positive-pressure, full face-piece SCBA. b. Hooded chemical resistant clothing. c. Gloves: inner and outer chemical resistant. d. Boots: chemical resistant, with steel toe and shank. * OPTIONAL, as applicable: Coveralls, boot covers, hard hat, face shield.
LEVEL C: SHOULD BE USED WHEN: 1. Atmospheric contaminants, liquid splashes, or other direct contact will adversely affect or be absorbed through skin. 2. Types of contaminants have been identified, concentrations measured, and an air purifying respirator can remove contaminant. 3. All criteria for use of air purifying respirators are met.	a. Full-face or half-mask air-purifying respirator. b. Hooded chemical resistant clothing. c. Gloves: inner and outer chemical resistant. * OPTIONAL, as applicable: Coveralls, boots (outer), boot covers, hard hat, escape mask, face shield.
LEVEL D: SHOULD BE USED WHEN:	a. Work uniform; used for nuisance contamination.

1. Atmosphere contains no known hazard, AND 2. Work functions preclude splashes, immersion, or potential for unexpected inhalation or contact with hazardous levels of any chemicals.	FRC Coveralls. b. Boots/shoes: chemical resistant, steel toe and shank. c. Safety glasses. * OPTIONAL, as applicable: Gloves, boots (outer), hard hat, escape mask, face shield.

CONDUCT AN INITIAL SURVEY OF THE SCENE:

The purpose of the survey is to assess the conditions and hazards of the incident so that evacuation, personnel safety procedures, mitigation activities, and cleanup can be planned. Facts concerning the incident can be accurately and timely disseminated to appropriate supervisory personnel.

Initial surveys, however, should NEVER risk human life. In some cases, the incident represents such an extreme hazard to life that the only safe course is to evacuate the area and protect the perimeter. When such conditions exist, initial surveys should be performed at safe distances, with binoculars or by aerial observation.

In situations where fire directly impinges on a tank car and there is a threat of the car rupturing violently, the initial survey should be performed from a distance of at least one-half mile and from the upwind side if possible. If highly radioactive materials or extremely toxic gases such as hydrocyanic acid are involved, only highly trained experts with proper protective equipment should survey the immediate area. An initial survey should determine the following information:

- Number and position of engines and/or cars derailed
- Identity and properties of the materials involved
- Potential hazards
- Presence of fire, smoke or fumes
- Disposition and overall condition of each container. Note structural damages, condition of valves, outer jacket torn, dents or gouges in inner tank etc.
- Evidence of leakage (wetness on sides of cars, vapor clouds, odors, etc.)
- Amount and rate of any leakage
- Look for material pooling, seeping into ground or entering any waterways
- Location of threatened waterways (streams, rivers, lakes, drainage ditches, culverts, sewers, etc.)
- Prevailing weather conditions (wind direction and speed, rain, humidity, temperature, etc.)
- Topography of and accessibility to the area
- Public exposure potential (nearest population, etc.)
- Nature and extent of any injuries

- Needed remedial action (dams or dikes, absorbents needed, etc.)
- Information obtained should be immediately provided to appropriate supervisory personnel, and the Chief/ Train Dispatcher

Work with Local Responders to Handle the Incident

Establish on-site procedure to coordinate the incident, and provide consistent information to local authorities. Train crews must not turn over the train manifest until authorized to do so by a Railroad Official.

Stabilize the Situation Until Expert Technical Assistance Arrives

The first and foremost goal is to protect lives and prevent injuries to the public. Once personnel are rescued and evacuated, and a perimeter has been secured, there is no need to rush into a scene and risk lives unnecessarily. In many cases, it is prudent to wait until expert assistance arrives before attempting to mitigate the situation.

If fire threatens a tank car, all personnel should be withdrawn until expert assistance arrives to assess whether or not it is safe to fight the fire.

Some materials react violently with water, while others can cause extensive environmental damage if diluting it with water spreads the contaminant. This frequently complicates and delays cleanup efforts.

REMEMBER: It is of critical importance to thoroughly understand the chemical and its properties before taking corrective action.

PNWR Emergency Response Plan – Fire Specific Information

The following is to be made available to fire fighters and first responders who are called to the scene in the event of a fire. This information is to ensure that the fire fighters are informed and is for their consideration in aiding PNWR in the case of an emergency.

Introduction to Rail Car Fires

Water is the most common and generally most available fire extinguishing agent. Exercise caution in selecting a fire extinguishing method since there are many factors to be considered in an incident. Water may be ineffective in fighting fires involving some materials; its effectiveness depends greatly on the method of application. Fires involving a spill of flammable liquids are generally controlled by applying a fire fighting foam to the surface of the burning material. Fighting flammable liquid fires requires foam concentrate which is chemically compatible with the burning material, correct mixing of the foam concentrate with water and air, and careful application and maintenance of the foam blanket. There are two general types of fire-fighting foam: regular and alcohol-resistant.

Examples of regular foam are protein-base, fluoroprotein, and aqueous film forming foam (AFFF). Some flammable liquids, including many petroleum products, can be controlled by applying regular foam. Other flammable liquids, including polar solvents (flammable liquids which are water soluble) such as alcohols and ketones, have different chemical properties.

A fire involving these materials cannot be easily controlled with regular foam and requires application of alcohol-resistant foam. Polar-solvent fires may be difficult to control and require a higher foam application rate than other flammable liquid fires (see NFPA/ANSI Standards 11 and 11A for further information). Refer to the appropriate guide to determine which type of foam is recommended. Although it is impossible to make specific recommendations for flammable liquids which have subsidiary corrosive or toxic hazards, alcohol-resistant foam may be effective for many of these materials. The emergency response telephone number on the shipping document, or the appropriate emergency response agency, should be contacted as soon as possible for guidance on the proper fire extinguishing agent to use. The final selection of the agent and method depends on many factors such as incident location, exposure hazards, size of the fire, environmental concerns, as well as the availability of extinguishing agents and equipment at the scene.

The following locations have been identified as foam sources:

Pasco, WA
BNSF Railway Fire Trailer
550 gallons AR/AFFF Foam
2-Fire Fighting Pumps
2-10,000 gallon Bladders for Water Storage
Various Hoses, Fittings and Nozzles
This Fire Trailer is capable of delivering 16,500 gallons of finished AR/AFFF Foam at 3% Concentration

Tacoma, WA
BNSF Railway Fire Trailer
275 gallons AR/AFFF Foam
1-Fire Fighting Pumps
1-10,000 gallon Bladders for Water Storage
Various Hoses, Fittings and Nozzles
This Fire Trailer is capable of delivering 8,600 gallons of finished AR/AFFF Foam at 3% concentration

Portland, OR
Maritime Fire and Safety Association Fire Fighting Trailer
600 Gallons of AFFF Foam
1-Fire Fighting Pump

Kalama, WA
Maritime Fire and Safety Association Fire Fighting Trailer
600 Gallons of AFFF Foam
1-Fire Fighting Pump

Specific tactics are involved when combating chemical fires. These tactics should only be attempted by qualified industrial firefighting personnel. Surgical application of foam and water is paramount in resolving the incident safely and quickly. Before any attempts are made at combatting the fire, all resources including water supplies and foam supplies, should be gathered at the site and used appropriately. An evaluation of each individual fire must be accomplished to decide if the incident should be allowed to continue to burn or needs to be extinguished. Each fire is evaluated on its own, and the decision to extinguish it or letting it continue to burn will depend on hazards, risk / benefit analysis, and environmental impact. These evaluations must only be performed by trained hazardous materials and firefighting personnel.

Flammable Liquid Properties – Flash Point / Boiling Point

- Flash Point Definition: the minimum temperature at which a liquid produces enough vapor to form an ignitable mixture in air.
    - USDOT:
        - Flammable Liquid = Liquids that have a flashpoint below 140 ^{o}F
        - Combustible Liquid = Liquids that have a flashpoint of 140 ^{o}F to 200 ^{o}F
    - NFPA:
        - Flammable Liquid = Liquids that have a flashpoint below 100 ^{o}F
        - Combustible Liquid = Liquids that have a flashpoint above 100 ^{o}F

- Boiling Point Definition: *the temperature at which the vapor pressure at the surface of the liquid is equal to or slightly greater than the atmospheric pressure. It's the point of maximum vapor production.*

Packing Groups

Packing Groups represent the degree of danger the material poses during transportation.

Table 4-5 - Class 3 Packing Groups

Class 3 (Flammable) Packing Groups		
Packing Group	**Flash Point**	**Initial Boiling Point**
I		**<= 35°C (95°F)**
II	**<23°C (73°F)**	**>35°C (95°F)**
III	**>23°C, <=60°C (140°F)**	**>35°C (95°F)**

Figure 4-6 - PG Key Physical Properties

Packing Group (PG) and Key Physical Properties of Common Flammable Materials							
	PG I Crude Oil*	PG II Crude Oil*	PG III Crude Oil*	Ethanol (PG II)	Gasoline (PGI or II)	Acetone (PG II)	LPG (Propane)
Boiling Point	*<95 °F*	*>95 °F*	*>95 °F*	*174 °F*	*90 - 410 °F*	*132 °F*	*- 43 °F*
Flashpoint	*<73 °F*	*<73 °F*	*>73 to <140 °F*	*55 °F*	*-36 to -50 °F*	*- 4 °F*	*- 156 °F*

*No two shipments (even from same well head or mine) will have the exact same chemical and physical composition, flashpoints/boiling points and Packing Groups will vary.

Vapor Density/Vapor Pressure

- Vapor Density Definition: Weight of a unit volume of gas or vapor compared to the weight of an equal volume of air (air is assumed to have a value of 1).
    - All Flammable Liquids have a Vapor Density Greater than 1 (air), meaning they will tend to accumulate in low areas
    - As such vapors can accumulate in low/depressed areas
    - Vapor accumulation will be affected by wind and topography

- Vapor Pressure Definition: the pressure exerted by a vapor in thermodynamic equilibrium with its condensed phases (solid or liquid) at a given temperature in a closed system.
    - A liquid with a high vapor pressure is considered to be volatile
    - Vapor pressure is directly related to temperature; Increasing temperature = Increasing vapor pressure
    - Light crude has a higher % of C1-C5 gases (i.e. methane, butane, ethane, propane, pentane) when compared to intermediate or heavy crudes which causes vapor pressures to be 10-12 psi range

Rail Specific Actions during an Incident Involving a Fire

- **Fire Fighting Considerations**
    - **Size up – from a distance and collect information**
        - What is burning?
        - What kind of railcars are burning (other than crude)?
        - What color is the smoke?
        - How long have the fires been burning?
        - Are there pool fires?
        - Pressure fires coming out of tank cars?
        - Intermittent fires from pressure relief devices or continuous fire?
        - What will be gained by an offensive approach?
        - Risk vs Reward
    - **BLEVE VS Heat Induced Tear**
        - *Boiling Liquid Expanding Vapor Explosion (BLEVE)*

BLEVEs can be caused by an external fire near the storage vessel causing heating of the contents and pressure build-up. While tanks are often designed to withstand great pressure, constant heating can cause the metal to weaken and eventually fail. If the tank is being heated in an area where there is no liquid, it may rupture faster without the liquid to absorb the heat. Gas containers are usually equipped with relief valves that vent off excess pressure, but the tank can still fail if the pressure is not released quickly enough. Relief valves are sized to release pressure fast enough to prevent the pressure from increasing beyond the strength of the vessel, but not so fast as to be the cause of an explosion. An appropriately sized relief valve will allow the liquid inside to boil slowly, maintaining a constant pressure in the vessel until all the liquid has boiled and the vessel empties.

If the substance involved is flammable, it is likely that the resulting cloud of the substance will ignite after the BLEVE has occurred, forming a fireball and possibly a fuel-air explosion, also termed a vapor cloud explosion (VCE). If the materials are toxic, a large area will be contaminated.

- *Heat Induced Tear* – low pressure container, lower energy, limited overpressure

    - Cause – Highly stressed metal (from heat/pressure) forms a "blister" then "pops"

    - Heat induced tears will occur in the vapor space (top of the car) so the pressurized liquid will be directed up.

    - Heat induced tears are the most common found instances where a general service tank car has been involved in a pool fire such as derailments involving crude oil or ethanol.

Note: Extreme caution should be used when a pressure tank car is involved in an incident involving a fire.

- **Fire protection and prevention**

Whenever hydrocarbons or flammable chemicals are present in closed containers such as tank cars and terminals the potential exists for release of liquids and vapors. These vapors could mix with air in the flammable range and, if subjected to a source of ignition, cause an explosion or fire. Spills and releases should be stopped from entering sewers and drainage systems. Small spills should be covered with dry earth and or absorbent materials , and larger spills with foam, to prevent vapors from escaping and mixing with air. Sources of ignition in areas when hydrocarbon vapors may be present should be eliminated or controlled. Portable fire

extinguishers should be carried on service vehicles and located at accessible and strategic positions throughout the incident.

Telephone numbers of responsible persons and agencies to be notified in case of an emergency should be posted at the facility and a means of communication provided. Local fire departments, emergency response, public safety and mutual aid organizations should also be aware of the procedures and familiar with the area and its hazards.

Hydrocarbon fires or chemical fires are controlled by one or a combination of methods, as follows:

- *Removing fuel.* One of the best and easiest methods of controlling and extinguishing a hydrocarbon fire is to shut off the source of fuel by closing a valve, diverting product flow or, if a small amount of product is involved, controlling exposures while allowing the product to burn away. Foam may also be used to cover hydrocarbon spills to prevent vapours from being emitted and mixing with the air.

- *Removing oxygen.* Another method is to shut off the supply of air or oxygen by smothering fires with foam or water fog, or by using carbon dioxide or nitrogen to displace air in enclosed spaces.

- *Cooling.* Water fog, mist or spray and carbon dioxide may be used to extinguish certain petroleum product fires by cooling the temperature of the fire below the product's ignition temperature and by stopping vapours from forming and mixing with air.

- *Interrupting combustion.* Chemicals such as dry powders and halon extinguish fires by interrupting the chemical reaction of the fire.

PNWR Emergency Response Plan – Oil Specific Plan

The following is to be made available to first responders and vendors who are called to the scene in the event of an oil spill. This information is to ensure that the vendors and responders are informed and is for their consideration in aiding PNWR in the case of an emergency.

Synopsis

Each incident and oil spill is different, therefore, phases of the spill will also vary depending on the type of oil, weather conditions, geographical location, environmental areas to be protected, logistics, etc.

However, there are many hardware systems and techniques, which remain similar, spill after spill. These will be described in this section for use as a training aid and ready reference.
Rapid deployment of containment and recovery equipment by on-site personnel increases the chance of a successful cleanup. This can significantly reduce the environmental impact and any subsequent cleanup and restoration costs. DO NOT BOOM GASOLINE OR ANY OTHER HIGHLY FLAMMABLE PRODUCT.

The Emergency Coordinator or Incident Commander should utilize the response decision diagram in Figure 4-1 to aid in decision making for the phases listed below.

- Detection
- Assessment
- Containment
- Recovery
- Shoreside Cleanup
- Restoration
- Decontamination
- Disposal

Priorities

The following priorities are general guidelines for response to an oil spill that may occur on any track operated by PNWR. They are based on the premise that the safety of life is of paramount importance in any pollution incident. The protection of the environment and property, although important, are secondary.

Nothing in this part is meant to indicate that higher priority items must be completed before performing a lower priority task. They may be carried out simultaneously or in the most logical sequence for each individual incident.

- Priority # 1 Safety of Life

  For all incidents which may occur, the safety of personnel must be given absolute priority. The term personnel include all individuals involved, including members of the response team. No personnel are to be sent into an affected area without first determining the hazards involved and subsequently, taking adequate precautions.

- Priority # 2 Protection of the Environment—By:

  - SECURE-STOP-THE SOURCE OF THE SPILL

    Every effort must be made to secure -- stop -- the source of the spill to prevent further damage. This is critical. All efforts made to ensure the safety and salvage of the train and track should be undertaken with the consideration to minimize further harm to the environment.

    - ON-WATER CONTAINMENT AND RECOVERY

      Rapid deployment of containment and recovery equipment will increase the likelihood of success during an oil spill.

- DIVERSION/EXCLUSION BOOMING TECHNIQUES / DAMMING

In the event that the location of the spill or the weather conditions does not permit open water recovery, protection of the shoreline becomes paramount. Environmentally sensitive areas must be given added consideration. It may not be possible to protect all areas entirely or even in part. It may be necessary to sacrifice some areas in order to achieve the best overall protection of the environment.

- DISPERSANT / BIOREMEDIATION / IN-SITU BURNING

It is highly unlikely that alternative response technologies will be a viable option in the rail operating areas.

- SHORESIDE CLEANUP/ REMEDIATION

Shoreside / land-based cleanup will be conducted when such removal can be accomplished with less environmental damage than allowing the oil to weather and biodegrade. Methods used will vary dependent on the area to be protected.

There are pros and cons to the bulk removal of oil and contaminated rock and sand. This process may remove oil and oily debris from a contaminated area but this may cause excessive erosion. In addition, the mechanical washing of rocks to remove oil could have damaging effects to the indigenous biological species.

<u>Assessment</u>

An important part of handling any oil spill response action is assessing the volume and direction of movement of the spill. An estimate of the oil spill volume allows response teams to determine both the type and quantity of equipment, and labor, necessary to recover the spilled oil. Plotting the spill movement allows response teams the time to plan their recovery strategies as well as protect environmentally sensitive areas.

Oil Spill Behavior

The rate at which oil spreads, evaporates and breaks down into the environment are all influenced by the processes of oxidation, dissolution, dispersion, emulsification and biodegradation. These processes over a period of days and/or weeks will alter the characteristics of spilled oil; thus, sometimes requiring a change in oil recovery equipment. However, in most cases, these processes aid in the cleanup operation by reducing the volume spilled. Weathering processes also reduce the toxicity of spilled oil, reducing its impact on the environment.

- Physical and Chemical Properties

- The term "oil" is applied to a wide variety of petroleum products ranging from crude oils to different grades of refined products.

- Crude oil is not a uniform substance and its properties vary widely from one location of origin to another.

- Oil spill behavior is a function of the oil's physical and chemical properties which include:

    - Density
    - Viscosity
    - Pour point
    - Flash point
    - Solubility in water

- By convention, physical and chemical properties of oil are measured at a standard or constant temperature and atmospheric pressure.

- However, the physical properties of oil will vary depending on local environmental conditions and may deviate considerably from values reported for "standard" conditions.

- The methods for dealing with spilled oil should be based on field observations.

<u>Response Options/Actions</u>

- Recovery
- Booming – Containment/Collection/Exclusion/Deflection/Diversion
- Blocking/Damming
- Decontamination
- Remediation/Shoreside Cleanup

Recovery

The recovery of oil is perhaps the most complex aspect of any oil spill control system. The types and volumes of oil, degrees of weathering and emulsification, sea state, presence of debris and/or ice, etc., all place constraints upon the size, ruggedness, complexity and capacity of a particular recovery device.

In brief, recovery devices (oil skimmers) can be categorized into systems that utilize adhesive surfaces, e.g. disc, belt, rope, and drum-type skimmers, and those that take advantage of gravitational effects, e.g. weirs, vortex skimmers, etc.

- Adhesive Surface (Oleophilic) systems require that a surface such as a disc, rope, or belt be drawn through an oil/water interface and out to where the oil can be scraped off or squeezed out of the adhesive material into a storage reservoir. The greatest advantage of the oleophilic skimmer is efficiency – (collects less water during recovery operations)- which can reduce the amount of temporary storage required. This can be a very important factor especially in remote locations.

- Gravitational/Weir systems involve such devices as centrifuges that increase the effects of gravity and thicken an oil slick for convenient removal, as well as weir devices that hold back water while allowing floating oil to pass over a slightly submerged barrier. Weir systems often have high recovery rates, but the temporary storage requirements will be much higher due to the amount of water that will be collected with the oil.

- Oil Sorbent Materials (pads/sweep/snare) are specialized materials which do not wet in water, but will absorb oil and most oil derivatives such as lube oil. The quantity of sorbents required and the application method depends on the size and location of a spill.

Booming Operations

The containment of oil at or near its source of discharge is desirable to limit its spread and to maximize the oil spill thickness, for more efficient recovery. Oil containment boom is a mechanical barrier that stops the flow of oil and surface water while allowing subsurface water to pass underneath. It is important for operations personnel to have a good working understanding of the various forces at work around an oil boom if successful boom performance is to occur at the spill site.

- Boom Forces
    - **WATER** current has the greatest effect on booms and must be seriously considered prior to boom deployment, or the boom can be badly damaged.
    - **WIND** currents are created and can be estimated as 3% of the wind's velocity.
    - **WAVE** action can cause oil to slop over or under a boom if the boom is not flexible enough to follow wave contours. It is an important factor in determining what boom to use in a spill cleanup.
- Boom Failure

- **EXCESSIVE LOADING & SUBMERGENCE** is the result of increased current velocities having shifted the boom to nearly a right angle. As the current increases, the loading increases on the boom, ultimately to a point above its design buoyancy. At that point, the boom will begin to sink, tear apart, or both.

- **ENTRAINMENT** occurs when the surface current hits the boom at a speed of 1.7 knots or greater, creating a hydraulic plane upstream of the boom. As oil thickens at the headwave of the oil slick, droplets of oil are torn away from the headwave by the current and forced down the hydraulic plane and under the boom, surfacing down current behind the boom.

- Proper Use of Boom

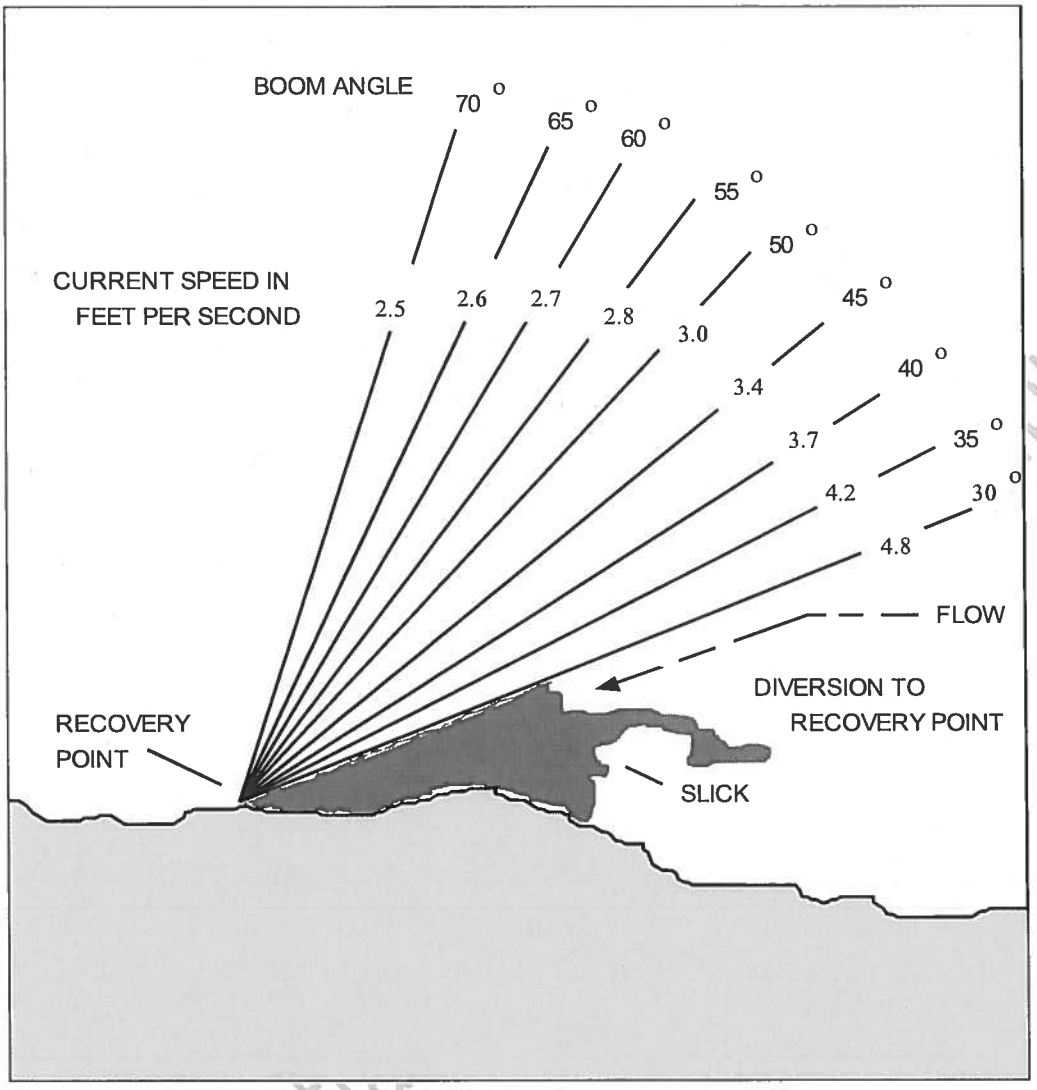
  - **DEFLECTION/DIVERSION -** In order to eliminate excessive boom loading and entrainment caused by high water currents (in excess of 1.7 knots), the boom is deployed at an angle to deflect and/or divert the oil. This type of deployment method slows the relative speed of the current to lessen entrainment and keeps oil off the shoreline or diverts the oil to a collection point. See Figure 4-2 Boom Deployment Angles.

  - **EXCLUSION** – Exclusion booming involves anchoring boom between two or more stationary points to exclude oil from entering water intakes, marinas, lagoons and other sensitive areas. Exclusion booms should also be deployed at an angle to the shoreline when possible to guide oil to an area where it can be recovered. In many cases, the deployment of a secondary boom behind the primary boom is needed to contain oil that may flow under the primary boom.

  - **COLLECTION/CONTAINMENT**– Containment at the source of the spill is accomplished by deploying boom around the area/source of the spill. This is the best way to prevent contamination of additional areas, but may not always be possible. Open water collection operations often involve "U", "V", "J", or "W" shaped configurations, that are used in conjunction with mechanical recovery or passive recovery devices.

  - **ANCHORING** – Anchor systems are usually deployed 3:1 (20ft water = 60ft of anchor line). The smaller scope usually works best if the chain attached to the anchor is a minimum of 6-8 ft. This helps with the angle and limits the upward pull on the anchor.

Figure 4-2 Boom Deployment Angles



- Fast Water / Swift Water Operations

Spill response operations on rivers can be accomplished with much of the same equipment, but some additional specialized equipment and techniques will make deployment operations safer and more effective. Boom with a shorter skirt (6-12") and 50-100' lengths will limit the amount of force placed on the boom. Line, hardware, and anchor points all need to have sufficient force and/or weight ratings. Personnel safety must always be considered first, since operations can involve steep slopes, slippery surfaces, and biological hazards. Pre-planning and staging rescue teams and first aid resources is recommended.

Blocking/Damming

If water is flowing into small estuarine entrances, damming may prevent oil from entering wetland areas. If the flow velocity is low, successful damming may be possible. Temporary

closures of these areas by damming should not cause environmental harm and impounded water should percolate through the sand. Damming can be accomplished using one of the following techniques:

- Flowing Water Dams

Dam locations should have high banks on the upstream side with the dam well-keyed into the banks. Construct dams with on / near site earthen materials, such as sandbags, plywood sheets, etc. Use heavy equipment or manual labor to excavate materials from the upstream side to increase dam storage capacity. Make the upstream side impermeable with plastic sheeting, if required. Underflow dams utilize inclined or valved pipes that have a flow capacity greater than the stream flow rate. Place the valved pipe(s) on the streambed and build a dam on top. Adjust the valve opening(s) until constant water / oil level is achieved behind the dam. Inclined pipes are placed in the dam at the lower end of the upstream side. The height of the raised end will determine the water level behind the dam.

For overflow dams, water flows over the top of the dam and boom positioned behind the dam contain the floating oil. Construct the dam as described above and cover it with plastic sheeting to prevent erosion. Anchor the boom several feet behind the dam. Pumps or siphons can also be used to pass water over the dam. To be effective, the pumping rate should be greater than the stream flow rate.

- Blocking Dam

Blocking dams are constructed across streambeds, ditches, or any other dry drainage courses to block and contain any flowing oil and to prevent oil mitigation during a rising tide. Dam locations should have high banks on the upstream side with the dam well-keyed into the banks.

Construct the dam using on-site earthen materials, such as sandbags, plywood sheets, or any other material that blocks the flow of oil. Excavate earthen materials from the upstream side to increase storage capacity. Oil is recovered from behind the dam by pumping or using vacuum trucks. Plastic sheeting should be placed over the dam to prevent oil penetration and erosion.

- Storm Drain Blocking

Sandbags, boards and specially constructed mats can be used to prevent spilled oil from entering urban storm drains. For curb inlets, position a board over the curb inlet and hold it in place with a sandbag. Street inlets can be blocked similarly with a board or plastic sheeting.

- Culvert Blocking

Boards, sandbags, inflatable plugs or earthen materials are used to block culverts as a means of containing oil flowing into ditches, creeks or other drainage courses that feed into culverts.

Culvert blocking may also be used to prevent oil from entering tidal channels that are connected to the ocean through culverts. Block the culverts by piling the dirt, sand or similar material over the upstream end of the culvert thereby creating a containment dam. Sandbags or plywood sheets are also effective - inflatable plugs work best if available at the site. Recover oil by skimming, vacuuming or pumping.

Remediation

An oil slick that is not contained will be carried by winds and currents into the open sea or onto a sensitive shoreline. Oil carried ashore should be removed quickly and thoroughly to minimize damage to property and sensitive ecosystems.

However, this is a complex ecological, technological and political issue. No decision making process should be undertaken without first consulting with experts in the field, including those representing various federal and state agencies.

The following factors will be considered in making decisions about whether to proceed with shoreline cleanup, and if so, to what extent.

- Will cleanup activities do more damage to sensitive shorelines than leaving the oil to biodegrade naturally?
- Some shoreline areas are not readily accessible to appropriate recovery equipment.
- Before cleanup of any shoreline takes place, the company legal/claims coordinator must procure authorization from the appropriate land management agency, or private land owner.
- Certain land classifications such as national and state parks, tribal lands, game refuges and private land may preclude cleanup operations, even when those activities are in the best interest of the particular shoreline.
- Biological and physical characteristics of a contaminated shoreline need to be evaluated.
- Sheltered shorelines not exposed to wave/flushing action should be given the highest priority for protection and cleanup

Decontamination

Keeping the oil and oily debris limited to a controlled area, as well as minimizing the contact of uncontaminated personnel and equipment with already contaminated personnel and equipment,

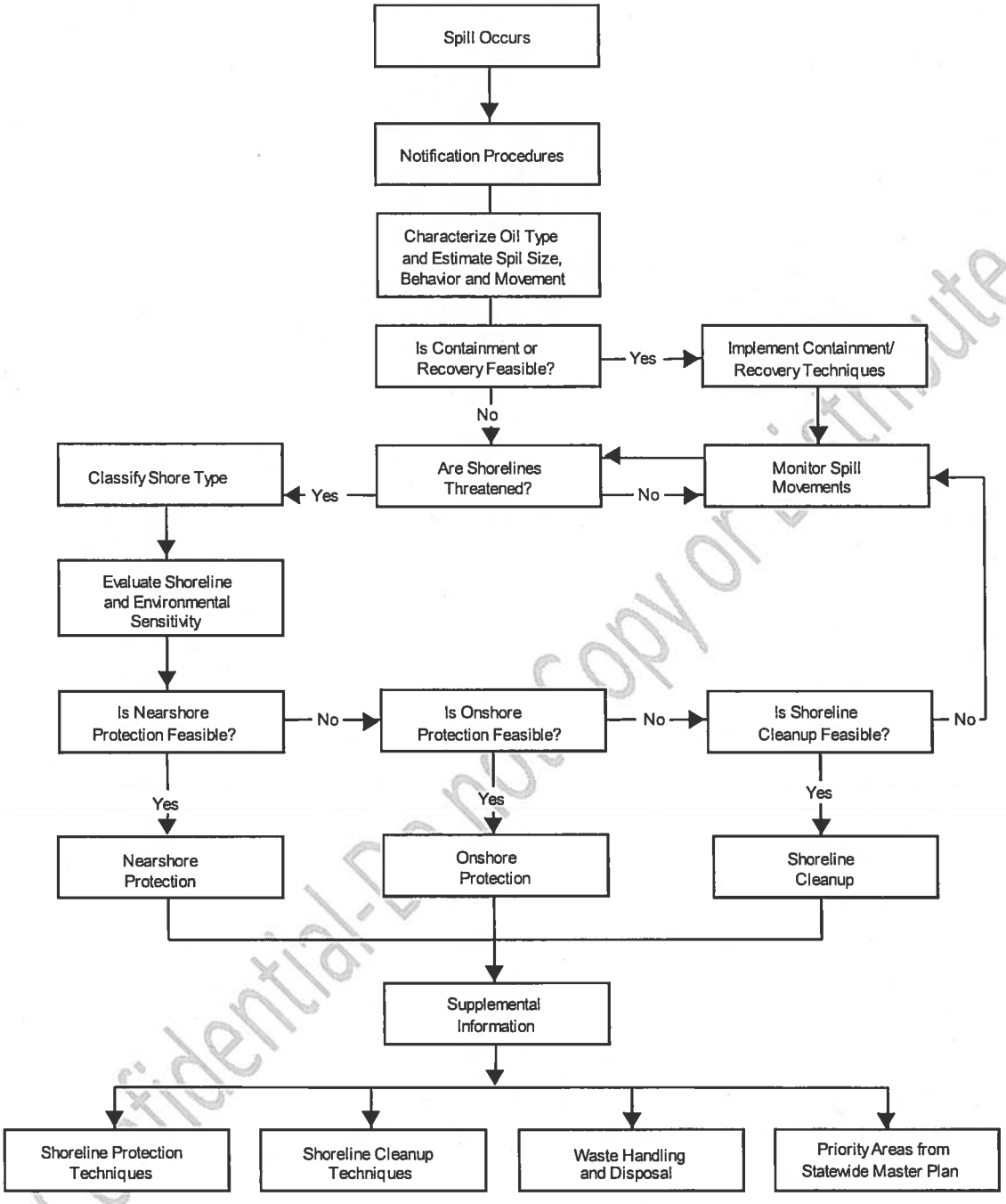
requires established procedures, and discipline. These procedures are to be developed, communicated, and implemented prior to entry of a contaminated (spill) area so that each person entering an area wearing protection equipment will understand the importance of keeping all contaminants inside the designated area.

Decontamination procedures should be tailored to a specific hazard. For an oil spill, this could mean making sure that protection equipment worn and the equipment used for cleanup are not taken away to a different area to be washed off with a hose and deposited down the storm drain. Precautions must be taken to insure that ALL oil or oily debris is properly contained and disposed of; that cleanup workers are decontaminated in such a way as to limit their exposure to any contamination; and, to limit any further (secondary) spreading of the contamination.

Decontamination procedures will vary from site to site, and according to available facilities and task categories. Specific procedures will be prescribed and supervised by the appropriate oil spill response contractor through their safety manager or field supervisor.

The essence of decontamination procedures is to remove all contamination from work clothing to prevent direct skin contact and secondary contamination of other garments and clean areas.

The PNWR Emergency Response Plan has notated initial methods for handling spills or leaks in the absence of fire **Figure 4-1 – Response Decision Diagram**



Preliminary First-Aid Measures

The preliminary first-aid measures to be taken due to exposure are as follows: Move victim to fresh air call emergency medical care. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact with material, immediately flush skin or eyes with running water for at least 20 minutes.

Points of Contact

The points of contact for the PNWR are:

Matthew E. Koon
Director of Compliance
3220 State Street Suite 200
Salem, Oregon 97301
(503) 480-7782 Office (503) 930-1723 Cell
Portland and Western Railroad

Craig G. Ashenfelter
Director of Safety
3220 State Street Suite 200
Salem, Oregon 97301
(503) 480-7760 Office (503) 816-8005
Portland and Western Railroad

Brad Landers
Vice President Mechanical Environmental
3220 State Street Suite 200
Salem, Oregon 97301
(503) 480-7761 Office (503) 816-8015
Portland and Western Railroad

Sincerely,

Matthew E. Koon
Director of Compliance
3220 State Street Suite 200
Salem, Oregon 97301
(503) 480-7782 Office (503) 930-1723 Cell
Portland and Western Railroad

Car: PPRX 661522

Waybill: 702874 Date: 5/17/14

****
* HAZARDOUS *
****

110 Tank Car
206073 Pound
UN1267
PETROLEUM CRUDE OIL
3
I
EMERGENCY CONTACT:
 CCN671546
  800-424-9300
HAZMAT STCC=4910165

****
********** END OF HAZMAT DATA **********

W A Y B I L L

Waybill: 702874 Date: 5/17/14

****
* HAZARDOUS *
****

PPRX 661522 T T209 RR 110 5/17/14 702874
Trailing Car
5905

STOP
THIS
CAR
AT

68254 PORT WESTWARD OR 939 BERTHOLD ND

BNSF WILBG PNWR S UBERPTW031T UT
1028681 BM
Delivery BOL Date 5/17/14 BOL Time 1:47

CONSIGNEE
PHILLIPS 66 CO
PORT WESTWARD OR

FREIGHT_BILL_PARTY
PHILLIPS 66 CO
PO BOX 8575
BARTLESVILLE OK 74005

SHIPPER
PHILLIPS 66 CO
BERTHOLD ND

CARE_OF_PARTY
COLUMBIA PACIFIC BIO-REFINERY
CLATSKANIE OR

Shipper's weight agreemen
Gross 280,462
Tare 74,200 Sec.7 NO

Net 206,262 Prepaid

IN-BOND TYPE: Blank

49 101 65
PETROLEUM CRUDE

TRANS SET: 421650001
I/C DATE : 5/19/14
LEAD_CAR
PPRX 661999
110 CLD HAZMAT

HAZARDOUS_INFO_____
110 Tank Car
206073 Pound
UN1267
PETROLEUM CRUDE OIL
3
I
EMERGENCY CONTACT:
CCN671546
800-424-9300
HAZMAT STCC=4910165
****

HAZARDOUS_INFO
********** END OF HAZMAT DATA **********

TRAILING_CARS_&_WEIGHTS_(GROSS,TARE,NET)

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W A Y B I L L

Ship_from_____
ENBRIDGE RAIL (NORTH DAKOTA) LP
1 MAIN ST S
BERTHOLD ND

W A Y B I L L

Waybill: 589413 Date: 5/20/14

****
* HAZARDOUS *
****

TILX 281707 T T108 TN 100 5/20/14 589413
Lead car
5905
STOP
THIS
CAR
AT

68254 PORT WESTWARD OR 1020 EPPING ND

BNSF WILBG PNWR S UEPPPTW003T UT
NS BM
Delivery BOL Date 5/20/14 BOL Time 6:22

CONSIGNEE
BP PRODUCTS NORTH AMERICA
PORT WESTWARD OR

FREIGHT_BILL_PARTY
BP PRODUCTS NORTH AMERICA INC
30 S WACKER DR
CHICAGO IL 60606

SHIPPER
BP PRODUCTS NORTH AMERICA
EPPING ND

CARE_OF_PARTY
COLUMBIA PACIFIC BIO-REFINERY
81200 KALLUNKI RD
CLATSKANIE OR 97016-224

Shipper's weight agreemen
Gross 280,000
Tare 84,000 Sec.7 NO

Net 196,000 Prepaid

IN-BOND TYPE: Blank

49 101 65
PETROLEUM CRUDE

TRANS SET: 433420001
I/C DATE : 5/23/14
100 CLD HAZMAT

HAZARDOUS_INFO_____
1 Tank Car
27090 Gallons
UN1267
PETROLEUM CRUDE OIL
3
I
EMERGENCY CONTACT:
CHEMTREC
800-424-9300
HAZMAT STCC=4910165
****
********** END OF HAZMAT DATA **********

W A Y B I L L

TRAILING_CARS_&_WEIGHTS_(GROSS,TARE,NET)

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TILX 281702	280100	84100	196000	TILX 281705	280100	84100	196000
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Tot Weight: 27936700 8336700 19600000

W A Y B I L L

Ship_from_____
CRESTWOOD MIDSTREAM PARTNERS LP
12324 60TH NW
EPPING ND

W A Y B I L L

Waybill: 715149 Date: 5/24/14

****
* HAZARDOUS *
****

CBTX 716419 T T108 TN 91 5/24/14 715149
Lead car
5904
STOP
THIS
CAR
AT

68254 PORT WESTWARD OR 3548 ELAND ND

BNSF WILBG PNWR S UELUPTW002T UT
NS BM
Delivery BOL Date 5/24/14 BOL Time 22:22

CONSIGNEE
BP PRODUCTS NORTH AMERICA
200 WESTLAKE PARK BLVD
PORT WESTWARD OR 77079

FREIGHT_BILL_PARTY
BP PRODUCTS NORTH AMERICA INC
30 S WACKER DR
CHICAGO IL 60606

SHIPPER
BP PRODUCTS NORTH AMERICA

ELAND ND

CARE_OF_PARTY
COLUMBIA PACIFIC BIO-REFINERY
81200 KALLUNKI RD
CLASKANIN OR 97016-2244

Shipper's weight agreemen
Gross 278,132
Tare 86,700 Sec.7 NO

Net 191,432 Prepaid

IN-BOND TYPE: Blank

49 101 65
PETROLEUM CRUDE

TRANS SET: 476680001
91 CLD HAZMAT

HAZARDOUS_INFO_____
91 Tank Car
28140 Gallons
UN1267
PETROLEUM CRUDE OIL
3
I
EMERGENCY CONTACT:
CHEMTREC
800-424-9300
HAZMAT STCC=4910165
****
********** END OF HAZMAT DATA **********

W A Y B I L L

TRAILING_CARS_&_WEIGHTS_(GROSS,TARE,NET)

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CBTX 716409	275439	86800	188639	CBTX 716420	278392	86900	191492
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CBTX 716373	276570	86500	190070	CBTX 716383	276858	86800	190058
CBTX 716403	272529	86800	185729	CBTX 716378	272234	86500	185734
CBTX 716408	278178	86700	191478	CBTX 716415	278192	86700	191492
CBTX 716340	277729	87000	190729	CBTX 716390	276807	86700	190107
CBTX 716347	276727	86700	190027	CBTX 716337	276873	86800	190073
CBTX 716444	272554	86800	185754	CBTX 716326	272614	86600	186014
CBTX 716418	274011	86800	187211	CBTX 716422	278106	86700	191406
CBTX 716348	278241	86800	191441	CBTX 716327	276795	86700	190095
CBTX 716334	276684	86600	190084	CBTX 716407	276778	86800	189978
CBTX 716430	276884	86800	190084	CBTX 716355	275370	86500	188870
CBTX 716401	276704	86700	190004	CBTX 716424	278669	87100	191569
CBTX 716359	278472	86900	191572	CBTX 716336	276773	86700	190073
CBTX 716349	276701	86600	190101	CBTX 716357	276941	86800	190141
CBTX 716449	277164	87000	190164	CBTX 716332	276795	86800	189995
CBTX 716402	276664	86600	190064	CBTX 716329	276481	86400	190081
CBTX 716395	278075	86600	191475	CBTX 716345	278143	86700	191443
CBTX 716375	276481	86400	190081	CBTX 716386	277010	86900	190110
CBTX 716380	276698	86600	190098	CBTX 716421	276773	86700	190073
CBTX 716342	276935	86900	190035	CBTX 716399	274328	86700	187628
CBTX 716411	276641	86600	190041	CBTX 716431	277961	86600	191361
CBTX 716443	278341	86900	191441	CBTX 716330	276313	86400	189913
CBTX 716388	276744	86700	190044	CBTX 716382	276981	86900	190081
CBTX 716406	276793	86800	189993	CBTX 716343	276810	86800	190010
CBTX 716350	277152	86900	190252	CBTX 716394	276564	86500	190064

Tot Weight: 25171852 7890100 17281752

Ship_from_____
BAKKEN OIL EXPRESS LLC
3761 115TH AVE SW
ELAND ND 58601
PHONE NUMBER: 7014830454

W A Y B I L L

Waybill: 279799 Date: 5/26/14

****
* HAZARDOUS *
****

TILX 350332 T T109 RR 104 5/26/14 279799
Trailing Car
5905

STOP
THIS
CAR
AT

68254 PORT WESTWARD OR 59209 DORE ND

BNSF WILBG PNWR S UDNDPTW008T UT
010869DR BM
Delivery BOL Date 5/26/14 BOL Time 12:04

CONSIGNEE
BP PRODUCTS NORTH AMERICA
200 WEST LAKE BLVD
PORT WESTWARD OR

SHIPPER
HIGH SIERRA CRUDE OIL MARKETING LLC
3773 CHERRY CREEK NORTH DRIVE
DENVER CO 80209

FREIGHT_BILL_PARTY
HIGH SIERRA CRUDE OIL MARKETING LLC
3773 CHERRY CREEK N DR
CALIBER DRIVE STE 100
DENVER CO 80210

CARE_OF_PARTY
COLUMBIA PACIFIC BIO-REFINERY
81200 KALLUNKI RD

PORT WESTWARD OR

Shipper's weight agreemen
Gross 260,218
Tare 74,100 Sec.7 YES

Net 186,118 Prepaid

IN-BOND TYPE: Blank

49 101 65
PETROLEUM CRUDE

Seals: 0 185102
185103 185104

TRANS SET: 464970001
LEAD_CAR
TILX 350321
104 CLD HAZMAT

HAZARDOUS_INFO_____
1 Tank Car
187294 Pound
UN1267
PETROLEUM CRUDE OIL
3
I

TN=(PETROLEUM CRUDE OIL 01)
EMERGENCY CONTACT:

HAZARDOUS_INFO
CHEMTREC #204043
8004249300
HAZMAT STCC=4910165
****
********** END OF HAZMAT DATA **********

TRAILING_CARS_&_WEIGHTS_(GROSS,TARE,NET)

TILX 350321	261194	73900	187294	TILX 350324	261460	74200	187260
TILX 350325	260660	74200	186460	TILX 350326	261211	74200	187011
TILX 350327	261003	74200	186803	TILX 350328	260645	74400	186245
TILX 350329	261028	74400	186628	TILX 350330	261438	74300	187138
TILX 350333	260298	74100	186198	TILX 350337	261136	74400	186736
TILX 350338	260283	74400	185883	TILX 350339	261009	74300	186709
TILX 350340	260991	74000	186991	TILX 350341	261001	74400	186601
TILX 350342	260588	74000	186588	TILX 350346	261017	74000	187017
TILX 350348	261336	74500	186836	TILX 350358	261173	74400	186773
TILX 350360	261295	74700	186595	TILX 350362	261617	74700	186917
TILX 350365	261150	74300	186850	TILX 350370	262064	74100	187964
TILX 350372	261216	74400	186816	TILX 350373	260464	74400	186064
TILX 350374	260445	74200	186245	TILX 350375	261344	74300	187044
TILX 350376	262324	74300	188024	TILX 350378	260619	74200	186419
TILX 350379	261331	74300	187031	TILX 350381	261115	74400	186715
TILX 350382	261168	74600	186568	TILX 350383	260214	74600	185614
TILX 350384	261092	74800	186292	TILX 350388	260825	74600	186225
TILX 350393	262081	74500	187581	TILX 350395	261660	74300	187360
TILX 350396	260880	74500	186380	TILX 350398	260758	74700	186058
TILX 350399	261255	74600	186655	TILX 350401	262075	74500	187575
TILX 350404	262208	74600	187608	TILX 350405	260517	74600	185917
TILX 350406	261086	74700	186386	TILX 350412	261204	74200	187004
TILX 350416	260979	74700	186279	TILX 350418	261148	74600	186548
TILX 350421	259765	74600	185165	TILX 350425	261429	74700	186729
TILX 350427	260254	74700	185554	TILX 350428	260141	74600	185541
TILX 350430	260206	74800	185406	TILX 350431	260779	74700	186079
TILX 350433	262165	75000	187165	TILX 350435	260180	74700	185480
TILX 350436	261656	74800	186856	TILX 350437	262423	74600	187823
TILX 350438	260402	74700	185702	TILX 350439	260879	74700	186179
TILX 350440	261301	74700	186601	TILX 350441	261959	74700	187259
TILX 350445	261301	74700	186601	TILX 350446	261189	74500	186689
TILX 350449	262647	74300	188347	TILX 350451	262090	74200	187890
TILX 350458	260220	74800	185420	TILX 350459	261370	74400	186970
TILX 350461	261060	74700	186360	TILX 350462	260578	74500	186078
TILX 350466	260403	74500	185903	TILX 350467	260868	74300	186568
TILX 350468	261955	74400	187555	TILX 350472	262684	74700	187984
TILX 350473	260733	74300	186433	TILX 350474	260242	74500	185742
TILX 350480	260851	74700	186151	TILX 350483	260892	74700	186192
TILX 350485	260706	74400	186306	TILX 350486	261475	74800	186675
TILX 350487	260223	74300	185923	TILX 350490	260598	74400	186198
TILX 350493	260148	74500	185648	TILX 350497	260860	74400	186460
TILX 350498	259565	74300	185265	TILX 350499	260759	74500	186259
TILX 350501	261848	74300	187548	TILX 350502	260880	74300	186580
TILX 350503	261362	74600	186762	TILX 350506	262472	74300	188172
TILX 350507	259847	74400	185447	TILX 350508	260451	74300	186151
TILX 350509	261629	74900	186729	TILX 350512	261767	74300	187467
TILX 350513	260848	74300	186548	TILX 350516	261389	74700	186689
TILX 350517	260784	74700	186084	TILX 350518	261181	74600	186581
TILX 350519	260019	74700	185319	TILX 350521	261027	74500	186527
TILX 350525	261242	74600	186642	TILX 350526	260108	74400	185708
TILX 350528	262242	74500	187742	TILX 350529	260872	74700	186172

W A Y B I L L

TILX 350530	260605	74700	185905
Tot Weight:	27149352	7745400	19403952

TRAILING_CAR_SEALS

TILX 350324	183533	183534	183535	183536
TILX 350325	185109	185110	185111	185112
TILX 350326	0	185110	185111	185112
TILX 350327	0	185110	185111	185112
TILX 350328	183374	183375	183376	183377
TILX 350329	0	183375	183376	183377
TILX 350330	185101	185102	185103	185104
TILX 350332	0	185102	185103	185104
TILX 350333	183917	183918	183919	183920
TILX 350337	183653	183654	183655	183656
TILX 350338	183977	183978	183979	183980
TILX 350339	183605	183606	183607	183608
TILX 350340	183557	183558	183559	183560
TILX 350341	0	183558	183559	183560
TILX 350342	183521	183522	183523	183524
TILX 350346	0	183522	183523	183524
TILX 350348	185149	185150	185151	185152
TILX 350358	014080	014081	014082	014083
TILX 350360	183657	183658	183659	183660
TILX 350362	183909	183910	183911	183912
TILX 350365	183386	183387	183388	183389
TILX 350370	183553	183554	183555	183556
TILX 350372	183601	183602	183603	183604
TILX 350373	183969	183970	183971	183972
TILX 350374	0	183970	183971	183972
TILX 350375	183394	183395	183396	183397
TILX 350376	185109	185110	185111	185112
TILX 350378	0	185110	185111	185112
TILX 350379	0	185110	185111	185112
TILX 350381	0	185110	185111	185112
TILX 350382	185125	185126	185127	185128
TILX 350383	181189	181190	181191	181192
TILX 350384	0	181190	181191	181192
TILX 350388	0	181190	181191	181192
TILX 350393	183549	183550	183551	183552
TILX 350395	014071	014072	014073	014074
TILX 350396	0	014072	014073	014074
TILX 350398	183965	183966	183967	183968
TILX 350399	183925	183926	183927	183928
TILX 350401	183905	183906	183907	183908
TILX 350404	183613	183614	183615	183616
TILX 350405	185169	185170	185172	183616
TILX 350406	0	185170	185172	183616
TILX 350412	183529	183530	183531	183532
TILX 350416	183513	183514	183515	183516
TILX 350418	183913	183914	183915	183916
TILX 350421	185129	185130	185131	185132
TILX 350425	0	185130	185131	185132
TILX 350427	183382	183383	183384	183385
TILX 350428	0	183383	183384	183385
TILX 350430	183961	183962	183963	183964
TILX 350431	014282	014283	014284	014285

W A Y B I L L

TILX 350433	183505	183506	183507	183508
TILX 350435	181185	181186	181187	181188
TILX 350436	183390	183391	183392	183393
TILX 350437	0	183391	183392	183393
TILX 350438	183973	183974	183975	183976
TILX 350439	014084	014085	014086	014087
TILX 350440	183649	183650	183651	183652
TILX 350441	0	183650	183651	183652
TILX 350445	0	183650	183651	183652
TILX 350446	0	183650	183651	183652
TILX 350449	0	183650	183651	183652
TILX 350451	183501	183502	183503	183504
TILX 350458	185137	185138	185139	185140
TILX 350459	0	185138	185139	185140
TILX 350461	183561	183562	183563	183564
TILX 350462	181193	181194	181195	181196
TILX 350466	0	181194	181195	181196
TILX 350467	0	181194	181195	181196
TILX 350468	183901	183902	183903	183904
TILX 350472	0	183902	183903	183904
TILX 350473	185173	185174	185175	185176
TILX 350474	183953	183954	183955	183956
TILX 350480	183509	183510	183511	183512
TILX 350483	183921	183922	183923	183924
TILX 350485	0	183922	183923	183924
TILX 350486	185117	185118	185119	185120
TILX 350487	183957	183958	183959	183960
TILX 350490	185121	185122	185123	185124
TILX 350493	185161	185162	185163	185164
TILX 350497	183525	183526	183527	183528
TILX 350498	185165	185166	185167	185168
TILX 350499	014075	014076	014077	014078
TILX 350501	185133	185134	185135	185136
TILX 350502	0	185134	185135	185136
TILX 350503	185153	185154	185155	185156
TILX 350506	183661	183662	183663	183664
TILX 350507	185157	185158	185159	185160
TILX 350508	185105	185106	185107	185160
TILX 350509	0	185106	185107	185160
TILX 350512	185145	185146	185147	185148
TILX 350513	185177	185178	185179	185180
TILX 350516	0	185178	185179	185180
TILX 350517	183378	183379	183380	183381
TILX 350518	183929	183930	183931	183932
TILX 350519	183517	183518	183519	183520
TILX 350521	0	183518	183519	183520
TILX 350525	185181	185182	185183	185184
TILX 350526	185141	185142	185143	185144
TILX 350528	0	185142	185143	185144
TILX 350529	0	183609	183610	185144
TILX 350530	0	183609	183610	185144

Ship_from_____
MUSKET CORP
DORE ND

STCC 4910165 PETROLEUM CRUDE

PETROLEUM CRUDE OIL 4910165
CLASS 3 (FLAMMABLE LIQUID) UN1267

PETROLEUM CRUDE OIL IS A DARK VISCOUS LIQUID. IT HAS A FLASH POINT OF LESS THAN 141 DEG. F. IT IS LIGHTER THAN WATER AND INSOLUBLE IN WATER. ITS VAPORS ARE HEAVIER THAN AIR.

IF MATERIAL ON FIRE OR INVOLVED IN FIRE
- DO NOT EXTINGUISH FIRE UNLESS FLOW CAN BE STOPPED
- USE WATER IN FLOODING QUANTITIES AS FOG
- SOLID STREAMS OF WATER MAY SPREAD FIRE
- COOL ALL AFFECTED CONTAINERS WITH FLOODING QUANTITIES OF WATER
- APPLY WATER FROM AS FAR A DISTANCE AS POSSIBLE
- USE FOAM, DRY CHEMICAL, OR CARBON DIOXIDE

IF MATERIAL NOT ON FIRE OR NOT INVOLVED IN FIRE
- KEEP SPARKS, FLAMES, AND OTHER SOURCES OF IGNITION AWAY
- KEEP MATERIAL OUT OF WATER SOURCES AND SEWERS
- BUILD DIKES TO CONTAIN FLOW AS NECESSARY
- ATTEMPT TO STOP LEAK IF WITHOUT UNDUE PERSONNEL HAZARD
- USE WATER SPRAY TO KNOCK-DOWN VAPORS

PERSONNEL PROTECTION
- AVOID BREATHING VAPORS
- KEEP UPWIND
- WEAR APPROPRIATE CHEMICAL PROTECTIVE GLOVES, BOOTS AND GOGGLES
- DO NOT HANDLE BROKEN PACKAGES UNLESS WEARING APPROPRIATE PERSONAL PROTECTIVE EQUIPMENT
- WASH AWAY ANY MATERIAL WHICH MAY HAVE CONTACTED THE BODY WITH COPIOUS AMOUNTS OF WATER OR SOAP AND WATER

ENVIRONMENTAL CONSIDERATIONS - LAND SPILL
- DIG A PIT, POND, LAGOON, HOLDING AREA TO CONTAIN LIQUID OR SOLID MATERIAL
- DIKE SURFACE FLOW USING SOIL, SAND BAGS, FOAMED POLYURETHANE, OR FOAMED CONCRETE
- ABSORB BULK LIQUID WITH FLY ASH, CEMENT POWDER, OR COMMERCIAL SORBENTS

ENVIRONMENTAL CONSIDERATIONS - WATER SPILL
- USE NATURAL BARRIERS OR OIL SPILL CONTROL BOOMS TO LIMIT SPILL TRAVEL
- REMOVE TRAPPED MATERIAL WITH SUCTION HOSES

ENVIRONMENTAL CONSIDERATIONS - AIR SPILL
- APPLY WATER SPRAY OR MIST TO KNOCK DOWN VAPORS

FIRST AID RESPONSES
- MOVE VICTIM TO FRESH AIR; CALL EMERGENCY MEDICAL CARE.
- IF NOT BREATHING, GIVE ARTIFICIAL RESPIRATION.
- IF BREATHING IS DIFFICULT, GIVE OXYGEN.
- IN CASE OF CONTACT WITH MATERIAL, IMMEDIATELY FLUSH SKIN OR EYES WITH RUNNING WATER FOR AT LEAST 20 MINUTES.

STCC 4910165 PETROLEUM CRUDE

REMOVE AND ISOLATE CONTAMINATED CLOTHING AND SHOES AT THE SITE.

End of report

cenovus ENERGY

LIGHT CRUDE OIL

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Identifier: LIGHT CRUDE OIL
Synonyms: Bakken Oil, Bakken Crude
Chemical Description: A naturally occurring mixture of aromatic hydrocarbons and small amounts of sulfur and nitrogen compounds
Product Use: Process stream, fuels and lubricants production
Manufacturer/Supplier: CENOVUS ENERGY INC.
500 Centre Street SE, PO Box 766
Calgary, AB T2P 0M5
Prepared By: Cenovus Energy Inc. Health and Safety
Phone Number: 1-403-766-2000
Emergency Telephone: 1-877-458-8080, CANUTEC 1-613-996-6666 (Canada)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous Ingredients	CAS Number	Approximate Concentration (%)
Petroleum Crude Oil	8002-05-9	100 v/v
Benzene	71-43-2	0.1 – 1.0 v/v

Hydrogen Sulfide in liquid is <0.1% v/v, vapour phase may contain higher concentrations.

3. HAZARDS IDENTIFICATION

Routes of Entry: Skin contact, skin absorption, eye contact, inhalation, ingestion
Emergency Overview: Warning. Flammable liquid and vapour. Liquid and vapour may cause irritation or burns to eyes, nose and throat. Inhalation of vapour may cause dizziness and drowsiness. Possible cancer hazard (benzene). Possible asphyxiation hazard (hydrogen sulfide). Wear personal protective equipment appropriate for the task.

WHMIS B2, D2-A, D2-B
NFPA F4, R0, H3

Potential Health Effects: Contains material which may cause cancer after long-term, repeated skin contact.

4. FIRST AID MEASURES

Eye Contact: Immediately flush eyes with large amounts of lukewarm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.

Skin Contact: Remove contaminated clothing. Flush skin with water. Get medical attention if irritation persists or large area of contact. Decontaminate clothing before re-use.

Inhalation: Ensure own safety. Remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek medical attention immediately.

Ingestion: Give 2-3 glasses of milk or water to drink unless patient is unconscious or has a decreased level of alertness. DO NOT INDUCE VOMITING. Keep patient warm and at rest. Seek medical attention immediately.

5. FIRE FIGHTING MEASURES

Flammable: Material will ignite at normal temperatures.
Means of Extinction: Foam, carbon dioxide (CO_2), dry chemical. Explosive accumulations can build up in areas of poor ventilation.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. Cut off fuel and allow flame to burn out.
TDG Classification: 3
Flash Point (°C) & Method: <-35 (PMCC) **Auto-Ignition Temp. (°C)**: 250 (estimated)
Upper Explosive Limit (% v/v): 8 (estimated) **Lower Explosive Limit (% v/v)**: 0.8 (estimated)
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes, at normal temperatures
Hazardous Combustion Products: Carbon monoxide, sulfur oxides, nitrogen oxides, smoke particles
NFPA 704 Rating: Flammability:4, Instability/Reactivity:0, Health:3

6. ACIDENTAL RELEASE MEASURES

Personnel precautions: Appropriately trained personnel should respond to uncontrolled releases. Avoid direct contact with material; use the personal protective equipment specified in Section 8. Stay upwind of release; isolate the immediate hazard area; and keep unnecessary and unprotected people away. Use water spray to cool containers. Eliminate all sources of ignition. Provide explosion-proof clearing ventilation, if possible.
Environmental precautions: Prevent material from entering soil, waterways, drains, sewers, or confined areas.
Cleanup measures: Stop leak if safe to do so. Dyke and pump material into containers for recycling or disposal. Contact appropriate regulatory authorities for disposal requirements (see Section 13). Notify the appropriate regulatory authorities of reportable releases (see Section 15).

7. HANDLING AND STORAGE

Handling: Wear appropriate personal protective equipment. Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions. Wash hands and face after handling and before eating, drinking or smoking.
Storage: Store material in a cool, dry, well-ventilated area away from heat, strong sunlight, hot metal surfaces and ignition sources. Use approved containers only. Separate from incompatible material (see Section 10).

Caution: Hydrogen sulfide may accumulate in headspaces of tanks and other equipment, even when concentrations in the liquid product are low. Factors increasing this hazard potential include heating, agitation and contact of the liquid with acid or acid salts. Assess the exposure risk by gas monitoring. Wear air supplying breathing apparatus if necessary. Overexposure to hydrogen sulfide may cause dizziness, headache, nausea and possibly unconsciousness and death.

8. EXPOSURE CONTROL/PERSONAL PROTECTION

Occupational Exposure Limits

Hazardous Ingredients	Alberta OEL	Saskatchewan	OSHA PEL	ACGIH TLV
Petroleum Crude Oil	300 ppm; 500 ppm (15min)	300 ppm	--	--
Benzene	0.5 ppm; 2.5 ppm (15min), Skin	--	1 ppm; 5 STEL; Petroleum Industry: 10 ppm; 25 ppm (C)	0.5 ppm; 2.5 STEL, Skin
Hydrogen Sulfide	10 ppm; 15 ppm (C)	--	20 ppm (C)	1 ppm

Engineering Controls: Use only in well-ventilated areas. Local exhaust ventilation required in confined areas. Equipment must be explosion proof.
Hygiene Measures: Wash hands and face after handling and before eating, drinking or smoking. Take off contaminated clothing and wash before re-use.
Personal Protection
Respirator: Where concentrations may exceed exposure limits, use full-face, positive pressure self-contained breathing apparatus; full-face, positive pressure supplied-air breathing apparatus; or cartridge air-purifying respirator approved for organic vapours (note: cartridge respirator not suitable for hydrogen sulfide, oxygen deficienct or IDLH situations).
Gloves: Chemical-resistant gloves: Viton (Nitrile adequate for short exposure to liquid.)
Eyewear: Chemical splash goggles. A face shield may also be necessary, depending on handling conditions.
Footwear: As per safety policy.
Clothing: As per fire protection policy.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Liquid	**Odour & Appearance**:	Dark Brown, hydrocarbon-like
Odour Threshold (ppm):	Not Available	**Specific Gravity**:	0.7 – 0.8
Vapour Density (air=1):	2.5 -5.0 (estimated)	**Vapour Pressure (mmHg)**:	280-360 @ 20°C
Evaporation Rate:	Not Available	**Boiling Pt. (°C)**:	-40 to 530
Freezing Pt. (°C):	<-60	**pH**:	Not Available
Coefficient of Water/Oil Distribution:	<0.1	**Percent Volatiles, (v/v)**:	15 - 30 (estimated)

10. STABILITY AND REACTIVITY

Chemical Stability: Stable under normal, ambient conditions.
Incompatibility: Incompatible with strong oxidizing agents (e.g. chlorine, peroxide).
Reactivity: Reactive to heat, strong sunlight and ignition sources.
Hazardous Decomposition Products: Carbon monoxide, sulfur oxides, nitrogen oxides, smoke particles
Hazardous Polymerization: Not known to occur.

11. TOXICOLOGICAL INFORMATION

Acute Exposure
Vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Contact with skin may cause irritation and possibly dermatitis. Contact of liquid with eyes may cause severe irritation or burns.

Hazardous Ingredients	Result	Species	Dose	Exposure
Petroleum Crude Oil	LD50 Oral LD50 Dermal LC50 Inhalation	Rat	>5 g/kg >2 g/kg >4300 ppm	-
Benzene	LD50 Oral LC50 Inhalation	Rat	0.9 g/kg 13200 ppm	- 4 hours
Hydrogen Sulfide	LC50 Inhalation	Rat	444 ppm	4 hours

Chronic Exposure
Due to presence of benzene, long term exposure may increase the risk of anemia and leukemia. Repeated skin contact may increase the risk of skin cancer.

Irritant: Yes
Skin Sensitization: Yes
Respiratory Sensitization: No
Carcinogenicity: Yes
Reproductive Toxicity: Possibly
Teratogenicity: Possibly
Mutagenicity: Possibly
Synergistic Materials/Products: None reported

Crude Oil
IARC – Crude oil is not classifiable as to its carcinogenicity to humans (Group 3).
ACGIH, OSHA, US NTP – not listed as a carcinogen.
Benzene
ACGIH A1-Confirmed Human Carcinogen
IARC, OSHA, US NTP – There is sufficient evidence that benzene is carcinogenic to man.
Hydrogen Sulfide
Hydrogen sulfide is not considered to be mutagenic or a reproductive or developmental toxicant.
ACGIH, IARC, OSHA, US NTP – Hydrogen sulfide is not listed as a carcinogen.

12. ECOLOGICAL INFORMATION

Aquatic Toxicity: Not available
Biodegradability: Not available

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Contact appropriate regulatory authorities for disposal requirements. Empty containers or liners may retain a product residue. This material and its container and rinseates must be disposed of safely and in compliance with the requirements of environmental protection and waste disposal legislation and regional local authority requirements. Avoid dispersal of spilled material and runoff contact with soil, waterways, drains and sewers.
Use which results in chemical or physical change of this material could subject it to regulation as a hazardous product. Container residues and rinseates could be considered hazardous waste.

US EPA Waste Numbers
D001 – Ignitability characteristic
D018 – Toxicity characteristic (Benzene) (Regulatory Level = 0.5 mg/L)

14. TRANSPORT INFORMATION

Regulatory Information	UN Number	Proper Shipping Name	Class	PG	Label	Additional Information
TDG	UN1267	Petroleum Crude Oil	3	I	Flammable Liquids	
DOT	UN1267	Petroleum Crude Oil	3	I	Flammable Liquid	49 CFR 173.150; 173.202; 173.242
IMDG	UN1267	Petroleum Crude Oil	3	I	Flammable Liquid	12°C, P001 EmS:F-E, S-E MARPOL Annex I
ICAO/IATA	UN1267	Petroleum Crude Oil	3	I	Flammable Liquid	ERG Code: 3L

North American Emergency Response Guide Number: 128

15. REGULATORY INFORMATION

Canadian Classification

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

WHMIS Classification: B2 – Flammable and combustible material – Flammable liquid
D2A – Poisonous and infectious material – Other effects – Very toxic
D2B – Poisonous and infectious material – Other effects – Toxic

WHMIS Ingredient Disclosure List:

Meets criteria for disclosure at 0.1% or greater of benzene.

CEPA Domestic Substance List: All components are either listed or exempt.

US Federal and State Regulations

The contents of this MSDS comply with the OSHA Hazard Communication Standard 29 CFR 1910.1200.

CERCLA/SARA – Section 302 Extremely Hazardous Substances: Exempt.

CERCLA/SARA 311-312 (Title III Hazard Categories):

Hydrogen Sulfide – Fire, Immediate (Acute),

Produced Hydrocarbons – Fire, Sudden Release of Pressure, Immediate (Acute), Delayed (Chronic).

CERCLA/SARA 313, Reportable Quantity: Benzene: 10 lbs; RCRA Code U019.

Clean Air Act Section 112(b) Hazardous Air Pollutants: Exempt.

United States National Chemical Inventory: All components are listed or exempted.

California 65: This product contains benzene a chemical known to the State of California to cause cancer and developmental harm.

16. OTHER INFORMATION

Guide to Abbreviations: ACGIH = American Conference of Governmental Hygienists; C = Ceiling; CAS = Chemical Abstracts Service Registry; Cenovus = Supplier recommendation based on composition; CEPA = Canadian Environmental Protection Act; DOT = Department of Transport; EmS = Environmental Management System; ERG = Emergency Response Guide
IARC = International Agency for Research on Cancer; ICAO/IATA = International Civil Aviation Organization/International Air Transport Association; IMDG = International Marine Dangerous Goods; MARPOL = The International Convention for the Prevention of Pollution from Ships; OEL = Occupational Exposure Limit; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit; PG = Packing Group; Skin = Danger of skin absorption; SARA STEL = Short Term Exposure Limit; TDG = Transportation of Dangerous Goods; TLV = Threshold Limit Value; US NTP = United States National Toxicology Program; v/v = volume per volume; WHMIS = Workplace Hazardous Materials Information System