Integrated Contingency Plan

Central Region Response Zone

Version Core 5.0/Annex 3.2
2017/2018
Central-ICP-##

ENBRIDGE

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Version: Core 5.0 | Annex 3.2
2017/2018

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Record of Revisions

CORE REVISIONS

Effective Date	Version	Subject No.	Subject Title	Change Type	Change Description
10/15	**Core Version 3.0**	ICP	Emergency Procedure Manual	Annual	First release in Region – Replaces Book 7 Part I and II
08/16	**Core Version 4.0**	ICP	Annual Review	Annual	Complete review and revision of Core Sections 1-4
02/17	**Core Version 4.1**	Core Section 1 & 3	Plan Introduction Elements, Training/Exercise Program	Critical	Updated Core Section 1.0 Enbridge Entities, 1.7 Canada System Map & 1.8 US System map to reflect the current Enbridge Entities/Boundaries after the sale of South Prairie Region and the boundary change in Great Lakes and Superior Region. Core Section 3 changes to Exercise Program to align with PREP Guidelines.
04/17	**Core Version 4.2**	Core Section 1	Plan Introduction Elements	Critical	Company 24/7 Emergency Phone Line – removed the call center number for South Prairie in 1.1. Added Tank Fire Prevention Protection sheet, 1.5.6 and Pipeline Inspections sheet, 1.5.7.
		Core Section 2	Core Plan Elements		As per PHMSA Letter of Correction Letter 04/12/2017: Add step by step instructions to the 2.4.9.6 In-situ Burn Guide insert regarding the approval process for in-situ burning,

Effective Date	Version	Subject No.	Subject Title	Change Type	Change Description
08/17	Core Version 4.3	Core 1.0	Enbridge Entities	Critical	Removed Ozark L.L.C from list of entities as the asset is no longer owned and operated by Enbridge.
		Core 1.8	U.S Pipeline System Map		Removed Line 51 from the map as the asset is no longer owned and operated by Enbridge.
		Core 2.4.9.5	Shoreline and Terrestrial Operations		As per PHMSA Letter of Correction dated 08/01/2017: Add the following to the "Non-Mechanical Response Options" paragraph: "In the U.S., the request to use dispersants as a tactic is requested through Unified Command to the appropriate Federal On-Scene Coordinator." To provide clarity to the approval process for the use of dispersants.
		Core 2.4.9.7	Bioremediation		As per PHMSA Letter of Correction dated 08/01/2017: Sub-section reworked to provide clarity on the approval process for the use of bioremediation (see document as text is lengthy).
12/17	Core Version 5.0	ICP	Annual Review	Annual	Complete review and revision of Core Sections 1-4

ANNEX REVISIONS

Date	Version	Subject No.	Subject Title	Change Type	Change Description
10/15	**Annex Version 1.0**	NEB Submission	Emergency Procedure Manual (NEW FORMAT)	First Publication	New Emergency Procedure Manual format – Replaces Book 7 Part I and II in full
11/30/15	**Annex Version 1.1**	Annex 1.5.2	Pipeline Information	Revision	Updated pipeline diameters to capture diameter change on the line.
		Annex 1.5.3	Terminal/Station Information	Revision	Revised to include all the pump stations that service L67.
		Annex 2.2.3a	Emergency Contact Information	Revision	Updated IMT list
		Annex 2.2.3g	Enbridge Reporting Criteria/Requirements/Deadlines	Revision	Updated Reporting Tables
03/21/16	**Annex Version 1.2**	Annex 1.5.4	Regional Tank Table	Revision	Add Tank 80 under Regina, Date Strapped: 2015, Total Volume: 221,700 Revised Total Barrel Capacity to 871,700
		Annex 1.10	Safety Data Sheets (SDS)	Revision	Addition of PSR Plains Sweet Regina
		Annex 2.2.3g	Enbridge External Incident Reporting-Criteria/Requirements/Deadlines	Revision	Updated the tables to latest version
04/28/16	**Annex Version 1.3**	Annex 1.5.4	Regional Tank Table	Revision	Revised “Date Strapped” column to read “Build Date.” Added TK 87, 199,200 bbl. & TK 88, 199,200 bbl. Revised Build Date for the following Tanks: TK 64 – TK 78, TK 94 – TK 100, TK 102, TK107 – TK 113 & TK 115. Revised Total Volume for the following Tanks: TK 65, TK 96 – TK 97, TK 99, TK 109 & TK 113. Revised Total Barrel Capacity for all Tank locations.
		Annex 1.10	Safety Data Sheets (SDS)	Revision	Added MID Midale Blend & MJT Moose Jaw Tops
		Annex 2.2.3g	Enbridge External Incident Reporting-Criteria/Requirements/Deadlines	Revision	Updated the tables to latest version

Date	Version	Subject No.	Subject Title	Change Type	Change Description
09/16/16	**Annex Version 2.0**	Annex 1-5	Annual Review	Annual	Completed review and revision of Annexes 1-5
		Annex 6/Field Emergency Response Plan	Annual Review	Annual	Review, revision and renaming of Annex 6 to Field Emergency Response Plan
11/04/16	**Annex Version 2.1**	Annex 1.9	Safety Data Sheets	Critical Revision	New product added, Canadian Heavy Sweet
		Annex 2.2.3a	Emergency Contact List		Removed alternate QI, updated titles
		Annex 2.2.3b	Incident Management Team List		Updated Incident Management Team List
		Annex 2.2.3l	Enbridge Reporting Criteria/Requirements/Deadlines		Updated tables to the latest version
		Annex 3.10	Transportation Areas		Updated line information on the table headers
03/02/17	**Annex Version 2.2**	Annex 1.0	Owner & Operator	Critical Revision	Added “Enbridge Bakken Pipeline Limited Partnership” to this list for Line 26.
		Annex 1.5.1	Central Region		Revised wording to include the Bakken Line information for Line 26
		Annex 1.5.2	Pipeline Information		Added Line 26 from US/CA Border to Portal, SK and Steelman Terminal to Cromer
		Annex 1.5.3	Terminal/Station Information		Added Line 26 to appropriate Stations
		Annex 1.5.5	County and Municipal Boundaries		Revised to include Line 26
		Annex 1.5.5	Regional Overview Map		Revised to include Line 26
		Annex 1.8	Emergency Response Time Maps		Revised to include Line 26
		Annex 2.2.3b	Incident Management Team List		Revised list to reflect changes due to BOEF
		Annex 2.2.3d	Enbridge External Incident Reporting-Criteria/Requirements/Deadlines		Updated the tables to the latest version

Date	Version	Subject No.	Subject Title	Change Type	Change Description
03/02/17	**Annex Version 2.2**	Field Emergency Response Plan	Incident Management Team, Regional Overview Maps		Revised list to reflect changes due to BOEF. Maps revised due to addition of Line 26.
05/11/17	**Annex Version 2.3**	Annex 1.4	Incident Commanders (Qualified Individuals)	Critical	Remove Barrie Ryan's name from Alternate Incident Commanders (QI) as he is retiring from the company.
		Annex 1.5.2	Pipeline Information		1st line for Line 26: Revise Pipeline Section for Ln26 to read "US/CA Border at Portal, SK to Steelman Bakken Pump Station." Begin Lat: 48.999108, Begin Long: -102.57108 Begin KM: No MP at this time End Lat: 49.28444 End Long: -102.63722 End KM: 162.31 MO 2nd line for Line 26: Revise Line Diameter "16," "Steelman Bakken Pump Station to Cromer Terminal" Begin Lat: 49.28444 Begin Long: -102.3722 Begin KM: 85.07 MPO End Lat: 49.75417 End Long: -97.53223 End KM: 287.84
		Annex 1.5.3	Terminal/Station Information		Remove Ln 26 from the following Pump Stations/Terminals: Loreburn, Craik, Regina, Odessa, Glenavon, Langbank, Souris, Glenboro, St. Leon and Gretna. Revise call sign for Cromer Terminal to "CM/QC" Add "Steelman Bakken Pump Station, Ln 26, 2605, QS, 85.07, 48.1718, -102.3813"
		Annex 1.5.5	County and Municipal Boundaries		Remove Ln 26 from all sections except for the new line added (see below for details), Add new line: "Steelman Bakken Pump Station, 26, 85.07, N/A, 162.31, N/A
		Annex 1.6.2	Spill Response Organizations – Internal & External Locations		Remove information for Barrie Ryan as he has retired from the Company.
		Annex 2.2.3a	Emergency Contacts		Remove information for Barrie Ryan as he has retired from the Company.

Date	Version	Subject No.	Subject Title	Change Type	Change Description
05/11/17	**Annex Version 2.3**	Annex 2.2.3b	Incident Management Team List	Critical	Remove information for Barrie Ryan in Incident Commander as he has retired from the Company.
		Annex 5.1	Revision Process		Add wording in revision process referencing IMS-07, NEB assessment mandated change: "The maintenance process for all Integrated Contingency Plans follows the IMS 07 Emergency Response Plans Development and Maintenance Process. The purpose of this process is to ensure that plans and other essential emergency response documents are developed, maintained and updated when required. The establishment and implementation of an Emergency Response Planning process is a requirement of the NEB."
06/26/2017	**Annex Version 2.4**	Annex 1.9	Safety Data Sheets	Critical	Add SDS DRA LP 100 Flow Improver
24/08/17	**Annex Version 2.5**	Annex 2.2.3i	Enbridge Reporting Criteria/Requirement Deadlines	Critical	Updated Book 1 Incident Reporting Standard to Version 18.0
11/12/17	**Annex Version 3.0**	Annex 1-5	Annual Review	Annual	Completed review and revision of Annexes 1-5
		Field Emergency Response Plan	Annual Review	Annual	Review and revision of the Field Emergency Response Plan
13/02/18	**Annex Version 3.1**	Annex 1.3	Management Certificate	Critical	Revise signer to Scott Ironside, Dir. Prairie Region
		Annex 1.4	Incident Commander/Qualified Individual		Revise Primary IC/QI to Scott Ironside, add Warren Lawrence as alternate, remove Eldon Strachan
		Annex 2.0.1	Notification Chart		Add Scott Ironside as Primary IC/QI, Greg Gianoli and Warren Lawrence as Alternates
		Annex 2.2.3a	Emergency Contacts		Remove reference to Environmental Protection Unit, update Alternate IC's to Greg Gianoli and Warren Lawrence
		Annex 2.2.3b	Incident Management Team		Update IC to Scott Ironside, remove Eldon Strachan, add Warren Lawrence

Date	Version	Subject No.	Subject Title	Change Type	Change Description
05/17/18	**Annex Version 3.2**	Annex 2.2.3b	Incident Management Team List	Critical	Updated IMT for Prairie Region
		Annex 2.2.3i	Enbridge Reporting Criteria / Requirements / Deadlines		Updated Book 1 Incident Reporting Standard to Version 21.0

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CORE SECTIONS	
1: Plan Introduction Elements	Enbridge Entities, Company 24/7 Emergency Phone Line, Acronyms/Glossary/Conversion Table, Purpose and Scope of Plan, Pillars of Emergency Management, Safety and Operational Reliability, Regulatory Compliance- Canada and U.S., System Maps- Canada and U.S.
2: Core Plan Elements	General Guidance (Guiding Objectives, Documentation, Personal Protective Equipment), Discovery/Detection (Observation, Discovery, & Detection), Notification and Communication (Field Notification, Control Center, Classification of Incident, Third-Party Notifications, External Notifications), Initial Response (Procedures, Isolation Distance, On-Site Work Areas, Evacuation), Operations (Response Management System, Site Security and Control, Hazard Specific Field Response Guides, Environmental Response, Waste & Disposal, Site Safety & Health Plan, Protection, Containment and Recovery), Demobilization (Equipment Inventory, Return & Restock, After- Action Review)
3: Training/Exercise Program	Training, Response Training, Incident Command System, Operational Training, HAZWOPER Training, Response Exercise Program, Third-Party Awareness Training
4: Forms/Templates	Company Forms & Templates, Industry Forms
ANNEXES	
1: Facility and Locality Information	Owner & Operator, Purpose, Interface with Jurisdictional and Company Plans, Management Certification, Incident Commanders (Qualified Individuals), Significant and Substantial Harm Certification, Response Zone Description (Information Summary), Local Spill Response Equipment, Evacuation, Worst-Case Discharge, Emergency Response Time Maps, Safety Data Sheets
2: Notification Procedures	Notifications Overview (Emergency Notification/ Activation), Emergency Responsibilities, Incident Reporting (Required Notifications, Incident Management Team, External AGENCIES AND Support Resources, Emergency Contact Information), Oil Spill Response Organization (OSRO)
3: Environmental Sensitive Area Information	Unusually Sensitive Area Information, Significant and Substantial Harm Maps and Unusually Sensitive Area Tables
4: Regulatory Cross Reference	DOT 49CFR§172 (North Dakota), DOT 49CFR§192, DOT 49CFR§194, DOT CFR§195, 29 CFR§1910.120, MDEQ Rule #5 (Chicago), Other Regulatory References (Worst- Case Discharge Methodology)
5: Administration	Distribution List, Revision Process, Record of Revisions
Field Emergency Response Plan	First Responder Checklist, Acronyms/Glossary, General Guidance, Response Zone Description (Information Summary), Discovery/Detection, Notification Procedures, Initial Response, Operations, Communications, Response Equipment, Protection, Containment & Recovery, Safety Data Sheet (SDS), Forms

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Section 1 – Table of Contents Page

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1.0 Enbridge Entities

The Integrated Contingency Plan ("ICP") applies to the following companies.

ENBRIDGE LEGAL COMPANY NAMES	
U.S. Owner & Address	Bakken Pipeline Company LP CCPS Transportation, L.L.C. Enbridge Energy, Limited Partnership Enbridge Storage (Cushing) L.L.C. Enbridge Pipelines (FSP) L.L.C. Illinois Extension Pipeline Company, L.L.C. Enbridge Storage (Patoka) L.L.C. Enbridge Pipelines (Southern Lights) L.L.C. Enbridge Pipelines (Toledo) Inc. North Dakota Pipeline Company L.L.C. Platte Pipe Line Company L.L.C Express Pipeline L.L.C 1100 Louisiana Street, Suite 3300 Houston, TX 77002-5216 Phone: (713) 821-2000
Canada Owner & Address	Enbridge Pipelines Inc. Enbridge Pipelines (NW) Inc. Enbridge Pipelines (Athabasca) Inc. Enbridge Southern Lights GP Inc. Enbridge Pipelines (Woodland) Inc. Enbridge Bakken Pipeline Company Inc. Hardisty Contract Storage Inc. Enbridge Midstream Inc. Express Pipeline Ltd. 10175-101st Edmonton, AB T5J 3S4 Phone: (780) 426-6088

Throughout this Plan, a reference to the "Company" includes the Enbridge companies listed above.

1.1 Company 24/7 Emergency Phone Line

In Case of Emergency – 24 hr. Contacts	
Edmonton Control Center	1-800-858-5253 US Regions 1-888-449-7539 Express Platte Region 1-877-420-8800 CDN Regions (Western, Central, Eastern, Northern) 1-888-813-6844 Athabasca Region
Enbridge Media Hotline	1-888-992-0997 Canada 1-877-496-8142 US

1.2 Acronyms / Glossary / Conversion Table

1.2.1 Acronyms

Terminology specific to the U.S. is shaded in grey.

Acronym	Description
AAR/IP	After Action Report/ Improvement Plan
ACP	Area Contingency Plan
API	American Petroleum Institute
BBL	Barrel (Unit of Volume Equal to 42 Gallons)
BPD	Barrels per Day
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act of 1980
CFR	Code of Federal Regulations
CGI	Combustible Gas Indicator
CMT	Crisis Management Team
CNW	Commercially Navigable Waterway (High Consequence Area)
COTP	Captain of the Port
CP	Control Point
CPM	Computational Pipeline Monitoring
CSA	Canadian Standards Association
CWA	Clean Water Act
DOCL	Documentation Unit Leader
DOSC	Deputy Operations Section Chief
DOT	U.S. Department of Transportation
DW	Drinking Water (High Consequence Area)
EAS	Emergency Alert System
EH&S	Environment, Health, & Safety
EMT	Emergency Medical Technician
ENR	Environment & Natural Resources (Northwest Territories Government)
ENVL	Environmental Unit Leader
EOC	Emergency Operations Center

Acronym	Description
EPA	U.S. Environmental Protection Agency
ERD	Emergency Response Directory
ERG	Emergency Response Guidebook
ERP	Emergency Response Plan
ERT	Emergency Response Team
ESA	Environmentally Sensitive Area (High Consequence Area)
E3RT	Enbridge Enterprise Emergency Response Team
ESD	Emergency Shutdown
FAA	Federal Aviation Administration
FE	Functional Exercise
FEMA	Federal Emergency Management Agency
FERP	Field Emergency Response Plan
FOSC	Federal On-Scene Coordinator
FP	Flashpoint
FRP	Facility Response Plan
FRT	Field Response Team
FSC	Finance Section Chief
FSE	Full Scale Exercises
FWPCA	Federal Water Pollution Control Act (as amended) (33 U.S.C. 1251 et seq.)
GIS	Geographic Information System
GIUE	Government-Initiated Unannounced Exercise in U.S.
GNWT	Government of Northwest Territories
GRP	Geographical Response Plans
HAZMAT	Hazardous Materials
HAZWOPER	Hazardous Waste Operations and Emergency Response
HCA	High Consequence Area
HSEEP	Homeland Security Exercise and Evaluation Program
HPA	High Population Area (High Consequence Area)
IAP	Incident Action Plan

Acronym	Description
IC	Incident Commander
ICP	Integrated Contingency Plan
ICS	Incident Command System
IMH	Incident Management Handbook
IMT	Incident Management Team
IST	Incident Support Team
JIC	Joint Information Center
LEL	Lower Exposure Limit
LEPC	Local Emergency Planning Committee
LMS	Learning Management System
LNO	Liaison Officer
LOSC	Local On Scene Coordinator
LPM	Line Pressure Monitor
LSC	Logistics Section Chief
MAOP	Maximum Allowable Operating Pressure
MBS	Material Balance System
NCP	National Contingency Plan
NFPA	National Fire Protection Area
NGL	Natural Gas Liquids
NEB	National Energy Board
NIMS	National Incident Management System
NIOSH	National Institute for Occupational Safety and Health
NPMS	National Pipeline Mapping System
NRC	National Response Center
NRDA	Natural Resources Damage Assessment
NRS	National Response System
NRT	National Response Team
OPA	Other Populated Area (High Consequence Area)
OPA 90	Oil Pollution Act of 1990

Acronym	Description
OPR	Onshore Pipeline Regulations
OSC	Operations Section Chief
OSHA	Federal Occupational Safety and Health Administration
OSRO	Oil Spill Response Organization
PAP	Public Awareness Program
PIA	Post-Incident Analysis
PIO	Public Information Officer
PHMSA	Pipeline and Hazardous Materials Safety Administration
PLC	Programmable Logic Controller
PLM	Pipeline Maintenance
PPE	Personal Protective Equipment
PPM	Parts Per Million
PREP	National Preparedness for Response Exercise Program
PSC	Planning Section Chief
PSI	Pounds per square inch
QA/QC	Quality Assurance/ Quality Control
QI	Qualified Individual
ROW	Right-of-Way
RSO	Radiation Safety Officer
SARA	Superfund Amendments and Reauthorization Act
SCADA	Supervisory Control & Data Acquisition
SCAT	Shoreline Clean-up Assessment Team
SCBA	Self-Contained Breathing Apparatus
SDS	Safety Data Sheet (also known as Material Safety Data Sheet)
SERC	State Emergency Response Commission
SMART	Special Monitoring for Applied Response Technologies
SML	Subject Matter Lead
SOFR	Safety Officer
SONS	Spill of National Significance

Acronym	Description
SOP	Standard Operating Procedure
SOSC	State On-Scene Commander
SPCC	Spill Prevention, Control, and Countermeasures
SSHP	Site Safety and Health Plan
SUBD	Support Branch Director
TFR	Temporary Flight Restrictions
TSB	Transportation Safety Board
TTX	Table Top Exercise
UC	Unified Command
UEL	Upper Exposure Limit
USA	Unusually Sensitive Areas
USC	U.S. Code
USCG	U.S. Coast Gaurd
WCD	Worst-Case Discharge

1.2.2 Glossary

Terminology specific to the U.S. is shaded in grey.

Term	Definition
A	
Absorbent Material	Any of several materials designed to absorb oil, both hydrocarbon and non-hydrocarbon.
Access/Staging Areas	Designated areas offering access to spill sites for the gathering and deployment of spill response equipment and personnel.
Adversary	Any individual, group, organization or government that conducts, or has the intention and capability to conduct, activities detrimental to critical assets (e.g., intelligence services of host nations, political terrorist groups, criminals, rogue employees, private interest, site insiders/outsiders).
Adverse Weather	The weather conditions that will be considered when identifying response systems and equipment in a response plan for the applicable operation environment. Factors to consider include significant wave height, ice, temperature, weather-related visibility, and currents within the COTP zone under the U.S. Coast Guard / or Canadian Coast Guard in which the systems or equipment are intended to function.

Term	Definition
Alert Levels	A progressive, qualitative measure of the likelihood of terrorist actions, from negligible to imminent, based on government or Company intelligence information. Different fixed or variable security measures may be implemented based on the level of threat to the facility.
Area Contingency Plan	A reference document prepared for the use by all agencies engaged in responding to environmental emergencies in a defined geographic area as described in the Oil Pollution Act of 1990.
Assisting Agency	An agency directly contributing tactical or service resources to another agency.
B	
Barrel ("bbl")	A barrel of crude oil is equal to 42 gallons (approximately 159 liters).
Boom	A temporary floating barrier used to contain an oil spill.
Boom Deployment	The placement of a boom on land or in water to contain a product release.
Business Critical Facilities	Facilities and assets, whether physical or virtual, so vital to the Company that the incapacity or destruction of such systems and assets would have a debilitating impact on people, the environment, property or economic viability of the Company.
C	
Cache	A pre-determined complement of tools, equipment, and/or supplies stored in a designated location, and available for incident use.
CERCLA	The Comprehensive Environmental Response, Compensation and Liability Act, (U.S.) regarding hazardous substance releases into the environment and the clean-up of inactive hazardous waste disposal sites.
Clean-Up Contractor	Non-Company person contractually engaged to respond to and clean-up an oil spill.
Command Post	A site located in the cold zone where response decisions and activities can be planned, coordinated, and managed. The Incident Commander and regulatory bodies may operate from this location.
Company	Includes companies in the United States and in Canada.
Competent Worker	A person who, because of training and experience, is capable of identifying hazardous or dangerous conditions and has the authority to take prompt corrective measures to eliminate them.
Containment Boom	A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to entrap and contain the product for recovery.
Contamination Reduction Zone	The area between the contaminated zone and the clean zone. This area is designed to reduce the probability that in the future the area would become contaminated. Also known as the warm zone.

Term	Definition
Contingency Plan	A document used by (1) Federal, Provincial/State, local and territorial agencies to guide entities' planning and response procedures regarding spill of oil, hazardous substances, or other emergencies; (2) a document used by industry as a response plan to spills of oil, hazardous substances, or other emergencies.
Contract or Other Approved Means	1. A written contractual agreement with a response contractor. The agreement should identify and ensure the availability of the specified personnel and equipment described under this plan within stipulated response times in the specified geographic areas; 2. Certification by the facility owner or operator that the specified personnel and equipment described under this plan are owned, operated, or under the direct control of the facility owner or operator, and are available within the stipulated times in the specified geographic areas; 3. Active membership in a local or regional oil spill removal organization that has identified specific personnel and equipment described under this plan that are available to respond to a discharge within stipulated times in the specified geographic areas.
Contractor	A company hired to complete specific work and paid directly by the Company.
Control Point ("CP")	A location downstream of a spill site on a stream or river where containment and recovery operations can occur.
Cooperating Agency	An agency supplying assistance other than direct tactical, support, or service functions or resources to the incident control effort.
Crisis	An incident, emergency, or combination of circumstances that could have a significant negative impact on the public, the environment, or the Company's employees, operations, reputation, earnings, or share value.
Crisis Communication	The effort taken by the Company to communicate with internal, external and public stakeholders when an unexpected event occurs that could have an impact on the Company's reputation.
Crisis Management Team ("CMT")	The executive group within the Company that functions away from the scene to support the Incident Management Team, facilitate planning, manage business recovery projects and address the implications of the problems and the potential impacts on the Company's viability, operability and credibility. Provides off-site strategic support.

Term	Definition
Critical Facility	A facility that meets one or more of the following criteria: • May be considered a viable terrorist target, and a release from the facility has the potential for mass casualties or significant impact on public drinking water affecting a major population center if damaged or destroyed, would have a detrimental impact on the reliability or operability of the pipeline system, significantly impairing the ability to service a large number of customers for an extended period • If damaged or destroyed, would significantly impair other modes of transportation or other critical infrastructures (e.g., electrical power generation, telecommunications, public utility)
Critical Infrastructure	Systems and assets, whether physical or virtual, so vital to the Company that the incapacity or destruction of such systems and assets would have a debilitating impact on security, national economic security, national public health and safety or any combination thereof.
Crude Oil	Any liquid hydrocarbon mixture occurring naturally in the earth, whether or not treated to render it suitable for transportation, and includes crude oil from which certain distillate fractions may have been removed and crude oil to which certain distillate fractions may have been added.
Culturally Sensitive Areas	Current, historic, prehistoric, and archaeological resources which include deposits, structures, sites, ruins, buildings, graves, artifacts, fossils, or other objects of antiquity which provide information pertaining to historical or prehistoric culture of people as well as the natural history of the area.
D	
Damage Assessment	The process of determining and measuring damages and injury to the human environment and natural resources, including cultural resources. Damages include differences between the conditions and use of natural resources and the human environment that would have occurred without the incident, and the conditions and use that ensued following the incident. Damage assessment includes planning for restoration and determining the costs of restoration.
Dark Site	Activated to manage internal/ external communications related to any emergency.
Decontamination (“Decon”)	The removal of hazardous substances from personnel and equipment necessary to prevent adverse health effects.
Diluents	A generic term that encompasses any mixture of light liquid hydrocarbons used to dilute a heavier petroleum product (such as bitumen). As a common carrier, Enbridge may transport several different mixtures of diluents.
Discharge	Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.

Term	Definition
Dispersants	Those chemical agents that emulsify, disperse, or solubilize oil into the water column or promote the surface spreading of oil slicks to facilitate dispersal of the oil into the water column.
Diversion Boom	A flotation/freeboard device, made with a skirt/curtain, longitudinal strength member, and ballast unit/weight designed to deflect or divert floating product towards a pick up point or away from certain areas.
Dredging	Underwater excavation activity where heavy equipment is used to collect and remove bottom sediments by scraping or sucking.
E	
Enbridge Enterprise Emergency Response Team ("E3RT")	Comprised of individuals from each business unit (Liquids Pipelines, Gas Processing and Pipelines, Gas Distribution) to ensure that the Company has a highly trained team of that can be called upon within the organization to respond to large scale incidents anywhere within the Company.
Emergency	An unforeseen combination of circumstances or a disruption of normal operating conditions that poses a potential threat to human life, health, property, and/or the environment if not contained, controlled, or eliminated immediately.
Emergency Operations Center ("EOC")	A pre-designated facility established by an agency or jurisdiction to coordinate the overall agency or jurisdictional response and support to an emergency response.
Emergency Organization	The chain of command used during emergency operations to provide effective management of the emergency and available resources.
Emergency Response Guidebook ("ERG")	This Guidebook is for Enbridge responders during the initial phase of a dangerous goods/hazardous materials transportation incident. It is a joint publication by the PHMSA, Transport Canada and the Secretariat of Transport and Communications of the Mexican Government.
Emergency Service	Those activities provided by the provincial/state and local governments to prepare for and carry out any activity to prevent, minimize, respond to, or recover from an emergency.
Enbridge Responder	Individual(s) employed by Enbridge who responds to a release or a potential release of hazardous substances as part of the initial response to the site for purposes of protecting nearby persons, property or the environment from the effects of the release.
Environmentally Sensitive Areas ("ESA")	Streams and water bodies, aquifer recharge zones, springs, wetlands, agricultural areas, bird rookeries, endangered or threatened species (flora and fauna) habitat, wildlife preserves or conservation areas, parks, beaches, dunes, or any other area protected or managed for its natural resource value.
Exercise Design Team	A team comprised of federal, provincial/state and industry representatives with responsibility for designing an Area Exercise. The exercise design team is charged with working with the lead plan holder to develop the scope, parameters and exercise scenario, although the lead plan holder retains the final decision on these.

Term	Definition
External First Responders, First Response Agency	A public health or safety agency (e.g. fire service or police department) charged with responding to a spill during the emergency phase and alleviating immediate danger to human life, health, safety, or property.
F	
Field Response Team ("FRT")	A team of tactical Enbridge responders who take actions at an incident scene to directly respond to the problem and its consequence. Provides on-site tactical support. This team is made up of the Pipeline Maintenance ("PLM") crew or other similar group. Also known as Spill Management Team.
Fish and Wildlife and Sensitive Environments	Areas that may be identified by either their legal designation or by evaluations of Area Committees (for planning) or members of the jurisdiction having authority in the spill response structure (during responses). These areas may include wetlands, National and Provincial/State parks, critical habitats for endangered/threatened species, wilderness and natural resource areas, marine sanctuaries and estuarine reserves, conservation areas, reserves, wildlife areas, wildlife refuges, wild and scenic rivers, recreational areas, national forests, Federal and provincial/state lands that are research national areas, heritage program areas, land trust areas, and historical and archeological sites and parks.These areas may also include unique habitats such as aquaculture sites and agricultural surface water intakes, bird nesting areas, critical biological resource areas, designated migratory routes, and designated seasonal habitats.
Function	In ICS, function refers to the five major activities in the ICS, i.e., Command, Operations, Planning, Logistics, and Finance/Administration. The term function is also used when describing the activity involved, e.g., "the planning function."
G	
Geographic Information System ("GIS")	An electronic information system that provides a geo-referenced database to support management decision-making.
H	
Handle	To transfer, transport, pump, treat, process, store, dispose of, drill for, or produce.
Harmful Quantity of Oil	The presence of oil from an unauthorized discharge in a quantity sufficient either to create a visible film or sheen or discoloration upon water, shoreline, tidal flat, beach, or marsh, or to cause a sludge or emulsion to be deposited beneath the surface of the water or on a shoreline, tidal flat, beach, or marsh.
Hazardous Substance / Material	Dangerous goods (solids, liquids or gases) that can harm people, other living organisms, property, or the environment, including but not limited to substances otherwise defined as hazardous wastes, dangerous wastes, extremely hazardous wastes, oil, or pollutants that are classified by CERCLA in the U.S and Environment Canada.

Term	Definition
Hazardous Waste Operations and Emergency Response ("HAZWOPER")	Training required in the U.S under OSHA *29CFR§1910.120*. for responders who are exposed to or potentially exposed to hazardous substances including hazardous waste. Canadian employees will be required to complete the appropriate training course based on their potential job duties in a cross border response.
Health Hazard	A chemical for which there is statistically significant evidence based on at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed persons.
I	
Incident	An event affecting Company operations that may be an emergency or crisis.
Incident Action Plan ("IAP")	A document Is initially prepared at the first planning meeting that contains general control objectives reflecting the overall incident strategy, and specific action plans for the next operational period. When complete, the Incident Action Plans will include a number of attachments.
Incident Commander ("IC")	Person responsible for all aspects of the response, including developing incident objectives and managing all incident operations. This means the most qualified person, not necessarily the most senior person, on scene.
Incident Command Post	The location at which the primary command functions are executed; may be collocated with the incident base.
Incident Support Team	The basic function of the IST is to identify and address strategic issues which might arise during an incident that fall beyond the scope or capacity of the regional Incident Management Team (IMT). This team will support emergency response to ensure Enbridge's commitment to safety and protection of people, environment, assets, and reputation.
Incident Command System ("ICS")	A standardized on-scene emergency management system specifically designed to allow its user(s) to adopt an integrated organizational structure equal to the complexity and demands of single or multiple incidents, without being hindered by jurisdictional boundaries.
Incident Management Handbook ("IMH")	The IMH is intended to be used as an easy reference job aid for responders; designed to assist responders in the use of the National Incident Management System (Incident Command) during response operations.
Incident Management Team ("IMT")	A team that functions at and/or away from the incident scene to support tactical response operations, facilitates planning, and addresses the concerns of public and government agencies.

Term	Definition
Incident Objectives	Statements of guidance and direction necessary for the selection of appropriate strategies, and the tactical direction of resources. Incident objectives are based on realistic expectations of what can be accomplished when all allocated resources have been effectively deployed. Incident objectives must be achievable and measurable, yet flexible enough to allow for strategic and tactical alternatives.
Industry	For the purpose of these guidelines, industry means the oil and hazardous substance industry required to submit response plans and comply with exercise requirements, as specified in appropriate vessel, facility, pipeline, and Outer Continental Shelf platform regulations. The USCG, EPA, PHMSA, NEB and AER administer these regulations.
Initial Notification	The process of notifying necessary Company personnel and necessary agencies having jurisdictional authority that a spill has occurred and including all pertinent available information surrounding the incident.
Initial Remediation	Remedial action at a site to eliminate acute hazards associated with a spill. An initial clean-up action is implemented at a site when a spill of material is an actual or potentially imminent threat to public health or the environment, or difficulty of clean-up increases significantly without timely remedial action. All sites must be evaluated to determine whether initial clean-up is total clean-up; however, this will not be possible in all cases due to site conditions (e.g., a site where overland transport or flooding may occur).
Injury	A measurable adverse change, either long- or short-term, in the chemical or physical quality of the viability of a natural resource resulting either directly or indirectly from exposure to a discharge of oil, or exposure to a product of reactions resulting from a discharge of oil.
In-Situ Burning	A technique that involves the controlled burning of an oil spill at the location of the spill.
Integrated Contingency Plan ("ICP")	A plan to provide guidance to Company personnel on the immediate procedures, notifications and sustained operations in the event of an emergency response incident.
Interim Storage Site	A site used to temporarily store recovered oil or oily waste until the recovered oil or oily waste is disposed of at a permanent disposal site. Interim storage sites include trucks, barges, and other vehicles, used to store waste until the transport begins.
J	
Joint Information Center ("JIC")	A facility established within, or near, the Incident Command Post where the Information Officer and staff can coordinate and provide incident information to the public, news media, and other agencies or organizations. The JIC is normally staffed with representatives from the jurisdiction having authority and the Responsible Party.

Term	Definition
Jurisdiction	A range or sphere of authority. At an incident, public agencies have jurisdiction related to their legal responsibilities and authority for incident mitigation. Jurisdictional authority at an incident can be political/geographical (e.g., city, county, provincial/state, or Federal boundary lines), or functional (e.g., police department, health department, etc.). (See Multi-Jurisdiction).
Jurisdictional Agency	The agency having jurisdiction and responsibility for a specific geographical area, or a mandated function.
L	
Lead Agency	The government agency that assumes the lead for directing response.
Lead Provincial/ State Agency	The agency that coordinates provincial/state support to Federal and/or Local governments or assumes the lead in the absence of Federal response.
Liquid Wastes	Liquids contaminated with solids or mixed with other liquids (e.g., emulsion, contaminated soil).
Local Emergency Planning Committees ("LEPC")	A local governmental entity that identifies and catalogues potential hazards, identifies available resources, mitigates hazards when feasible, and has input into emergency plans for operations occurring in their geographical jurisdiction. According to the U.S. National Response Plan the initial response to an emergency incident or disaster is by local officials. The role of the LEPC is to anticipate and plan the initial response for foreseeable disasters in their jurisdiction.
Local On-Scene Coordinator ("LOSC")	Local Government Representative.
Location Boundaries	Areas where oil may be expected to impact during the first day of a spill event.
Lower Explosive Limit ("LEL")	Air measurement to determine the lowest concentration of vapours that support combustion. This measurement must be made prior to entry into a spill area.
N	
National Contingency Plan ("NCP")	The plan prepared in the U.S. under the FWPCA and CERCLA, and revised from time to time.
National Response Center ("NRC")	The U.S. Federal authorities to be the first notified in the event of an incident.
Natural Resource	Land, fish, wildlife, biota, air, water, groundwater, drinking water supplies, and other resources belonging to, managed by, held in trust by, appertaining to or otherwise controlled by the province/state, federal government, private parties, or a municipality.

Term	Definition
Natural Resource Damage Assessment ("NRDA")	The process of collecting and analyzing information to evaluate the nature and extent of injuries resulting from an incident, and determine the restoration actions needed to bring injured natural resources and services back to baseline and make the environment whole for interim losses. (15CFR§990.30)
National Incident Management System ("NIMS")	Identifies concepts and principles that answer how to manage emergencies from preparedness regardless of their cause, size, location or complexity.
Non-Persistent or Group I Oil	Refers to a petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions -- a) At least 50% of which by volume, distill at a temperature of 340° C (645° F); and b) At least 95% of which by volume distill at a temperature of 370° C (700° F).
Non-Petroleum Oil	Oil of any kind that is not petroleum-based. It includes, but is not limited to, animal and vegetable oils.
O	
Oil or Oils	Naturally occurring liquid hydrocarbons at atmospheric temperature and pressure coming from the earth, including condensate and natural gasoline, and any fractionation thereof, including, but not limited to, crude oil, petroleum gasoline, fuel oil diesel oil, oil sludge, oil refuse, and oil mixed with wastes other than dredged spoil.
Oil Spill Cooperative (Mutual Aid)	Multi-company cooperative organization developed by industry to assist with oil spill response and clean up. Typically, manpower and equipment are identified by a company on a voluntary basis.
Oil Spill Response Organization ("OSRO")	An entity that provides oil spill response resources, and includes any for-profit or not-for-profit contractor, cooperative, or in-house response resources that have been established in a geographic area to provide required response resources.
Oil Spill Response Contractors	Persons/Companies contracted to undertake a response action to contain and/or clean up a spill.
Oily Waste	Oil-contaminated waste resulting from an oil spill or spill response operations.
Operations Section Chief	A member of the General Staff who establishes the tactics to meet the incident objectives and directs all operational resources.
Owner or Operator	Any person, individual, partnership, corporation, association, governmental unit or public or private organization of any character.

Term	Definition
P	
Persistent Oil	Under OPA 90, persistent oils are petroleum-based oils that do not meet the distillation criteria for non-persistent oil. Persistent oils are classified based on specific gravities as follows: • Group II – specific gravity less than .85; • Group III – specific gravity between .85 and less than .95; • Group IV – specific gravity .95 to and including 1.0.; and • Group V – specific gravity greater than 1.0.
Physical Security	Security systems and architectural features that are intended to improve protection (e.g., fencing, doors, gates, walls, turnstiles, locks, motion detectors, vehicle barriers, hardened glass).
Post-Emergency Response	The portion of a response performed after the immediate threat of a release has been stabilized or eliminated and clean-up of the sites has begun.
PREP	National Preparedness for Response Exercise Program – workable exercise program which meets the intent of section 4202(a) of the Oil Pollution Act of 1990 (OPA 90) in the United States. Enbridge follows PREP guidelines across the system in both the United States and Canada.
Procurement Unit	Functional unit within the Finance/Administration Section responsible for financial matters involving vendor contracts.
Q	
Qualified Individual ("QI")	A qualified individual is the person who is authorized to do the following: (1) activate and engage in contracting with oil spill removal organizations; (2) act as a liaison with the on-scene coordinator; and (3) obligate funds required to effectuate response activates. For Enbridge, this person is typically the Incident Commander.
R	
Regional Response Team ("RRT")	A U.S. Federal response organization, consisting of representatives from specific Federal and state agencies, responsible for regional planning and preparedness before an oil spill occurs and for providing advice to the FOSC in the event of a major or substantial spill.
Response Activities	Refers to the containment and removal of oil from the water and shorelines, the temporary storage and disposal of recovered oil, and the taking of other actions as necessary to minimize or mitigate damage to the environment.
Response Guidelines	Guidelines for initial response that are based on the types of product involved in the spill; these guidelines are utilized to determine clean-up methods and equipment.

Term	Definition
Response Plan	A practical plan used by Industry for responding to a spill. Its features include (1) identifying the notification sequence, responsibilities, response techniques, etc. in an easy to use format; (2) using decision trees, flowcharts, and checklists to ensure the proper response for spills with varying characteristics; and (3) segregating information needed during the response from that required by regulatory agencies to prevent confusion during a spill incident.
Response Resources	The personnel, equipment, supplies and other capability necessary to perform the Response Activities identified in a Response Plan.
Responsible Party	The Owner/Operator of the vessel or facility that is the spill source.
Risk	Potential for damage to or loss of an asset. Risk, in the context of process security, is the potential for a catastrophic outcome.
Rivers and Canals	A body of water confined within the Inland area that has a projected depth of 12 feet or less, including the Intracoastal Waterway and other waterways artificially created for navigation.

Term	Definition
S	
Safety-Related Condition (Gas Only)	Any condition on a jurisdictional pipeline facility that lies within 220 yards of any building intended for human occupancy or an outdoor place of assembly or is within the right-of-way (ROW) of an active railroad or an asphalt/concrete paved road/ street / highway that meets one of the following criteria: • A material defect, physical damage or localized pitting on an effectively coated and cathodically protected pipeline operating at or above 20% SMYS and required repair as per Company procedure, • A leak in a pipeline that is characterized by the need for immediate corrective action to protect the public or property, • Unintended movement or abnormal loading by an environmental cause (e.g., earthquake, landslide, flood) that impairs the serviceability of a pipeline, applying sudden occurring movement in particular, • Any equipment malfunction or operating error that causes the pressure in a pipeline to exceed the maximum allowable operating pressure (MAOP) and the plus allowed build-up or overpressure, and • A shutdown of the pipeline or a reduction in operating pressure of 20% or more that is done in reaction to an imminent hazard or a known unsafe condition.
Site Conditions	Details of the area surrounding the facility, including shoreline descriptions, typical weather conditions, socioeconomic breakdowns, etc.
Site Emergency	Means an incident has occurred and the entire terminal, with the exception of critical employees has been sheltered on-site or evacuated.
Site Safety and Health Plan ("SSHP")	The SSHP, at minimum, addresses, includes, or contains the following elements: health and safety hazard analysis for each site task or operation, comprehensive operations work plan, personnel training requirements, personal protection equipment ("PPE") selection criteria, site-specific occupational medical monitoring requirements, air monitoring plan, site control measures, confined space entry procedures (if needed), pre-entry briefings (tailgate meetings, initial and as needed), pre-operations commencement health and safety briefing for all incident participants, and quality assurance of SSHP effectiveness.
Site Security and Control	Steps that must be taken to provide safeguards needed to protect personnel and property, as well as the general public, to ensure an efficient clean-up operation.
Site Supervisor	A generic term that refers to the employee responsible for the location (i.e., Pipeline Maintenance ("PLM") coordinator/supervisor, technician, terminal supervisor), or designate.
Skimmers	Mechanical devices used to skim the surface of water and recover floating oil. There are four basic categories of skimmers; suction heads, floating weirs, oleophilic surface units, and hydrodynamic devices. These vary in efficiency depending on the type of oil and size of spill.

Term	Definition
Sorbents	Materials ranging from natural products to synthetic polymeric foams placed in confined areas to soak up small quantities of oil. Sorbents are very effective in protecting walkways, boat decks, working areas, and previously uncontaminated or cleaned areas.
Source Control	Actions necessary to control the spill source and prevent the continued release of oil or hazardous substance(s) into the environment.
Span of Control	The number of organizational elements that may be directly managed by one person. Span of Control may vary from three to seven, and a ratio of one to five reporting elements is recommended.
Spill Observer	The first Company individual who discovers an oil spill. This individual must function as the responsible person-in-charge until relieved by an authorized supervisor.
Spill Response	All actions taken in responding to spills of oil and hazardous materials (HAZMAT), i.e., receiving and making notifications; information gathering and technical advisory phone calls; preparation for and travel to and from spill sites; direction of clean-up activities; damage assessments; report writing, enforcement investigations and actions; cost recovery; and program development.
Spill Response Personnel	Federal, Provincial/State, Local agency, and industry personnel responsible for participating in or otherwise involved in spill response. All spill response personnel will be preapproved on a list maintained in each Company region.
Staging Area	Location established where resources can be placed while awaiting a tactical assignment. The Operations Section manages Staging Areas.
Stakeholders	Any person, group, or organization affected by, and having a vested interest in, the incident and/or the response operation.
State Emergency Response Commission ("SERC")	A group of officials in the U.S. appointed by the Governor to implement the provisions of Title III of the Federal Superfund Amendments and Reauthorization Act of 1986 ("SARA"). The SERC approves the State Oil and Hazardous Substance Discharge Prevention and Contingency Plan and Local ERPs.
Strategy	The general plan or direction selected to accomplish incident objectives.

Term	Definition
Submerged Oil	Oil suspended beneath the surface or that sinks to the bottom of a body of water.
Substantial Threat of a Discharge	Any incident or condition involving a facility that may create a risk of discharge of Crude Oil and Oil. Such incidents include, but are not limited to storage tank or piping failures, above ground or underground leaks, fires, explosions, flooding, spills contained within the facility, or other similar occurrences.
T	
Tactical Direction	Directions given by the Operations Section Chief including: the tactics appropriate for the selected strategy; the selection and assignment of resources; tactics implementation; and performance monitoring for each operational period.
Tactics	Deploying and directing resources during an incident to accomplish the desired objective.
Technical Specialists	Personnel with special skills or technical expertise who can be used anywhere within the ICS organization.
Temporary Flight Restrictions ("TFR")	Temporary airspace restrictions for non-emergency aircraft in the incident area. TFRs are established by the FAA to ensure aircraft safety and are normally limited to a five-nautical-mile radius and 2000 feet in altitude.
Transfer of Command	An ICS term which means the process of moving the responsibility from one incident command team to another. This term primarily relates to the Incident Commander.
U	
Unusually Sensitive Area ("USA")	A drinking water or ecological resources area that is unusually sensitive to environmental damage from a hazardous liquid pipeline release.
V	
Vendors	Vendors are defined as external parties that provide HAZWOPER training following OSHA standards in *29CFR§1910.120* and also satisfy the OSHA recommendations for instructors in *29CFR§1910.120*; Appendix E "*Training Curriculum Guidelines*".
W	
Wildlife Rescue	Efforts made in conjunction with the appropriate jurisdictional agencies to retrieve, clean, and rehabilitate birds and wildlife affected by an oil spill.
Workers	Company employees and contract workers.
Worst-Case Discharge ("WCD")	Worst Case Discharge is described in detail in Annex 4 of applicable Regional Integrated Contingency Plans.

1.2.3 Conversion Table

Imperial / Metric Conversions

English to Metric		Metric to English	
Length			
1 inch (in)	2.54 centimetres (cm)	1 cm	0.393 in
1 foot (ft)	0.3048 meters (m)	1 m	3.28 ft
1 mile (mi)	1.609 kilometres (km)	1 km	0.621 mi
1 nautical mile (nm)	1. 852 kilometres (km)	1 km	0.540 nm
Area			
1 square foot (ft^2)	929 square centimetres (cm^2)	1 cm^2	0.0129 ft^2
1 square foot (ft^2)	0.0929 square metres (m^2)	1 m^2	10.76 ft^2
1 acre (ac)	4.047 square metres (m^2)	1 000 m^2	0.247 ac
1 square mile (mi^2)	2.59 square kilometres (km^2)	1 km^2	0.386 mi^2
Volume			
1 US Gallon (US gal)	3.785 litres (l)	1 l	0.264 U.S. gal
1 Imperial Gallon (Imp gal)	4.546 litres (l)	1 l	0.220 imp gal
1 Barrel	0.16 cubic metres (m^3)	1m^3	6.29 bbl
1 Barrel (bbl)	159 litres (l)	1 l	0.00629 bbl
Velocity			
1 mile per hour (mph)	1.609 kilometres/hr (kph)	1 km/h	0.621 mph
1 nautical mile per hour (knot)	1.852 kilometres/hr (kph)	1 km/h	0.54 knot
1 foot per second (fps)	0.3048 metre/second (m/sec)	1 m/sec	3.28 fps
1 foot per second (fps)	1.097 kilometres/hr (kph)	1 km/h	0.911 fps
Weight			
1 pound (lb)	0.454 kilogramme (kg)	1 kg	2.205 lb
1 short ton (st)	0.907 tonne (mt)	1 t	1.102 st
1 long ton (lt)	1.016 tonne (mt)	1 t	0.984 lt
Temperature			
$^oF = (^oC\ (9) \div 5) + 32$			
Pressure			
1 pound per square inch (psi)	0.0689 bar	1 bar	14.504 psi
1 pound per square inch (psi)	6.89 kilopascals (kPa)	1 kPa	0.145 psi
1 pound per square inch (psi)	0.704 metre (water column) (mwc)	1 m CE	1.42 psi
1 inch mercury (in Hg)	25.4 mm mercury (mm Hg)	1 mm Hg	0.0394 in Hg
1 atmosphere (atm)	1.033 kg/cm^2	1 kg/cm^2	0.968 atm
1 atmosphere (atm)	760 mm mercury (mm Hg)	1 mm Hg	0.00132 atm
Flow			
1 gallon per minute (gpm)	0.227 $metre^3$ per hour (m^3/hr)	1 m^3/h	4.403 gpm
1 cubic foot per minute (cfm)	1.699 cubic meters per hour (m^3/hr)	1 m^3/h	0.5886 cfm
1 barrel per day (bph)	0.1104 litres per minute (lpm)	1 lpm	9.057 bpd
Power			
1 horsepower (hp)	0.746 kilowatt (kw)	1 kw	1.341 hp

1.3 Purpose and Scope of Plan

The purpose of this Plan is to provide guidance to Company personnel on the immediate procedures, notifications and sustained operations in the event of an emergency originating at any Company area of operations. The Plan's primary purpose is to ensure an effective, comprehensive response that will prevent injury or damage to Company employees and the public and mitigate any possible impact on the environment.

The objectives of the Plan are to:

- Outline the training and exercise program that prepares Enbridge responders.
- Define alert and notification procedures to be followed when an emergency occurs.
- Describe response teams' roles and responsibilities under the Incident Command System ("ICS").
- Document equipment, manpower and other resources available to assist with an emergency.
- Provide guidelines for handling emergency response operations.
- Define organizational lines of responsibility to be adhered to during an emergency
- Describe the Operating Regions or Response Zones and determine the worst case discharge to minimize impacts to environmentally sensitive areas.
- Apply an "All Hazards, All Risks" approach to Emergency Response

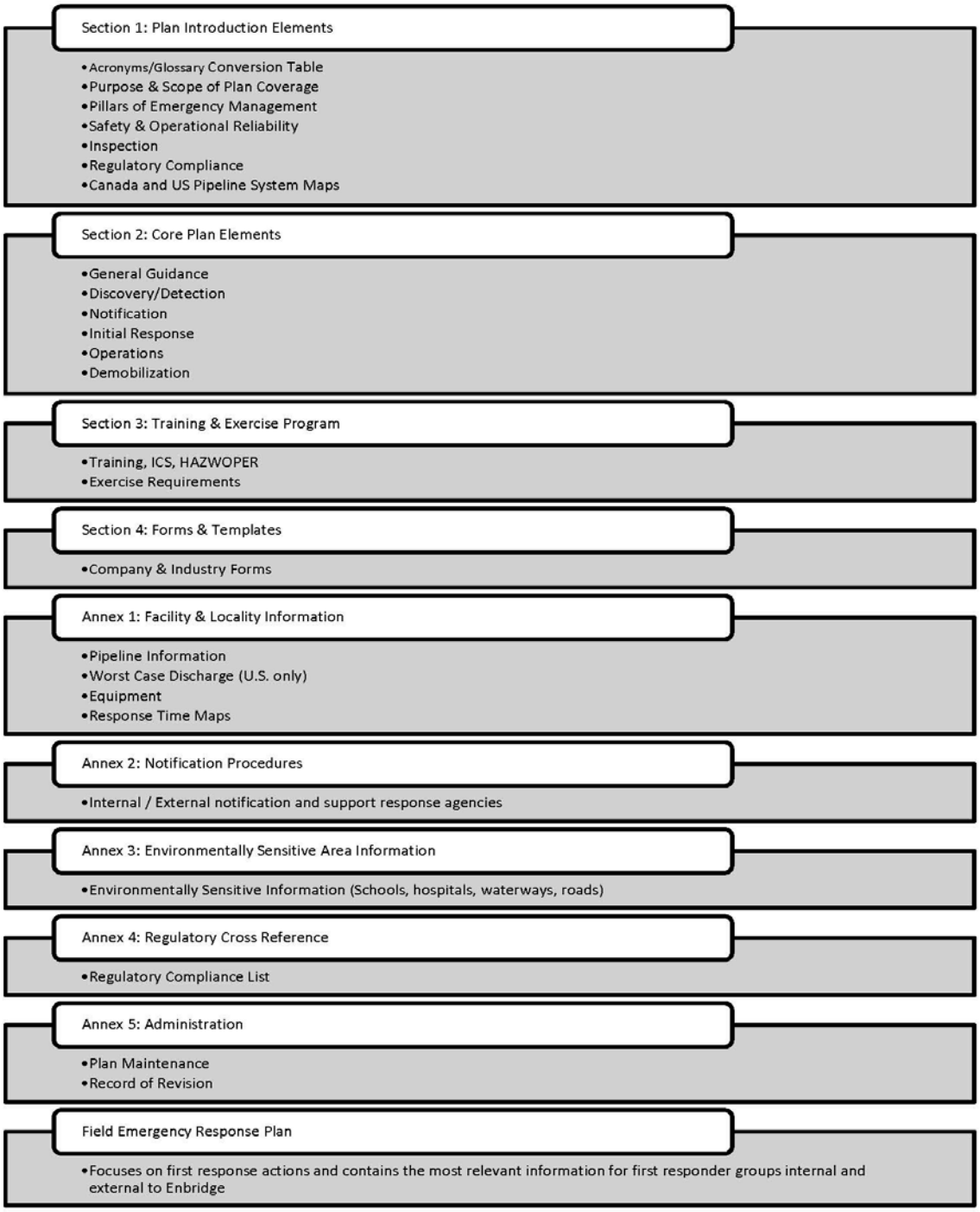
The format of the plan aligns with the U.S. National Response Team's ("NRT") Integrated Contingency Plan ("ICP") Guidance (Federal Register #61: 28641 28664). The guidance suggests formatting the ICP into two parts. The "Core" outlines information that is applicable across all operating regions or response zones and is followed by a series of "Annexes" that contains specific information per Response Zone. The ICP is a mechanism to address multiple regulations that the Company is governed by throughout the United States and Canada.

This ICP demonstrates the response capabilities available by the Company to respond to any product release. It is not a guarantee of what will occur or the equipment/deployment sequencing that will be used in an actual spill event. Nothing in this Plan is intended to limit the discretion of Company employees to select any sequence of actions or to take whatever time they deem necessary to maximize the effectiveness of the response, consistent with safety considerations.

This Plan applies to emergency response operations carried out by the on-site field personnel and the Field Response Team ("FRT"), Regional Incident Management Team ("IMT"), Incident Support Team ("IST"), Crisis Management Team ("CMT"), and Enbridge Enterprise Emergency Response Team ("E3RT") for any type or size of incident that may occur. It contains guidance for personnel to follow in the event of a release or other emergency situation involving Company assets.

This Plan represents a planning standard, but is not and should not be regarded as a performance guarantee. Response operations in any spill event will be tailored to meet the actual circumstances.

1.3.1 ICP Format Overview



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1.4 Pillars of Emergency Management

The four pillars of emergency management are: prevention and mitigation, preparedness, response, and recovery. All four pillars link to the environmental management system. *Figure 1-The Emergency Management Cycle* shows linkages between programs and processes.

Mitigation & Prevention
Enbridge takes an "all hazards" approach to mitigation and prevention which includes programs, plans and actions intended to reduce or remove the effects of an emergency incident, and preventing exposures from turning into larger emergency incidents with long-term significant impacts.

Preparedness
Preparedness includes the programs, plans, and actions taken prior to an emergency incident to ensure that Enbridge can deliver an effective response. Despite efforts made through mitigation and prevention, emergency incidents can occur and preparing for an effective response and recovery is critical.

Response
Response is the activation, mobilization, and coordination of all necessary resources and activities to manage a hazard, exposure, or a threat's immediate consequences as it escalates into and exists as an emergency or elevated threat level.

Recovery
Recovery includes the programs, plans and actions which aim to restore the affected area back to its pre-incident or better condition. Recovery programs and activities should ensure that resources (people, teams, and equipment) are replaced/replenished/debriefed and the response is reviewed as part of a continuous improvement process which feeds back into the full Emergency Management Cycle.

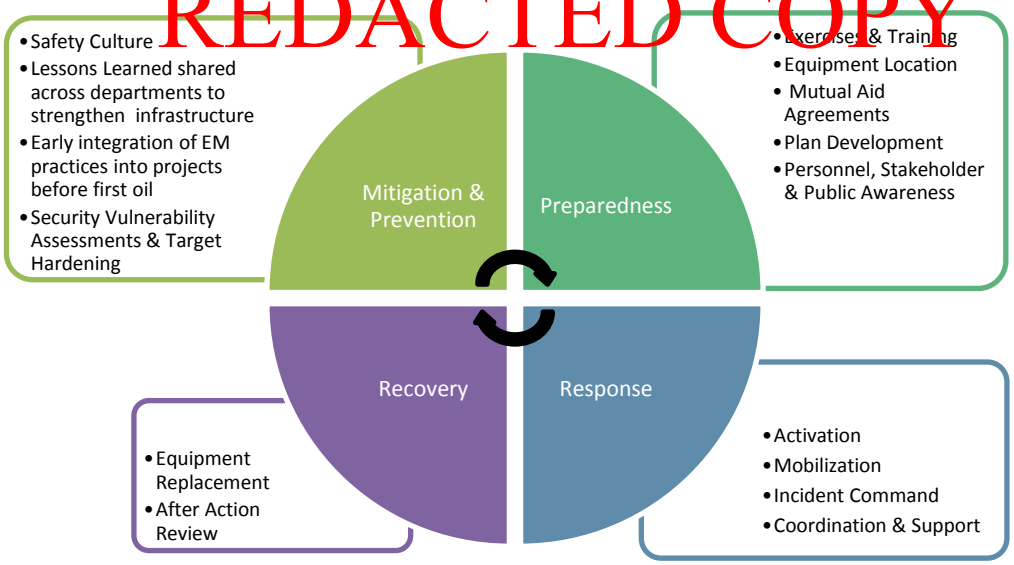

Figure 1: The Emergency Management Cycle

The Company takes action to mitigate and prevent emergencies from occurring; *Section 1.5 – Safety and Operational Reliability* and *Section 1.5.7 – Inspections* provide an overview of these efforts. Despite efforts made through mitigation and prevention, emergency and security events can occur. *Section 2: Core Plan Elements* is designed to guide the Company through the response phase.

This document and all response activities support the Enbridge LP Environmental Policy. The Company will minimize the consequences of emergency events by ensuring prompt and effective response.

1.4.1 Enbridge Emergency Response and Support Teams Hierarchy

Enbridge's Emergency Response has been structured to ensure that appropriate resources and support can be deployed to suit the complexity and severity of the emergency, from the boots on the ground (Field Response Team) to additional levels of support as needed. Both tactical and strategic response and support has been considered.

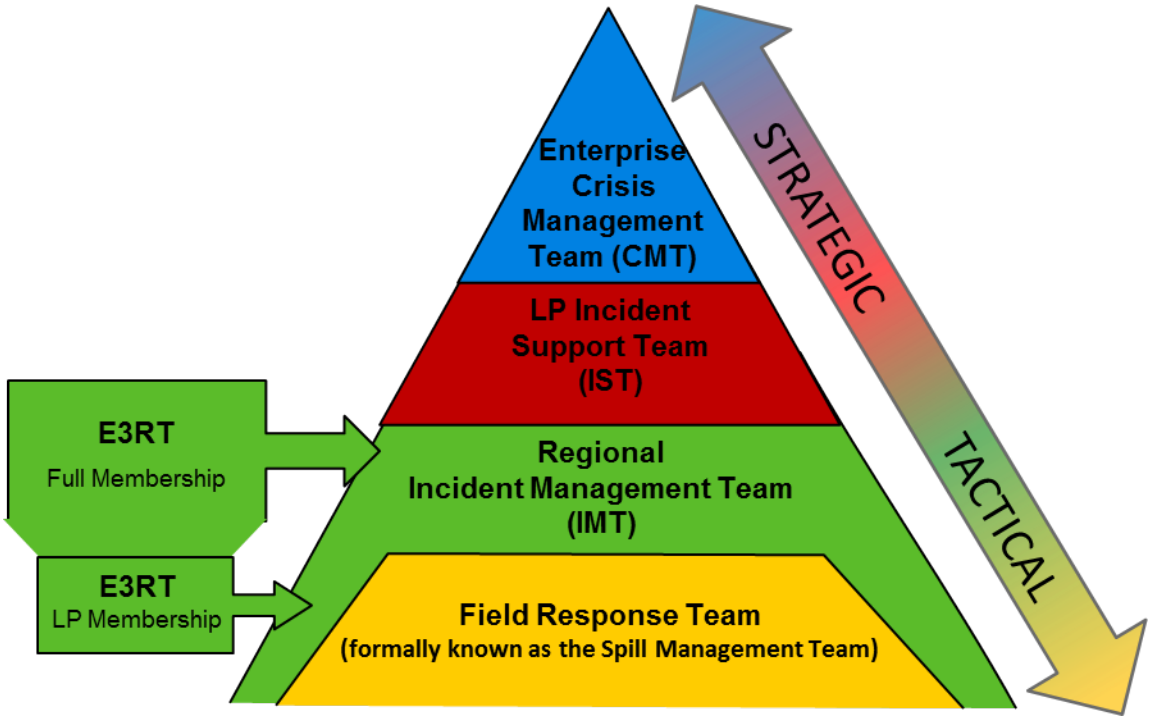

Figure 1.4.1a Emergency Response and Support Structure

Each team's primary objective is described below as well as the suggested guidance document(s) which further describes the team's roles, responsibilities and procedures.

Enterprise Crisis Management Team – Strategic (EXTERNAL TO IMS 07)

As identified in the Enterprise Crisis Management Plan (external to this framework and IMS 07): Responsible for "Actions taken away from the scene to support and assist the IST and [IMT] in planning, business recovery projects and address the implications of the problem and its potential on the Company's viability, operability and credibility"

LP Incident Support Team - Strategic

Actions taken at and/or away from the incident scene to support the IMT, facilitate planning, and manage business recovery projects.

Incident Management Team – Tactical & Strategic (Regional)

Actions taken at and/or away from the incident scene to support tactical response operations, facilitate planning, and address the immediate concerns of the public and government agencies. *Guiding Plan: Integrated Contingency Plan.*

LP Membership – Enbridge Enterprise Emergency Response Team
At the request of the Regional Incident Management Team (IMT), the LP membership of E3RT will provide LP mentorship to the IMT, and/or fill substantive roles in the IMT. LP members would deploy first, followed by the remainder of the E3RT membership for future operational periods.
Full Membership – Enbridge Enterprise Emergency Response Team
At the request of the Regional Incident Management Team, the full membership of this cross-business unit team of individuals, who are specially trained to support significant incidents, will fill roles in the IMT.

Field Response Team - Tactical

Actions taken by responders at an incident scene to directly attack the problem and its consequences.
Guiding Plans: Field Emergency Response Plan (Integrated Contingency Plan), Tactical Response Plan/Control Point Maps, Pre-Fire Plan and other tools

1.5 Safety and Operational Reliability

1.5.1 Corrosion Mitigation

For external corrosion prevention, the Company generally manages corrosion of buried pipelines by using approved long-life pipeline coatings supplemented with cathodic protection. Above-ground facilities are generally inspected annually and provided with protective coating systems to prevent corrosive deterioration. These primarily include buildings, above-ground pipelines and tanks.

In order to prevent internal corrosion of the pipelines, the Company may use one or more of the following methods; corrosion inhibitor injection or mechanical cleaning pigs. To monitor the both internal and external corrosion, the Company performs inspections including high population density areas and environmentally sensitive areas with inline inspection tools, where appropriate. Some pipelines may be hydrostatically tested.

1.5.2 Facility Spill Mitigation

Several spill mitigation measures are built into the design of facilities and emergency shutdown procedures. The following spill mitigation measures are found in the current design Company standard:

- Gas and fire detection alarms announced in Control Center for immediate shut down and isolation;
- Remotely-operated, electrically-actuated isolation valves;
- Releases resulting from pump seal failures are piped to sump tanks;
- Above ground piping in stations to allow visual inspection and early detection of leaks; and
- In all regions except Express Platte there are buildings over pumping stations to contain spills and any spray resulting from a release. On-site and on-call employees are trained as initial responders, and would focus on public/employee safety, isolation and containment upon arriving at any spill.

The Company has a number of safety systems and practices in place to prevent the occurrence and mitigate the subsequent consequences of any release. The systems are designed to alert operators with alarms. Pipeline operators are trained to respond to the various system alarms in order to identify, and mitigate the consequences immediately. These systems include:

- Regularly scheduled visual and aerial monitoring and inspections
- Marker signs and signage with emergency contact number for the public
- System wide third-party alerts/emergency telephone line in the Control Center
- The Supervisory Control and Data Acquisition (“SCADA”) system
- Local Control System sensors and shutdown, isolation capability
- Scheduled line balance calculations

- Computational Pipeline Monitoring ("CPM") Systems, based on DNV-GL SPS, Atmos Pipe and/or in-house developed software for leak detection and system protection
- High and low pressure alarms
- Leak Prevention practices and procedures
- Release detection equipment and procedures
- Pipeline and breakout tank inspection and testing procedures
- Recognition of emergency conditions and prediction of the consequences
- Leak response actions
- Public Awareness and education.

The routine responsibilities that ensure releases will be detected and mitigated as soon as possible by personnel may include, but are not limited to the following:	
✓	Regularly scheduled visual and aerial monitoring
✓	Routine walk-through and monitoring of process equipment to ensure proper operation of all equipment at each facility
✓	Immediate response to alarms and signals that may indicate a possible release
✓	Identification, de-energizing the system, isolation and containment of a release as soon as safely possible
✓	Notify the Regional on-call representative

1.5.3 Leak Detection Systems

The Company has a comprehensive approach to leak detection where pipelines are monitored for possible leaks using multiple complementary methods. These include CPMs, scheduled line balance calculations, Controller monitoring, visual surveillance and internal line inspection tools. Each method has a different approach featuring differing technology, resources and timing. Used together, these methods provide a complementary and comprehensive leak detection strategy intended to mitigate the consequences of any release.

Visual Inspection of Facilities & Pipeline Right-of-Way
Line patrols (aerial and ground) and third-party reports of oil or oil odors are used to identify leaks. Aerial line patrols are performed at intervals not exceeding two weeks and managed by Field Operations. Both aerial and ground patrols can also be completed whenever there are concerns about pipeline integrity. Third-party reports are handled through the emergency telephone line, managed by the Control Center.

Marker Signs
ROW marker signs are installed and maintained at road and water crossings and other noticeable points and provide an emergency 24-hour telephone number to be used by any person wishing to report a concern including a pipeline leak.

Third-Party Damage Prevention & Reporting System
If the systems are properly designed, constructed, operated and maintained, then the most probable cause of release is third-party damage. In order to minimize any damage caused by a third-party a number of steps may be taken, including but not limited to the following:

	Prevention of Third-Party Damage
✓	The facilities are designed to reduce the chance of third-party damage. For example, most of the facilities are buried or located within fenced and locked areas
✓	Inspectors are onsite during any Enbridge work near a pipeline
✓	Areas especially sensitive to third-party damage are road, railroad, and water crossings. Pipelines in these areas usually have increased pipeline wall thickness, burial depth, or the pipeline is encased to reduce the chance of damage
✓	Company participates in one-call pipeline locating and notification systems where available
✓	Company conducts education programs to reduce the possibility of third-party damage

The Company's Third-Party Reporting System allows external parties to report visible oil or oil odors. The Company manages third-party reports through the emergency telephone line, and communicates with affected public and local emergency officials through its Public Awareness Program ("PAP"). The Company may also conduct focused additional patrols upon review of the status of a pipeline.

SCADA Description & Controller Monitoring

The SCADA system collects and displays a comprehensive set of pipeline operating data, including flows and pressures updated in real-time. The Pipeline Controller monitors this data, to identify unexpected operational changes, such as pressure drops, that may indicate a leak. Additional sensors monitored through SCADA such as the detection of combustible gases, pump seal failures, equipment vibration levels, leak alarms and sump levels can also be used by the Controller to identify potential leaks.

The SCADA system provides automatic backup pressure protection through a number of subroutines, including an extension to the Line Pressure Monitor ("LPM") alarm system. The LPM alarm system monitors station discharge and suction pressures and can initiate set-point reductions, unit shutdowns, or entire line shutdowns as necessary to avoid overpressure situations. In addition to SCADA's primary functions, it runs several analytical tools, including the generation of preconfigured or customized graphical trends and reports that may be used in the analysis of pipeline operations and that assist in the assessment of operational changes.

Local Control System sensors and shutdown description

Locally, the mainline pump station's control system is comprised of numerous instrumentation and electrical devices that are all connected directly or indirectly to a Programmable Logic Controller ("PLC"). The PLC's main function is to control, monitor, and protect the station and various electrical equipment from overpressure, surges, abnormal operating conditions, and other anomalies by shutting down and locking out the appropriate equipment in order to protect the environment, facilities, public, and station personnel.

Scheduled line balance calculations

These are calculations of oil inventory and performed at fixed intervals, typically every two and 24 hours. A rolling 24-hour calculation based on volume balance is completed at a specific frequency each day. The purpose of these calculations is to identify unexpected losses of pipeline inventory that may indicate a possible leak. The Company utilizes line balance calculations within the Commodity Movement Tracking system.

Computational Pipeline Monitoring System (CPM) – description including critical instrumentation

The Company uses one or more CPM systems as its primary real-time system for detecting leaks on its liquid pipelines. A CPM is a computer-based monitoring approach that uses continuous measurements of pipeline conditions. This is an industry standard for dedicated leak detection. The industry standard that defines CPM is *API 1130*. The CPM systems are designed to meet the requirements of *CSA Z662* Annex E, and *API 1130*.

Real-time Transient Model (RTTM) based CPMs

A vendor based software application is used to create real-time transient models of the pipeline systems. These models combine a static description of the pipeline including the length, diameter and roughness of pipe with real-time operating data such as flow and pressure. The result is a sophisticated computer model of the pipeline that accurately replicates the real-time behavior of the pipeline.

The Enbridge Material Balance System (MBS) utilizes the RTTM software to detect leaks. The system uses flow measurements to divide the pipeline into one of more volume balance sections and includes overlapping sections when multiple flow measurements are available. It calculates the imbalance in each volume balance section and is optimized to look for various leak sizes. The MBS systems are capable of detecting leaks during all operations, including steady flow, transients, with or without column separation and shutdown/shut-in.

The Automated Pressure Deviation or APD system also uses the RTTM software to detect leaks. This algorithm uses closed valves to divide the pipeline into sections. It is only enabled during shut-in operation but may provide superior leak detection sensitivity during this operation.

Other CPMs used by Enbridge

Enbridge also uses different vendor application software to create a compensated volume balance leak detection system. These systems also segment the pipeline and are optimized to find a variety of different leak sizes. Sophisticated statistical analysis is used to evaluate imbalances. Separate software modules provide leak detection capabilities during flowing and shut down operations.

Another leak detection layer implemented and developed by Enbridge is the Rupture Detection system (RDS) which uses station suction and discharge pressures and applies pattern recognition algorithms to quickly and reliability detect ruptures.

CPM System - CPM Alarm Analysis procedures

In addition to the pipeline controllers, a dedicated Leak Detection Analyst (LDA) is on shift 24x7 to provide root cause alarm analysis support to the control room. The LDA uses procedures that provide step by step instructions on performing root cause analysis of leak alarms. In addition, the procedure also provides detail on the protocol for communications between the Leak Detection Analyst and the Control Center to ensure consistent, effective alarm analysis and response. Note: This section applies to all Enbridge facilities except the Express Platte Region, which will continue to use their existing systems as described in the Express-Platte General

Routine Inspections

Personnel perform routine station walk-around inspections and terminal rounds when they are on-site for preventative maintenance or repair activities. Equipment and facilities are checked for evidence of leaks or spills in addition to various other observations such as security, equipment operation, etc. The condition of facilities, equipment and tanks are informally observed by personnel on-shift. If issues are observed or repairs required, they are reported through the MAXIMO maintenance management system. Formal preventative maintenance activities are assigned, tracked and documented through MAXIMO, as well. Express Platte Region uses Bentley IVARA as the maintenance management system.

In all regions except Express Platte, formal safety inspections at manned locations are performed quarterly, during which personnel may also detect leaks.

Right-of-Way Patrols

Patrols of the entire Right Of Way (“ROW”) and the land adjacent to the ROW are performed at intervals not exceeding three weeks (21 days), but a minimum of 26 times per calendar year using methods of walking, driving, flying or other appropriate means. Any spill, abnormal surface condition or activity observed by ground personnel or the pilot is immediately reported to the closest attended regional location for further investigation response, or to the Control Center.

Safe Fill

When pipeline receipts or transfers are made, the volumes used in the calculations for space available use a safe fill height as the maximum operating level.

Receipt Monitoring

Terminal employees coordinate all receipts with pipeline representatives. This involves determination of the volume of each product grade prior to receipt. The receipt progress, incoming volumes and high level alarm signals are monitored at all times when product is being transferred into the terminal from the pipeline by the Control Center.

Tank Gauging

In all regions except Express Platte, each tank scheduled to receive a receipt is gauged prior to receipt to confirm that space is available for the receipt.

High Level Alarms

All tanks are equipped with high level alarms. High level alarms are indicated by an audible signal as well as visual indication in the Control Center. A signal is also sent to the Control Center and requires immediate contact with the facility operator. Alarms are tested periodically in accordance with Company preventive maintenance procedures.

Volume Reconciliation

Tanks are gauged at month end as part of the Company's physical inventory reconciliation program.

Pipe Testing

The Company's Risk Management ("RM") department has extensive testing guidelines of all pipeline systems throughout their entire geographical operational area.

Observations and Documentation

The conditions of tanks and equipment are observed when employees responsible for the operation and maintenance of the terminal are on shift. Documentation of these conditions will be logged periodically at the discretion of the local supervisor.

1.5.4 Oil Inventory Control System

Physical Inventory

This currently serves as the basis for comparing an inventory-reporting period with the previous reporting period. Current practice uses end of month physical inventory calculated in net barrels per petroleum measurement.

Railroad Facility Throughput

Facility throughput is product leaving a tank through a railroad loading rack with meters. Meters on railroad loading racks are to be calibrated according to a set interval. They are also reconciled in conjunction with physical inventory, taken as well as on a standalone basis. Quantity loaded shall be determined on a net basis using temperature from temperature probes and density from the Micro Motion Corriollis meters, which are mounted at each load arm and measured in gross barrel quantities from meter pulses. These throughput quantities shall be deducted from inventory.

Product Variation

A physical inventory can be taken to compare with the book inventory quantity, if necessary. The difference between the book and physical quantity is a product variation. Variations may be positive or negative. Statistical Process Control is the basis for determining whether this variation should trigger an investigative effort to determine whether product is unknowingly being discharged.

Statistical Process Control

Control limits (both upper and lower) are set for each product variation based upon historical information at each facility. Product variations between the control limits are considered to be satisfactory and do not require an investigation or documentation. These variations inside of limits are considered to be a "random" occurrence that is an inherent part of the control process. The control limits will be periodically checked to determine if they are still valid or whether process changes or improvements have invalidated them.

1.5.5 Public Awareness & Education

The safety of the public and employees and the protection of the environment are of the highest importance to Enbridge. A key component of the Company safety and community involvement program is an effective PAP, which targets those stakeholders who share the Company's goal of safe, reliable and environmentally responsible operations. The Company is committed to effective communications with the Company's key stakeholders through an ongoing, relevant PAP. The goal of Enbridge's PAP is to continually educate those who live, work and play near our systems, as well as police and fire departments and other organizations/agencies about:

- Call or Click Before You Dig programs
- General location of the pipelines, facility or asset
- Safety procedures in the event of an emergency
- Products transported
- Safe working practices when working/excavating near the pipeline
- Description of how Enbridge personnel will work with local response agencies during an emergency to protect people, property and the environment
- Emergency and non-emergency contact information

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Tank Fire Prevention and Protection

Each tank is designed in accordance with API 650, and maintained in accordance with API 653. Specific fire prevention mitigation measures that apply:

- Hazardous area designations and including safe work permit process to restrict hot work;
- Continuous fluid level monitoring by remote Control Center, with graduated high level warning, and high-high level alarm notification to remote Control Center;
- Independent high-high level mechanism;
- Primary and secondary floating roof seals to reduce flammable and explosive emissions;
- Floating tank roof grounding shunts and bonding cables; and
- Tank grounding rods and cables.

The following fire protection measures are found in the current tank design standard:

- Tank spacing, secondary containment and lot grading in accordance with NFPA 30;
- Semi-fixed or fully-fixed foam delivery system designed to address tank rim seal fires;
- Automated roof-top fire detection, with notification to remote Control Center; and
- Hydrant system (as required) for foam delivery or adjacent tank cooling.

Since terminal design standards have evolved over time, not all tanks are equipped with fire protection measures; however a Pre-Fire Plan has been prepared for each individual terminal. These plans contain specific fire protection information for each tank, and are reviewed with local fire departments and specialized tank fire fighters. Tanks that are not equipped with foam delivery systems or hydrant cooling are typically spaced greater than one diameter apart in individual secondary containment areas to reduce the risk to adjacent tanks.

Larger tank terminals are manned at all times. Personnel are trained to respond to incipient fires (up to, and including a rim seal fire) in accordance with the Pre-Fire Plans. Local fire fighters and specialized tank fire-fighting capabilities and resources are also identified in the Pre-Fire Plans for fires beyond the incipient stage. Tank fire foam deployment drills are conducted at all terminals.

Tank Fire Prevention and Protection

Storage Tank Overfill Lines

All overflow or vent lines on bulk storage tanks, as well as the built-in heating oil and gasoline additive tanks, are directed into the tank's secondary containment area.

Visual Tank / Breakout Tank Inspection

High level alarms on storage tanks are inspected routinely to simulate actual operating conditions to ensure that overfill during tank filling operations are adequately detected.

Tank Inspections Annual, Five year, 20 year

The visual tank inspection will include tank foundation and associated piping. All tankage, pumping equipment, piping and related terminal equipment are inspected every working day for leakage, malfunctions of seals, etc. Storage tanks are inspected monthly and annually and findings are recorded. Facility Operators visually inspect the exterior of aboveground storage tanks. Facility operators visually inspect all tanks each working day for leaks. Daily tank gauges are reviewed for evidence of product loss that would indicate a leak in the tank. Any visible oil leaks from tank seams, gaskets, rivets and/or bolts are corrected immediately.

The visual tank inspection checklist presented below has been included as guidance for inspections and monitoring. Also included in the visual tank inspection will be an inspection of the tank foundation and associated piping. All tankage, pumping equipment, piping and related terminal equipment are inspected every working day for leakage, malfunctions of seals, etc. Storage tanks are inspected monthly and annually and findings are recorded. These records shall be maintained for a minimum of five years.

Check tanks for leaks, specifically looking for:

- Drip marks
- Discoloration of tanks
- Puddles containing stored materials
- Corrosion
- Cracks
- Localized dead vegetation
- Various tank inspections are performed in addition to normal terminal rounds.

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Visual Tank / Breakout Tank Inspection cont.

Monthly Inspections

Visually inspect the exterior of aboveground storage tanks monthly for:

- Evidence of leaks (e.g., on shell, flanges and mixers)
- Changing conditions (e.g., shell distortions, settlement or heaving and active corrosion) oil or water in tank lot/pad or on roof; and
- Condition of the foundation, paint coatings, floating roof, insulation systems and appurtenances.

Annual Inspections

Visually inspect aboveground storage tanks annually for:

- Condition of the foundation;
- Condition of platforms and ladders;
- Condition of roof legs, manholes, vents and drains;
- Leaks in pontoons;
- Condition of seals;
- Condition of rescue tank davit; and
- Seal gap measurements as required.

Monthly and annual tank inspections are typically assigned, tracked and documented in the MAXIMO maintenance management system. Formal in-service and out-of-service inspections are also performed, in accordance with API 653

Check foundation for:

- Cracks
- Discoloration
- Settling
- Gaps between tank and foundation
- Damage caused by vegetation roots

Check piping for:

- Corrosion
- Discoloration
- Droplets of stored material
- Bowing of pipe between supports
- Evidence of stored material seepage on valves and seals
- Localized dead vegetation

Visual Tank / Breakout Tank Inspection cont.

Facility operators visually inspect all tanks each work week. Daily tank gauges are reviewed for evidence of product loss that would indicate a leak in the tank. Any visible oil leaks from tank seams, gaskets, rivets and/or bolts are corrected immediately. Tank roof drains and firewall drains are normally kept closed. The Company's major tanks have tank gauges which transmit oil heights to the Operations Control Center, where tank levels are monitored continuously. The tank gauges have alarms set for each tank for high tank level, low tank level, and emergency low tank level. Each tank also has an independent device which gives an alarm for emergency high tank level.

Secondary Containment Inspection

The secondary containment areas shown on the site plans will be inspected on an annual basis. The inspections will include checking for the following:

Dike or berm system:

- Level of precipitation in dike/available capacity
- Proper dike drain operation (Tank lot drainage pattern)
- Excessive debris or vegetation in the tank lot
- Signs of erosion or damage to the tank berm
- Proper warning signs in place (Location/status of pipes, inlets, drainage beneath tanks, etc.)

Secondary containment:

- Cracks
- Discoloration
- Presence of stored materials (standing liquid)
- Corrosion
- Valve conditions

Storm water Drainage

Storm water within a containment structure (station/terminal containment or tank berms) is visually inspected for an oily sheen or suspended solids. If visual inspection indicates that storm water may be contaminated, storm water samples are collected and sent to a laboratory for analysis. Adequate remediation of contaminated storm water is required prior to release. Retention and drainage ponds are inspected for erosion, available capacity, presence of stored material, debris, and stressed vegetation.

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Pipeline Inspections

All pipelines within the Company Pipeline System are monitored on a regular and routine basis. Control Center personnel monitor and control line pressures and product flow rate, operate remote controlled valves, operate pumps and engines, and monitor the type of product currently in the line at any given point. These Control Centers are operated on a 24-hour basis. Should a leak occur, the operators monitoring the lines can have the line shut down within 13 minutes. The operators can then dispatch field personnel to physically inspect the line in the area of the suspected leak.

Lines that are not connected to the SCADA System are generally smaller crude gathering pipelines. These lines are observed regularly by facility/pipeline maintenance personnel. In addition to these inspections, aircraft will fly along the pipeline on a regular schedule to inspect the lines.

Buried Piping

When a leak is detected from a buried pipe, the Company will excavate, examine and evaluate the pipe for the cause of the failure. Localized pipe failures will be repaired or replaced. For extensive pipe failures requiring substantial reconstruction, the Company will upgrade to the standard specified under the applicable regulations.

Elevated Pipes

Elevated pipelines to the loading racks are sufficiently high and the supports adequately protected to prevent tank trucks from accidentally hitting them. Speed limit signs posted at the entrance of each loading rack bay are intended to limit any impact damage to aboveground pipelines.

Dike Drainage

Drainage of precipitation accumulation from dike areas is performed only after inspection of the accumulation to ensure compliance with applicable water quality standards. Any water possessing a film, sheen or discoloration on the surface is not discharged until such sheen has been physically removed with the use of absorbent pads.

Drain valves are sealed and locked at all times except when there is an operator on-site who:

· Inspects the water for a film, sheen, or discoloration;

· Removes any film, sheen, or discoloration;

· Monitors the discharge; and,

· Records the discharge event in the SPCC plan.

Pipe Supports

In accordance with good engineering practice and petroleum industry standards, pipe supports are designed to minimize abrasion and corrosion and allow for expansion and contraction of the pipeline.

Delivery Lines and Manifold

The facility tests the delivery lines and manifold on an annual basis with a two 2) hour recorded pressure test.

High Level Alarms

High level alarms on storage tanks are inspected routinely to simulate actual operating conditions to ensure that overfill during tank filling operations are adequately detected. Results of high-level alarm inspections are recorded in the SPCC plan once every six months.

Cathodic Protection System

The entire pipeline, including stations and terminals are protected by a cathodic protection system to protect buried piping from external corrosion. Cathodic protection rectifiers are read bi-monthly to ensure proper operation. A full cathodic protection system survey is performed annually, with required remediation actions to be performed within one year.

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1.5.8 Prevention of Security Related Threats

Lighting

Facility lighting is appropriate with the operation and the type and location of the facility to assist in the discovery of discharges and to prevent discharges occurring through acts of vandalism. Lighting at the facility is provided to illuminate tanks, loading racks, offices and entrance/exit gates.

Security Programs

Security must be considered with any incident response for the protection of personnel, the public, the environment and property. The LP security plan is documented in IMS Security Management Program and includes a security incident management process. In addition to the IMS Security Management Program, the regions have developed site specific security procedures. Enterprise security must be immediately notified of any security related incidents. Enterprise Security can also support a region's incident response by activating the Intelligence Officer role of the Incident Command System.

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1.6 Regulatory Compliance – Canada and U.S.

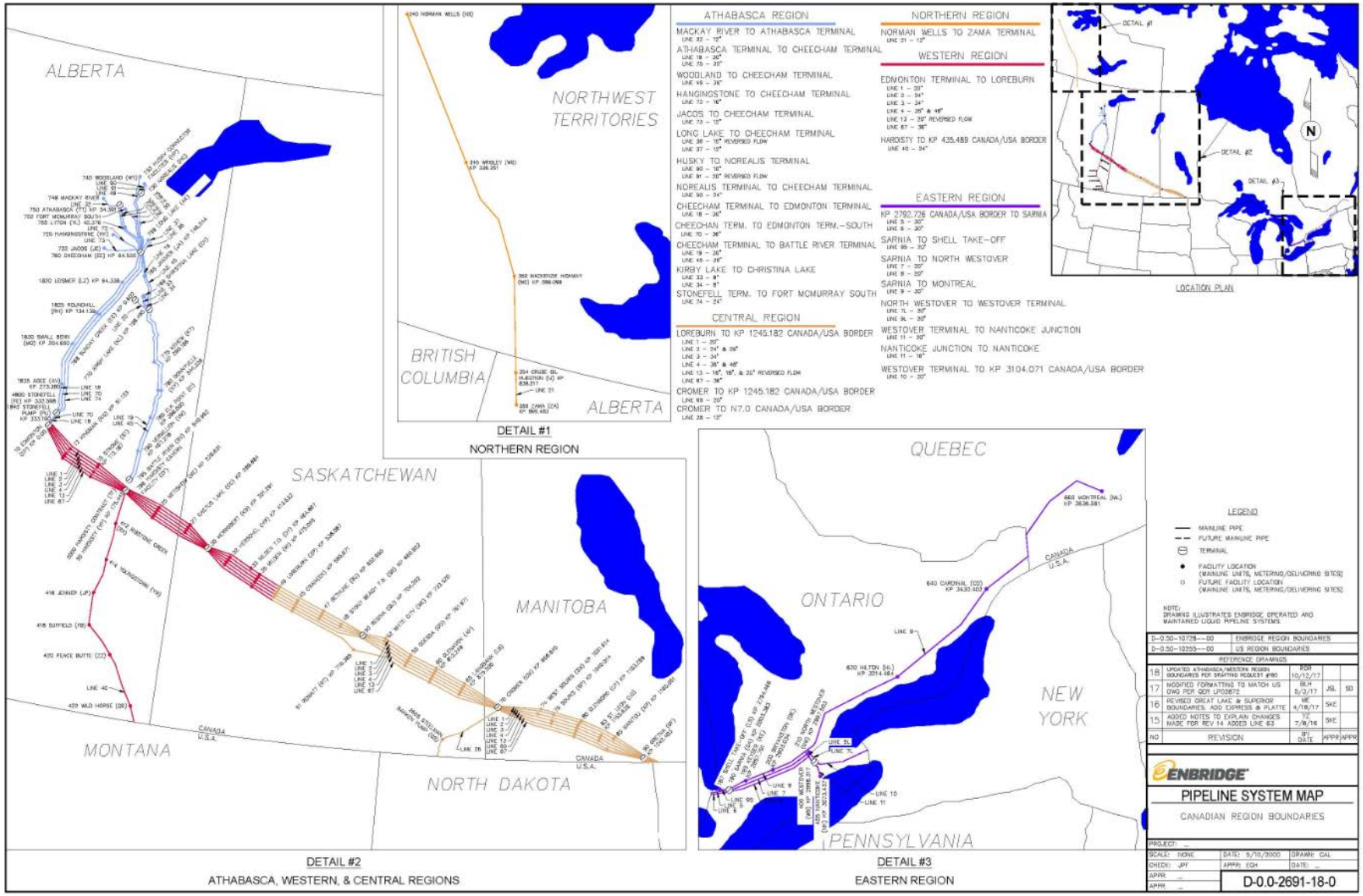
This ICP is based on the National Incident Management System ("NIMS") and the Incident Command System ("ICS"). This Plan utilizes the standard format guidance provided for by the U.S. National Response Team. As such it has been developed to allow assimilation of other Federal, Provincial and State agencies into the Plan.

	The Plan is intended to satisfy the requirements of regulatory agencies mandating written procedures to address planning and response to emergencies, including:
✓	Alberta Energy Regulator ("AER") • Pipeline Act, RSA, c P-15, Sections 35-36 • Pipeline Rules, AR 91/2005, Sections 8, 27 and 76 • AER Directive 071: Emergency Preparedness and Response Requirements for the Petroleum Industry, 2009 • AER Directive 056: Energy Development Applications and Schedules
✓	• Alberta Environment and Parks ("AEP") Environmental Protection and Enhancement Act, RSA 2000, c.E-12Sections 110 to 112 • Release Reporting Regulation, AR 117/1993
✓	Environment Canada • Canadian Environmental Protection Act 1999, SC 1999, c. 33, Sections 95, 96, 169, 179 Part 8 (Section 193 to 205) • Federal Halocarbon Regulations, 2003, Release Reports, section 32-33
✓	Fisheries and Oceans Canada • Fisheries Act, RSC 1985, c F-14, Section 38(4) – (7)
✓	Manitoba Ministry of Environment • The Environment Act, CCSM, c. E125, Section 30.1 • Notice and Reporting Regulation, MR 126/2010
✓	National Energy Board ("NEB"): • National Energy Board Onshore Pipeline Regulations SOR/99-294,Sections 32-36, 46,52, Incident Reports • National Energy Board Event Reporting Guidelines
✓	Northwest Territories • Environmental Protection Act, RSNWT 1988 c.E-7 Section 5.1 • Spill Contingency Planning and Reporting Regulations, NWT Reg 063-93 • A Guide to Spill Contingency Planning & Reporting Regulations, March 2011 • Indian and Northern Affairs Canada, INAC Guidelines for Spill Contingency Planning, April 2007
✓	Ontario Ministry of Environment • Environmental Protection Act, RSO 1990, c. E.19 Part X (Spills) 2 • Classification and Exemption of Spills and Reporting of Discharges, Ont. Reg 675/98 • Spills Reporting A Guide to Reporting Spills & Discharges, May 2007

The Plan is intended to satisfy the requirements of regulatory agencies mandating written procedures to address planning and response to emergencies, including:	
✓	Quebec Minister of Sustainable Development, Environment and Action against Climate Change • Environment Quality Act, CQLR, c. Q-2 • Regulation Respecting Halocarbons, QCLR, c. Q-2, r. 29 • Regulation Respecting Hazardous Material, CQLR, c. Q-2, r. 32
✓	Saskatchewan Ministry of Environment • The Environmental Management and Protection Act, 2010, SS 2010, c E-10 -22 , Sections 9-10 • Environmental Spill Control Regulations, Section 4
✓	Saskatchewan Ministry of the Economy • The Emergency Planning Act, SS 1989-90, c. E-8.1 • Pipelines Regulations, 2000, RRS c. P-12.1, Reg. 1, Sections 20-21 • The Oil and Gas Conservation Regulations, 2012, RRS c. O-2, Reg. 6, Section 99
✓	Transport Canada • Transportation of Dangerous Goods Act, 1992, SC 1992, c. 34, Section 18 • Transportation of Dangerous Goods Regulations, SOR/2015-100 Part 8, Accidental Release and Imminent Accidental Release Report Requirements
✓	Transportation Safety Board (“TSB”): • Transportation Safety Board Regulations, SOR/2014-37, Section 4

The Plan is also intended to satisfy the requirements of regulatory agencies (primarily DOT PHMSA) mandating written procedures to address planning and response to emergencies, including:	
✓	Oil Pollution Act of 1990 “OPA 90”
✓	The Department of Transportation’s (“DOT”) regulations as defined in *§194*, *§172.600 Subpart G and* similar regulations issued by the state agencies
✓	The Department of Transportation’s (“DOT”) regulations as defined in *49CFR§195.403*
✓	The Department of Transportation’s (“DOT”) regulations as defined in *49CFR§172.600*
✓	United States Coast Guard (“USCG”), *33CFR§154*
✓	The National Oil and Hazardous Substances Pollution Contingency Plan (“NCP”) and applicable Area Contingency Plans (“ACPs”)
✓	OSHA’s *29CFR§1910*
✓	Applicable State and local requirements
✓	U.S. Environmental Protection Agency's (“EPA”) Oil Pollution Prevention Regulations, *40CFR§112*, that requires a Non-Transportation Related Facility Response Plan
✓	Company has opted to follow the PREP Guidelines for exercise/drilling purposes
✓	American Petroleum Institute (“API”) 1162.

1.7 Canada Pipeline System Map



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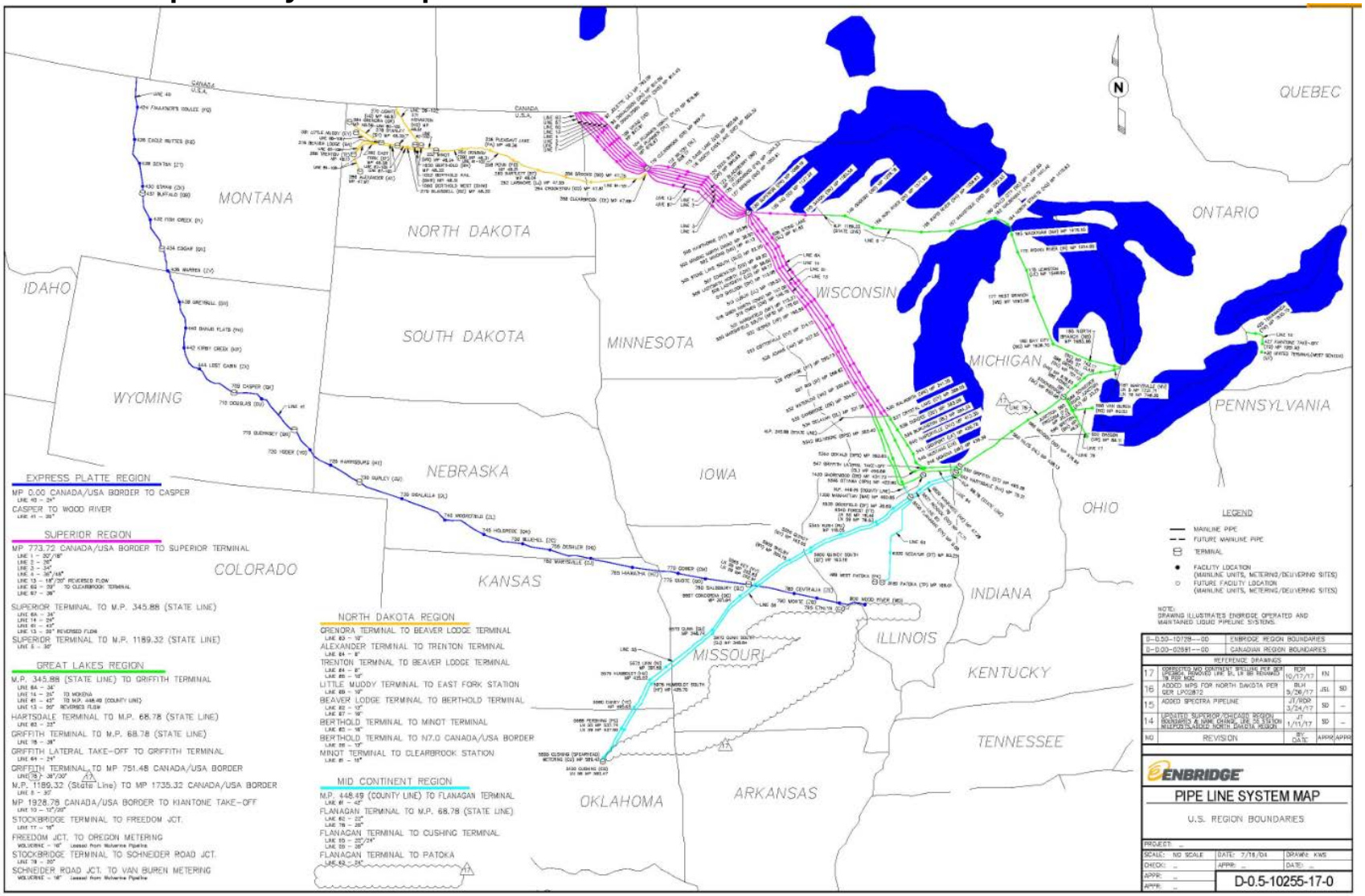
1.8 U.S. Pipeline System Map



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Section 2 – Table of Contents Page

Section 2 – Table of Contents Page

Section 2 – Table of Contents Page

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2.0 General Guidance

- Guiding Objectives
- Documentation
- Personal Protective Equipment (PPE)

2.1 Discovery/Detection

- Observation & Detection

2.2 Notification Procedures

- Field Notifications
- Control Center
- Classification of the Incident
- Third Party Notifications - Jurisdiction having authority

2.3 Initial Response

- Isolation Distances (Hot, Warm, Cold)
- Setting Up On-site Work Areas
- Evacuation -Personnel & Community

2.4 Operations

- Response Management System - Incident Command System
- Site Security and Control
- Response Procedures
- Environmental Response
- Waste and Disposal
- Site Safety and Health Plan
- Protection, Containment, and Recovery
- Decontamination

2.5 Demobilization

- Transition Plan
- Equipment Inventory, Return and Restock
- After Action Review

2.0 General Guidance

2.0.1 Guiding Objectives

Section 2 of this document provides guidance on emergency response and management during an incident. Enbridge will prudently over respond to any incident with priorities in the following order:

- **P**eople
- **E**nvironment
- **A**ssets
- **R**eputation

Additionally, during a response, the following **objectives** (what you plan to do in priority order) and **strategies** (how you plan to accomplish objectives) should be considered. Not all objectives apply to all incidents:

Objectives	Strategies
1. Ensure the Safety of Citizens & Response Personnel	• Establish site control (hot zone, warm zone, cold zone and security) • Consider evacuations, as needed • Establish vessel and/or aircraft restrictions • Monitor air in impacted areas • Develop Site Safety and Health Plan (“SSHP”) for response personnel • Ensure safety briefings are conducted • Manage medical emergencies/injuries
2. Control the Source	• Complete emergency shutdown • Initiate temporary repairs • Transfer product
3. Manage Coordinated Response Effort	• Complete or confirm notifications • Activate ICS and facilities (command post, etc.) • Ensure local, Indigenous officials are included in response organization • Initiate emergency response Incident Action Plan (“IAP”) • Ensure mobilization and tracking of response resources and personnel • Complete documentation • Evaluate planned response objectives vs. actual response (debrief)
4. Maximize Protection of Environmentally-Sensitive Areas	• Implement pre-designated response strategies • Identify resources at risk in impacted and potential impacted areas • Track pollutant movement and develop trajectories/plume modeling • Conduct visual assessments (e.g., over-flights) • Develop/implement appropriate protection tactics

Objectives	Strategies
5. Contain and Recover Spilled Material	• Deploy containment boom at appropriate spill source and collection areas
6. Recover and Rehabilitate Injured Wildlife	• Conduct injured wildlife search and rescue operations
7. Remove Oil from Impacted Areas	• Conduct clean-up efforts
8. Minimize Economic Impacts	• Consider tourism, vessel movements, and local economic impacts throughout response • Protect public and private assets, as resources permit • Establish damage claims process
9. Keep Stakeholders Informed of Response Activities	• Provide forum to obtain stakeholder input and concerns • Provide stakeholders with details of response actions, concerns and issues, and address as practical • Provide elected officials details of response actions
10. Keep the Public Informed of Response Activities	• Provide timely safety announcements • Establish a Joint Information Center (“JIC”) (if applicable) • Conduct regular news briefings • Manage news media access to spill response activities • Conduct public meetings, as appropriate
11. Minimize Business Interruption	• Identify business interruption and potential business interruption issues • Conduct notifications of joint venture partners • Assist with internal/external investigations.

2.0.2 Documentation

Records will be made and kept as events occur that capture the following information:

- Notification
- Response Actions
- Communications with Non-Company Personnel
- List of All Persons On-Scene
- Costs Incurred

The IC is responsible for the maintenance of complete and accurate records of all events that occur during any response activity in chronological order as it is essential for legal requirements, and post-incident review.

When an emergency has been declared, the Law Department should be notified early on to provide direction on the inclusion of the Enterprise Records Management department. The Enterprise Records Management Department will advise of specific requests for document retention, including managing and classifying incident emails per Email Management Policy.

Each group within the response organization is responsible for compiling and maintaining adequate records. If the ICS has not been fully activated, the IC must maintain and keep an accurate, chronological record of the key events related to the release.

Standards for response documentation are illustrated below:

Standards for Management of Records	
✓	Response documentation is a record of activities and not a place for analysis, conclusions, speculation, opinions, or comments
✓	Records will be complete to capture the whole sequence of events
✓	Records will be clearly stated to support the recovery costs at a later date
✓	Only relevant information will be recorded
✓	Records will include the name and position of the person who prepared the document
✓	Records will be managed and available throughout the response
✓	A scribe will be appointed to document
✓	All entries will include a time and date to reconstruct sequences of events at a later date.

Essential Emergency Response Documentation

- **Level 1 Emergency** – ICS 201 packet (verbal or written depending on the nature of the emergency)
- **Level 2 Emergency** – ICS 201 packet, followed by an IAP for multiple operational periods
- **Level 3 Emergency** – Detailed IAP created for each operational period.

If software is utilized in any emergency response (including drills and exercises) to develop an Incident Action Plan, all documents will be stored on the system and printed for retention at the regional office as per the Record Retention Policy.

Unit/Individual Logs from each ICS group will be maintained from the time of emergency confirmation until the operations are completed and will be handed in to the documentation unit at the end of every operational period.

Incident Records

Electronic Documentation

When an emergency has been declared, the Law Department should be notified early on to provide direction on the inclusion of the Enterprise Records Management Department. All emails will be stored in an email folder created specifically for the incident. The Enterprise Records Management Department will advise of specific requests for document retention.

Visual Records

Photographs

Photographs will be used to record the following information:

- Initial conditions at the release site
- Containment and response activities (chronological progression)
- Aerial photographs (if possible)
- Overall “panoramic” view of the site to tie-in permanent features
- Conditions at the end of the response operations
- Recovery of the area over time

The following information will be written on each photograph immediately after development:

- Release name and location;
- Date and time;
- Photographer’s name and contact number;
- Location where the photograph was taken and direction the camera was facing (use copy of site sketch where possible), and
- Specific information being documented.

Video

Use video with a verbal commentary to supplement (not replace) photographs if appropriate. Verbal comments are only used to reference information pertaining to the release site and associated activities.

For specific policies, standards and guidance on managing records at Enbridge, please see the Enterprise Records and Information Management Elink page under "Policies and Resources, Records Management.

2.0.3 Personal Protective Equipment

Appropriate personal protective equipment ("PPE") will be worn/used during response activities, meaning appropriate to the hazard and to the activities the responder will be undertaking. Responders will be trained and experienced in the use, care and maintenance of PPE and are responsible for personal items.

At minimum, these measures may include:

Personal Protective Equipment	
The Safety Officer and/or Site Supervisor will determine the PPE requirement based on the work to be conducted, a documented hazard assessment, and other factors as listed below.	
Respiratory:	Wear a positive pressure air supplied respirator in situations where there may be potential for airborne exposure above exposure limits as identified by air sampling. If exposure concentration is unknown, or if conditions immediately dangerous to life or health (IDLH) exist, a National Institute of Occupational Safety and Health (NIOSH) approved self-containing breathing apparatus (SCBA) or equivalent shall be operated in a pressure demand or other positive pressure mode.
Head:	Approved hard hats shall be worn unless all overhead hazards have been eliminated.
Gloves:	Gloves shall be used based on emergency conditions and shall be sufficient for work being performed.
Eye/Face:	Approved safety or prescription safety glasses with fitted side shields and protective lenses shall be worn to safeguard against potential eye contact, irritation or injury. Depending on conditions of use, a face shield may also be necessary.
Foot:	Safety boots with a minimum of 6" (15 cm) ankle support to the top of the boot from the heel is required, unless on a controlled or supervised site/facility tour or when not exposed to hazards that would require foot protection.
Hearing:	Hearing protection shall be worn where exposed to noise at 85 dBA or above.
Clothing:	Full length pants and long sleeves shall be worn on any facililty or work site. Approved High Visibility Safety Apparel (HVSA) shall be worn when required by hazard assessment, in areas of heavy congestion or when working near traffic areas. Flame Resistant (FR) garments are required inside fenced or operating facilities, where there is a potential for flame exposure or as based on a hazard assessment. Imperveous clothing should be worn as needed.
Other Protective Equipment:	A source of clean water should be available in the work area for flushing eyes and skin.

Personal Protective Equipment	
The Safety Officer and/or Site Supervisor will determine the PPE requirement based on the work to be conducted, a documented hazard assessment, and other factors as listed below.	
	Suggestions for the use of specific protective materials are based on readily available published data. Users should check with the Safety Officer and follow Company safety policies.

** Other PPE maybe required based on hazard assessment*

• PPE Use and Limitations	
Several factors must be considered when selecting and using PPE	
✓	The protective clothing, gloves and boots must be resistant to permeation or penetration by oil and other chemicals that may be encountered on the site
✓	Protective clothing and gloves should be durable for heavy work
✓	Protective clothing and glove materials must maintain protection and flexibility in hot or cold weather conditions
✓	Protective clothing must be large enough to fit over other clothing without ripping and tearing
✓	For respirator use, procedures must be in place for the proper selection, use, care, and fit testing of the respirators. Additionally, the wearer must be advised as to respirator cartridge expected life and of monitoring for contaminant breakthrough, etc.
✓	Protective footwear must have non-slip soles. Additionally, conditions may require the use of steel toe and/or steel shank footwear
• Work Duration	
The work duration is expected to last for the full shift and will involve moderate to heavy physical exertion during clean-up activities.	
• PPE Maintenance and Storage	
PPE will be maintained and stored by an assigned work crew. Protective clothing and gloves will be evaluated during and at the end of each shift and will be replaced as necessary. Boots and other PPE may be decontaminated for re-use.	
• PPE Decontamination and Disposal	
PPE may be decontaminated in designated areas by assigned crews using soap or another suitable cleanser and rinse water. The cleaning solution used will be disposed of in properly labeled containers according to applicable regulations. Contaminated protective gloves and any other PPE to be disposed of will be placed in properly labeled bags and disposed of according to applicable regulations.	

• PPE Training and Proper Fitting	
All site clean-up workers, supervisors/managers and others entering the contaminated zone will be given training in proper use of PPE. The training will include:	
✓	How to use PPE
✓	When and where to use the PPE
✓	How to inspect PPE to determine if it is working properly
Care will be taken to ensure workers are provided properly fitted PPE.	
• PPE Donning and Doffing Procedures	
Prior to starting work, all site clean-up workers and others required to wear PPE will be trained in proper donning and doffing procedures.	

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2.1 Discovery/Detection

2.1.1 Observation, Discovery & Detection

The detection of a discharge from the Company pipeline system may occur in a number of ways, including: Discharge detection by Company personnel, pipeline patrols, or the general public. Discharge detection by the SCADA system and or controller at the Control Centre which monitors flow and pressure on most lines as well as tank oil levels

2.1.1.1 Pressure Alarm

In the event of a change in pressure beyond a specified range, the operator will be signaled by an alarm which may result in the operator shutting down the associated pipeline or process equipment.

Control Center Alarm Procedures	
✓	Ensure that the pipeline/terminal is in a safe state
✓	Notify supervisor/manager of any abnormal operation
✓	Once a shutdown decision has been made personnel will be dispatched to assess situation
✓	The supervisor/manager may request a field inspection of the pipeline ROW in question to identify the source of the suspected leak
✓	In the event a release is discovered along the pipeline, this Plan will be activated
✓	In the event a release is not found, an investigation into the cause of the pressure change will continue until determined.

If a release is detected, personnel are directed to notify the proper authorities (see *Annex 2- Notification Procedures*).

Facility Discharge Detection (Tanks, Terminals and Piping)

Enbridge facilities are equipped with high level alarms including mechanical switches.. The Control Center also receives an alarm if this "high level" is reached. When the Company receives these alarms, the alarming tank is shut down, and immediate contact with the facility operator on duty or on-call personnel is established. The high level alarm is set below the tank overfill height to ensure adequate time to shut down the line before overfilling occurs.

2.1.1.2 Discharge Mitigation

This section provides guidelines for controlling a release near the source and mitigating the associated consequences. Source control and mitigation involve anything from shutdown of operations to containing a spill, dispersing a vapor cloud, protecting a sensitive area, recovering the spilled material, or other such activities that are involved in an emergency response.

Company personnel have been trained to respond to abnormal pipeline/facility operations. Source control will be maintained with the following systems and procedures:

- Company facilities are equipped with Automated Emergency Support Systems (e.g., sumps, safety control valves, emergency shutdowns, etc.). These systems can alarm Control Centre operators and close individual valves or the entire pipeline/facility.
- In the event the incident does not allow automatic control, the operator has the ability to control a release by manually activating shutdown devices or closing valves, etc.
- In the event the source cannot be controlled by the pipeline operator or remotely with a safety system, the Company will activate this Plan and assemble a team to respond to the situation.

Initial Actions For a Pipeline Incident:	
✓	Shutting down the pipeline
✓	Isolating the line section by closing the appropriate valves
✓	Dispatch first responder to assess

Initial Actions For a Tank Leak/Overfill:	
✓	Terminating operations to the tank, if in progress
✓	Transferring the tank contents into available tankage or back into the pipeline
✓	Dispatch first responder to assess

Source control measures are implemented as close as possible to the source of a spill to minimize the extent of the affected area and generally involve:	
✓	Construction of barriers, trenches, or earthen berms for containment
✓	Construction of berms or trenches for diverting spill to containment area
✓	Deployment of containment booms in waterways down- current of the source
✓	Deployment of recovery equipment (pumps, vacuum trucks, skimmers)

Leak Detection System

The Company monitors the pipelines for possible leaks using multiple methods, each with a different focus and each using a different technology, resource and timing. Together, these methods provide overlapping and layered leak detection capabilities:

Controller (Operator) monitoring – The Supervisory Control and Data Acquisition (SCADA) system is designed to identify operational changes, such as pressure drops that may indicate a leak. This SCADA system also monitors vapor concentrations, pump-seal failures, equipment vibration levels, and sump levels.

Computational pipeline monitoring – The Company is constantly monitoring pressure, temperature and other key data from thousands of points along the systems to quickly identify and respond to unexpected changes. Computer based systems use measurement and pipeline data to detect anomalies that could indicate possible leaks.

Scheduled Line Balance Calculations – Regularly scheduled intervals, throughout the day, calculate and confirm the volumes of crude oil received into the pipeline system to precisely match the volumes delivered.

Visual surveillance – Regular aerial and ground line patrols are conducted on the pipeline systems. Emergency telephone hot lines are operated for the use of third party reports.

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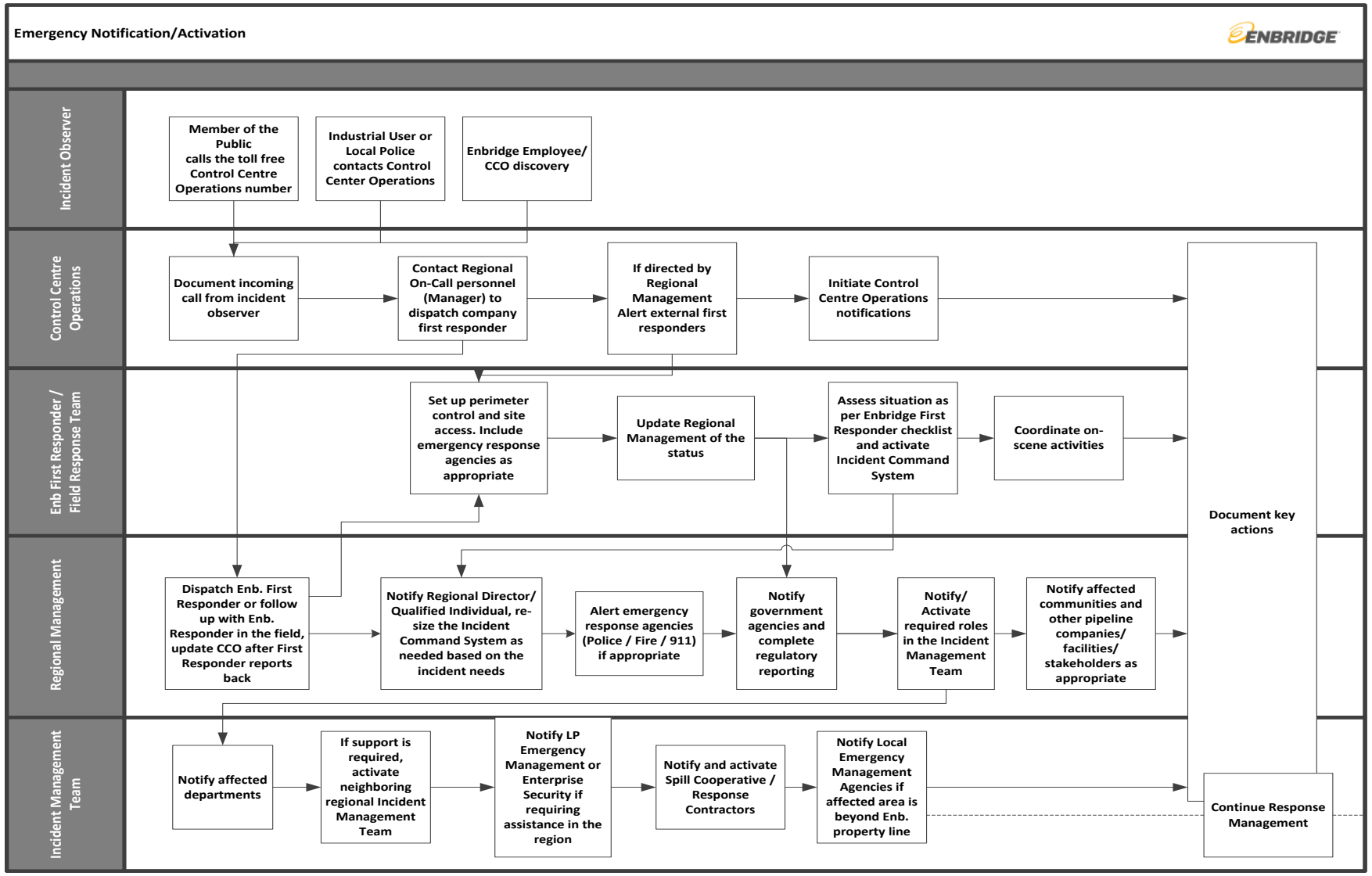
2.2 Notification and Communication

General guidelines on the procedures and sequence for making the various internal and external notifications following any type of product release or other emergency incident can be found in this Plan in *Annex 2*. The information provided herein focuses primarily on general notifications and reporting. Relevant internal and external notifications will be found in the geographic specific Geographical Annex of the ICP along with all notification checklists applicable to that area.

The purpose of the notification process is to:

- Protect the safety of the public and responders;
- Control potential environmental effects as effectively and quickly as possible; and
- Meet regulatory requirements.

The notification process is triggered by an emergency or suspected emergency that is detected by, or reported to, the Control Center by the public, contractors, external first responders or an employee.



2.2.1 Field Notifications

Any person who observes or becomes aware of a release, shall immediately report the incident to the Control Center and Regional Management. Information should be documented on the Receiving Emergency Information form, located in *Section 4 - Forms*.

Enbridge First Responder

The Enbridge First Responder on-scene will:

- Contact Regional Manager on call – see Regional Manager On Call Schedule
- Contact Control Center
- Follow Annex 2-Notification Procedures to activate the Regional IMT
- Work with the first responding agency on scene to ensure a coordinated response

Regional Management/Representative

As the scope of the incident requires, Regional Management will:

- Dispatch Enbridge First Responder(s) to investigate the report
- Notify the Control Center if an Enbridge Responder has been dispatched
- Depending on the circumstances of the emergency, consider launching aircraft for situational awareness
- Activate Incident Management Team as required
- See Annex 2 - Notification Procedures for required regulatory Notifications
- Call response agencies/oil spill removal agencies (Annex 2)

In the Northern Region, the Regional Management will contact stakeholders and authorities.

2.2.2 Control Center

Any abnormal operating condition detected by the Control Center, or any reported or observed emergency or possible emergency situation, will be given an emergency status until the report is confirmed or negated. Follow up investigation and confirmation of a spill, or threat of spill, will be done immediately.

The Control Center personnel will notify:

- Regional on-call representative
- Others identified in the Control Center operations procedures
- The Municipal/Community emergency services will be notified at the request of Regional Management)

The Control Center and IMT will confirm that additional notifications are completed, including those to:

- Government agencies
- Local authorities
- Response contractors
- Indigenous groups in Canada in/or in the U.S.
- Stakeholders

Figure 1

ALERT LEVEL	LEVEL 1 EMERGENCY	LEVEL 2 EMERGENCY	LEVEL 3 EMERGENCY
- Minimal area impacted - Immediate control at hand - Restricted to site - Low probability of escalation - No immediate impact to operations *May complete 3rd party notification	- No immediate threat to people - No threat to facility infrastructure, no effects outside company property, very limited effects on pipeline ROW - Control of released product pending - Minimal environmental impacts (including wildlife, ecosystems) - Minimal impact to operations - Can respond with existing resources - Minimal impact on company property and no impact on public property	- Potential exists for injury/ threat to people - Offsite impact possible - Potential threat to company facility infrastructure, no immediate threat outside company property, moderate effect on pipeline ROW - Moderate environmental impacts - Limited or short-term impact to operations - External resources may be required	- Fatality/ serious injury or illness and/or ongoing threat to public safety - Ongoing threat to facility infrastructure - High environmental impact - Potential for long-term or significant impact to operations (or no indication of how long impact may last) - External resources required
ALERT RESPONSE	**TIER 1 RESPONSE**	**TIER 2 RESPONSE**	**TIER 3 RESPONSE**
- Handled through normal operating procedures under the direction of the supervisor or senior worker on site	- Response control at hand and can quickly move to Tier 2 as situation warrants - ICS is activated, IMT staffed as required - ICS 201 packet completed - Local resources/ contractors and response organizations may be required - Response activities under direction of Incident Commander	- Actions taken to ensure public safety - Support personnel/equipment from neighboring region activated and awaiting notice of deployment as needed - Broader range of response activities - CMT notified if emergency warrants - ICS activated, IMT to manage reactive and proactive phases -IAP required for multiple operational periods -Incident Support Team activated to support if required -Local resources/ contractors and response organizations required and sourced	- Actions taken to ensure public safety - Support personnel/equipment from neighboring region deployed - CMT notified - Full IMT team activation - Detailed IAP created for each operational period - Incident Support Team and E3RT activated to support longer term incidents if required - Immediate multi-agency involvement required, UC established - Local resources/contractors and response organizations required and sourced

Note:

1) **Regulatory classification levels may not align with Enbridge Classifications**
2) **In Eastern Region, 3rd party notifications will be reported for alert level incidents**

Not all criteria is required to determine a specific level. However, there may be instances where an aspect of the emergency is so significant, that it would affect the level to be increased. The Incident Commander or designate is responsible for determining the level of the emergency.

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2.2.4 Third-Party Notifications - Jurisdiction having Authority

The IC is responsible for assuring that all required notifications/reports are completed in a timely manner for all incidents. All contact with external agencies must be properly documented. The Control Center is a 24/7 support tool designed to provide communication assistance to the IC to facilitate a timely response to emergency situations. Upon completion of the initial notifications and the implementation of the initial response actions, periodic follow-up notifications should be made to the applicable agencies.

For reporting guidelines for all agency contact information, refer to *Annex 2.*

2.2.5 External Communications

All Public statements and notification must be pre-approved by the Public Information Officer (PIO) if appointed, and approved by the Incident Commander (IC).

Regional Management (or designate) should notify On-call PIO of any of any emergency situation where external public communication may be required. The PIO may be activated at any time by the Incident Commander in any operational incident or emergency.

Refer all media and general public inquiries to the PIO.

The Liaison Officer (LNO) also works with the PIO to develop messaging. The LNO is responsible to communicate with specific stakeholder groups as determined by the size, scale and complexity of the incident. This may include but is not limited to:

- Indigenous groups
- Community Leaders
- Government Representatives (elected and public service, various jurisdictions)
- Regulators
- Landowners

External Communications should:

1. **Focus on Priorities**

   The company's priority in an emergency is to protect the public and responders, limit environmental impact and resolve the problem calmly, professionally and safely while ensuring stakeholders are kept informed.

2. **Coordinate with Local Resources**

   Local fire, police and emergency medical service (EMS) officials will be requested to communicate the emergency situation to those in proximity to the incident. The LNO role (which may be filled by groups such as Community Relations, Stakeholder Relations and Indigenous Relations representatives or Land Agents for the area) will also contact/follow up with local landowners, municipal representatives, government, regulators, Indigenous groups and other stakeholders.

Initial Response Phase - Enbridge First Responders

Enbridge First Responders should use the following to respond to the Media until a Public Information officer is available:

- Provide media members with the toll free media line (1-888-992-0997 in Canada and 1-877-496-8142 in the US)
- Communicate with the public and media in a calm, professional and respectful manner, showing concern for their safety.
- State that you are not an official spokesperson for the company but a representative will respond to their inquiry as quickly as possible.

Crisis Communications

This section serves as a general guide for the Incident Management Team in making critical decisions related to public information management. This applies to response personnel communicating with the public, stakeholders and the media regarding real or potential emergencies. The objective is to establish Enbridge as an early, credible source of information, reduce speculation and inaccuracies in reporting and to ensure consistent messaging and information flow regardless of channel or audience.

Methods stated here are as-needed and may not apply in every emergency.

In a larger incident, additional support outside of the Incident Management Team may be required. The Crisis Communications and Response Team supports the Incident Management Team and may be activated for two purposes:

- To support Enbridge's communications response during an operational upset through the Public Information Officer, and
- To engage in strategic internal and external communications and reputation management for operational and non-operational crises (e.g. financial stories, negative media, etc.).

The Crisis Communications and Response Team is aligned with the Incident Command System, and enables a communications structure that supports Enbridge's emergency response teams. This team reports to the Incident Management Team PIO and/or LNO based on the nature of the incident.

Crisis Communication Activities	
	External communications must be reviewed and approved by the Legal Officer (or Law department) prior to being communicated as there may be legal implications for the Company.
	The PIO, with authorization from the IC:
	Gathers information to develop a communications plan and messaging
	If appropriate, releases a statement to media
	If appropriate, activates web specialists to post a statement on the company website
	Works with LNO to develop messaging for communication with stakeholders
	If appropriate, issues emergency bulletins containing key information for internal and external communications
	The PIO issues status updates through modes listed above
	The IC, PIO and LNO coordinate internally, and then reach out to local emergency service officials and local/regional emergency management agencies regarding status updates.
	As safe access permits, LNO team and/or Land Right-of-Way Agents, in cooperation with local public safety officials, go door-to-door to notify landowners of the possible impact on their property and establish how future communication will be handled for updates.
	If necessary, a community center is established (led by PIO) to address questions/comments/concerns of residents in the area.
	The PIO will document all public inquiries regarding the incident allowing the Company the ensure responses are made in a timely manner.
	Lands and Right-of-Way personnel gather emergency contact information from the database of all property owners, residents and tenants along the pipeline system.
	Lands and Right-of-Way Agents obtain emergency contact information including:
	area map indicating location of pipeline and location of residences or workplaces
	names
	addresses, including GPS coordinates
	phone numbers (home and mobile)
	email addresses
	mobile text message capability
	In the event of potential impact to public health due to extended exposure to air or waterborne substance, generally a notice is distributed by the local public health department, followed by a news release to media and notification to residents.

Alternate Means of Communication	
	If appropriate, under the responsibility of the PIO (upon approval from the IC), an incident call center/hotline incident-specific website and community center may be established where individuals can contact the company regarding the status and support being provided to the community by the company.
	In the event of an extended evacuation, the company provides daily updates to explain what is being done to return evacuees to their homes and to discuss and accommodate their needs. This messaging is coordinated with the applicable Local Authority(s).
	If appropriate, an incident-specific website will be activated to manage external communication related to an emergency.
Public Evacuation / Shelter-in-Place	
	If an evacuation or shelter-in-place order is necessary, the PIO and LNO will support public safety officials and may assist with coordination under the direction of that authority. E.g. Lands & Right-of-Way agents could assist by notifying the public and adjoining facilities.
	If a public warning system or Emergency Alert System (EAS) is present and accessible, it may be used by local authorities to communicate emergency information and actions to the public. PIO and LNO should support Local Authorities by ensuring they have the right information and necessary details to define clear public emergency actions.
	The LNO works with local public safety officials and local public emergency organizations (i.e., Red Cross) to establish and furnish shelters to house and feed evacuees.
	The PIO, via Senior Communications Officer, notifies Executive Leadership (Incident Support Team and if activated the Crisis Management Team) of any evacuation or shelter-in-place messaging

2.3 Initial Response

Initial command actions are those taken by local personnel immediately upon becoming aware of a release or emergency incident, before the Company Response Teams (Field Response Team "FRT" and Incident Management Team "IMT") are formed and functioning. Timely implementation of these initial steps is of the utmost importance because they can greatly affect the overall response operation.

Immediate actions are required at the onset of an emergency response to mitigate the extent of a release, minimize the potential hazard to human health and the environment, as well as implement an effective response. It is also important to act decisively and in doing so, create a professional working atmosphere among the Company and regulatory authority personnel and public officials. This section is intended to provide guidance for determining the appropriate initial response and notification actions that should be carried out in the event of a release or other emergency incident.

It is the IC's responsibility to first make the appropriate notifications to the Control Center and Regional Management, and to initiate response operations until a transfer of command occurs and the IMT has been activated.

2.3.1 Initial Response Procedures

A person evaluating a situation must assess the circumstances surrounding an event, to determine if an emergency situation exists, and respond accordingly. Company personnel are trained in hazards or emergency recognition procedures as described below.

An emergency in pipeline and facility operations often originates with the unexpected release of product. Uncontained commodities and high vapor concentrations present substantial hazards for fires or explosions until they dissipate to safe levels. In these situations, sources of ignition must be controlled to eliminate fire and explosion hazards. The Company has strict rules for controlling sources of ignition within its properties to avoid such explosions or fires. Potential sources of ignition become more difficult to control on public property. Early detection and quick response are the best actions to reduce the hazards.

The purpose of this section is to identify the response checklist/procedures (which follow below) based on the type of incident that could occur at a Facility and related pipeline systems. The checklists below are developed to allow the field personnel the ability to make sound decisions during the initial response to an incident. The checklists are not meant to substitute for emergency response knowledge, training, or sound judgment calls and do not account for all circumstances. In the event of any type of incident, it is imperative that the safety of **all** personnel be considered **first** and the protection of the environment second.

The level of required response is dependent upon the severity of the release, the size, potential environmental, social and economic impact and the expected public interest in the event. Company personnel and provision contractors will be familiar with the tiered response model and how emergencies are classified. Any employee/contractor who first observes an emergency will immediately report the details to the Control Center.

The Control Center employee that receives notice of a potential emergency will immediately call Regional Management to dispatch the Enbridge Responder on-call.

For planning purposes, potential emergencies will be classified by emergency levels. The classification levels are necessary for determining an appropriate tiered response. Escalating levels result in increased required resources, notification requirements and potential increased response complexity to deal with the emergency.

See the *Emergency Classification and Tiered Response Table* located in *Section 2.2*, which defines emergency response levels and the appropriate tiered response to support emergency operations.

Immediate actions will be taken at the onset or discovery of an incident to mitigate the effects and carry out an effective response. **Under no circumstances** will personnel place themselves in harm's way or be directed to do so by others when performing response activities.

Such actions include, but are not limited to:

- For a natural gas release, contacting local law enforcement for possible reverse 911 (or local emergency responder) public notifications or activation of public alarm systems (e.g. Emergency Broadcast System, Public Awareness Announcements, etc.) ensuring the health and safety of the public; evacuation to safe areas as necessary and restricting access to the area;
- Securing the site using best methods available;
- If necessary, contacting local emergency response agencies (police, fire and EMS) for assistance;
- Taking measures to reduce or control the impact of the emergency (e.g., block culverts/sewers, dam ditches, shut down ignition sources), maintaining the safety of personnel involved in these activities;
- Coordinating with response personnel arriving at the site; and
- Documenting key events using best methods available. All documents and logs drafted during an initial response will be submitted to the Documentation Unit for permanent retention.

2.3.1.1 Initial Response

Purpose: To be used when exploring a suspected or reported emergency. Safe work practices will be followed per the following guidelines (the order of these actions will depend on the situation).	
EXPLORE- To be reviewed by the First Responder prior to taking any immediate action.	
☐	Notify Senior staff on-site immediately if a pressure drop has been observed or a leak is suspected and stop all product transfers. Close all automatic isolation valves, if available.
☐	Conduct a field level hazard assessment to identify and mitigate all hazards including potential for fire, explosion, and hazardous toxic vapors. • Determine the wind direction and approach cautiously from upwind. • Explore the suspected release area only when wearing appropriate PPE using the buddy system if possible. • Ensure safety of personnel in the area. • Eliminate or shut off all potential ignition sources in the immediate area. • Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms)
☐	If appropriate, request surveillance fly-over to determine: • If there is any abnormal activity and dead vegetation in the vicinity of a pipeline • Size and description of oil slick • Direction of movement • Coordinates of leading and trailing edge of oil slick • Sensitivities endangered • Areas of population that are threatened If radio contact cannot be made; the line flyer will land report to Company management by telephone
☐	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person.
APPROACH	
☐	If hazards cannot be safely mitigated, move to a safe upwind location, monitor the incident, and keep people out the hot zone.
☐	Are people injured or trapped? Are there outside people involved in rescue or evacuation?
☐	Are there immediate signs of potential hazards such as: • Electrical lines down or overhead? • Unidentified liquid or solid products visible? • Vapors visible? • Smells or breathing hazards evident? • Fires, sparks or ignition sources visible? • Holes, caverns, deep ditches, fast water or cliffs nearby? • Is local traffic a potential problem? • Ground conditions (select one) ☐ Dry ☐ Wet ☐ Icy
CONFIRM & CONTROL	
☐	Begin a 214A Individual log when notified of an incident and continue documenting key actions throughout the response.
☐	Determine level of response needed, hazards of product(s) involved and proper response guidelines to be followed. Confirm identification of spilled material and check the SDS sheets. Consider the following: • Assess the spill threat, site safety, and parameters such as spill volume, extent and direction of movement. • Has pipeline(s) been shut down? • Has wind direction been confirmed and windsock erected? • Has the public been protected or evacuation considered if necessary? • Have all ignition sources been identified and eliminated? • Have personal protection and safety requirements been established and communicated? • Is adequate fire protection equipment available and in place? • Are tank and VAC-truck electrical equipment properly grounded? • Have decontamination sites and procedures been established? • Are activities and events being logged/ documented? • Eliminate sources of vapor cloud ignition, consider the ignition of NGL. Shut down all engines and motors. • Establish Exclusion zone and Safe Work Areas (Hot, Warm, and Cold).

CONFIRM & CONTROL (Con't)	
☐	If on water, consult Control Point and HCA maps for appropriate response strategies for incoming resources. • Review pipeline alignment sheets to become familiar with the location of mainline valves and elevation characteristics. • Review ESA maps for the location of any sensitive area that may be impacted (Annex 3).
☐	Once support has arrived conduct transfer of command and start preparing for tactical and planning meetings.
COMMUNICATION/NOTIFICATIONS	
☐	Initiate actions to notify government agencies including local authorities of area affected or at risk areas via the Control Centre, Regional Management or designate. • Complete notifications for emergency call-out, including regulatory agencies. This will be done by Regional Management or designate. • If excavating, has One-Call agency been notified? • Ensure notifications have been captured • Has a radio channel been established for communication between the site and other personnel in field? • Notify External Emergency Services as appropriate. Work with local law enforcement to make sure all personnel/citizens are a safe distance away from the hazard area. • Notify the appropriate Company management. • Advise neighboring property owners and operators of any threat to their property or personnel. • Notify appropriate federal, state and local government agencies, including local utilities.
INCIDENT COMMAND	
☐	Once it has been determined to activate the ICS, the IC will initiate the following actions: • Confirm that containment equipment and oil spill contractors have been deployed. • Integrate local evacuation plans into the Unified Command decision-making process. Work with response team once they arrive on site to establish a workable Incident Command Post and Communications Center. • Direct initial response actions. • Begin development of an initial incident action plan (ICS 201 Forms).
EMERGENCY SHUT DOWN PROCEDURES	
☐	The following emergency shutdown procedures should be initiated if company personnel are threatened by the release of product from a pipeline to the environment or when coordinating activities for prompt and safe repair of the pipeline and the return to normal operating conditions: • Shutting in the line at the nearest block valves. • Notifying the nearest pump station and/or the appropriate Control Center. • Maintenance crewmembers should notify their immediate supervisor who will in turn notify appropriate Company contacts. • If the exact location of the leak is unknown, the immediate supervisor will request a line flyer, or if it is at night, manpower might be used to walk the line. Once a leak site has been located, the following information should be obtained: • Have all ignition sources been eliminated? • Are any water intakes at risk? • Are any schools, homes or commercial properties at risk and should they be evacuated? • Should access to the area be restricted (roads blocked)? If so, assistance should be requested from law enforcement agencies. • Have local response agencies been advised of the product's characteristics and handling precautions which are described in the SDSs? • Are railroads or utility companies in the area and have they been notified? • Will product flow into any waterways or roadways? • In the U.S. work with Company Environmental Department to conduct a Natural Resource Damage Assessment. The Control Center should be notified following an assessment of the release site; an evaluation should be made regarding the effect of downtime on product scheduling. Appropriate report, logs & notifications will be made.

2.3.2 Isolation Distance (Hot, Warm, Cold)

Establish initial control perimeters based on the following guidelines (see *Figure 1*):

- Hot Zone
- Warm Zone– could initially be considered containment area
- Cold Zone

The following table depicts safe distancing as recommended by the latest edition of the Emergency Response Guidebook (ERG) by the Department of Transportation and Transport Canada. Reference to the latest edition of the ERG is further recommended to confirm safe distancing relative to the site specific conditions.

Set up a Command Post, Staging Areas, and Decontamination Stations as necessary for the circumstances.

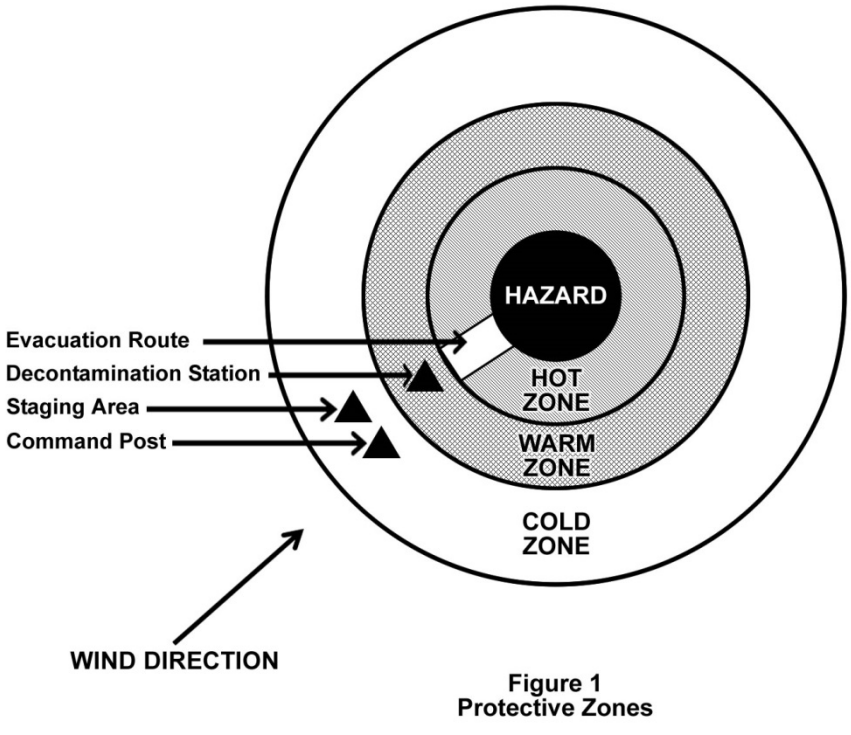

Figure 1
Protective Zones

Isolation Distance / Emergency Response Guidebook * ** ***

Product	Guide #	ID #	Immediate Precautionary Evacuation Measure	Large Spill Evacuation	Evacuation in the Event of a Fire
Condensate(Diluent), Natural Gas, Butane, Ethane, Methane, Propane	115	1971, 1011, 1075, 1035, 1078	100 meters (330 feet)	800 meters (½ mile)	1,600 meters (1 mile)
Napthalene Crude	133	1334	25 meters (75 feet)	100 meters (330 feet)	800 meters (½ mile)
Petroleum Crude Oil, Petroleum products, Pentane, Hexane, Heptane, Octane, Nonane, Decane	128	1270, 1267, 1265,1268, 1208, 1206, 1262, 1920, 2247	50 meters (150 feet)	300 meters (1,000 feet)	800 meters (½ mile)
Petroleum sour crude oil, flammable, toxic	131	3494	60 meters (200 feet)	800 meters (½ mile)	800 meters (½ mile)
Benzene, Toulene, Xylene	130	1114, 1294, 1307	50 meters (150 feet)	300 meters (1,000 feet)	800 meters (½ mile)
Hydrogen Sulfide Gas	117	1053	100 meters (330 feet)	300 meters (1,000 feet)	1,600 meters (1 mile)

***** Flash Fire and Vapor Cloud Explosion should be considered potential hazards in structurally condensed areas (heavy urban areas) especially under low wind, stable weather conditions. Pool Fires should be considered potential hazards in structurally condensed areas (heavy urban areas) especially if wind speed is high and ignition is delayed (product has pooled significantly). These hazards may result in a travelling flame front, damaging overpressure or exposure to thermal radiation, therefore responders should use the distances identified for “Evacuation in the Event of a Fire” even if no fire is present. In a full bore rupture where there is a risk of Flash Fire or Vapor Cloud Explosion, these distances should be doubled.

****** Additional conditions that should be considered when determining an evacuation zone include weather, full bore rupture, wind speed, overcast/clear sky and day/night

******* These substances may also present a Toxic Inhalation Hazard (TIH) and night time distances will defer from above.

2.3.3 Setting Up On-Site Work Areas

The IC or designate will assess the accessibility of the site and will separate the site into three distinct areas to clearly identify the high risk areas and to reduce the hazards to the on-site responders. The three areas could be defined as the safe area, the hazardous area and the decontamination (or "Decon") area.

Protective Zones
To minimize spreading contamination from an emergency site to unaffected areas, the Safety Officer must record protective zones (see Figure 1) on the ICS 201-5 Site Safety and Control Form. Protective zones should identify:

- Hot Zone
- Warm Zone
- Cold Zone.

Hot Zone
The hot zone is the release site or site of clean-up operations. Any area that requires respiratory protection must be within the boundary of a designated hot zone. Access to the hot zone is restricted to trained and properly equipped emergency response personnel only. Personnel not involved in emergency operations must be prevented from entering and escorted off the site if necessary.

Warm Zone
The warm zone is a transition zone where equipment may be cleaned, and contaminated clothing removed, before leaving the site. Follow the established Decon plan. Appropriate PPE is required.

Cold Zone
The cold zone is the largest zone and includes all areas not immediately involved in the emergency. Take all possible efforts to ensure contamination does not spread to this area.
Air monitoring delineates the perimeter where air contaminants and combustible vapors cease to be detected. The cold zone must be established outside of this perimeter. Locate the Incident Command Post and staging area (pre-deployment staging area for equipment arriving on site) in the cold zone. For large incidents, ensure that the Incident Command Post is not positioned near the incident.

2.3.4 Evacuation

2.3.4.1 Personnel Evacuation

Evacuation plans will be located in the applicable facility. All evacuation directives will be communicated through an audible signal, either through voice by the Designated Individual, such as PLM supervisor, Emergency Warden, Area Supervisor, Area Manager or Area Coordinator, or by the activation of an alarm system. All facility personnel are trained routinely in evacuation and emergency response procedures. The facility contains no critical

equipment that requires employees to continue to operate after the evacuation notification is made.

The purpose of the evacuation plan is to provide some guidance in the event shutdown and evacuation are necessary. In the event of an incident, the facility operator will stop the flow of product by normal operating procedures. The facility supervisor/manager shall be notified immediately of the emergency. All facility personnel should evacuate with the exception of any individuals designated to remain on site. The Fire Department will be notified if there is a fire. Arriving personnel, equipment and fire resources will be met at the main gate or muster point of the facility, unless deemed unsafe to do so. Tactical deployment of arriving resources will depend on the current situation.

Evacuating personnel shall proceed in an orderly manner. The Supervisor/Manager or Designated Individual will account for all employees and arrange for medical assistance as required. When the alarm is sounded or a signal to evacuate is given all personnel should:

Evacuation Checklist	
✓	Immediately stop work activities.
✓	Check the wind direction
✓	Move upwind or cross wind
✓	Check the wind again
✓	Conduct a head count to account for all personnel known to be at the facility
✓	Assist in alerting and escorting personnel, including visitors and contractors to the appropriate muster point
✓	Notify the Control Center
✓	Assist in hazard control activities as requested
✓	Assist in search and rescue of missing persons
✓	Injured personnel will be transported to the nearest emergency medical facility. All other personnel will remain at the evacuation point until the "All Clear" signal is given.
Note: Evacuation should be carried out in an orderly manner. Personnel should walk, NOT run or panic.	

Personnel evacuation direction is further defined as follows:

- **Facility Employees** - All Company employees who are not directly involved with the abatement of the emergency will immediately evacuate the area of the emergency. They will proceed via an unthreatened route to the facility main gate and remain in a "stand by" mode until instructed by the Facility Management to do otherwise. Should access to the facility main gate be threatened by the emergency, proceed to a location on the facility unthreatened by the emergency and notify the Emergency Warden and/or Area Supervisor/Manager and/or Designated Individual of your whereabouts as soon as practical.

- **Contractors, Freight Haulers, Vendors and Other Visitors** - All non-Company personnel will immediately evacuate the area when notified of an emergency. All material loading or unloading will cease. Non-Company personnel will exit immediately upon approval of the Facility Management. Should access to the facility main gate be threatened by the emergency, proceed to a location on the facility unthreatened by the emergency and notify the Emergency Warden and/or Area Supervisor/Manager and/or Designated Individual of your whereabouts as soon as practical. After personnel evacuation is initiated, emergency response agencies and teams will be notified (either from on-site or off-site immediately after the evacuation was completed), and immediate response actions will be initiated to minimize threats to human health and the environment.

2.3.4.2 Community Evacuation

Evacuation of the public should only proceed when it is safe to do so and ONLY in cooperation and coordination with Local Emergency Services. As identified under community emergency response plans, the responsibility and decision to evacuate is a community responsibility. The Company will support the evacuation and cover the cost of the response.

It is important to remember that evacuations beyond Company property will have to be initiated and coordinated with local emergency response/management organizations which have the legislative authority to order the movement of persons. State, Provincial, Territorial, Indigenous and local authorities have primary responsibility and authority for evacuation planning and for the transportation, sheltering, public safety, and security of persons and non-Federal property within their respective jurisdictions. The unique challenges that might confront State, Provincial, Territorial, Indigenous and local governments during a mass evacuation could require them to request additional assistance, of either a logistical or operational nature, from within their province, from other provinces pursuant to mutual aid and assistance compacts, or from the Federal government.

The Company:

- Should ensure that local emergency response/management organizations are provided with a clear recommendation to evacuate the public should the Company become aware of an immediate threat to life and safety that may not be under action by first responders.
- Will serve only in an advisory capacity during an evacuation order and may assist with the logistics of an evacuation.
- Must provide as much product information as possible to any emergency management organization coordinating an evacuation. The latest version of the Emergency Response Guidebook (“ERG”) should be consulted in order to determine safe evacuation distances.

The priority for all Company personnel in any emergency is protecting the public and responders.

Prevent public access to the emergency site while there is any danger of explosion, fire, hazardous vapors or other hazardous conditions. For example:

- Seal off routes into the emergency site and establish a security perimeter
- Contact local police to set up road blocks at all access points, as applicable
- Employees/contractors, police and/or security personnel can be used, as well as physical barriers (e.g., barricades, reflective tape) to control access to hazardous areas.

Coordinate with external emergency response agencies (e.g., police, fire and EMS departments) to establish appropriate response measures for public protection as required, including:

- Monitoring for hazardous atmospheres;
- Evacuating people from the area (homes and businesses);
- Eliminating ignition sources near a release site;
- Preventing ignition sources from entering a release site; and
- Stopping traffic (e.g., on roads, rail lines, bridges), as required.

In the unlikely event that evacuation plans were required beyond the boundary of the facility, the designated individual would communicate further directives. These plans will include guidance of where to move potentially affected parties to minimize threats to human health and the environment. This will be accomplished in conjunction with local emergency response officials. The notification mechanisms will be based on monitored air quality and other situations that might arise during the emergency.

Evacuation is recommended for incidents in which the plume is visible and egress can occur in any direction away from the plume. A recommendation to evacuate should be made by a Qualified Individual/Incident Commander with access to LEL monitors and or air quality monitoring.

Under the direction of the IMT, community evacuation will be coordinated with the local authority. The recommendation to evacuate would be the decision of the IC. Refer to the ERG for product/evacuation guidance.

If the public must be evacuated before external response agencies arrive or if these agencies are not available, the IC must take all steps necessary to ensure public protection (e.g., assigning Company employees to begin a door to door evacuation), then turn over these duties to community agencies as soon as possible.

For long-term releases, evacuation is preferred to sheltering if public safety can be assured during the evacuation process. Evacuation is a viable public protection measure in circumstances when:

- The location of the plume is known and safe egress routes can be assured.
- The release will not likely be contained in the near future.
- Visibility and road conditions are good.
- The residents clearly understand their directions.

Residents should also be evacuated during ongoing emergency flaring or burning if their health and safety could be affected by the operation.
In planning an evacuation, the following must be considered:

- The size and expected duration of the release;
- Egress routes;
- Current and expected meteorological conditions; and
- The potential for unexpected ignition.

Sheltering is the primary public protection measure for high vapor pressure products and when the hazard is of limited duration. Sheltering within a building creates an indoor buffer to protect affected individuals from higher (more toxic) concentrations that may exist outdoors. The goal is to reduce the movement of air into and out of the building until either the hazard has passed or other appropriate emergency actions can be taken (such as evacuation).

Sheltering indoors is a viable public protection measure in circumstances when:

- There is insufficient time or warning to safely evacuate the public.
- Residents are waiting for evacuation assistance.
- The release will be of a limited size and /or duration.
- The location of the release has not been identified.
- The public would be at a higher risk if evacuated.

In conjunction with shelter-in-place and evacuation strategies, a natural gas release may be ignited at the source in order to reduce public exposure to the hazard. If an immediate threat to human life exists and there is not sufficient time to evacuate the hazard area the IC is authorized to ignite the release.

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2.4 Operations

2.4.1 Enbridge's Response Management System

2.4.1.1 Cross Border Response

For a larger scale incident, employees may be required to cross the border to support relieve Incident Management Team members, contact HR.mobility@enbridge.com prior to traveling across the border.

2.4.1.2 Incident Command Structure

The ICS enables a well-managed response and limits the effects of an emergency through the rapid, effective, coordinated response of resources. ICS is the standard international practice for emergency management, and clarifies the roles of personnel involved in emergency response. ICS is effective for emergency response because essential information and resources are organized into a logical structure for planning and implementing the required actions. It also provides a flexible preplanned emergency response organizational structure for any type or size of incident. The structure of the ICS required depends on the nature and complexity of the emergency, and is based on need, rather than rigid organizational structure. For Level 1 emergencies, one position may assume many responsibilities, whereas in higher-level emergencies (Levels 2 and 3), several positions may be required. The IMT would be mobilized, as appropriate, to fill ICS roles. The FRT functions under the Operations section in the ICS.

The FRT consists of trained personnel that will respond to all Company emergency incidents. Trained and qualified third-party contractors will be called on to fill the Incident Command System/Unified Command (ICS/UC) roles as required, including but not limited to positions in the Operations, Planning, Logistics and Finance sections. Note as well, that if requested by the local governing emergency management agency, Enbridge may provide a Liaison Officer to a community's Emergency Operations Center.

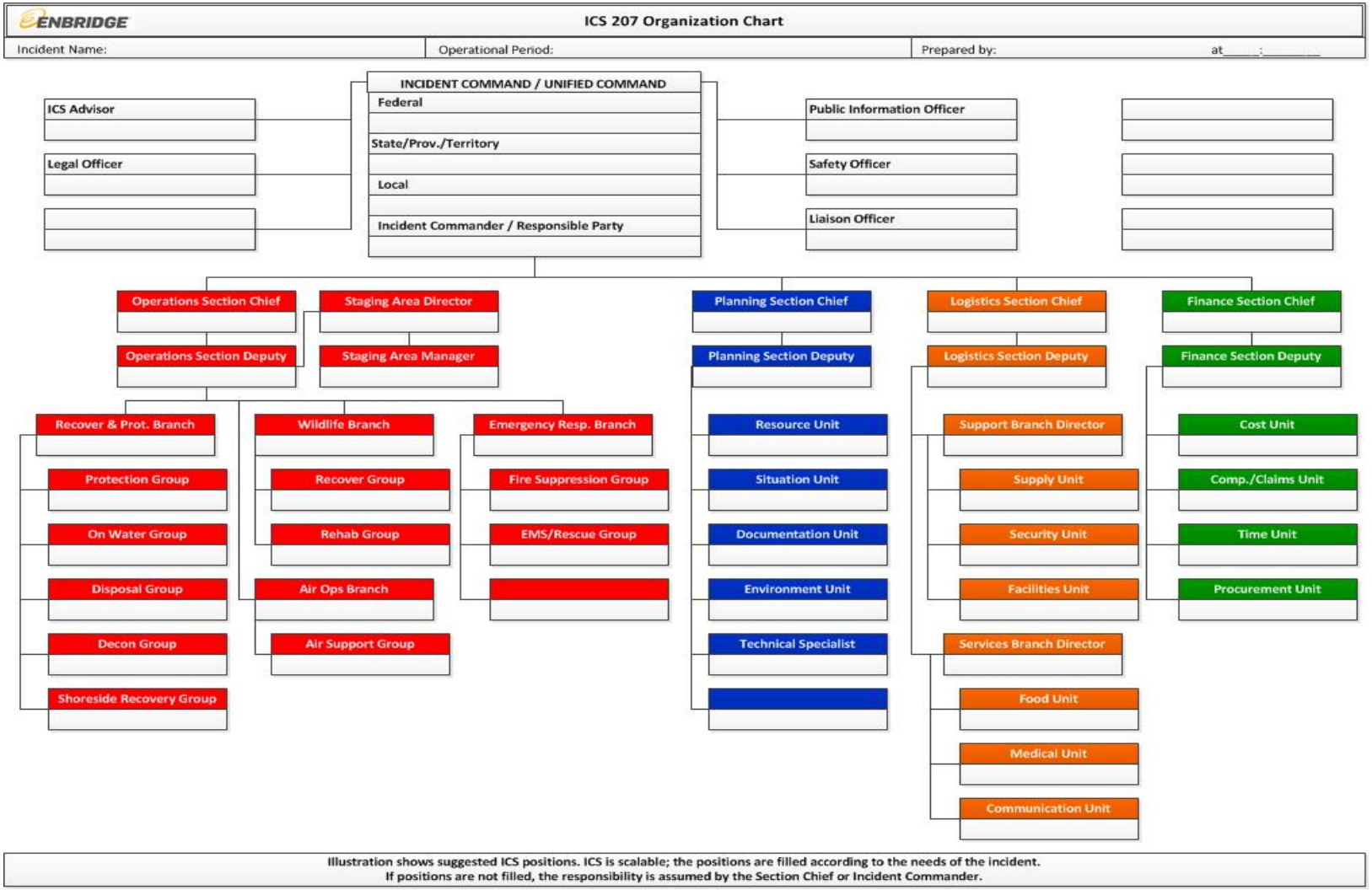
Key responsibilities for the FRT are aligned with the ICS organizational structure (Refer to ICS 207 Organization Chart).

Assignment of responsibilities in the ICS starts with the top position (i.e., IC) and works down, as required. The IC and SOFR roles must be filled at all times during the emergency. The IC would mobilize positions directly beneath, as required. When a position is not mobilized, the position directly above would assume the responsibilities. ICS when activated requires as a minimum an IC and Safety Officer positions.

Determine the level of emergency and tier of response required to effectively manage the response. Refer to the Company Emergency Classification and Tiered Response Chart located in *Section 2.2 Notification Procedures*.

ICS Is Scalable And Will Be Activated To Meet The Needs Of An Emergency	
Level 1	ICS is activated, IMT staffed as required, at minimum IC and Safety Officer will be staffed
Level 2	ICS is activated; IMT to manage reactive and proactive phases. Command and general staff will be required with the potential to fill additional positions. CMT will be notified based on significant incident criteria. IST should be notified.
Level 3	Full IMT will be activated, CMT and IST is notified.

2.4.1.3 ICS 207 Organization Chart



This chart is not an all-inclusive list of potential ICS roles

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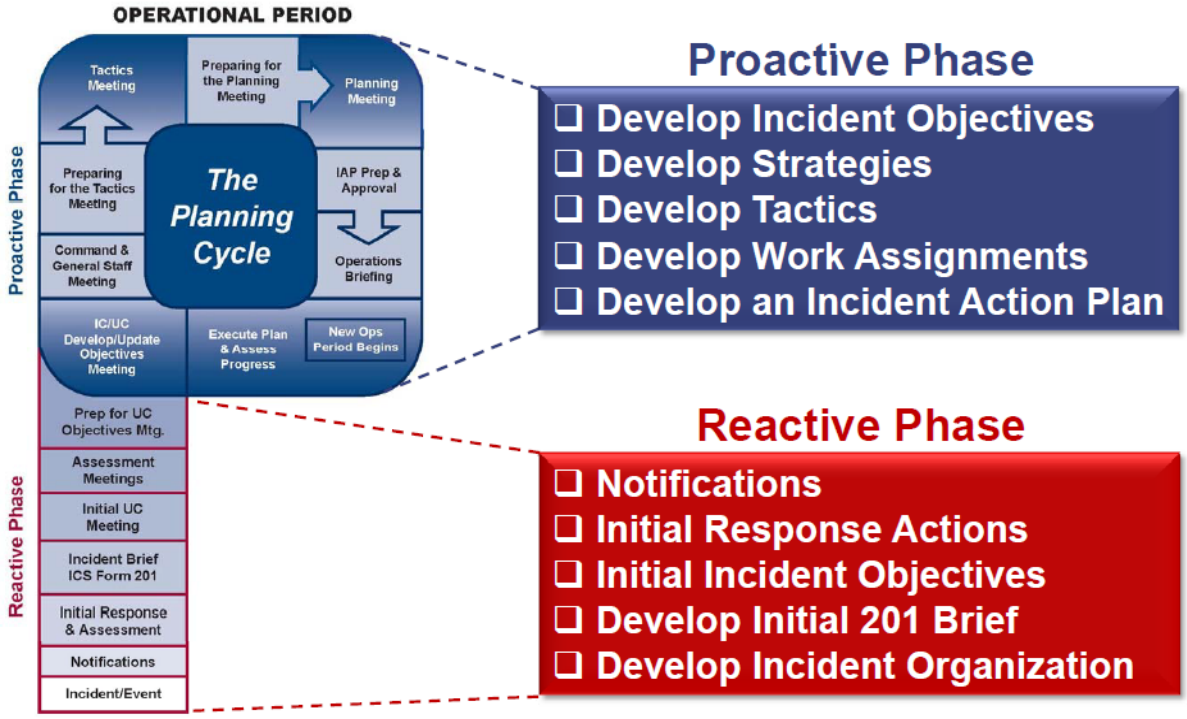
2.4.1.4 Operational Period Planning Cycle

In more complex Level 2 or 3 emergencies, planning for the next operational period will take place in the proactive phase. The move from reactive to proactive will be situation specific and depends on the incident, skill set and staff available. Once the scale and scope of the event has been determined (a situational assessment is complete and a common operating picture has been established), the IC should discuss with the IMT and determine when a move into the proactive phase would be appropriate. A detailed IAP will be put together and the following meetings will be conducted to ensure all personnel are briefed on the objectives and have the appropriate work plan in hand.



2.4.1.5 ICS Roles and Responsibilities

The roles and responsibilities under the Incident Command System are identified on the following pages by ICS section.

INCIDENT COMMAND / UNIFIED COMMAND

FEDERAL

STATE / PROVINCIAL

INCIDENT COMMANDER / RESPONSIBLE PARTY

Overall Management of the incident

ICS ADVISOR
Responsible for providing continuity and consistency throughout the response organization

INCIDENT SUPPORT TEAM LIASION
Responsible for updating the Incident Support Team

DEPUTY INCIDENT COMMANDER

Special projects and replacement

PUBLIC INFORMATION OFFICER
Develops and releases information about the incident to the news media, incident personnel and other appropriate agencies and organizations

LIAISON OFFICER

Contact for all responding resources and outside agencies

SAFETY OFFICER
Develops and recommends measures for assuring personnel safety and assess and/or anticipates hazardous and unsafe situations

LEGAL OFFICER

Legal advice

Command and Staff Roles 2.4.1.5a

ENBRIDGE

All activities must be documented at all Levels of Emergency

Command and Staff Roles 2.4.1.5a

Roles Common To All

Common Responsibilities Checklist

After initial notification and receiving your assignment:

- ❑ Review job assignment (e.g., Strike Team designation, position, etc.).
- ❑ Receive brief overview of type and magnitude of incident.
- ❑ Receive resource order number and request number.
- ❑ Receive reporting location & time.
- ❑ Receive travel instructions.
- ❑ Receive any special communications instructions (e.g., travel, radio frequency).
- ❑ Maintain a checklist of items and if possible a personal Go-Kit including medication, computer and climate specific work wear.
- ❑ Inform your people leader as to where you are going and how to contact you.
- ❑ Review Incident Management Handbook (IMH) and role specific requirements.
- ❑ Take advantage of available travel to rest prior to arrival. Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations: Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.
- ❑ If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
- ❑ Receive briefing from immediate supervisor.
- ❑ Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
- ❑ Abide by and champion Enbridge Values and Code of Conduct.
- ❑ Consider human factors in decision making and exercise emergency authority to stop and prevent unsafe acts.
- ❑ Participate in IMT meetings and briefings, as appropriate.
- ❑ Ensure compliance with all safety practices and procedures. Report unsafe conditions, own it then report it to the SOFR.
- ❑ Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
- ❑ Organize and brief subordinates.
- ❑ The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
- ❑ Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.
- ❑ Use clear text and ICS/UC terminology (no codes) in all radio communications.
- ❑ Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
- ❑ Ensure any equipment you require is operational prior to each work period.
- ❑ Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
- ❑ Respond to demobilization orders and brief subordinates regarding demobilization.
- ❑ Return all assigned equipment to appropriate location.
- ❑ Complete Demobilization check-out process before returning to home base.
- ❑ Participate in After-Action activities as directed.
- ❑ Carry out all assignments as directed.
- ❑ Wear the appropriate vest and role identification where possible
- ❑ Understand and enforce safe working hours and lead by example
- ❑ Consider Human Factors in decision making
- ❑ Exercise emergency authority to stop and prevent

Incident Commander

The IC's responsibility is the overall management of the incident. On most incidents, the command activity is carried out by a single IC. The IC is selected by qualifications and experience. Deputies may also be used at the section and branch levels of the ICS/UC organization. Deputies should have the same qualifications as the person for whom they work, as they must be ready to take over that position at any time. When span of control becomes an issue for the IC, a Deputy IC/Chief of Staff may be assigned to manage the Command Staff.

Incident Commander and Qualified Individual Checklist

- ❑ Serve as initial point of contact for response personnel in initial response.
- ❑ Assess incident situation, declare emergency level, and activate ICS system.
- ❑ Ensure regulatory notifications have been completed.
- ❑ Establish appropriate communications with external agencies.
- ❑ Oversee initial and ongoing response actions.
- ❑ Notify and activate local resources/contractors/ response organizations as required.
- ❑ Obtain a briefing from the prior IC (201 Briefing).
- ❑ Determine incident objectives & general direction for managing the incident.
- ❑ Establish the immediate priorities.
- ❑ Establish a command post (if applicable).
- ❑ Brief Command Staff and General Staff and ensure routine updates occur
- ❑ Ensure planning meetings are scheduled as required.
- ❑ Approve and authorize the implementation of an IAP.
- ❑ Ensure that adequate safety measures are in place.
- ❑ Coordinate activity for all Command Staff and General Staff.
- ❑ Coordinate with key people and officials.
- ❑ Approve requests for additional resources or for the release of resources above approved threshold.
- ❑ Keep internal and external stakeholders informed.
- ❑ Evaluate/Approve the use of trainees and auxiliary personnel. Other response personnel, such as volunteers and casual workers, will not be used unless there is a prevalent need, at that time.
- ❑ Authorize release of information to the news media.
- ❑ Ensure ICS 209 is completed and forwarded to appropriate higher authority.
- ❑ Analyze incident potential against environment, organizational impact and safety consequences.
- ❑ Consider need for extended (24-hour) coverage.
- ❑ Once a situation improves, the decision to downgrade the level is made by the Incident Commander and the applicable regulating agencies. All the affected persons and the media must be kept informed of the status of the emergency.
- ❑ Order the demobilization of the incident when appropriate.
- ❑ Ensure the ICS structure is being followed and address any discrepancies between line leadership and ICS leadership
- ❑ Motivate staff and celebrate milestones, progress and achievements
- ❑ Lead by example, be calm, listen well and communicate clearly, your attitude will affect others.

Deputy Incident Commander

The Deputy Incident Commander may assume responsibility for a specific portion of the primary position, work as relief, or be assigned other tasks. The Deputy should always be as qualified to make decisions and manage the incident as the Incident Commander.

Deputy Incident Commander Checklist

- ❑ If no assistant has been assigned to the Incident Commander, support the Incident Commander by documenting details of the emergency, focusing on activities and decisions made.
- ❑ Manage the flow of traffic to and communication with the Incident Commander so that the Incident Commander can focus on managing the incident.
- ❑ Conduct status update meetings.
- ❑ See Incident Support Team Liaison
- ❑ Deal with some day to day decision making.
- ❑ Assume duties of the Incident Commander, if required.

Public Information Officer

The PIO is responsible for developing and releasing information about the incident to the news media, to incident personnel, and to other appropriate agencies and organizations. Only one primary PIO will be assigned for each incident, including incidents operating under a Unified Command and multiple jurisdiction incidents. The PIO may also have assistants as necessary, and the assistants may also represent assisting agencies or jurisdictions. Agencies have different policies and procedures relative to the handling of public information.

Public Information Officer Checklist

- ❑ Review common responsibilities.
- ❑ Assist the UC/IC with maintaining a positive public perception of effective response activities
- ❑ Engage public and media via social media
- ❑ Brief the IC/UC regularly on media and public issues
- ❑ Review public messaging material developed by the Joint Information Center prior to distribution
- ❑ Determine from the ICS/UC if there are any limits on information release.
- ❑ Develop material for use in media briefings.
- ❑ Obtain IC/UC approval of media releases (after legal reviews it if possible)
- ❑ Inform media and conduct media briefings.
- ❑ Arrange for tours and other interviews or briefings that may be required.
- ❑ Manage a Joint Information Center if established.
- ❑ Obtain media information that may be useful to incident planning.
- ❑ Review current information summaries and/or displays on the incident and provide information on the status of the incident to assigned personnel.

For all media and public inquiries; the following will be recorded:

- ❑ Date and time of the inquiry;
- ❑ Name, employer and city of the media reporter;
- ❑ Questions and answers provided; and
- ❑ Time and station of any media broadcasts.

Liaison Officer

Incidents that are multi-jurisdictional, or have several governmental agencies involved, may require the establishment of the LNO position on the Command Staff. Only one primary LNO will be assigned for each incident, including incidents operating under UCS and multi-jurisdiction incidents. The LNO may have assistants as necessary, and the assistants may also represent other agencies or jurisdictions.

Liaison Officer Checklist

- ❑ Be a contact point for agency representatives; ensure updates are provided in a timely manner.
- ❑ Maintain a list of assisting and supporting agencies, including name and contact information. Monitor check-in sheets daily to ensure that all agency representatives are identified.
- ❑ Assist in establishing and coordinating interagency contacts.
- ❑ Keep agencies supporting the incident aware of incident status (to include Historical/Archeological and Aboriginal Contacts).
- ❑ Monitor incident operations to identify current or potential inter-organizational problems.
- ❑ Participate in planning meetings, providing current resource status, including limitations and capability of assisting agency resources. Create advisory groups as necessary.
- ❑ Coordinate response needs for cooperating agencies activities with the OSC during responses.
- ❑ Coordinate response resource needs for incident investigation activities with the OSC.
- ❑ Ensure that all required agency forms, reports and documents are completed prior to demobilization.
- ❑ Brief IC/UC on agency issues and concerns.
- ❑ Coordinate activities of visiting dignitaries.

Ensure the following information is documented

- ❑ Authority limits (e.g., financial, contractual, supervisory, media/public relations, etc.);
- ❑ Work delegation agreements;
- ❑ Government approvals;
- ❑ Follow-up requirements/responsibilities;
- ❑ Landowners/stakeholders' permission to enter land from landowner/government;
- ❑ Agreement on dealings with sensitive areas;
- ❑ Consensus on alternative requirements regarding items (accommodations, water, livestock relocation, etc.);
- ❑ Work with finance on any initial cost/inconvenience agreement.
- ❑ Agreements for use of cooperative equipment.

Incident Support Team

- ❑ Collect and report situational updates to Incident Support Team where applicable
- ❑ Communicate requests, constraints, and opportunities between the Incident Commander and Incident Support Team

Safety Officer

The SOFR function is to develop and recommend measures for assuring personnel safety and to assess and/or anticipate hazardous and unsafe situations. Only one primary SOFR will be assigned for each incident. The SOFR may have specialists as necessary, and the assistants may also represent assisting agencies or jurisdictions. Safety assistants may have specific responsibilities, such as air operations, hazardous materials, etc.

Safety Officer Checklist

- ❑ Identify hazardous situations associated with the incident associated with the location, weather and operations.
- ❑ Complete the initial IAP site safety and control analysis (ICS 201-5).
- ❑ Participate in tactics and planning meetings, and other meetings and briefings as required.
- ❑ Review the IAP for safety implications.
- ❑ Provide safety advice in the IAP for assigned responders.
- ❑ Exercise emergency authority to stop and prevent unsafe acts.
- ❑ Investigate accidents that have occurred within the incident area.
- ❑ Assign assistants, as needed.
- ❑ Review and approve the medical plan (ICS 206).
- ❑ Develop the site safety plan and publish site safety plan summary (ICS 208) as required.
- ❑ Coordinate with governmental safety agencies to ensure compliance with approved safety practices.
- ❑ Assign daily safety meetings at command post and work sites.

Ensure the following safety information specific to the release is recorded

- ❑ ICS Safety Officer (including relief activities, timing, etc.);
- ❑ Safety meetings (e.g., date, time, location, topics, attendees, action items);
- ❑ Hazard assessments, permits, inspections, and job observations;
- ❑ Identification and resolution of safety concerns;
- ❑ Identification of hazards and mitigation measures;
- ❑ Incidents/near misses/observations;
- ❑ Safety equipment and resources;
- ❑ Other emergency equipment (e.g., fire, medical, etc.);
- ❑ Records of atmospheric monitoring related to occupational hygiene.
- ❑ Copies of SDS;
- ❑ Records of conversations with safety regulators;
- ❑ Initial emergency site air testing results; and
- ❑ Air monitoring results for ongoing work at an emergency site.
- ❑ Develop some specific orientation to highlight unique incident hazards.
- ❑ Develop daily safety message as a focus for all meetings (ICS 223).

ICS Advisor

ICS Advisor is Responsible for providing continuity and consistency throughout the response organization, the ICS Advisor provides ICS expertise to the Incident Commander and the response team.

- ❑ Assist with the establishment of an appropriate ICS structure.
- ❑ Provide ICS expertize to the ICS and Incident Management Team
- ❑ Attend all planning meetings to ensure meeting continuity
- ❑ Be available to attend press briefing and clarify technical issues

Intelligence Security

The Intelligence Officer provides the Incident Commander with a conduit to intelligence information that can have a direct impact on the safety of response personnel and influence tactical decisions. The Intelligence Officer also ensures that sensitive information is handled in accordance with the prescribed safeguards

- ❑ Collect and analyze incoming intelligence information from all sources.
- ❑ Determine the applicability, significance, and reliability of incoming intelligence information.
- ❑ As requested, provide intelligence briefings to the ICS/UC.
- ❑ Provide intelligence briefings in support of the ICS Planning Cycle.
- ❑ Provide Situation Unit with periodic updates of intelligence issues that may impact operations.
- ❑ Answer intelligence questions and advise Command Staff and General Staff as appropriate.
- ❑ Supervise, coordinate, and participate in the collection, analysis, processing, and dissemination of intelligence.
- ❑ Assist in establishing and maintaining systematic, cross-referenced intelligence records and files.
- ❑ Establish liaison with all participating law enforcement agencies.
- ❑ Conduct first order analysis on all incoming intelligence and fuse all applicable incoming intelligence with current intelligence holdings in preparation for briefings.
- ❑ Prepare all required intelligence reports and plans.
- ❑ As the incident dictates, determine need to implant Intelligence Specialists in the Planning and Operations Sections.
- ❑ Liaise with LP Corporate Security

Legal Officer

Legal Officer Checklist

- ❑ Review common responsibilities.
- ❑ Obtain briefing from the IC.
- ❑ Advise the IC/UC, as appropriate, on all legal issues associated with response operations.
- ❑ Establish documentation guidelines for and provide advice regarding response activity documentation to all incident personnel.
- ❑ Provide legal input to the Documentation Unit, the Compensation/Claims Unit, and other appropriate units as requested.
- ❑ Review press releases, documentation, contracts and other matters that may have legal implications for the Company.
- ❑ Participate in ICS meetings and other meetings, as requested.
- ❑ Participate in incident investigations and the assessment of damages (including natural resource damage assessments).
- ❑ Liaise with Risk & Insurance

ENBRIDGE®

OPERATIONS SECTION CHIEF
Manages operations directly applicable to the primary objectives

STAGING AREA DIRECTOR
Supervises staging area managers and coordinates their activities

OPERATIONS SECTION DEPUTY OR ON-SCENE COMMANDER
Support Operations Section Chief

STAGING AREA MANAGER
Receives, maintains, checks-in/out, stores and distributes resources

RECOVERY & PROTECTION BRANCH DIRECTOR
Oversee & implement containment & cleanup

- **PROTECTION GROUP** — *Deploy containment*
- **ON WATER GROUP** — *Manage water recovery*
- **DISPOSAL GROUP** — *Coordinate on-site activities*
- **DECON GROUP** — *Decontamination*
- **SHORESIDE RECOVERY GROUP** — *Shoreside cleanup*

WILDLIFE BRANCH DIRECTOR
Minimize wildlife injuries

- **WILDLIFE RECOVERY GROUP** — *Search & tag wildlife*
- **WILDLIFE REHAB GROUP** — *Oversight facility ops*

AIR OPS BRANCH DIRECTOR
Logistical support to aircraft

AIR SUPPORT GROUP
Coordinate support to aircraft

EMERGENCY RESPONSE BRANCH DIRECTOR
Implement emergency measures

- **PUBLIC SAFETY LEADER** — *Coordinate public protection*
- **FIRE SUPPRESSION GROUP** — *Suppression & resources*
- **EMS/RESCUE GROUP** — *Coordinate response*
- **LAW ENFORCEMENT GROUP** — *Directing law enforcement activities and manage public protection action*

Operations Section Roles 2.4.1.5b

ENBRIDGE

All activities must be documented at all Levels of Emergency

Operations Section Roles 2.4.1.5b

Roles Common To All

Common Responsibilities Checklist

After initial notification and receiving your assignment:

- ❑ Review job assignment (e.g., Strike Team designation, position, etc.).
- ❑ Receive brief overview of type and magnitude of incident.
- ❑ Receive resource order number and request number.
- ❑ Receive reporting location & time.
- ❑ Receive travel instructions.
- ❑ Receive any special communications instructions (e.g., travel, radio frequency).
- ❑ Monitor incident related information from media, internet, etc., if available.
- ❑ Assess personal equipment readiness for specific incident and climate (e.g. medications, money, computer, medical record, etc.).
- ❑ Maintain a checklist of items and if possible a personal Go-Kit.
- ❑ Inform others as to where you are going and how to contact you.
- ❑ Review Incident Management Handbook (IMH).
- ❑ Take advantage of available travel to rest prior to arrival. Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations:
- ❑ Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.
- ❑ If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
- ❑ Receive briefing from immediate supervisor.
- ❑ Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
- ❑ Acquire work materials.
- ❑ Abide by organizational code of ethics.
- ❑ Participate in IMT meetings and briefings, as appropriate.
- ❑ Document information and key actions.
- ❑ Ensure compliance with all safety practices and procedures. Report unsafe conditions to the SOFR.
- ❑ Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
- ❑ Organize and brief subordinates.
- ❑ The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
- ❑ Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.
- ❑ Use clear text and ICS/UC terminology (no codes) in all radio communications.
- ❑ Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
- ❑ Ensure all equipment is operational prior to each work period.
- ❑ Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
- ❑ Respond to demobilization orders and brief subordinates regarding demobilization.
- ❑ Prepare personal belongings for demobilization.
- ❑ Return all assigned equipment to appropriate location.
- ❑ Complete Demobilization check-out process before returning to home base.
- ❑ Participate in After-Action activities as directed.
- ❑ Carry out all assignments as directed.
- ❑ Maintain Individual/Activity Log (ICS 214a).

Operations Section Chief

The OSC, a member of the General Staff, is responsible for the management of all operations directly applicable to the primary mission. Assignment as the OSC will be based on qualifications and experience. If a response is federalized or has federal participation, the OSC will normally be selected from the agency with the most jurisdictional responsibility for the incident and will work in the ICP.

The OSC activates and supervises organization elements in accordance with the IAP and directs its execution. The OSC also directs the preparation of Unit operational plans, requests or releases resources, makes expedient changes to the IAP, as necessary, and reports such to the IC.

Based on the needs of the incident, the Operations Section Chief may establish an:

On-Scene Commander

- ❑ Coordinates and directs on-scene operational activities under the direction of the OSC or Deputy On-Scene Commander (DOSC).

Or Branch Director(s)

- ❑ Responsible for the implementation of the portion of the IAP appropriate to the branches.

Operations Section Chief Checklist

- ❑ Review common responsibilities.
- ❑ Obtain briefing from IC/UCS.
- ❑ Request sufficient section staffing for both operations & planning activities.
- ❑ Convert operational incident objectives into strategic and tactical options through a work analysis matrix.
- ❑ Coordinate and consult with the Planning Section Chief (PSC), SOFR, technical specialists, modeling scenarios, trajectories on selection of appropriate strategies and tactics to accomplish objectives.
- ❑ Identify kind and number of resources required to support selected strategies.
- ❑ Subdivide work areas into manageable units.
- ❑ Develop work assignments and allocate tactical resources based on strategy requirements.
- ❑ Coordinate planned activities with the SOFR to ensure compliance with safety practices.
- ❑ Prepare ICS 234 Work Analysis Matrix with PSC to ensure Strategies, Tactics and tasks are in line with ICS 202 Response Objectives to develop ICS 215.
- ❑ Participate in the planning process and the development of the tactical portions (ICS 204 and ICS 220) of the IAP.
- ❑ Assist with development of long-range strategic, contingency, and demobilization plans.
- ❑ Supervise operations section personnel.
- ❑ Monitor need for and request additional resources to support operations as necessary.
- ❑ Evaluate and monitor current situation for use in next operational period planning.
- ❑ Utilize valve schematics and control point maps, digital copies can be accessed by typing the URL into the browser http://myteamsites.cnpl.enbridge.com/sites/EmergencySM/maps/default.aspx
- ❑ Interact and coordinate with Command staff on achievements, issues, problems, significant changes special activities, events, and occurrences.
- ❑ Troubleshoot operational problems with other IMT members.
- ❑ Implement the IAP.
- ❑ Supervise and adjust operations organization and tactics as necessary.
- ❑ Participate in operational briefings to IMT members as well as briefings to media, and visiting dignitaries.
- ❑ Assemble/dissemble task force/strike teams as appropriate.
- ❑ Identify/utilize staging areas.
- ❑ Develop recommended list of Section resources to be demobilized and initiate recommendation for release when appropriate.
- ❑ Receive and implement applicable portions of the Incident Demobilization Plan.

Operations Section Deputy

The Operations Section Deputy is as fully qualified as an OSC. The roles of the DOSC are flexible. Specifically, the DOSC may support the OSC in a relief capacity;

- ❑ To oversee operations in the ICP while OSC participates in the incident planning process; or
- ❑ To supervise field operations in lieu of an On-Scene Commander. The DOSC may be selected from other organizations / agencies / jurisdictions in a multi-agency/multi-jurisdictional incident.
- ❑ Refer to Operations Section Chief duties.

On-Scene Commander

Coordinates and directs on-scene operational activities under direction of the Operations Section Chief or Deputy as necessary and provided a Deputy OSC is not assigned to that task. The On-Scene Commander may also be assigned to supervise Operations Branch Directors in the field and is responsible for providing input into the IAP development as well as implementation of the IAP for all field tactical operations.

- ❑ Review common responsibilities.
- ❑ Ensure response activities are implemented in accordance with the IAP.
- ❑ Ensure all response personnel are aware of and follow guidelines set forth in the Site Safety Plan (ICS 208)
- ❑ Report all injuries to the Safety Officer.
- ❑ Coordinate site access control with the Security Officer.
- ❑ Review Division/Group Assignment Lists (ICS Form 204) and modify based on effectiveness of current operations.
- ❑ Direct or coordinate tactical field activities either directly or through supervision of Operations Branch Directors, Division/Group Supervisor, or Task Force/Strike Team Leaders.
- ❑ Request maps and charts of impacted areas as required to support field operations.
- ❑ Assign specific work tasks to Division /Group Supervisors.
- ❑ Resolve logistics problems reported by subordinates
- ❑ Receive Incident Status Summary input from the Division/Group Supervisors and forward to Situation Unit
- ❑ Report to Operations Section Chief when the IAP is to be modified and significant change in status of events.
- ❑ Approve accident and medical reports originating from the field.

Staging Branch Director

The Staging Branch Director is responsible for supervising the Staging Area Managers as well as coordinating their activities including assigning Staging Area Managers and receiving, maintaining, checking –in/out, storing, and distributing resources. The Staging Branch Director is only activated if multiple staging areas are established that require multiple Staging Area Managers. The Director will generally remain in the ICP and supervise the Staging Area Managers from there.

Staging Branch Director Checklist

- ❑ Review Common Responsibilities.
- ❑ Proceed to Command Post.
- ❑ Establish communication with all Staging Area Managers in the field.
- ❑ Establish consistent check-in/out functions at each Staging Area using the ICS 211p (personnel) and 211e (equipment) forms as well as the ICS 210 Change of Status form.
- ❑ Determine any support needs for equipment, feeding, sanitation and security and provide to Staging Area Manager or Logistics Section Chief.
- ❑ Assist Staging Area Managers with maintenance service for equipment at Staging Area as appropriate.
- ❑ Respond to request for resource assignments. (Note: This may be direct from the OSC/DOSC or via the Incident Communications Center.)
- ❑ Determine required resource levels from the OSC/DOSC.
- ❑ Advise the OSC/DOSC when reserve levels reach minimums.
- ❑ Coordinate with Staging Area Managers and Logistics Section regarding staging requirements for ordered and en-route resources.
- ❑ Demobilize Staging Area(s) in accordance with the Incident Demobilization Plan.
- ❑ Debrief with OSC/DOSC or as directed at the end of each shift.

Staging Area Manager

The Staging Area Managers (STAM's) are individually assigned by the Staging Branch Director to a specific staging area and responsible for managing all activities within that area which includes establishing, maintaining, check-in, storage, and distribution of resources at staging. The Managers report to the Staging Branch Directors and are typically utilized when multiple staging areas are established. The Managers should work closely with the Security Manager, Resource Unit, Operations, and Logistics.

Staging Area Manager Checklist

- ❑ Review common responsibilities.
- ❑ Proceed to staging area.
- ❑ Establish staging area layout.
- ❑ Obtain briefing from person you are relieving, if applicable.
- ❑ Determine any support needs for equipment, feeding, sanitation, and security.
- ❑ Establish check-in function as appropriate.
- ❑ Coordinate with Logistics Section Chief regarding equipment requests.
- ❑ Determine required resources levels from the OSC/DOSC.
- ❑ Ensure security of staged resources.
- ❑ Post area for identification and traffic control.
- ❑ Request maintenance service for equipment at staging area as appropriate.
- ❑ Respond to request for resource assignments.
- ❑ Advise the OSC/DOSC when reserve levels reach minimums.
- ❑ Maintain and provide status to Resource Unit of all resources in staging area.
- ❑ Demobilize staging area in accordance with the Demobilization Plan.
- ❑ Debrief with OSC/DOSC or as directed at the end of each shift.

Recovery and Protection Branch

The Recovery and Protection Branch Director (typically activated only for oil spills) is responsible for overseeing and implementing the protection, containment and cleanup activities established in the IAP.

Recovery and Protection Branch Checklist

- ❑ Review Branch Director Responsibilities.
- ❑ Identify Divisions, Groups, and resources assigned to the Branch.
- ❑ Obtain briefing from OSC/DOSC/On-scene Commander and person you are relieving.
- ❑ Implement IAP for Branch by assigning specific work tasks.
- ❑ Develop with subordinates alternatives for Branch control operations.
- ❑ Review Division/Group Assignment Lists (ICS 204) for Divisions/Groups within the Branch. Modify lists based on effectiveness of current operations.
- ❑ Attend planning meetings at request of the OSC/DOSC/On-scene Commander.
- ❑ Ensure through chain of command that Resources Unit is advised of changes in the status of resources assigned to the Branch.
- ❑ Report to OSC/DOSC/On-scene Commander when: the IAP is to be modified; additional resources are needed; surplus resources are available; or hazardous situations or significant events occur.
- ❑ Approve accident and medical reports originating within the Branch.
- ❑ Consider demobilization well in advance.
- ❑ Debrief with OSC/DOSC and/or as directed at the end of each shift.

Protection Group

The Protection Group Supervisor is responsible for the deployment of containment, diversion, and adsorbent/absorbent materials in designated locations in compliance with the IAP. Depending on the size of the incident, the Protection Group may be further divided into Teams, Task Forces and Resources.

Protection Group Checklist

- ❑ Review Division/Group Supervisor Responsibilities.
- ❑ Implement Protection Strategies in the IAP.
- ❑ Direct, coordinate, and assess the effectiveness of protective actions.
- ❑ Modify protective actions, as needed.
- ❑ Maintain Individual Log (ICS 214a).

On Water Group

The On Water Recovery Group Supervisor is responsible for managing on water recovery operations in compliance with the IAP. The Group may be further divided into Teams, Task Forces and Single Resources.

On Water Group Checklist

- ❑ Review Division/Group Supervisor Responsibilities.
- ❑ Implement Recovery Strategies in the IAP
- ❑ Direct, coordinate, and assess the effectiveness of on water recovery actions.
- ❑ Modify recovery actions as needed

Disposal Group

The Disposal Group Supervisor is responsible for coordinating the on-site activities of personnel engaged in collecting, storing, transporting, and disposing of waste materials in compliance with the IAP.

Disposal Group Checklist

- ❑ Review Division/Group Supervisor Responsibilities.
- ❑ Implement the Disposal Portion of the IAP.
- ❑ Ensure compliance with all hazardous waste laws and regulations.
- ❑ Maintain accurate record of recovered materials.
- ❑ Maintain Individual Log (ICS 214a)

Shoreside Recovery Group

The Shoreside Recovery Group Supervisor is responsible for managing shoreside cleanup operations in compliance with the IAP.

Shoreside Recovery Checklist

- ❑ Review Division/Group Supervisor Responsibilities.
- ❑ Implement Recovery Strategies in the IAP.
- ❑ Direct, coordinate, and assess the effectiveness of shoreside recovery actions.
- ❑ Modify recovery actions as needed.

Decon Group

The Decontamination Group Supervisor is responsible for the operations of the decontamination element and for providing decontamination, as required by the CP.

Decon Group Checklist

- ❑ Review Division/Group Supervisor Responsibilities.
- ❑ Implement Decontamination Plan.
- ❑ Determine resource needs to implement Decontamination Plan and requisition through Logistics using ICS 213 Resource Request.
- ❑ Establish the Contamination Reduction Corridor(s).
- ❑ Identify contaminated people and equipment.
- ❑ Supervise the operations of the decontamination element in the process of decontaminating people and equipment.
- ❑ Direct and coordinate decontamination activities.
- ❑ Maintain control of movement of people and equipment within the Contamination Reduction Zone.
- ❑ Brief Site Safety Officer on conditions.
- ❑ Maintain communications and coordinate operations with the Entry Leader.
- ❑ Maintain communications and coordinate operations with the Site Access Control Leader and the Safe Refuge Area Manager (if activated).
- ❑ Coordinate the transfer of contaminated patients requiring medical attention (after decontamination) to the Medical Group.
- ❑ Coordinate handling, storage, and transfer of contaminants within the Contamination Reduction Zone.

ENBRIDGE®

Operations Section Roles Emergency Response 2.4.1.5c

OPERATIONS SECTION CHIEF
Manages operations directly applicable to the primary objectives

OPERATIONS SECTION DEPUTY OR ON-SCENE COMMANDER
Support Operations Section Chief

STAGING AREA DIRECTOR
Supervises staging area managers and coordinates their activities

STAGING AREA MANAGER
Receives, maintains, checks-in/out, stores and distributes resources

RECOVERY & PROTECTION BRANCH DIRECTOR
Oversee & implement containment & cleanup

- **PROTECTION GROUP** — *Deploy containment*
- **ON WATER GROUP** — *Manage water recovery*
- **DISPOSAL GROUP** — *Coordinate on-site activities*
- **DECON GROUP** — *Decontamination*
- **SHORESIDE RECOVERY GROUP** — *Shoreside cleanup*

WILDLIFE BRANCH DIRECTOR
Minimize wildlife injuries

- **WILDLIFE RECOVERY GROUP** — *Search & tag wildlife*
- **WILDLIFE REHAB GROUP** — *Oversight facility ops*

AIR OPS BRANCH DIRECTOR
Logistical support to aircraft

- **AIR SUPPORT GROUP** — *Coordinate support to aircraft*

EMERGENCY RESPONSE BRANCH DIRECTOR
Implement emergency measures

- **PUBLIC SAFETY LEADER** — *Coordinate public protection*
- **FIRE SUPPRESSION GROUP** — *Suppression & resources*
- **EMS/RESCUE GROUP** — *Coordinate response*
- **LAW ENFORCEMENT GROUP** — *Directing law enforcement activities and manage public protection action*

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Roles Common To All

Common Responsibilities Checklist

After initial notification and receiving your assignment:

- ❑ Review job assignment (e.g., Strike Team designation, position, etc.).
- ❑ Receive brief overview of type and magnitude of incident.
- ❑ Receive resource order number and request number.
- ❑ Receive reporting location & time.
- ❑ Receive travel instructions.
- ❑ Receive any special communications instructions (e.g., travel, radio frequency).
- ❑ Monitor incident related information from media, internet, etc., if available.
- ❑ Assess personal equipment readiness for specific incident and climate (e.g. medications, money, computer, medical record, etc.).
- ❑ Maintain a checklist of items and if possible a personal Go-Kit.
- ❑ Inform others as to where you are going and how to contact you.
- ❑ Review Incident Management Handbook (IMH).
- ❑ Take advantage of available travel to rest prior to arrival. Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations:
- ❑ Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.
- ❑ If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
- ❑ Receive briefing from immediate supervisor.
- ❑ Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
- ❑ Acquire work materials.
- ❑ Abide by organizational code of ethics.
- ❑ Participate in IMT meetings and briefings, as appropriate.
- ❑ Document information and key actions.
- ❑ Ensure compliance with all safety practices and procedures. Report unsafe conditions to the SOFR.
- ❑ Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
- ❑ Organize and brief subordinates.
- ❑ The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
- ❑ Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.
- ❑ Use clear text and ICS/UC terminology (no codes) in all radio communications.
- ❑ Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
- ❑ Ensure all equipment is operational prior to each work period.
- ❑ Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
- ❑ Respond to demobilization orders and brief subordinates regarding demobilization.
- ❑ Prepare personal belongings for demobilization.
- ❑ Return all assigned equipment to appropriate location.
- ❑ Complete Demobilization check-out process before returning to home base.
- ❑ Participate in After-Action activities as directed.
- ❑ Carry out all assignments as directed.
- ❑ Maintain Individual Log (ICS 214a).

Emergency Response Branch Director

The Emergency Response Branch Director is primarily responsible for overseeing and implementing emergency measures to protect life, mitigate further damage to the environment, and stabilize the situation. For a USA incident designate a Law Enforcement Group supervisor and for a Canadian incident designate a Public Safety Leader.

Emergency Response Branch Director Checklist

- ❑ Review Branch Director Responsibilities
- ❑ Develop with subordinates alternatives for Branch control operations.
- ❑ Attend planning meetings at the request of the OSC/ DOSC/On-scene Commander
- ❑ Review Division/Group Assignment Lists (ICS Form 204) for Divisions/Groups the within the Branch. Modify lists based on effectiveness of current operations.
- ❑ Assign specific work tasks to Division/Group Supervisors.
- ❑ Report to OPS when: the IAP is to be modified; additional resources are needed; surplus resources are available; or hazardous situations or significant events occur.
- ❑ Approve accident and medical reports (home agency forms) originating within the Branch.

Fire Suppression

The Fire Suppression Group Supervisor, when activated, is under the direction of the OSC. The Fire Department's initial Operations Section Chief at a maritime fire is often redesignated the Fire Suppression Branch Director under a UC. The Director is responsible for the assigned portion of the IAP that deals with fire suppression activities, assignment of resources within the branch, reporting progress of control activities, and status of resources within the branch in compliance with the IAP.

Fire Suppression Checklist

- ❑ Review Division/Group Supervisor Responsibilities.
- ❑ Prioritize responses to incident-related fires.
- ❑ Determine resource needs.
- ❑ Direct and coordinate firefighting mission.
- ❑ Manage dedicated firefighting resources.
- ❑ Brief Emergency Response Branch Director on activities.

EMS / Rescue Group

Search and Rescue Mission Coordinator

The SMC is typically a government agency representative designated (usually pre-designated) by the SAR Response System for each specific SAR mission and coordinates the overall response to a SAR mission in compliance with the IAP.

- ❑ Gather detailed information relating to the distress situation.
- ❑ Issue an Urgent marine Information Broadcast (UMIB) to inform mariners in the area of the distress situation.
- ❑ Conduct SAR operations in accordance with SAR procedures and Standards.
- ❑ Assign an SAR On-Scene Coordinator (SAR OSC) as appropriate.
- ❑ Use search planning tools to develop search plans that optimally use available resources.
- ❑ Ensure all documentation to the Documentation Unit Leader.

Search and Rescue On-Scene Coordinator

The SAR OSC coordinates the SAR mission on-scene using the resources made available by SMC.

Search and Rescue On-Scene Coordinator

- ❑ Establish and maintain communications with the SMC.
- ❑ Assume operational control and coordination of all SRUs assigned until relieved or mission is completed.
- ❑ Establish and maintain communications with all SRUs using assigned on scene channels.
- ❑ Require all aircraft to make "operations normal" reports to the SAR OSC.
- ❑ Establish a common altimeter setting for all on scene aircraft.
- ❑ Obtain necessary information from arriving SRU's, provide initial briefing and search instructions, and provide advisory air traffic service to aid pilots in maintaining separation from one another.
- ❑ Carry out SAR action plans.
- ❑ Receive and evaluate all sighting reports, and divert SRUs to investigate sightings.
- ❑ Obtain search results from departing SRUs.
- ❑ Submit sequentially numbered situation reports (SITREPs) to the SMC at regular intervals.

Law Enforcement Group (USA)

Under the direction of the Emergency Response Branch Director, the Law Enforcement Group Supervisor is responsible for coordinating and directing all law enforcement activities related to the incident, including but not limited to, isolating the incident, crowd control, traffic control, evacuations, beach closures, and/or perimeter security in compliance with the IAP.

- ❑ Review Division/Group Supervisor Responsibilities.
- ❑ Determine resource needs.
- ❑ Direct and coordinate law enforcement response.
- ❑ Manage dedicated law enforcement resources.
- ❑ Manage public protection action (e.g., evacuations, beach closures, etc.)
- ❑ Brief Emergency Response Branch Director on activities.

Public Safety Leader

Under the direction of the Emergency Response Branch Director, the Public Safety Leader is responsible for coordinating and directing all public safety actions related to the incident, including but not limited to, isolating the incident, monitoring, evacuations and establishing a reside registration cente

In the US some of these responsibilities would be under the Law Enforcement Group – see "Law Enforcement Group (USA)

- ❑ Confirm communication links with the Emergency Response Branch Director and the Operations Section Chief.
- ❑ In conjunction with the Emergency Response Branch Director, the Operations Section Chief and the Planning Section Chief, develop and implement an Incident Action Plan (IAP)..
- ❑ Assign personnel to assume the following positions as required: Air Monitoring (LEL), Reception Centre Representative, Roadblocks.
- ❑ Dispatch trained air monitoring personnel with the appropriate hand-held LEL monitors to record concentrations at the nearest un-evacuated residences downwind of the incident site.
  - ❑ Mobilize third party mobile air monitoring units.
  - ❑ Maintain communication with the applicable government regulator and environment agency regarding air monitoring needs and activities.
- ❑ Determine the need for and location of Roadblocks to isolate and secure the area.
  - ❑ Ensure all Roadblock personnel are properly trained and have appropriate roadblock kits.
  - ❑ Ensure all Roadblock personnel have the legal authority to restrict access to the area.
- ❑ In conjunction with the Operations Section Chief determine the hazard area; identify the residents, businesses, industrial operators, and / or transients in the area; and determine the initial public protection measures to be taken and determine the need for evacuation / sheltering. This is based on air monitoring (LEL) readings at the nearest downwind residence.
- ❑ Review resident lists, industrial users lists, reception centres, and telephone numbers within the ERP.
- ❑ Assess public impact in conjunction with the local authorities and discuss public protection measures.
- ❑ Prioritize residents and industrial users to establish the order of evacuation. Coordinate evacuation or shelter of residents, industrial users (via Telephoners).
  - ❑ Determine who needs to be notified and what script will be used: Shelter-in-Place or evacuation message.
  - ❑ If residences are evacuated, a reception centre must be established and it must be located in a safe area away from the hazard.
  - ❑ Determine and notify landowner / occupant(s) as soon as possible.
- ❑ Establish in coordination with Logistics the alternate drinking water sources for the public where required
- ❑ Determine the need for helicopters to identify human activity in the area.
- ❑ Regularly update the Emergency Response Branch Director and the Operations Section Chief .
  - ❑ Confirm communication links with: Air Monitors, Reception Centre, Roadblocks, and Telephoners. Personnel should check in at scheduled intervals.
  - ❑ Review and confirm evacuation of residents, area industrial users, transients, etc. from the area.
- ❑ If required, request that a Notice to Airmen (NOTAM) is issued to restrict the airspace above the hazard area.

Roadblock

In the event of an emergency, roadblock locations and road detours will be established. Enbridge may initially establish and maintain roadblocks until relieved by highway maintenance contractors or police. The Public Safety Leader must be continuously updated by Roadblock personnel so that all vehicles entering and exiting are accounted for.

- ❑ In conjunction with the Public Safety Leader, determine the need for and location of roadblocks.
- ❑ Pickup and check roadblock kits.
- ❑ Proceed to roadblock locations.
- ❑ Confirm communication links.
- ❑ Establish roadblocks to secure the hazard area.
- ❑ Monitor area for LEL with personal monitors and document readings.
- ❑ Report all reading changes / increases to the Public Safety Leader.
- ❑ For your own safety, ensure the Public Safety Leader is notified immediately if readings are approaching 10% LEL.
- ❑ Document all incoming and outgoing traffic, personnel, and equipment.
- ❑ Forward information given to you by people passing through your location to the Public Safety Leader.
- ❑ Maintain communication with the Public Safety Leader.
- ❑ Maintain roadblock locations. Do not leave until requested to do so by the Public Safety Leader or until relieved by other Roadblock personnel.
- ❑ Assist with post-incident activities.

Air Monitoring Unit

LEL or other toxic substance concentrations will be monitored continuously during the incident response. It is crucial that Air Monitors continuously update the Public Safety Leader with monitored results. If air monitoring readings show high levels of LEL the Public Safety Leader may need to initiate evacuation / shelter of additional residences, change the location for site control or ignite the release (if applicable).

- ❑ Obtain and check equipment and information (maps, forms, communications, reports, monitors, safety, and breathing equipment).
- ❑ Confirm communication links.
- ❑ Monitor closest downwind public location or residence.
- ❑ Monitor environment for adverse effects.
- ❑ Document and report all readings at established intervals to the Public Safety Leader.
- ❑ For your own safety, ensure the Public Safety Leader is notified immediately if readings are approaching 10% LEL.
- ❑ Prepare Mobile Monitoring Plan.

Telephone Unit

In the event of an emergency in which residents and industrial users need to be sheltered and / or evacuated, a team of Telephoners will be established to contact people in the area and provide instructions to ensure their safety. The Public Safety Leader must be continuously updated with the Telephoner's progress so that unsuccessful contact attempts can be followed up on immediately.

- ❑ Confirm resident contact lists are available.
- ❑ Confirm communication links.
- ❑ In conjunction with the Public Safety Leader, determine who needs to be notified (residents, businesses, industrial users, etc.).
- ❑ Review with the Public Safety Leader the telephoner scripts to be used: Shelter-in-Place or Evacuation Phone Message.
- ❑ Contact residents and industrial users and advise them to evacuate or shelter.
- ❑ Document all resident interactions and report this information to the Public Safety Leader . Immediately advise the Public Safety Leader about unsuccessful contacts and any residents requiring assistance.
- ❑ Assist with post-incident activities.

Reception Centre Unit

In the event of an emergency in which residents need to be evacuated, a Reception Centre must be established to receive and register the evacuees. A Reception Centre Representative is assigned to manage / coordinate activities at the Reception Centre. The Reception Centre Representative continuously updates the Public Safety Leader with a list of those who have, and have not, checked in at the Reception Centre.

- ❑ Confirm Reception Centre is available for use.
- ❑ Establish Reception Centre.
- ❑ Confirm communication links.
- ❑ Receive evacuees and maintain a Reception Centre Registration Log.
- ❑ Arrange for food and accommodations for the evacuees.
- ❑ Record and follow up on all evacuees who choose to make their own accommodation arrangements.
- ❑ Arrange for temporary care of pets (if necessary) and the security of evacuated property.
- ❑ Establish and oversee compensation administration activities at the reception centre.
- ❑ Reimburse evacuees for their immediate out-of-pocket expenses and log details on a Resident Compensation Log.
- ❑ Where possible, provide evacuees with information regarding their property and the incident.
- ❑ Forward all media and incident inquiries to the Public Information Officer.
- ❑ Report all names of evacuees who have registered at the Reception Centre to the Public Safety Leader.
- ❑ Document activities using the Emergency Actions Log.
- ❑ Assist with post-incident activities.
- ❑ Confirm information to be released to public with the Public Information Officer.
- ❑ Address resident concerns and forward them to the Public Safety Leader.

Operations Section Roles Emergency Response 2.4.1.5c

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Operations Section Roles Wildlife 2.4.1.5d

OPERATIONS SECTION CHIEF
Manages operations directly applicable to the primary objectives

STAGING AREA DIRECTOR
Supervises staging area managers and coordinates their activities

OPERATIONS SECTION DEPUTY OR ON-SCENE COMMANDER
Support Operations Section Chief

STAGING AREA MANAGER
Receives, maintains, checks-in/out, stores and distributes resources

RECOVERY & PROTECTION BRANCH DIRECTOR
Oversee & implement containment & cleanup

- **PROTECTION GROUP** — *Deploy containment*
- **ON WATER GROUP** — *Manage water recovery*
- **DISPOSAL GROUP** — *Coordinate on-site activities*
- **DECON GROUP** — *Decontamination*
- **SHORESIDE RECOVERY GROUP** — *Shoreside cleanup*

WILDLIFE BRANCH DIRECTOR
Minimize wildlife injuries

- **WILDLIFE RECOVERY GROUP** — *Search & tag wildlife*
- **WILDLIFE REHAB GROUP** — *Oversight facility ops*

AIR OPS BRANCH DIRECTOR
Logistical support to aircraft

AIR SUPPORT GROUP
Coordinate support to aircraft

EMERGENCY RESPONSE BRANCH DIRECTOR
Implement emergency measures

- **PUBLIC SAFETY LEADER** — *Coordinate public protection*
- **FIRE SUPPRESSION GROUP** — *Suppression & resources*
- **EMS/RESCUE GROUP** — *Coordinate response*
- **LAW ENFORCEMENT GROUP** — *Directing law enforcement activities and manage public protection action*

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Roles Common To All

Common Responsibilities Checklist

After initial notification and receiving your assignment:

- ❑ Review job assignment (e.g., Strike Team designation, position, etc.).
- ❑ Receive brief overview of type and magnitude of incident.
- ❑ Receive resource order number and request number.
- ❑ Receive reporting location & time.
- ❑ Receive travel instructions.
- ❑ Receive any special communications instructions (e.g., travel, radio frequency).
- ❑ Monitor incident related information from media, internet, etc., if available.
- ❑ Assess personal equipment readiness for specific incident and climate (e.g. medications, money, computer, medical record, etc.).
- ❑ Maintain a checklist of items and if possible a personal Go-Kit.
- ❑ Inform others as to where you are going and how to contact you.
- ❑ Review Incident Management Handbook (IMH).
- ❑ Take advantage of available travel to rest prior to arrival. Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations:
- ❑ Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.
- ❑ If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
- ❑ Receive briefing from immediate supervisor.
- ❑ Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
- ❑ Acquire work materials.
- ❑ Abide by organizational code of ethics.
- ❑ Participate in IMT meetings and briefings, as appropriate.
- ❑ Document information and key actions.
- ❑ Ensure compliance with all safety practices and procedures. Report unsafe conditions to the SOFR.
- ❑ Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
- ❑ Organize and brief subordinates.
- ❑ The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
- ❑ Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.
- ❑ Use clear text and ICS/UC terminology (no codes) in all radio communications.
- ❑ Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
- ❑ Ensure all equipment is operational prior to each work period.
- ❑ Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
- ❑ Respond to demobilization orders and brief subordinates regarding demobilization.
- ❑ Prepare personal belongings for demobilization.
- ❑ Return all assigned equipment to appropriate location.
- ❑ Complete Demobilization check-out process before returning to home base.
- ❑ Participate in After-Action activities as directed.
- ❑ Carry out all assignments as directed.
- ❑ Maintain Individual Log (ICS 214a).

Wildlife Branch Director

The Wildlife Branch Director is responsible for minimizing wildlife injuries during spill responses, coordinating early aerial and ground reconnaissance of the wildlife at the spill site and reporting results to the SUL; advising on wildlife protection strategies, including divisionary boom, hazing measures, in-situ burning, and chemical countermeasures; removing of oiled carcasses; employing wildlife hazing measures as authorized in the IAP; and recovering and rehabilitating impacted wildlife.

A central Wildlife Processing Center should be identified and maintained for, evidence tagging, transportation, veterinary services, treatment and rehabilitation storage, and other support needs. The activities of private wildlife care groups, including those employed by the RP, will be overseen and coordinated by the Wildlife Branch Director.

Wildlife Branch Director Checklist

- ❑ Review Branch Director Responsibilities.
- ❑ Develop the Wildlife Branch portion of the IAP.
- ❑ Supervise Wildlife Branch operations.
- ❑ Determine resource needs.
- ❑ Review the suggested list of resources to be released and initiate recommendation for release of resources.
- ❑ Assemble and disassemble teams/task forces assigned to the Wildlife Branch.
- ❑ Report information about special activities, events, and occurrences to the OPS.
- ❑ Assist the Volunteer Coordinator and Training Specialist in determining training needs of wildlife recovery volunteers.
- ❑ Conduct all wildlife protection, recovery, and rehabilitation activities in compliance with the IAP.

Wildlife Recovery Group

The Wildlife Recovery Group is responsible for coordinating the search or collection and field tagging of dead and live impacted wildlife and transporting them to the processing center(s). This group should coordinate with the Planning Situation Unit and Air Operations Branch Director in conducting aerial and group surveys of wildlife populations in the vicinity of the spill. They should also deploy acoustic and visual wildlife hazing equipment, as needed.

Wildlife Recovery Checklist

- ❑ Review Division/Group Supervisor Responsibilities.
- ❑ Determine resource needs.
- ❑ Establish and implement protocols for collection and logging of impacted wildlife.
- ❑ Coordinate transportation of wildlife to processing station(s).

Wildlife Rehab Group

The Wildlife Rehabilitation Group is responsible for the oversee of facility operations, including: receiving oiled wildlife at the processing center, recording essential information, collecting necessary samples, and conducting triage, stabilization, treatment, transport and rehabilitation of oiled wildlife. The Wildlife Rehabilitation Center Manager is responsible for assuring appropriate transportation to appropriate treatment centers for oiled animals requiring extended care and treatment.

Wildlife Rehab Checklist

- ❑ Review Common Responsibilities.
- ❑ Determine resource needs and establish a processing station for impacted wildlife.
- ❑ Process impacted wildlife and maintain logs.
- ❑ Collect numbers/types/status of impacted wildlife and brief the Wildlife Branch Operations Director.
- ❑ Coordinate the transport of wildlife to other facilities.
- ❑ Coordinate release of recovered wildlife.
- ❑ Implement Incident Demobilization Plan.

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Operations Section Roles Air Ops 2.4.1.5e

OPERATIONS SECTION CHIEF
Manages operations directly applicable to the primary objectives

OPERATIONS SECTION DEPUTY OR ON-SCENE COMMANDER
Support Operations Section Chief

STAGING AREA DIRECTOR
Supervises staging area managers and coordinates their activities

STAGING AREA MANAGER
Receives, maintains, checks-in/out, stores and distributes resources

RECOVERY & PROTECTION BRANCH DIRECTOR
Oversee & implement containment & cleanup

- **PROTECTION GROUP** — *Deploy containment*
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WILDLIFE BRANCH DIRECTOR
Minimize wildlife injuries

- **WILDLIFE RECOVERY GROUP** — *Search & tag wildlife*
- **WILDLIFE REHAB GROUP** — *Oversight facility ops*

AIR OPS BRANCH DIRECTOR
Logistical support to aircraft

AIR SUPPORT GROUP
Coordinate support to aircraft

EMERGENCY RESPONSE BRANCH DIRECTOR
Implement emergency measures

- **PUBLIC SAFETY LEADER** — *Coordinate public protection*
- **FIRE SUPPRESSION GROUP** — *Suppression & resources*
- **EMS/RESCUE GROUP** — *Coordinate response*
- **LAW ENFORCEMENT GROUP** — *Directing law enforcement activities and manage public protection action*

ENBRIDGE®

Roles Common To All

Common Responsibilities Checklist

After initial notification and receiving your assignment:

- ❑ Review job assignment (e.g., Strike Team designation, position, etc.).
- ❑ Receive brief overview of type and magnitude of incident.
- ❑ Receive resource order number and request number.
- ❑ Receive reporting location & time.
- ❑ Receive travel instructions.
- ❑ Receive any special communications instructions (e.g., travel, radio frequency).
- ❑ Monitor incident related information from media, internet, etc., if available.
- ❑ Assess personal equipment readiness for specific incident and climate (e.g. medications, money, computer, medical record, etc.).
- ❑ Maintain a checklist of items and if possible a personal Go-Kit.
- ❑ Inform others as to where you are going and how to contact you.
- ❑ Review Incident Management Handbook (IMH).
- ❑ Take advantage of available travel to rest prior to arrival. Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations:
- ❑ Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.
- ❑ If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
- ❑ Receive briefing from immediate supervisor.
- ❑ Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
- ❑ Acquire work materials.
- ❑ Abide by organizational code of ethics.
- ❑ Participate in IMT meetings and briefings, as appropriate.
- ❑ Document information and key actions.
- ❑ Ensure compliance with all safety practices and procedures. Report unsafe conditions to the SOFR.
- ❑ Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
- ❑ Organize and brief subordinates.
- ❑ The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
- ❑ Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.
- ❑ Use clear text and ICS/UC terminology (no codes) in all radio communications.
- ❑ Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
- ❑ Ensure all equipment is operational prior to each work period.
- ❑ Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
- ❑ Respond to demobilization orders and brief subordinates regarding demobilization.
- ❑ Prepare personal belongings for demobilization.
- ❑ Return all assigned equipment to appropriate location.
- ❑ Complete Demobilization check-out process before returning to home base.
- ❑ Participate in After-Action activities as directed.
- ❑ Carry out all assignments as directed.
- ❑ Maintain Individual Log (ICS 214a).

Air Ops Branch

The AOBD is ground-based and is primarily responsible for preparing the air operations portion (ICS 220) of the IAP and/or providing logistical support to incident aircraft. The AOBD will ensure that agency directives, to include COMDTINST M3710.1e, flight manuals, unit restrictions, and other agency directives will not be violated by incident aircraft (e.g., flight hours, hoist limitations, night flying, etc.). After the IAP is approved, the AOBD is responsible for overseeing the tactical and logistical assignments of the Air Operations Branch. In coordination with the Logistics Section, the AOBD is responsible for providing logistical support to aircraft operating on the incident.

Air Ops Branch Checklist

- ❑ Review Common Responsibilities.
- ❑ Organize preliminary air operations.
- ❑ Coordinate airspace use with the FAA. Request declaration (or cancellation) of Temporary Flight Restriction (TFR) IAW FAR 91.173 and post Notice to Airmen (NOTAM) as required.
- ❑ Attend the tactics meeting and planning meeting to obtain information for completing ICS 220.
- ❑ Participate in preparation of the IAP through the OSC/DOSC. Insure that the air operations portion of the IAP takes into consideration the Air Traffic Control requirements of assigned aircraft.
- ❑ Coordinate with the COML to designate air tactical and support frequencies.
- ❑ Perform operational planning for air operations.
- ❑ Prepare and provide Air Operations Summary Worksheet (ICS 220) to the Air Support Group and Fixed-Wing Bases.
- ❑ Supervise all air operations activities associated with the incident.
- ❑ Evaluate helibase and helispot locations.
- ❑ Establish procedures for emergency reassignment of aircraft.
- ❑ Coordinate approved flights of non-incident aircraft in the TFR.
- ❑ Coordinate Coast Guard air assets with the appropriate Command Center(s) through normal channels on incident air operations activities.
- ❑ Consider requests for logistical use of incident aircraft.
- ❑ Report to the OSC/DOSC on air operations activities.
- ❑ Report special incidents/accidents.
- ❑ Develop Aviation Site Safety Plan in concert with SOFR.
- ❑ Arrange for an accident investigation team when warranted.
- ❑ Debrief with OSC/DOSC as directed at the end of each shift.

Air Support Group

Air Tactical Group Supervisor

The ATGS tasks for oil spills are: coordination and scheduling of aircraft operations to locate, observe, track, survey, support dispersant applications or open water skimming operations, and others. Coordination activities may be performed by the ATGS while airborne.

- ❑ Review Air Tactical Group Supervisor Responsibilities.
- ❑ Obtain a briefing from the Air Operations Branch Director or the OPS.
- ❑ Coordinate dispersant, in-situ burning, and bioremediation application through the Air Operations Branch Director.
- ❑ Coordinate air surveillance mission scheduling and observer assignments with the SUL.
- ❑ Identify remote sensing technology that may enhance surveillance capabilities.
- ❑ Coordinate air surveillance observations and provide reports by the most direct methods available.
- ❑ Report on air surveillance and operations activities to the Air Operations Branch Director.
- ❑ Coordinate application-monitoring requirements with the Helicopter and Fixed Wing Coordinators and the Situation Unit.
- ❑ Report on air application activities to the Air Operations Branch Director.

Air Support Group Supervisor

The ASGS is primarily responsible for supporting aircraft and aircrews. This includes: 1) providing fuel and other supplies; 2) providing maintenance and repair of aircraft; 3) keeping records of aircraft activity, and 4) providing enforcement of safety regulations. The ASGS reports to the AOBD

- ❑ Review Common Responsibilities.
- ❑ Obtain a copy of the IAP from the AOBD, including Air Operations Summary Worksheet (ICS 220).
- ❑ Participate in AOBD planning activities.
- ❑ Inform AOBD of group activities.
- ❑ Identify resources/supplies dispatched for the Air Support Group.
- ❑ Request special air support items from appropriate sources through Logistics.
- ❑ Determine need for assignment of personnel and equipment at each airbase.
- ❑ Coordinate activities with AOBD.
- ❑ Obtain assigned ground-to-air frequency for airbase operations from the Communications Unit Leader (COML) or Communications Plan (ICS 205).
- ❑ Inform AOBD of capability to provide night flying service.
- ❑ Ensure compliance with each agency's operations checklist for day and night operations.
- ❑ Ensure dust abatement procedures are implemented at helibases and helispots.
- ❑ Provide crash-rescue service for helibases and helispots.
- ❑ Debrief as directed at the end of each shift.

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PLANNING SECTION CHIEF

Collects, evaluates and disseminates emergency information

PLANNING SECTION DEPUTY

Support Planning Chief

DOCUMENTATION UNIT

Establishes the incident documentation process, reviews records for accuracy and sorts files

TECHNICAL SPECIALISTS UNIT

Coordinates activities with appropriate consultants and contractors

DEMOBILIZATION UNIT

Organizes demobilization

SITUATION UNIT

Collects and analyzes incident data to determine the current status for all resources

RESOURCES UNIT

Maintains an accounting system indicating location and status for all resources

ENVIRONMENT UNIT

Coordinates the assessment of spill hazards and identification of environmentally sensitive areas

ENBRIDGE

All activities must be documented at all Levels of Emergency

Roles Common To All

Common Responsibilities Checklist

After initial notification and receiving your assignment:
- ❑ Review job assignment (e.g., Strike Team designation, position, etc.).
- ❑ Receive brief overview of type and magnitude of incident.
- ❑ Receive resource order number and request number.
- ❑ Receive reporting location & time.
- ❑ Receive travel instructions.
- ❑ Receive any special communications instructions (e.g., travel, radio frequency).
- ❑ Monitor incident related information from media, internet, etc., if available.
- ❑ Assess personal equipment readiness for specific incident and climate (e.g. medications, money, computer, medical record, etc.).
- ❑ Maintain a checklist of items and if possible a personal Go-Kit.
- ❑ Inform others as to where you are going and how to contact you.
- ❑ Review Incident Management Handbook (IMH).
- ❑ Take advantage of available travel to rest prior to arrival. Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations:
- ❑ Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.
- ❑ If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
- ❑ Receive briefing from immediate supervisor.
- ❑ Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
- ❑ Acquire work materials.
- ❑ Abide by organizational code of ethics.
- ❑ Participate in IMT meetings and briefings, as appropriate.
- ❑ Document information and key actions.
- ❑ Ensure compliance with all safety practices and procedures. Report unsafe conditions to the SOFR.
- ❑ Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
- ❑ Organize and brief subordinates.
- ❑ The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
- ❑ Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.
- ❑ Use clear text and ICS/UC terminology (no codes) in all radio communications.
- ❑ Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
- ❑ Ensure all equipment is operational prior to each work period.
- ❑ Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
- ❑ Respond to demobilization orders and brief subordinates regarding demobilization.
- ❑ Prepare personal belongings for demobilization.
- ❑ Return all assigned equipment to appropriate location.
- ❑ Complete Demobilization check-out process before returning to home base.
- ❑ Participate in After-Action activities as directed.
- ❑ Carry out all assignments as directed.
- ❑ Maintain Individual/Activity Log (ICS 214a).

Planning Section Chief

The PSC, a member of the General Staff, is responsible for the collection, evaluation, dissemination, and use of incident information and maintaining status of assigned resources.

Information is needed to:
1) understand the current situation;
2) predict the probable course of incident events;
3) prepare alternative strategies for the incident, and
4) submit required incident status reports.

The PSC may have a Deputy PSC, who may be from an assisting governmental agency.

Planning Section Chief Checklist
- ❑ Review common responsibilities.
- ❑ Collect, process, and display incident information.
- ❑ Assist OSC in the development of response strategies.
- ❑ Supervise preparation of the IAP.
- ❑ Develop Situation Report (ICS 209)
- ❑ Facilitate planning meetings and briefings.
- ❑ Assign personnel already on-site to ICS/UC organizational positions as appropriate.
- ❑ Establish information requirements and reporting schedules for Planning Section Units (e.g., Resources, Situation).
- ❑ Determine the need for any specialized resources in support of the incident.
- ❑ Establish special information collection activities as necessary (e.g., weather, environmental, toxics, etc.).
- ❑ Assemble information on alternative strategies.
- ❑ Provide periodic predictions on incident potential.
- ❑ Keep IMT apprised of any significant changes in incident status.
- ❑ Compile and display incident status information.
- ❑ Oversee preparation and implementation of the Incident Demobilization Plan.
- ❑ Incorporate plans (e.g., Traffic, Medical, Communications, and Site Safety) into the IAP.
- ❑ Develop other incident supporting plans (e.g., salvage, transition, security).
- ❑ Assist Operations with development of the ICS 234 Work Analysis Matrix.

Planning Section Deputy

The Planning Section Deputy may assume responsibility for a specific portion of the primary position (listed below) , work as relief, or be assigned other tasks. The Deputy should always be fully qualified to make decisions and manage the incident as the Planning Section Chief.

- ❑ Review common responsibilities.
- ❑ Collect, process, and display incident information.
- ❑ Assist OSC in the development of response strategies.
- ❑ Supervise preparation of the IAP.
- ❑ Develop Situation Report (ICS 209)
- ❑ Facilitate planning meetings and briefings.
- ❑ Assign personnel already on-site to ICS/UC organizational positions as appropriate.
- ❑ Establish information requirements and reporting schedules for Planning Section Units (e.g., Resources, Situation).
- ❑ Determine the need for any specialized resources in support of the incident.
- ❑ Establish special information collection activities as necessary (e.g., weather, environmental, toxics, etc.).
- ❑ Assemble information on alternative strategies.
- ❑ Provide periodic predictions on incident potential.
- ❑ Keep IMT apprised of any significant changes in incident status.
- ❑ Compile and display incident status information.
- ❑ Oversee preparation and implementation of the Incident Demobilization Plan.
- ❑ Incorporate plans (e.g., Traffic, Medical, Communications, and Site Safety) into the IAP.
- ❑ Develop other incident supporting plans (e.g., salvage, transition, security).
- ❑ Assist Operations with development of the ICS 234 Work Analysis Matrix.

Demobilization Unit

Responsible for developing the Incident Demobilization Plan.

Demobilization Unit Checklist
- ❑ Review common responsibilities.
- ❑ Review incident resources records to determine the likely size and extent of demobilization effort and develop a matrix.
- ❑ Coordinate demobilization with agency/company representatives.
- ❑ Monitor Operations Section resource needs.
- ❑ Identify surplus resources and probable release time.
- ❑ Utilize the demobilization checkout procedures for release of incident resources (ICS 221).
- ❑ Establish communications with off-incident facilities, as necessary.
- ❑ Develop an Incident Demobilization Plan including process by which suppliers inspect condition of released resources and sign off if acceptable prior to moving offsite.
- ❑ Distribute demobilization plan (on and off-site).
- ❑ Provide status reports to appropriate requestors.
- ❑ Develop incident check-out function for all units.
- ❑ Evaluate logistics and transportation capabilities to support demobilization.
- ❑ Ensure that all Sections/Units understand their specific demobilization responsibilities.
- ❑ Supervise execution of the incident demobilization plan.
- ❑ Brief the PSC on demobilization progress.

Resources Unit

Responsible for maintaining the status of all assigned tactical resources and personnel at an incident. Achieved by overseeing check-in of all tactical resources and personnel, maintaining a situation status board to indicate current location and status of resources.

Resources Unit Leader Checklist
- ❑ Review Common Responsibilities.
- ❑ Review Unit Leader Responsibilities.
- ❑ Establish the check-in (ICS 211P) function at command post.
- ❑ Work with Staging Area Manager(s) in the field to ensure they are utilizing the check-in (ICS 211P & E) process to track equipment and personnel arriving and departing the staging area.
- ❑ Prepare Organization Assignment List (ICS 203) and Organization Chart (ICS 207) working with each officer, section chief and unit leader.
- ❑ Ensure appropriate resource tracking process is established and communicated.
- ❑ Maintain master roster of all tactical resources checked in at the incident.
- ❑ Ensure ICS 210 Change Status forms are utilized when resources are reassigned to another location.
- ❑ Work with Operations and Logistics to review ICS 213RR resource requisition and provide input on resources available in staging.
- ❑ Maintain and post the current status and location and assignments of all tactical resources.
- ❑ Work with Operations and Environmental Unit to prepare strategies and tactics (ICS 234 Work Analysis Matrix) to support objectives (ICS 202)
- ❑ Draft ICS 215 Operational Planning Worksheet with Operations, Environment Unit and Safety to determine required resources needed to implement tactics in the field and what additional resources need to be ordered.
- ❑ Prepare appropriate parts of Division Assignment Lists (ICS 204).
- ❑ Attend meetings and briefings as required by the PSC.
- ❑ Provide resources and organization information to SITL for situation status display.

Environment Unit

Ensure that the following specific to the release is recorded:
- ❑ ICS Environmental Unit Leader (including relief activities, timing, etc.);
- ❑ Meetings where environmental issues are discussed (date, time, location, topics, attendees, & action items);
- ❑ Environmental sensitivity/issue information;
- ❑ Environmentally sensitive areas in/adjacent to the release site;
- ❑ Environmental assessment results;
- ❑ Mitigation measures and success of these measures;
- ❑ Agreements on key issues with government, landowners and other stakeholders;
- ❑ Environmental equipment and resources;
- ❑ Impacts on wildlife;
- ❑ Any waste or recovered product removed from a release site or temporary storage site; and
- ❑ Community air quality monitoring results.

Initial Situational Assessment
Upon discovery refer to High Consequence Area (HCA) and Control Point (CP) maps and tables in order to protect environmentally & economically sensitive areas. These maps include:

HCA Maps & Tables
- ❑ Regional Operations maintain maps identifying HCAs along the pipeline, including:
- ❑ High Population Areas (HPA)
- ❑ Other Population Areas (OPA)
- ❑ Commercially Navigable Waterways (CNW)
- ❑ Environmentally Sensitive Areas (ESA)
- ❑ Drinking Water (DW)

Control Point Maps
Regions maintain Control Point Map sets that identify product containment and recovery sites (control points) on high risk water-bodies that could be impacted by a pipeline leak. The impact mechanism could be via direct crossing, overland flow or spray.
Regional management is responsible for ensuring that a field reconnaissance of each control point is carried out at least once in a 3 year period.

Environment Unit Leader Checklist
- ❑ Review common responsibilities.
- ❑ Predict movement and dispersion of products.
- ❑ Provide clean up expertise.
- ❑ Engage specialists as needed (e.g., shoreline cleanup assessment, trajectory analysis, resources at risk and air monitoring).
- ❑ Develop and review sampling plans, water and air monitoring results.
- ❑ Review and recommend alternative technologies as identified in ACP.
- ❑ Work with LNO to establish advisory meetings as needed.
- ❑ State and Federal Natural Resource Trustees will also assess NRDA impacts, an Enbridge NRDA Manager will want to monitor Trustee activity to determine concerns and document Trustee sample and documentation activities .

Ensure that the following specific to the release is recorded
- ❑ ICS Environmental Unit Leader (including relief activities, timing, etc.);
- ❑ Meetings where environmental issues are discussed (date, time, location, topics, attendees, and action items);
- ❑ Environmental sensitivity/issue information;
- ❑ Environmentally sensitive areas in/adjacent to the release site;
- ❑ Environmental assessment results;
- ❑ Mitigation measures and success of these measures;
- ❑ Agreements on key issues with government, landowners and other stakeholders.
- ❑ Environmental equipment and resources;
- ❑ Impacts on wildlife;
- ❑ Any waste or recovered product removed from a release site or temporary storage site; and
- ❑ Community air quality monitoring results.

Documentation Unit

Responsible for providing incident documentation, reviewing records for accuracy and sorting documentation files. Due to the nature of the legal ramifications, individuals with legal and records management experience should be assigned to this particular duty and liaise with the Legal Officer during the entire cleanup scenario.

Documentation Unit Leader Checklist
- ❑ Review common responsibilities.
- ❑ Set up work area; begin organization of incident files.
- ❑ Establish duplication service, respond to requests.
- ❑ File all official forms and reports. (e.g. Legal Documentation and After Action Report)
- ❑ Review records for accuracy and completeness; inform appropriate units of errors or omissions.
- ❑ Provide incident documents as requested.
- ❑ Retain all documentation for official records.
- ❑ Organize files for submitting final incident documentation package.
- ❑ Prepare meeting summary (ICS 231).

Technical Specialist

Responsible for coordinating activities with appropriate consultants and contractors (e.g., accountants, engineers, oil spill clean-up experts, right-of-way agents, NRDA reps).

Technical Specialists Checklist
- ❑ Review common responsibilities.
- ❑ Provide technical expertise and advice to command and general staff.
- ❑ Attend meetings and briefings to clarify and help resolve technical issues.
- ❑ Provide expertise during the development of the IAP and other support plans.
- ❑ Work with the SOFR to mitigate unsafe practices.
- ❑ Work closely with LNO to help facilitate understanding among stakeholder and special interest groups.
- ❑ Be available to attend press briefings to clarify technical issues.
- ❑ Work closely with Operations Section to monitor compliance and planned actions.
- ❑ Research technical issues and provide findings to decision makers.
- ❑ Provide appropriate modeling and predictions as needed.
- ❑ Troubleshoot technical problems and provide advice on resolution.
- ❑ Review specialized plans and clarify meaning.

Situation Unit

The Situation Unit Leader (SITL) is responsible for collecting, processing and organizing incident information relating to the growth, mitigation or intelligence activities taking place on the incident. The SITL may prepare future projections of incident growth, maps and intelligence information .

Situation Unit Leader Checklist
- ❑ Review common responsibilities.
- ❑ Begin collection and analysis of incident data as soon as possible.
- ❑ Prepare, post, or disseminate resources and situation status information as required, including special requests.
- ❑ Prepare Incident Status Summary Form (ICS 209).
- ❑ Provide photographic services and maps as required.
- ❑ Conduct situation briefings at the command and general staff meetings, tactics meeting, planning and operations briefing.
- ❑ Develop IAP.
- ❑ Maintain Situation Report Board for incident in the common area of the ICP for all responders to view.

Environment Unit

Responsible for environmental matters associated with the response, including strategic assessment, modeling, surveillance, sensitive area identification, and environmental monitoring and permitting.

Environment Unit Leader Checklist
- ❑ Review common responsibilities.
- ❑ Predict movement and dispersion of products.
- ❑ Provide clean up expertise.
- ❑ Engage specialists as needed (e.g., shoreline cleanup assessment, trajectory analysis, resources at risk and community air monitoring).
- ❑ Develop and review sampling plans, water and community air monitoring results.
- ❑ Review and recommend alternative technologies as identified in ACP.
- ❑ Work with LNO to establish advisory meetings as needed.
- ❑ State and Federal Natural Resource Trustees will also assess NRDA impacts, an Enbridge NRDA Manager will want to monitor Trustee activity to determine concerns and document Trustee sample and documentation activities .
- ❑ Notify Operations of any potential water intake impacts

Planning Section Roles 2.4.1.5f

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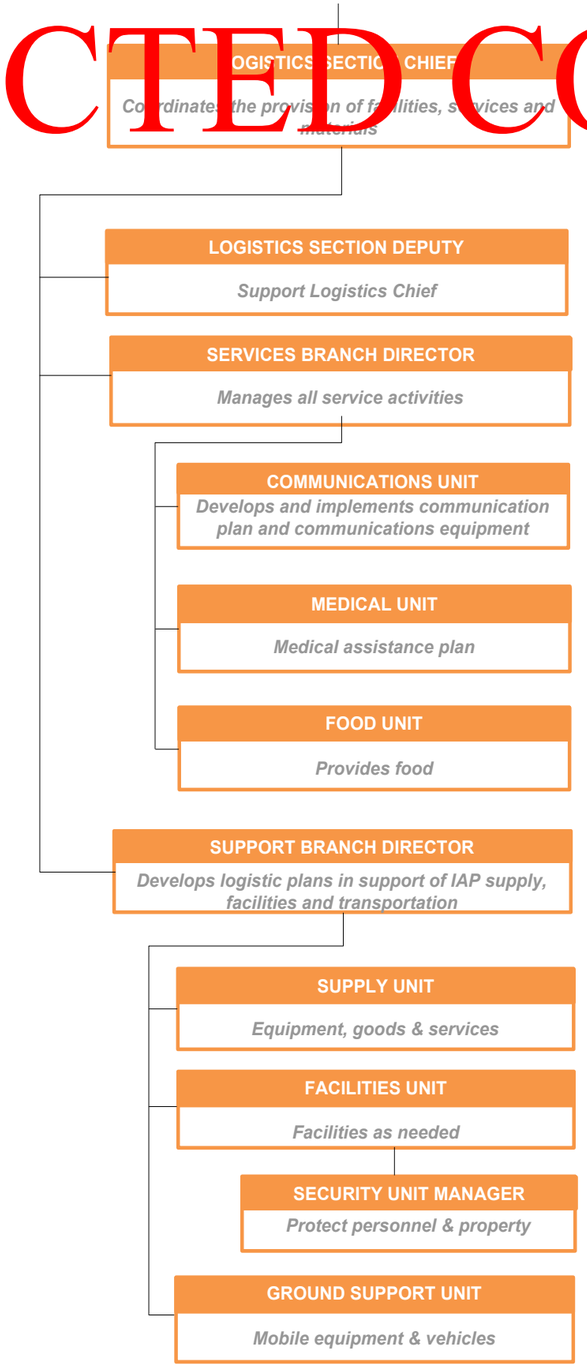

All activities must be documented at all Levels of Emergency

Roles Common To All

Common Responsibilities Checklist

After initial notification and receiving your assignment:
- ❑ Review job assignment (e.g., Strike Team designation, position, etc.).
- ❑ Receive brief overview of type and magnitude of incident.
- ❑ Receive resource order number and request number.
- ❑ Receive reporting location & time.
- ❑ Receive travel instructions.
- ❑ Receive any special communications instructions (e.g., travel, radio frequency).
- ❑ Monitor incident related information from media, internet, etc., if available.
- ❑ Assess personal equipment readiness for specific incident and climate (e.g. medications, money, computer, medical record, etc.).
- ❑ Maintain a checklist of items and if possible a personal Go-Kit.
- ❑ Inform others as to where you are going and how to contact you.
- ❑ Review Incident Management Handbook (IMH).
- ❑ Take advantage of available travel to rest prior to arrival. Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations:
- ❑ Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.
- ❑ If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
- ❑ Receive briefing from immediate supervisor.
- ❑ Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
- ❑ Acquire work materials.
- ❑ Abide by organizational code of ethics.
- ❑ Participate in IMT meetings and briefings, as appropriate.
- ❑ Document information and key actions.
- ❑ Ensure compliance with all safety practices and procedures. Report unsafe conditions to the SOFR.
- ❑ Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
- ❑ Organize and brief subordinates.
- ❑ The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
- ❑ Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.
- ❑ Use clear text and ICS/UC terminology (no codes) in all radio communications.
- ❑ Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
- ❑ Ensure all equipment is operational prior to each work period.
- ❑ Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
- ❑ Respond to demobilization orders and brief subordinates regarding demobilization.
- ❑ Prepare personal belongings for demobilization.
- ❑ Return all assigned equipment to appropriate location.
- ❑ Complete Demobilization check-out process before returning to home base.
- ❑ Participate in After-Action activities as directed.
- ❑ Carry out all assignments as directed.
- ❑ Maintain Individual/Activity Log (ICS 214a).

Logistics Section Chief

The LSC, a member of the General Staff, is responsible for providing personnel, facilities, services, and material in support of the incident. The LSC participates in the development and implementation of the IAP and activates and supervises the Branches and Units within the Logistics Section.

The LSC may have Deputy LSCs. The Deputy LSC must have the same qualifications as the person for whom they work, as they must be ready to take over that position at any time.
- ❑ Review common responsibilities.
- ❑ Plan the organization of the Logistics Section.
- ❑ Assign work locations and preliminary work tasks to section personnel.
- ❑ Notify the Resources Unit of the Logistics Section Units activated, including names and locations of assigned personnel.
- ❑ Assemble and brief Logistics Branch Directors and Unit Leaders.
- ❑ Determine and supply immediate incident resource and facility needs.
- ❑ In conjunction with Command, develop and advise all Sections of the resource approval and requesting process (ICS 213RR).
- ❑ Attend tactics meeting. Review proposed tactics for upcoming operational period for ability to provide resources and logistical support.
- ❑ Identify long-term service and support requirements for planned and expected operations.
- ❑ Advise Command and other Section Chiefs on resource availability to support incident needs.
- ❑ Develop the Communications Plan, Medical Plan and Traffic Plan.
- ❑ Identify resource needs for incident contingencies.
- ❑ Coordinate and process requests for additional resources.
- ❑ Track resource effectiveness and make necessary adjustments.
- ❑ Advise on current service and support capabilities.
- ❑ Develop recommended list of Section resources to be demobilized and initiate recommendation for release when appropriate.
- ❑ Receive and implement applicable portions of the Incident Demobilization Plan.
- ❑ Determine and supply long term incident resources and facility needs.
- ❑ Ensure the general welfare and safety of Logistics Section personnel.

Logistics Section Deputy

The Logistics Section Deputy may assume responsibility for a specific portion of the primary position (listed below) , work as relief, or be assigned other tasks. The Deputy should always be as qualified to make decisions and manage the incident as the Logistics Section Chief.
- ❑ Review common responsibilities.
- ❑ Plan the organization of the Logistics Section.
- ❑ Assign work locations and preliminary work tasks to section personnel.
- ❑ Notify the Resources Unit of the Logistics Section Units activated, including names and locations of assigned personnel.
- ❑ Assemble and brief Logistics Branch Directors and Unit Leaders.
- ❑ Determine and supply immediate incident resource and facility needs.
- ❑ In conjunction with Command, develop and advise all Sections of the resource approval and requesting process (ICS 213RR).
- ❑ Attend tactics meeting. Review proposed tactics for upcoming operational period for ability to provide resources and logistical support.

Logistics Section Deputy *continued*

- ❑ Identify long-term service and support requirements for planned and expected operations.
- ❑ Advise Command and other Section Chiefs on resource availability to support incident needs.
- ❑ Develop the Communications Plan, Medical Plan and Traffic Plan.
- ❑ Identify resource needs for incident contingencies.
- ❑ Coordinate and process requests for additional resources.
- ❑ Track resource effectiveness and make necessary adjustments.
- ❑ Advise on current service and support capabilities.
- ❑ Develop recommended list of Section resources to be demobilized and initiate recommendation for release when appropriate.
- ❑ Receive and implement applicable portions of the Incident Demobilization Plan.
- ❑ Determine and supply long term incident resources and facility needs.
- ❑ Ensure the general welfare and safety of Logistics Section personnel.

Service Branch Director

Responsible for the management of all service activities (Communications, Medical and Food Units) at the incident.
- ❑ Review common responsibilities.
- ❑ Obtain work materials.
- ❑ Determine level of service required to support operations.
- ❑ Participate in planning meetings of Logistics Sections personnel.
- ❑ Review IAP.
- ❑ Organize and prepare assignment for service branch personnel.
- ❑ Coordinate activities of branch units.
- ❑ Inform the LSC of branch activities.
- ❑ Resolve service branch problems.

Communications Unit

The Communications Unit Leader is responsible for developing plans for the effective use of incident communications equipment and facilities; installing and testing of communications equipment; supervision of the Incident Communications Center; distribution of communications equipment to incident personnel; and the maintenance and repair of communications equipment.
- ❑ Review common responsibilities.
- ❑ Review unit lead responsibilities.
- ❑ Determine unit personnel needs.
- ❑ Prepare and implement the radio communication plan (ICS 205).
- ❑ Ensure a communications center is established if needed.
- ❑ Establish appropriate communications distribution/ maintenance location at the incident site.
- ❑ Provide technical information as required on:
  - ❑ Adequacy of communication systems currently in operation.
  - ❑ Geographic limitation on communication systems.
  - ❑ Equipment capabilities/limitations.
  - ❑ Amount and types of equipment available.
  - ❑ Anticipated problems in the use of communications equipment.
- ❑ Supervise communications unit services.
- ❑ Maintain records on all communications equipment as appropriate.
- ❑ Ensure equipment is tested and repaired.
- ❑ Recover equipment from units being demobilized.

Medical Unit

The Medical Unit Leader (MEDL) is primarily responsible for; 1) development of the Medical Plan, 2) providing medical care and overseeing health aspects of response personnel, 3) obtaining medical aid and transportation for injured and ill incident personnel, 4) coordinating with other functions to resolve health and safety issues, and 5) preparation of reports and records

Review Common Responsibilities
- ❑ Review Unit Leader Responsibilities.
- ❑ Participate in Logistics Section/Service Branch planning activities.
- ❑ Establish the Medical Unit.
- ❑ Prepare the Medical Plan (ICS 206).
- ❑ Provide any relevant medical input into the planning process for strategy development.
- ❑ Coordinate with Safety Officer, Operations, hazmat specialists, and others on proper personnel protection procedures for incident personnel.
- ❑ Prepare procedures for major medical emergency.
- ❑ Develop transportation routes and methods for injured incident personnel.
- ❑ Ensure incident personnel patients are tracked as they move from origin, care Facility and disposition.
- ❑ Provide continuity of medical care for incident personnel.
- ❑ Declare major medical emergency as appropriate.
- ❑ Provide or oversee medical and rehab care delivered to incident personnel.
- ❑ Monitor health aspects of incident personnel including excessive incident stress.
- ❑ Respond to requests for medical aid, medical transportation and medical supplies.
- ❑ In conjunction with Finance/Admin Section, prepare and submit necessary authorizations, reports and administrative documentation related to injuries, compensation or death of incident personnel.
- ❑ Coordinate personnel and mortuary affairs for incident personnel fatalities.
- ❑ Provide oversight and liaison as necessary for incident victims among emergency medical care, medical examiner and hospital care.
- ❑ Provide for security and proper disposition of incident medical records.

Food Unit

Responsible for supplying the food needs for the entire incident, including all remote locations and providing food for personnel unable to leave their tactical field assignments. Supervises Communications, Medical and Food Units.
- ❑ Determine method of feeding to best fit each facility or situation.
- ❑ Obtain necessary equipment and supplies and establish cooking facilities.
- ❑ Ensure that well-balanced menus are provided.
- ❑ Maintain food service areas, ensuring that all appropriate health and safety measures are being followed.
- ❑ Supervise caterers, cooks, and other Food Unit personnel as appropriate.

Support Branch Director

Responsible for development of logistic plans in support of IAP supply, facilities and transportation.
- ❑ Review common responsibilities.
- ❑ Obtain work materials.
- ❑ Determine initial support operations in coordination with the LSC and service branch.
- ❑ Prepare initial organization and assignments for support operations.
- ❑ Assemble and brief support branch personnel.

Support Branch Director *continued*

- ❑ Prepare Security, Transportation, Traffic routing plans as required by the incident.
- ❑ Determine if assigned branch resources are sufficient.
- ❑ Maintain surveillance of assigned units work progress and inform the LSC of these activities.
- ❑ Resolve problems associated with requests from the Operations Section.

Supply Unit

The Supply Unit Leader (SPUL) is primarily responsible for procuring all resources (personnel, equipment and supplies) for the incident. If not conducted by the Staging Area Manager(s), the SPUL is also responsible for receiving, storing and distributing all supplies; maintaining an inventory of supplies; and storing, disbursing and servicing non-expendable supplies and equipment.
- ❑ Review Common Responsibilities.
- ❑ Review Unit Leader Responsibilities.
- ❑ Participate in Logistics Section/Support Branch planning activities.
- ❑ Determine the type and amount of resources en route to the incident.
- ❑ Review the IAP for information on operations of the Supply Unit.
- ❑ Develop and implement safety and security requirements for equipment/supplies storage areas/facilities.
- ❑ Order, receive, distribute and store supplies and equipment.
- ❑ Receive and respond to requests for personnel, supplies and equipment.
- ❑ Maintain an inventory of supplies and equipment.
- ❑ Prepare ICS 210 Change Status forms if equipment or other significant resources are deployed from storage areas.
- ❑ Service reusable equipment.
- ❑ Submit reports to the SUBD.

Ground Support Unit

The Ground Support Unit Leader (GSUL) is responsible for: 1) maintaining tactical equipment, vehicles, mobile ground support equipment, 2) providing fueling services, 3) transportation of personnel, supplies, food and equipment, 4) recording equipment usage time, including contract equipment assigned to the incident, and 5) implementing the Transportation Plan for the incident.
- ❑ Review Unit Leader Responsibilities
- ❑ Participate in Support Branch/Logistics Section planning activities.
- ❑ Develop and implement the Transportation Plan.
- ❑ Notify the Resource Unit of all status changes (ICS Form 210) on support and transportation vehicles.
- ❑ Arrange for and activate fueling, maintenance and repair of ground resources.
- ❑ Maintain inventory of support and transportation vehicles, establish file to record daily equipment use and communicate to Finance Section Chief.
- ❑ Provide transportation services in association with requests from the Logistics Section Chief.
- ❑ Collect use information on rented equipment.
- ❑ Requisition maintenance and repair supplies, e.g., fuel, spare parts.
- ❑ Maintain incident roads.
- ❑ Submit reports to Support Branch Director as directed.

Facilities Unit

The FACL is primarily responsible for the set up, maintenance and demobilization of incident facilities, e.g., Base, ICP and Staging Areas, as well as security services required to support incident operations. The FACL provides sleeping and sanitation facilities for incident personnel and manages Base operations. Each facility is assigned a manager who reports to the FACL and is responsible for managing the operation of the facility. The FACL reports to the SUBD.
- ❑ Review Unit Leader Responsibilities.
- ❑ Obtain a briefing from the SUBD or the LSC.
- ❑ Receive and review a copy of the IAP.
- ❑ Participate in Logistics Section/Support Branch planning activities.
- ❑ In conjunction with the Finance Section, determine locations suitable for incident support facilities and secure permission to use through appropriate means.
- ❑ Inspect facilities prior to occupation and document conditions and preexisting damage and/or contamination.
- ❑ Determine requirements for each facility, including the ICP.
- ❑ Prepare layouts of incident facilities.
- ❑ Notify Unit Leaders of facility layout.
- ❑ Activate incident facilities.
- ❑ Provide sleeping facilities, security services, food and water service, sanitation and shower service, & facility maintenance services, e.g., sanitation, lighting, clean up, trash removal, etc.
- ❑ Inspect all facilities for damage and potential claims.
- ❑ Demobilize incident facilities.
- ❑ Establish/maintain a file to record daily equipment use and communicate (FSC).

Security Manager

The SECM is responsible for providing safeguards needed to protect personnel and property from loss or damage.
- ❑ Establish contacts with local law enforcement agencies, as required.
- ❑ Contact the Resource Use Specialist for crews or Agency Representatives to discuss any special custodial requirements that may affect operations.
- ❑ Request required personnel support to accomplish work assignments.
- ❑ Ensure security of classified material and/or systems.
- ❑ Ensure that support personnel are qualified to manage security problems.
- ❑ Develop Security Plan for incident facilities and adjust for personnel and equipment changes as necessary.
- ❑ Develop Traffic Plan for safely routing vehicle traffic around incident area, ICP, staging areas, etc. and work with local law enforcement to implement.
- ❑ Provide personnel to perform personnel and equipment check-in duties (ICS Forms 211p & e) at ICP, Staging Areas, Bases, etc. as requested and communicate to RESL.
- ❑ Coordinate security activities with appropriate incident personnel
- ❑ Keep the peace, prevent assaults and settle disputes with response agencies.
- ❑ Prevent theft of all company, contractor, government and personal property.
- ❑ Document all complaints and suspicious occurrences.

Logistics Section Roles 2.4.1.5g

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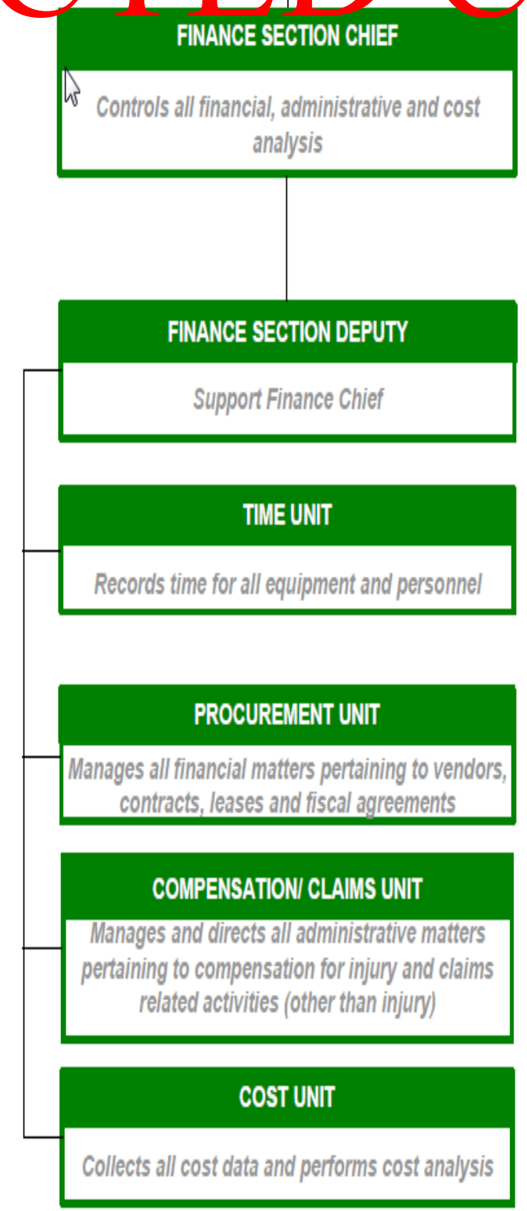

Roles Common To All

Common Responsibilities Checklist

After initial notification and receiving your assignment:

- ❑ Review job assignment (e.g., Strike Team designation, position, etc.).
- ❑ Receive brief overview of type and magnitude of incident.
- ❑ Receive resource order number and request number.
- ❑ Receive reporting location & time.
- ❑ Receive travel instructions.
- ❑ Receive any special communications instructions (e.g., travel, radio frequency).
- ❑ Monitor incident related information from media, internet, etc., if available.
- ❑ Assess personal equipment readiness for specific incident and climate (e.g. medications, money, computer, medical record, etc.).
- ❑ Maintain a checklist of items and if possible a personal Go-Kit.
- ❑ Inform others as to where you are going and how to contact you.
- ❑ Review Incident Management Handbook (IMH).
- ❑ Take advantage of available travel to rest prior to arrival. Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations:
- ❑ Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.
- ❑ If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.
- ❑ Receive briefing from immediate supervisor.
- ❑ Agency Representatives from assisting or cooperating agencies report to the LNO at the Incident Command Post after check-in.
- ❑ Acquire work materials.
- ❑ Abide by organizational code of ethics.
- ❑ Participate in IMT meetings and briefings, as appropriate.
- ❑ Document information and key actions.
- ❑ Ensure compliance with all safety practices and procedures. Report unsafe conditions to the SOFR.
- ❑ Supervisors shall maintain accountability for their assigned personnel with regard as to exact location(s) and personal safety and welfare at all times, especially when working in or around incident operations.
- ❑ Organize and brief subordinates.
- ❑ The Command Staff and General Staff shall ensure branches are identified, set up and allocate divisions and groups within them to stay within the recommended span of control (1 Supervisor per 4-7 people).
- ❑ Know your assigned communication methods and procedures for your area of responsibility and ensure that communication equipment is operating properly.
- ❑ Use clear text and ICS/UC terminology (no codes) in all radio communications.
- ❑ Complete forms and reports required of the assigned position and ensure proper disposition of incident documentation as directed by the Documentation Unit Leader (DOCL).
- ❑ Ensure all equipment is operational prior to each work period.
- ❑ Report any signs/symptoms of extended incident stress, injury, fatigue or illness for yourself or coworkers to your supervisor.
- ❑ Respond to demobilization orders and brief subordinates regarding demobilization.
- ❑ Prepare personal belongings for demobilization.
- ❑ Return all assigned equipment to appropriate location.
- ❑ Complete Demobilization check-out process before returning to home base.
- ❑ Participate in After-Action activities as directed.
- ❑ Carry out all assignments as directed.
- ❑ Maintain Individual/Activity Log (ICS 214a).

Finance Section Chief

The FSC, a member of the General Staff, is responsible for all financial, administrative and cost analysis aspects of the incident and for supervising members of the Finance/Admin Section. The FSC may have a Deputy FSC. The Deputy FSC must have the same qualifications as the person for whom they work as they must be ready to take over that position at any time.

Finance Section Chief Checklist

- ❑ Review common responsibilities.
- ❑ Participate in incident planning meetings and briefings as required.
- ❑ Review operational plans and provide alternatives where financially appropriate.
- ❑ Manage all financial aspects of an incident.
- ❑ Provide financial and cost analysis information as requested.
- ❑ Gather pertinent information from briefings with responsible agencies.
- ❑ Develop an operating plan for the Finance/Admin Section; fill supply and support needs.
- ❑ Meet with assisting and cooperating Agency Representatives, as needed.
- ❑ Maintain daily contact with agency(s) administrative headquarters on Finance/Admin matters.
- ❑ Ensure that all personnel time records are accurately completed and transmitted to home agencies, according to policy.
- ❑ Provide financial input to demobilization planning.
- ❑ Ensure that all obligation documents initiated at the incident are properly prepared and completed.
- ❑ Brief agency administrative personnel on all incident-related financial issues needing attention or follow-up prior to leaving incident.
- ❑ Develop recommended list of section resources to be demobilized and initial recommendation for release when appropriate.
- ❑ Receive and implement applicable portions of the Incident Demobilization Plan.

Finance Section Deputy

The Finance Section Deputy may assume responsibility for a specific portion of the primary position listed below) ; work as relief, or be assigned other tasks. The Deputy should always be as qualified to make decisions and manage the incident as the Finance Section Chief.

Finance Section Deputy Checklist

- ❑ Review common responsibilities.
- ❑ Participate in incident planning meetings and briefings as required.
- ❑ Review operational plans and provide alternatives where financially appropriate.
- ❑ Manage all financial aspects of an incident.
- ❑ Provide financial and cost analysis information as requested.
- ❑ Gather pertinent information from briefings with responsible agencies.
- ❑ Develop an operating plan for the Finance/Admin Section; fill supply and support needs.
- ❑ Meet with assisting and cooperating Agency Representatives, as needed.
- ❑ Maintain daily contact with agency(s) administrative headquarters on Finance/Admin matters.
- ❑ Ensure that all personnel time records are accurately completed and transmitted to home agencies, according to policy.
- ❑ Provide financial input to demobilization planning.
- ❑ Ensure that all obligation documents initiated at the incident are properly prepared and completed.
- ❑ Brief agency administrative personnel on all incident-related financial issues needing attention or follow-up prior to leaving incident.
- ❑ Develop recommended list of section resources to be demobilized and initial recommendation for release when appropriate.
- ❑ Receive and implement applicable portions of the Incident Demobilization Plan.

Time Unit

The Time Unit is responsible for ensuring the accurate recording of daily personnel time, compliance with specific agency time recording policies and managing commissary operations if established at the incident.

- Record daily personnel time, ensure compliance with specific agency time recording policies, and manage commissary operations if established at the incident.
- ❑ Submit cost estimate data forms to Cost Unit as required.
- ❑ Ensure that all records are current and complete prior to demobilization.

Time Unit Leader Checklist

- ❑ Review common responsibilities.
- ❑ Track the time of all personnel on site. (ICS 211P)

Procurement Unit

Responsible for managing all financial matters pertaining to vendors, contracts, leases and fiscal agreements.

Procurement Unit Leader Checklist

- ❑ Review common responsibilities.
- ❑ Review incident needs and any special procedures with unit leaders, as needed.
- ❑ Coordinate with local jurisdiction on plans and supply sources.
- ❑ Develop a procurement plan.
- ❑ Prepare and authorize contracts and agreements with supply vendors.
- ❑ Interpret contracts and agreements.
- ❑ Coordinate with the compensation claims unit for processing claims.
- ❑ Coordinate cost data in contracts with the cost unit leader.
- ❑ Brief the FSC on current problems and recommendations, outstanding issues and follow-up requirements.

Compensation/Claims Unit

Responsible for the overall management and direction of all administrative matters pertaining to compensation for injury and claims related activities (other than injury) for an incident.

Compensation/Claims Unit Leader Checklist

- ❑ Review common responsibilities.
- ❑ Review Unit Leader Responsibilities.
- ❑ Obtain briefing from Finance Section Chief.
- ❑ Establish contact with the Incident Medical Unit, Safety Officer and Liaison officer (or Agency Representatives if no LNO is assigned).
- ❑ Determine the need for compensation for injury and claims specialists and order personnel as needed.
- ❑ Review medical plan (ICS 206).
- ❑ Ensure that compensation/claims specialists have adequate workspace and supplies.
- ❑ Brief the Claims Specialists on incident activity.
- ❑ Review and coordinate procedures for handing claims with the procurement unit.
- ❑ Periodically review logs and forms produced by specialists to ensure that they are complete.
- ❑ If applicable, ensure that all compensation for injury and claims logs and forms are completed.
- ❑ Develop process for managing community claims.
- ❑ Brief FSC on unit status and activity.
- ❑ Demobilization unit in accordance the plan.

Cost Unit

The Cost Unit provides all incident cost analysis. It ensures the proper identification of all equipment and personnel requiring payment; records all cost data; analyzes and prepares estimates of incident costs; and maintains accurate records of incident costs.

- ❑ Collect and evaluate cost data to establish an accurate picture of the incident costs.
- ❑ Create cost summaries, cost estimates, and cost saving recommendations.
- ❑ Prepare resources-use cost estimates for the Planning Section.
- ❑ Identify all equipment and personnel requiring payment.

Cost Unit Leader Checklist

- ❑ Review common responsibilities.
- ❑ Obtain a briefing from the FSC.
- ❑ Coordinate with FSC on cost reporting procedures.
- ❑ Collect and record all cost data.
- ❑ Develop incident cost summaries.
- ❑ Prepare resources- use cost estimates for the planning section.
- ❑ Ensure all cost documents are accurately prepared.
- ❑ Complete all records prior to demobilizations.
- ❑ Provide reports to the FSC.

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2.4.1.6 Incident Command Posts

Centralize communications between Company emergency response personnel and external response agencies at the Incident Command Post.

The Operations Section Chief and IC, or designate, are responsible for selecting the location of the Incident Command Post based on factors such as wind direction, areas of high ground and site access. The potential for plume development/migration, explosion and toxic effects of a spill must be taken into account.

Locate the Incident Command Post:

- In the cold zone, e.g. a minimum of 90 m from a product release site or 800 m from a Natural Gas Liquids ("NGL") release site, or
- As determined by the IC or designate

Check wind direction frequently to ensure wind shifts do not compromise the safety of the Incident Command Post site.

If a vapor cloud is present or imminent, adapt the location of the Incident Command Post to the specific circumstances of the emergency. For example:

- In isolated areas, it may be more appropriate to locate the Incident Command Post several miles from the emergency site.
- In populated areas, it may be more appropriate to locate the Incident Command Post close to the emergency site.

For evolving incidents, the Incident Command Post may need to be moved to allow for expanding activities. This may include moving to a community center, hotel conference room or other location at the decision of the IC.

The Incident Command Post must be clearly illuminated and identified by signage at the emergency site entrance (or just inside), visible to all entering the site. The Incident Command Post must be attended at all times.

Incident Command Post personnel must maintain periodic contact with anyone entering the site alone (e.g., to shut off valves, survey the area, evacuate the public).

The ICS 208 Site Safety Plan must be posted on the situation status board at the Incident Command Post that identifies alert procedures, protective zones, evacuation routes and assembly.
Facilities required for oil spill response typically include:

- Staging sites;
- Decontamination and temporary waste handling sites;
- Accommodations; and
- Incident Command Post.

The Incident Command Post will be the initial spill response management command post for assessing the incident and communicating with the FRT and the IMT. Each operational plan (pipeline, terminal, marine) will identify pre-designated primary Incident Command Post facilities and their locations, and options for other field Incident Command Posts.

Each primary Incident Command Post will have the following minimum materials:

- Maps (sensitivity and operational atlases, Control Point tactical plans, geographical response plans;
- Situation status boards;
- Spill response plans (the operational General Oil Spill Response Plan and corresponding operational plan); and
- Communications systems, including radio, internet and telephone.

Depending on the complexity of response and the amount of resources, personnel and management required, multiple or expanded facilities may be required.

During a major incident, the FRT, IMT and participating government agencies would require a formal external communications plan and team. The JIC would provide the venue for all key representatives in the response to prepare messages and communications for external parties jointly. The JIC is generally located away from the Incident Command Post but sufficiently near the center of activity. External affairs and press officers will be appointed to the JIC, so that all messages will be approved by the Incident Command Post before being issued.

Depending on the scale of the emergency, a Forward Operating Base (FOB) may be established to support tactical operations. Typically a FOB is not located near the Incident Command Post as it's used to support tactical operations. The base may be used for an extended time period and is support by the Incident Command Center.

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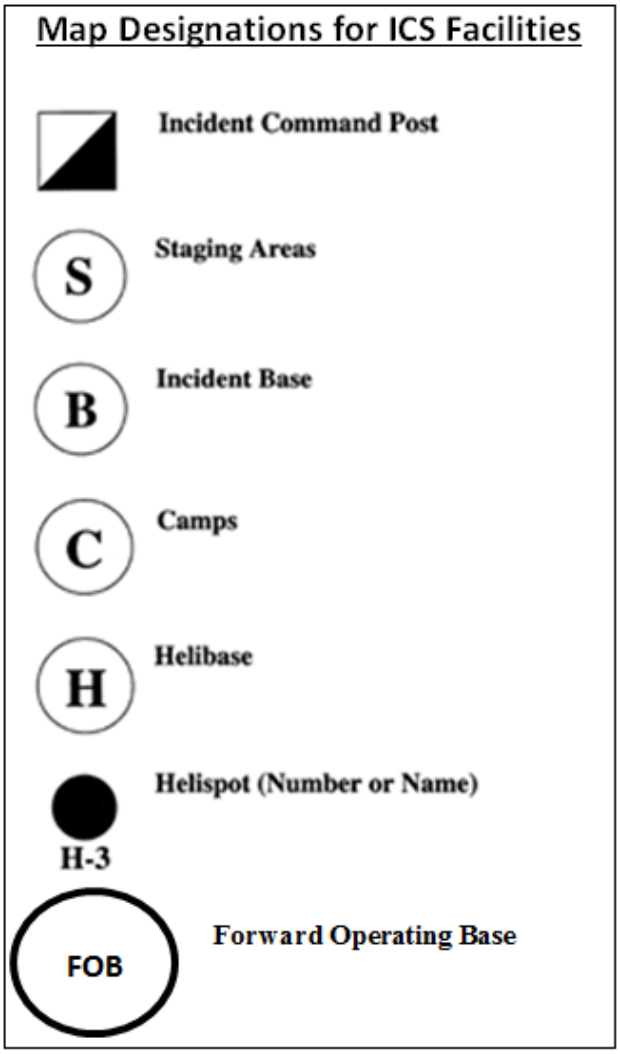

2.4.1.7 Expanding Incidents / Unified Command

When an emergency crosses geographic areas, political boundaries or government departments, the IC may establish a unified command group that includes a representative from each jurisdiction (Federal, Provincial/State and local).

Depending upon the response situation and needs, the IMT may add specialized personnel, contractors and consultants to:

- Provide advice on operations and technical issues.
- Help in planning meetings.
- Interface with provincial and federal authorities, as needed.

The IMT will be responsible for:

- Safety
- Spill source control
- Community interface
- Wildlife activities
- Recovered material disposal
- Contract variations and business controls
- The overall management of the clean-up
- Corporate communications.

In the U.S., Federal and State agencies have the authority to exercise overall responsibility during a response. The designated federal monitoring officer monitors response operations undertaken by the IMT.

The environmental authority may recommend environmental priorities and provides expert environmental advice and services to the federal monitoring officer for review. The federal monitoring officer then passes this advice to the IC. The advice may cover a broad range of environmental matters, including:

- Weather conditions
- Spill fate and effects
- Sensitive areas.

Joint command may be established with a representative for the province/state working with the IC to establish response objectives and to approve incident action plans.

In the U.S., a Federal On-Scene Coordinator (“FOSC”) or a State On-Scene Coordinators (SOSC) may be designated by the Environmental Protection Agency or by the United States Coast Guard may support an emergency. FOSC’s are responsible for providing access to federal resources, technical assistance, coordinates, monitors or directs response efforts and serves as the point of contact for all federal efforts related to the emergency. SOSC’s essentially provide the same type of assistance but from a State perspective, not Federal.

When federal and/or state agencies arrive on-scene to participate in managing a response action, the agencies and Enbridge will utilize a Unified Command structure to jointly manage the spill incident. In the Unified Command, decisions with regard to the response will be made by consensus and documented through a single IAP for each operational period. When a consensus cannot be reached, the FOSC has the ultimate decision-making authority under the National Contingency Plan ("NCP"). If in the rare occurrence this happens, the circumstances surrounding this action will be clearly documented in the IAP.

2.4.2 Site Security and Control

Security is necessary to protect the public and responders, prevent any additional damage due to sabotage, protect the equipment, and eliminate congestion at the work site due to unauthorized personnel. If there is a security incident, the Regional Emergency Response Coordinator should be notified.

The priority of all Enbridge personnel in any emergency is protecting the public and responders. The public will be prevented access to an emergency site while there is any danger of explosion, fire, hazardous vapors, or other hazardous condition.

For example:

- Routes into the emergency site will be sealed off and a security perimeter established.
- Local police will be contacted to set up road blocks at all access points as applicable.
- Employees/contractors, police and/or security personnel can be used as well as physical barriers (e.g. barricades and reflective tape) to control access to hazardous areas.

Security measures need to be established early in the incident to provide the following:	
✓	Protect personnel from loss or damage and assets
✓	Ensure the safety of the general public
✓	Establish a perimeter (zone of safety) around the spill area
✓	Ensure the general public does not interfere with the spill response and clean-up operations
✓	Ensure access for personnel and equipment to the access point, staging area and Incident Command Post

To ensure adequate security and depending on applicability, consider the following:

- Contact Enterprise Security.
- Contact the Company contracted security service.
- Request the assistance from the authority having jurisdiction and/or fire department to limit highway access to the spill scene by:
  - Setting up road blocks and beach closures where necessary to secure a safety zone.
  - Providing escort and access for spill response personnel and equipment, as needed.

- Request assistance from local security firms to assist federal, provincial/state and local police departments and expand area of coverage at the scene.
- Establish a pass system and distribute prepared security passes to those who need to enter the site, as applicable.
- Request the Federal Aviation Administration ("FAA") or Transport Canada to restrict air space over the spill area, as applicable.
- Request the U.S. or Canadian Coast Guard to establish a safety zone in the spill area and that they limit access of all vessels not involved in the spill effort, as applicable.

2.4.3 Hazard-Specific Field Response Team Considerations

Enbridge uses an all hazards approach to mitigate and respond to a variety of hazards and threats. General procedures for response considerations listed below should still be applied where required.

2.4.3.1 Priorities

The Company will prudently over respond to any incident with priorities in the following order:

People
- Ensure safety of employees & contractors located in the field
- Ensure safety of staff located inside regional buildings
- Ensure safe of surrounding community
- Repair and restart assets

Environment
- Take mitigative action to prevent impacts of an incident

Assets
- Where possible protect company assets located on regional property; tanks, pipelines, equipment, vehicles, etc.

Reputation

2.4.3.2 Safety

- Conduct hazard assessment
- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)
- Consider your safety first, then the safety of others
- Stay out of hazard zone
- If performing recon, approach up wind, uphill, up stream
- Determine the immediate hot zone
- Ensure proper levels of PPE
- Ensure PPE is in line with Site Safety and Health Plans (SSHP)
- Establish site control (hot zone, warm zone, cold zone and security).

2.4.3.3 Notifications

- Follow Notification Procedures (Notification section of this plan A2)

2.4.3.4 Isolate And Deny Entry

- Evacuate the immediate area
- Deny entry to the immediate area
- Ask others to help deny entry into the area
- If on the scene, ask agency resources to help deny entry into immediate area

2.4.3.5 Command Management

- First Responders assumes the role of the Incident Commander until transfer of command occurs
- Make an announcement to everyone on scene that you have assumed Command
- Set up mobile Incident Command Post (ICP) trailer up wind, uphill and upstream of the incident in the cold zone
- Establish a Staging Area up wind, uphill and upstream of the incident in the cold zone
- Begin assigning ICS positions as per Regional Incident Management Team
- Meet and brief responding Agencies as they arrive at the ICP trailer
- Ensure Safety Officer begins and completes a Site Safety Plan

See section 2.4 for information on Enbridge's Response Management System

2.4.4 Hazard Specific Response Actions

Specific actions to mitigate and respond to following hazards are listed below:

2.4.4.1 Medical Emergencies

The three basic steps to follow in a medical emergency are as follows:

CHECK the person

- Does the person want your help? If the person is unable to answer, assume you have consent to give first aid
- Check the person's ABCs

CALL for assistance/additional resources

- If the person responds, find out if there is a need to call for additional help (e.g. 911, EMS)
- If the person does not respond, call for help.

CARE for life-threatening conditions first

- Reduce the risk of disease transmission by using protective equipment such as disposable gloves and a barrier device

2.4.4.2 Pipeline Release

In the event of a pipeline release carry out the following actions:

- CCO Notification
- Shut off flow
- Isolate leaking section of piping
- Notify Terminal Supervisor, Manager or designee
- Contain in a safe fashion
- Initiate spill containment (if outside containment area)
- Evacuate contents of line with suction pump or flush with water to remove remaining oil
- Block and purge affected equipment
- Initiate recovery/clean-up actions

2.4.4.3 Tank Failure

In the event of a tank failure carry out the following actions:

- CCO Notification
- Immediately stop work activity
- If safe, ensure dike drains are closed
- Notify Terminal Supervisor, Manager or designee
- Secure area
- Initiate response actions
- Shut off flow to tank
- Begin transfer of contents to other tankage.

2.4.4.4 Equipment Failure

In the event of equipment failure, carry out the following actions:

- Shut off the flow and transfer pumps. Close header & tank valves
- Notify Terminal Operations/Manager
- Evacuate the area as necessary
- Drain remaining contents to containment tanks
- Secure area if safe to do so
- Tighten leaky valve or fitting, if safe
- Initiate response actions

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On-Water Spill Surveillance Guidelines

- Spill surveillance should begin as soon as possible to aid response personnel with assessing spill size, movement and potential impact locations.
- Cloud shadows, sediment, floating organic matter, submerged sand banks, or wind-induced patterns on the water may resemble an oil slick if viewed from a distance.
- It is difficult to adequately observe oil on the water from a boat, dock or shoreline.
- Spill surveillance is best accomplished using helicopters or small planes. Helicopters are preferred due to their superior visibility and maneuverability characteristics.
- If fixed-wing planes are used, high wing types provide better visibility than low-wing types.
- Document all observations in writing and with photographs and/or videotapes.
- Describe the approximate oil slick dimensions based on available reference points (i.e. vessel, shoreline features, facilities, etc.). Use aircraft or vessel (if safe to do so) to traverse the length and width of the slick while timing each pass. Calculate the approximate size and area of the slick by multiplying speed and time.
- Record aerial observations on detailed maps.
- In the event of reduced visibility, such as dense fog or cloud cover, boats may be used for patrols and documenting the location and movements of the spill. Boats will only be used if safe conditions are present, including on-scene weather and product characteristics.
- Surveillance is also required during spill response operations in order to gauge effectiveness of response operations, to assist in locating skimmers and to continually assess size, movement and impact of spill.

Spill Volume Estimation & Methods

Early in a spill response, estimation of spill volume is required in order to:

- Report to agencies.
- Determine liquid recovery requirements.
- Assess manpower and equipment requirements.
- Determine disposal and interim storage requirements.
- In the event that actual spill volumes are not available, it may be necessary to estimate this volume (see flowchart)

Initial Estimates:

If available, information provided from the control center can be used to provide an initial estimate of the spill volume. The volume released should match the change in a cutoff inventory measurement.

Tanks:

If the leak source can be isolated to a tank, an initial leak volume estimate can be determined as:

Volume = the change in height of the tank x the volume per inch as found on the tank strapping table

Mainline Releases - An initial release volume can be calculated as:

Volume = (the mainline flow rate x the time to isolate) + the volume of drain-up from the release site to the next high point in the line

The volume release estimate can be verified by the mismatch in injection and delivery flow meters or tank volume change. In systems where ATMOS pipe is used for leak detection (i.e. gathering system), the estimated leak size is available in the user screen.

Land:

The following is a list of possible tools that can assist with determining a spill volume on land.

Transportation Spill to Land Estimation Tool
SCADA (Control Center calculation)
Tank Data Program

Leak on Land - Field Measurement:

To estimate the volume of a spill in a field location, the spill is segmented to a summation of area calculations. The volume of each area is calculated as the length x the width x the depth.

Conversions:

1 m3 = 6.29 bbls 1 ft3 = 0.178 bbls

1 in = 0.0254 meters 1inch = 0.0833 ft.

Water

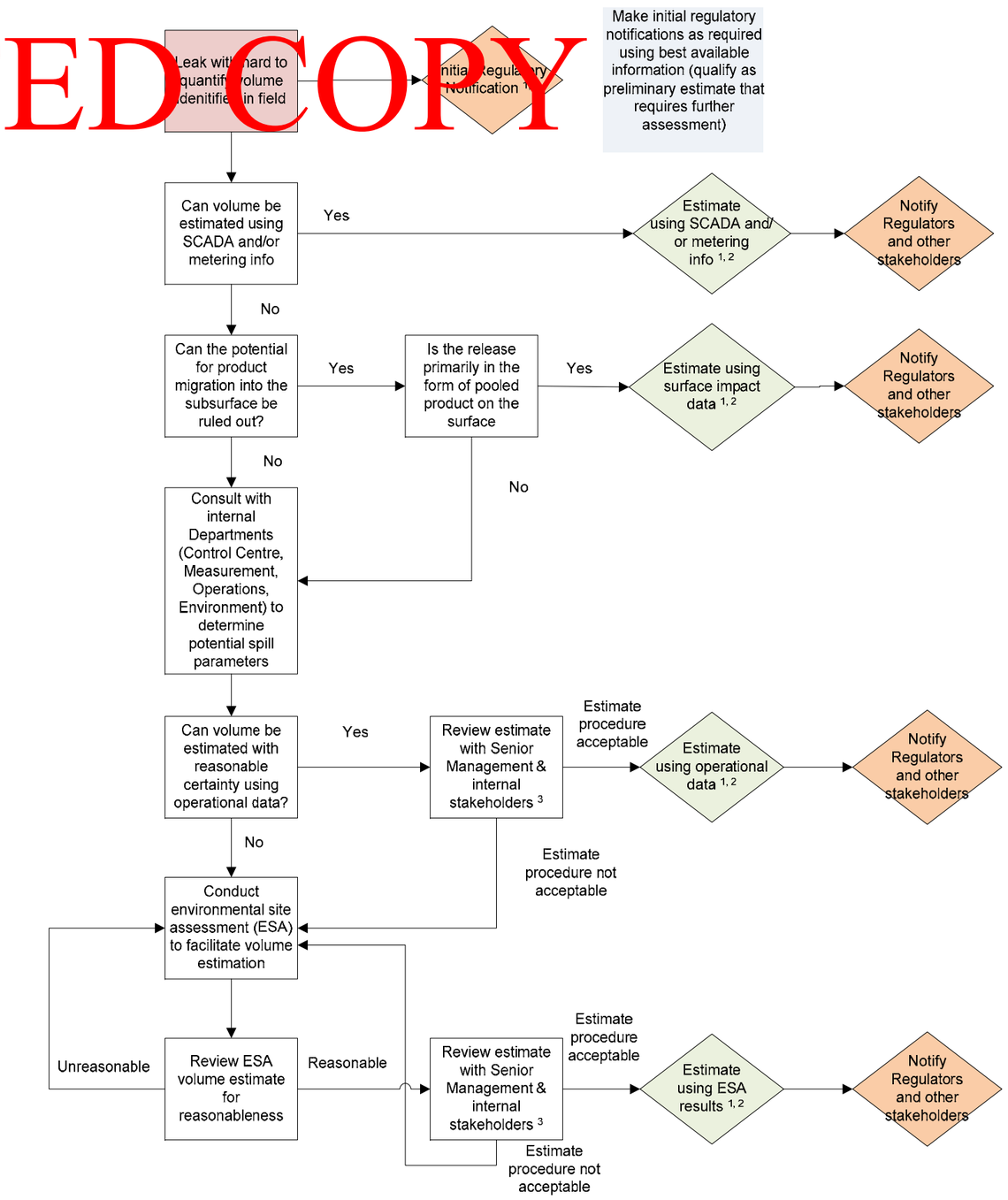
Visual observation and calibration with the A.P.I. Task Force on Oil Spill Cleanup, Committee for Air and Water Conservation's Spill Size Estimation Matrix Table. Methods which can be used to determine size and volume of a spill include, but are not limited to:

Vessel / line capacity formulas
Infra-red thermal imaging

Leak on Water - Visual Observation:

Using only visual observation to obtain an accurate volume estimate for a product on water is improbable. When possible, the estimate should be based on one of the above methods (i.e. tank or mainline release calculations with Control Center input). The National Oceanic and Atmospheric Administration (NOAA) does provide a job aid to assist with visually estimating the volume of a release on water, but it is more suitably used to subjectively characterize and describe the spill. It may be found at: http://response.restoration.noaa.gov/oil-and-chemical-spills/oil-spills/resources/open-water-oil-identification-job-aid.html

Volume Estimates Flowchart



Notes:

1. Estimates must take uncertainties (such as extent of subsurface contamination, duration of leak, etc) into account.
2. In situations where there are significant uncertainties, it is preferable to estimate using a range (low case, likely case, and high case).
3. Internal stakeholders typically include Operations, Public & Government Affairs, Environment and Law.

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Estimating Spill Trajectories

Oil spill/NGL trajectories may initially be estimated in order to predict direction and speed of the slick movement. Trajectory calculations provide an estimate of where oil slicks may impact shorelines and other sensitive areas and provide an estimate of the most likely locations for protection, containment and recovery.

The following method may be used to predict spill movement:

- Computer trajectory modeling programs (including but not limited to):
  - World Oil Spill Model (WOSM)
  - OilMap
  - General NOAA Oil Modeling Environment (GNOME)

The Company will utilize internal subject matter leads (SML) with consultants as necessary to perform trajectory analysis and fate & effect

Input variables for proper modeling include, but are not limited to: · Spill location, volume, and time of spill. • Nature of the spill - continuous or single incident • Wind speed & direction. • Water movement (current) speed & direction. • Water temperature. • Atmospheric temperature. • Characteristics of spilled material	This information can be obtained from many sources, including but not limited to: · Reports from personnel at the spill site. • Commercial weather services. • NOAA. • Internal company databases. • Oil Map software.

Product Volume Tracking

An estimate of the amount of product recovered. In order to provide relevant information, a uniform procedure for sampling, analyzing and calculating the amount of product recovered from remediation activities at the release location should be established for the site.

Product volume tracking requires identification of each waste stream. Examples of typical waste streams from an oil release include:

- Soil and/or sediment impacted by the hydrocarbon product (hazardous and non-hazardous)
- Debris (e.g. impacted sorbents, boom, pads, plastic, PPE, vegetation)
- Water (hazardous and non-hazardous)

A sampling protocol will be established for each waste stream and will include:

- Number of samples required per volume of waste generated
- Laboratory analysis required
- Data reporting requirements

In the case of a crude oil release, the data provided by the waste stream disposal contractors (e.g. volumes converted to mass) and the validated analytical results (Oil and Grease in mg/kg) may be used as a basis to calculate the amount of crude oil recovered per waste load. These calculations will be maintained in a "Daily Waste Load Summary" spreadsheet.

Oil Volume Calculation Table

Visual Color

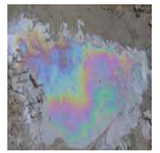
	Sheen (Silver Grey)	Rainbow	Metallic	Transitional	Dark (or True) Color		Sheen (Silver Grey)	Rainbow	Metallic	Transitional	Dark (or True) Color
											
	Sheen (Silver/Grey)	**Rainbow**	**Metallic**	**Transitional**	**Dark (or True)**		**Sheen (Silver/Grey)**	**Rainbow**	**Metallic**	**Transitional**	**Dark (or True) Color**
Approximate Thickness	0.04 to 0.3 um	0.3 to 5.0 um	5.0 to 50 um	50 to 200 um	>200 um	Approximate Thickness	1.6×10^{-5} to 1.2×10^{-5} inches	1.2×10^{-5} to 2.0×10^{-5} inches	2.0×10^{-4} to 2.0×10^{-3} inches	2.0×10^{-5} to 1.2×10^{-5} inches	8×10^{-3} inches
Area	**Volume (liters)**					**Area**	**Volume (gallons)**				
100 m2	0.004 to 0.03	0.03 to 0.5	0.5 to 5	5 to 20	>20	100 yd^2	0.003 to 0.007	0.007 to 0.11	0.11 to 1.1	1.1 to 4.4	>4.4
500 m2	0.02 to 0.15	0.15 to 2.5	2.5 to 25	25 to 100	>100	500 yd^2	0.013 to 0.03	0.03 to 0.56	0.56 to 5.6	5.6 to 22	>22
1,000 m2	0.04 to 0.3	0.3 to 5	5 to 50	50 to 200	>200	1,900 yd^2	0.026 to 0.07	0.07 to 1.1	1.1 to 11.1	11.1 to 44	>44
1,500 m2	0.06 to 0.45	0.45 to 7.5 ·	7.5 to 75	75 to 300	>300	1,500 yd^2	0.039 to 0.10	0.10 to 1.67	1.67 to 16.7	16.7 to 66	>66
2,000 m2	0.08 to 0.6	0. 6 to 10	10 to 100	100 to 400	>400	2,000 yd^2	0.052 to 0.14	o.14t o22	22 to 222	222 to 88	>88
3,000 m2	0.12 to 0.9	0.9 to 15	15 to 150	150 to 600	>600	3,000 yd^2	0.078 to 020	0.20 to 3.3	3.3 to 33.3	33.3 to 132	>132
5,000 m2	0.2 to 1.5	1.5 to 25	25 to 250	250 to 1000	>1000	5,000 yd^2	0.13 to 0.34	0.34 to 5.6	5.6 to 55.5	55.5 to 220	>220
10,000 m2	0.4 to 3	3 to 50	50 to 500	500 to 2000	>2000	10,000 yd^2	026 to 0.68	0.68 to 11.1	11.1 to111	111 to 440	>440
50,000 m2	2 to 15	15 to 250	250 to 2500	2500 to 10,000	>10,000	50,000 yd^2	1.3 to 3.4	3.4 to 55.5	55.5 to 555	555 to 2,200	>2,200
100,000 m2	4 to 30	30 to 500	500 to 5000	5000 to 20,000	>20,000	100,000 yd^2	2.6 to 6.8	6.8 to 111	111 to 1,110	1,110 to 4,400	>4,400
150,000 m2	6 to 45	45 to 750	750 to 7500	7500 to 30,000	>30,000	150,000 yd^2	3.9 to 102	10.2 to 167	167 to 1,665	1,665 to 6,600	>6,600
200,000 m2	8 to 60	60 to 1000	1000 to 10,000	10,000 to 40,000	>40,000	200,000 yd2	5.2 to 13.6	13.6 to 222	222 to 2,.220	2,220 to 8,800	>8,800
400,000 m2	16 to 120	120 to 2000	2000 to 20,000	20,000 to 80,000	>80,000	400,000 yd^2	10.4 to 272	272 to 444	444 to 4,440	4,440 to 17,600	>17,600
600,000 m2	24 to 180	180 to 3000	3000 to 30,000	30,000 to 120,000	>120,000	600,000 yd^2	15.6 to 40.8	40.8 to 666	666 to 6,66 0	6,660 to 26,400	>26,400
800,000 m2	32 to 240	240 to 4000	4000 to 40,000	40,000 to 160,000	>160,000	800,000 yd^2	20.8 to 54.4	54.4 to 888	888 to 8,880	8,880 to 35,200	>35,200
1,000,000 m2	40 to 300	300 to 5000	5000 to 50,000	50,000 to 200,000	>200,000	1,000,000 yd^2	26 to 68	68 to 1,110	1,110 to 11,100	11,100 to 44,000	>44,000

Table is based off of information in NOAA's *Open Water Oil Identification Job Aid for Aerial Observation*

Discovery / Investigation

The Enbridge Responder will take action to mitigate the situation and prevent escalation if safe to do so. For the initial action it is important to remember:

- Don't try to control more area than can be effectively isolated and controlled ;
- The more time, distance and shielding between the Enbridge Responder and the released product, the lower the risk;
- Designate an emergency evacuation signal and identify muster points if emergency evacuation is necessary;
- Ensure appropriate PPE;
- Ensure compliance to safety and health policies for working alone
- Never permit response personnel to perform activities in areas where un-ignited gasses or vapors may accumulate; and
- Assess the hazards posed by the release (health, physical, chemical, other).

Immediately inform the Control Center and contact the QI/IC and provide a situation report. Assess the emergency level and activate the ICS based on need. The most qualified Enbridge Responder on scene will assume the role of IC and direct on-scene response activities until otherwise relieved.

Identifying NGL Releases

Indications of an NGL release include:

- Cloud of steam or mist (caused by condensation and freezing moisture);
- Ice buildup on exposed pipe, or frozen ground around an underground pipe;
- Brown vegetation (indicates soil saturation);
- Yellow-stained snow (may indicate NGL accumulation under the snow); and/or
- Odor (which is the condensate fraction of NGL).

Standard Safety Precautions

- Ensure proper documentation has been completed (Safe Work Permit, Field Level Hazard Assessment, etc.)

- Determine the wind direction and approach cautiously from upwind.
- Park vehicles upwind in vapor-free areas and on high ground, if possible.
- Shut down vehicles when not in use.
- Eliminate or shut off all potential ignition sources in the immediate area.
- Explore the suspected release area only when wearing appropriate PPE; explore on foot, using the buddy system if possible.
- Do not carry ignition sources.
- Do not attempt to walk in product releases or vapors.
- Maintain constant or scheduled communication "buddy" or back-up personnel.
- Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).

Assess the site for potential impacts, for example:

- Electrical lines down or overhead.
- Unidentified visible liquid or solid products.
- Visible vapors.
- Odors or breathing hazards.
- Fire, sparks or other ignition sources.
- Holes, caverns, deep ditches, fast water or steep slopes nearby.
- Local traffic.
- Ground conditions (dry, wet or icy).

Standard Safety Precautions, cont.

There is no one single barrier that will effectively combine both chemical and thermal protection. Also any type and level of impermeable protective clothing creates the potential for heat stress injuries. Remember that PPE is the LAST line of defense. Enbridge responders have been seriously burned and injured because they did not use their protective clothing and equipment.

Flammable liquids and gases give off a tremendous amount of radiant heat. Responders need to be aware and protect exposed areas as appropriate. No attempt should be made to extinguish a flammable gas fire. Always control or isolate the source of the leak as best as possible. If the source can't be isolated, then attempt to reduce the operating pressure of the pipeline. Try and permit the fire to self-extinguish, if possible and consume any residual fuel that may remain inside or outside the pipeline.

In addition to the standard safety precautions, when exploring outdoors use a gas detector to determine the presence of vapors. Natural gas is odorless and colorless. However, even if there is no odor present or there is an odor, a dangerous concentration may be present.

A combustible gas indicator (CGI) or a gas flame ionization detector (FID) could be used to determine the flammability hazards. Most CGIs and flammable gas detectors are set to alarm at 10% of the LEL of the gas upon which the sensor is calibrated (approximately 4000 ppm). In the natural gas industry, virtually all CGIs and flammable gas sensors are calibrated on pentane.

Natural gas may follow disturbed soil and enter grade areas around the pipe or other venues. The flammability range of natural gas is 4% to 15% in air by volume. Controlling ignition sources is a priority. Some examples you may not have thought about are:

- Doorbells
- Flashlights
- Telephones
- Burglar Alarms
- Heating Systems
- Vehicles and Trucks
- Pagers
- Light Switches
- Garage Door Openers

Since natural gas is extremely flammable the following should be considered:

- With any leak, always anticipate and expect that ignition will occur;
- Natural gas released inside buildings presents one of the greatest flammable hazards to emergency responders. Buildings full of natural gas should only be approached when needed with extreme caution and with a minimum number of personnel;
- Natural Gas / Methane (UN1971) is lighter than air and will rise;
- Do not close main valves or any other large transmission or distribution valves. This can lead to serious problems elsewhere in the natural gas pipeline system;
- Upon ignition, vapors may burn back to the source of gas; therefore make sure source is controlled;
- Vapors may cause dizziness or asphyxiation;
- Establish an effective and safe perimeter;
- Position all response support out of danger zone;
- Secure the scene and deny entry;
- If necessary, evacuate the public to a safe distance;
- Monitor the atmosphere, using multiple monitors where possible;
- Monitor for gas traveling away from source toward exposures;
- Control ignition sources (smoking, open flames, vehicles, internal combustion engines and motors);
- Do not operate electric devices such as switches, etc. Sparks could cause ignition; and
- If safely possible, ventilate the area, keeping in mind that during this process, if the flammable atmosphere is above the UEL the gas may pass back through the flammable range of 4% to 15% gas to air.

Prompt and Effective Management of Release

Small Release

If the released NGL is creating a local safety hazard, the NGL may then be ignited following the procedure for igniting NGL (see below). Where available, water fog may be used to break up and disperse small vapor clouds. Fire monitors are also an effective method of providing air circulation in confined areas or in buildings. Ensure they are safe (intrinsically safe) to use in the environment.

Large Release

If the NGL release is large or the NGL batch cannot be pumped past the release site, ignite the NGL following the standard procedure.

If the vapor plume is moving toward a populated area the area will be evacuated. If the vapor cloud cannot be ignited and repair procedures must begin, all equipment and vehicles will be located a minimum of 0.5 mi (0.8 km) upwind of the leak site. Continuously monitor the perimeter of the vapor cloud to detect any shift in the vapor cloud.

Isolating the Pipeline Section

When NGL is escaping uncontrolled, the affected pipe section will be immediately isolated by closing the appropriate sectionalizing valves.

Relieving Pressure

Use one of the following methods to relieve pressure at a pipeline section releasing NGL:

- If NGL is present at the blowdown valve, install a pipe discharge line and flare the NGL
- Transfer the product to a properly rated pressure containment vessel
- Install a pump complete with a discharge check valve to pump across the downstream sectionalizing valve
- If elevation does not provide a standing head in the isolated section, a transfer pump connected to the blowdown valve will be needed to fill a properly rated pressure containment vessel

Evacuation/Site Security

Due to the high flammability of NGL and the possibility of a vapor plume forming, it may be necessary to evacuate workers and visitors from the area, and to secure the site to protect the public and property.

Digging out a Release Site

Repair operations involving NGL are difficult, slow and hazardous. Pockets of gas may be trapped in the ground. In addition, if NGL has been leaking for some time, the condensate portion may have saturated the soil for a considerable distance around the site. Before beginning excavation or line repairs, active NGL releases are ignited or left burning.

When digging out an NGL release site, the following methods will be used:

- Ensure liquid has replaced the NGL at the release site;
- Follow appropriate Company standards on pipeline excavation;
- Ensure fire extinguishing equipment is immediately at hand;
- Consider obtaining external firefighting services and equipment;
- If no wind is blowing, use air movers to keep air moving across the worksite and away from workers;
- Continuously monitor air using a gas detector; and
- Constantly monitor wind direction

Igniting an NGL Plume

Before ignition of an NGL plume:

- Ensure the area where people are congregating is and remains a Cold Zone by the use of gas detectors;
- Ensure proper permits for firearm and ignition if applicable;
- The area of the vapor plume is maintained clear of people and vehicles and people are prevented from going near the area;
- The potential impact on adjacent facilities is evaluated;
- Every attempt to obtain clearance from Regional Management and the municipal fire chief has been made;
- Stage fire extinguishers nearby;
- Review flare pistol safe handling procedures (jurisdictional firearm rules apply); and
- Confirm that the available pistol is in working order, verify the number of flares available and ensure that they are the correct type for the firearm.

If contact with the QI/IC cannot be obtained quickly (e.g. no cell phone communication in area or no definite answer given) and there is an immediate risk to the public, the Enbridge Responder or a designee trained in NGL ignition may proceed with ignition.

If applicable have local fire department on-scene prior to any attempt at ignition. Review the Ignition Decision Flowchart on the next page.

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Consider the Impact of Ignition on People, the Environment and Property

Assess as follows:

If the plume remains un-ignitied or the wind direction changes:

- ❑ Are the responders or the public at risk?
- ❑ Is there a greater potential for property and/or environmental damage due to accidental ignition or explosion?

No

Continuously review:

- ❑ Employee and public safety considerations.
- ❑ Existing site conditions and changes..
- ❑ Site control procedures.
- ❑ Monitoring of the Emergency Hazard Area.

Yes

Review pre-ignition considerations:

- ❑ Consider safer alternatives (i.e. close valves, ventilate, etc.)
- ❑ Assess the area/perimeter of impact
- ❑ Proximity to residences, public facilities, towns or urban centers.
- ❑ Status of evacuations.
- ❑ Wind conditions and general topography.
- ❑ The potential for changes in weather and its implications.
- ❑ Transition from daylight to night darkness.
- ❑ Fire hazard after ignition in relation to adjacent area.
- ❑ Safety of all personnel in the Hazard Area.
- ❑ The presence of other underground or overhead utilities.De-energize if possible
- ❑ Will the situation worsen by burning seals out of adjacent valves or by starting pumps on fire?
- ❑ Controlled depressurization at other locations in the damaged section will reduce down time.

IS IGNITION THE MOST FAVORABLE CONTROL POINTS OPTION TO MINIMIZE THE HAZARDS?

No

- ❑ Continue with release control procedures onsite.
- ❑ Review alternative control procedures.

Yes

- ❑ Is there time to discuss the ignition decision with Regional QI/IC, Regional On-Call or Supervisor?

No

Go to Ignition Procedures Flowchart.

Yes

- ❑ Review decision to Ignite with Regional QI/IC, On Call or Supervisor.
- ❑ Determine post-ignition emergency service requirements.
- ❑ Assemble and brief Ignition Team.
- ❑ Go to Figure 2: Ignition Procedure Flowchart.

Onsite personnel will coordinate and lead the safe igniton of gas release.

PREPLANNING

Prior to ignition the Operations Section Chief will:

- ❑ Ensure all nonessential personnel are evacuated.
- ❑ Isolate the hazard area using manned roadblocks.
- ❑ Assemble the Ignition Team (2 people).
- ❑ Ensure the Ignition Team is protected with personal protective equipment, clothing and breathing apparatus (cover exposed skin).
- ❑ Erect windsock and streamers (if time permits).
- ❑ Monitor the area for combustible gas.
- ❑ Fully discuss ignition procedures.
- ❑ Check radio communications.

APPROACH

Select a position to attempt safe ignition which will:

- ❑ Allow for safe retreat.
- ❑ Provide cover from the intial flash.
- ❑ Be upwind of the gas leak 250m (820 ft) minimum from edge of identified vapor plume for first attempt – this may be reduced in subsequent attempts as long as it is safe to move forward).
- ❑ Be in an area where no combustible gas is detected.
- ❑ Shoot for the outer edge of the cloud

ATTEMPT IGNITION

- ❑ Aim for the outer edge of plume. The center of the plume is too rich to ignite. Arcing shots or bounce shots can be used.
- ❑ Turn away from target to avoid heat flash.
- ❑ Lay down if possible to minimize percussion to body

PLUME IGNITED?

No

REPEAT IGNITION

- ❑ Continue approach inwards using short distances and repeat (as long as safe to do so) until successful. Do not go closer than 100m (330 ft) from plume.

Yes

POST IGNITION

- ❑ Advise Regional Management.
- ❑ Continue to monitor downwind for gas accumulations.
- ❑ Maintain security around immediate area.
- ❑ Assist emergency service crews with any fire control measures needed.

2.4.4.7 Enbridge Field Response Team Guide - Fire and Explosion

***Under no circumstances are Enbridge employees to engage in offensive fire-fighting tactics unless they are trained, certified, and have the correct PPE and firefighting equipment**

FIRE RESPONSE STANDARD FIRES

1. Look or call for help.
2. Notify fire department.
3. Activate fire alarm, if one is available.
4. Implement Emergency Procedures and Evacuation Plan.
5. If safe to do so, shut off sources of fuel to fire and facility electricity and eliminate ignition sources.
6. Shut down pumping only if essential to fight or control the fire to stop a leak.
7. Report fire to the control center and initiate reporting.

FOAM SYSTEMS COMPRESSOR BUILDINGS

If one of the UV/IR fire detection sensors in the compressor building detects a fire:

1. An emergency shutdown (ESD) condition is triggered, which automatically shuts down any operating units, isolates the station from the mainline, and vents all gas from the station.
2. A warning horn sounds.
3. The fire pump starts, drawing water from the concrete tanks and mixing it with the liquid foaming agent.
4. Foam is pumped from the control building to the compressor building, where it is ejected through the foam heads in the ceiling, and continues until it runs out or the foam system is deactivated. Do not use water to extinguish fires in or close to

FACILITIES WITH CO2 FIXED SYSTEMS

When a fixed system is triggered, an audible pre-discharge signal sounds as a warning that the system will activate within 30 seconds. In compressor unit enclosures, where there is no delay or audible alarm, there is a visual indication that the CO2 system is
activated.

1. As soon as fire is detected or audible pre-discharge signal sounds, evacuate protected area.
2. If extinguishing system does not trigger automatically, manually activate

MAINLINE FIRES

1. Assess fire.
2. Initiate fire response:
   - if fire is small and in early stages, and it is safe to do so, attempt to extinguish it using multiple portable extinguishers simultaneously, including 150lb or 350lb wheeled unit.
   - if fire is large or fully involved:
     - follow standard fire response procedure
     - notify nearby tenants, landowners and businesses
     - build a fire break around perimeter of fire if possible
   - if fire is beside a pipeline and pipeline is not leaking, continue pumping to keep pipeline cool.

STATION YARD PIPING OR MANIFOLD FIRES

1. Follow standard fire response procedure.
2. Attempt to contain fire with earth dikes, water fog or foam blanket.
3. Ensure all ignition sources (e.g., electrical short circuits) have been isolated or
   eliminated.
4. Extinguish fire with foam or dry chemical extinguishers.
5. Cool hot pipes and tanks with water, if possible.

SUMP FIRES

1. Assess fire.
2. Initiate fire response:
   - if fire is small and in early stages, and it is safe to do so, attempt to extinguish it using dry chemical extinguishers
   - to keep fire from spreading or reigniting, use available water to cool adjacent facilities or sump metal
   - if fire is large or fully involved, follow standard fire response procedure
3. Isolate sump and close lid if possible.

NATURAL GAS FIRES

1. Follow standard fire response procedure.
2. Close appropriate valves to isolate pipe section.
3. Consider blowing down pressure at a safe location.
4. Let fire burn down.
5. Do not extinguish a fire involving natural gas until fire burns down, flow of gas can be stopped and there is no chance of re-ignition.

PCB FIRES

1. Evacuate and secure area.
2. Call fire department or HAZMAT representative.
3. Ensure power is off to equipment containing PCB (e.g., transformer or capacitor).
4. If fire is within an enclosed building, close air inlets/outlets and access to building ventilation system.
5. Assist fire fighters and/or HAZMAT officials in extinguishing fire.

DIESEL STORAGE TANK FIRES

1. If possible and safe to do so, isolate diesel tank by closing remote or manually operated valves.
2. Remove any combustible materials (e.g., timber, rags) located near fire.
3. Allow tank to burn itself out.
4. Keep other installations in the vicinity cool with water spray if possible.

TANK FIRES

1. Activate Alarm
2. Evacuate area.
3. Notify the control center.
4. Notify fire department, if applicable.
5. From a safe distance, assess type of fire.
6. Implement emergency procedures and evacuation plan.
7. Activate terminal Pre-Fire Plan for:
   - First Responder actions
   - local fire department contacts and equipment list
   - Safety Data Sheets (SDS)
   - tank fire and tank datasheets

- Respond accordingly to procedures outlined in the Pre-Fire Plans

VEHICLE FIRES

1. Sound facility alarm (if applicable).
2. Assess situation.
3. If fire is small and in early stages, and it is safe to do so, attempt to extinguish using dry chemical extinguishers. Otherwise, withdraw and secure area.

Flash Fire, Vapour Cloud Explosion, Pool Fire

HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames
CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient. For mixtures containing alcohol or polar solvent, alcohol- resistant foam may be more effective

1. Do not extinguish fire unless flow can be stopped and it is safe to do so
2. Keep unauthorized personnel away.
3. Use water in flooding quantities as fog. Solid streams of water may spread fire.
4. Cool all affected containers with flooding quantities of water.
5. Apply water from as far a distance as possible.
6. If fire becomes uncontrollable or container is exposed to direct flame - consider

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Wildfire 2.4.4.8

Actions Before/During a Wildfire:

- Follow FireSmart principals, continuously manage vegetation in and around facilities
- Identify evacuation staging areas in evacuation plans for use during a wildfire event
- Set up triggers for evacuation
- Establish air monitoring at all manned facilities impacted
- Ensure personnel are aware of evacuation alerts, evacuation routes and evacuation staging areas away from the wildfire.
- Identify methods of transportation for evacuation (air, ground, water)
- Obtain and maintain emergency contact lists
- Decrease the number of personnel onsite during a wildfire event
- Stay tuned to local media for updates on the wildfire conditions

Release Mitigation Actions

Actions that can be taken during a wild fire to mitigate a release include:

- Discussion required before shutting down the line(s) as the product movement can reduce the heat flux on the system
- Shutting down the lines, etc.
- Isolation of energized systems
- Reassess the need to further manage vegetation in and around the facilities and cut it back further if required
- Gain situational awareness of fire behavior, monitor fuel spread and wind direction to predict the how the hazard area may change
- Conduct fly-over patrol for fire behavior impact in coordination with local authorities and respecting any NOTAMs (notice to airmen)

Additional Notifications

- Safety Coordinator/Officer
- State/Provincial Wildfire and/or Forestry officials

Additional References

www.ready.gov/wildfires
www.firewise.org/wildfire-preparedness.aspx
www.redcross.org/prepare/disaster/wildfire
www.wildfire.alberta.ca/fire-smart-industry (see oil and gas)

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Earthquake 2.4.4.9

Actions During an Earthquake

If outside:

- Stay outside, do not enter a building
- Stay away from buildings, utility wires and fuel and gas lines
- If outside, stay away from the exterior walls of a building
- Once on the open, get down low (to avoid being knocked down by strong shaking) and stay there until the shaking stops

If in an vehicle:

- Stop as quickly and safely as possible
- Move your vehicle to the shoulder or curb, away from utility wires and under or overpasses
- Stay in the car and set the parking brake
- Turn on the radio for emergency broadcast information
- Watch for hazards created by the earthquake

If inside:

- Do not evacuate outside, stay where you are until the shaking stops
- "Drop, Cover and Hold On"
    - DROP down onto your hands and knees
    - COVER your head and neck
    - HOLD ON to your shelter
- Do not get in a doorway as this doesn't provide protection from falling debris
- Stay away from glass and windows

Actions After an Earthquake

- Check for injuries, administer first aid if required and call for assistance
- Check for secondary hazards that may have resulted after the earthquake, keeping in mind aftershocks may strike at any time
- Extinguish small fires, shut of the water supply if broke pipes are leaking, shut off the electricity when damaged wiring threatens to spark fires, shut of the off the gas if you suspect a leak
- Assess Damage (establish a Damage Assessment Team). Access to buildings that have sustained structural damage should be prohibited until they can be assessed by a structural engineer.
- Evacuate building(s) when any of the above hazards are present or if there is structural damage

Release Mitigation Actions

The following actions could be taken during an earthquake to mitigate further damage:

- Isolate and/or shut down energized systems to anticipate aftershock and/or additional tremors
- Shutting down the lines, etc. (others from Geohazard group)

Additional Notifications

- Enbridge Geohazard Department
- Safety Coordinator/Officer
- Facility Integrity Department

Additional References

- Earthquake Monitoring System, USGS: www.earthquake.usgs.gov/monitoring/
- www.getprepared.gc.ca/cnt/hzd/rthqks-en.aspx
- www.fema.gov/earthquake-safety-home
- PI-97 Seismic Monitoring Procedure

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2.4.4.10 Enbridge Field Response Team Guide - Flooding

Personnel Protective Actions

Prevent and mitigate damage to pipeline facilities and ensure public and environmental safety in areas affected by flooding:

Actions to Consider Before a Flood:

- Utilize experts in river flow, such as hydrologists or fluvial geomorphologists, to evaluate a river's potential for scour or channel migration at each pipeline river crossing
- Evaluate each pipeline crossing a river to determine the pipeline's installation method and determine if that method (and the pipeline's current condition) is sufficient to withstand the risks posed by anticipated flood conditions, river scour, or river channel migration. In areas prone to these conditions and risks, consider installing pipelines using horizontal directional drilling to help place pipelines below elevations of maximum scour and outside the limits of lateral channel migration.
- Determine the maximum flow or flooding conditions at rivers where pipeline integrity is at risk in the event of flooding (e.g., where scour can occur) and have contingency plans to shut down and isolate those pipelines when those conditions occur
- Evaluate the accessibility of pipeline facilities and components that may be in jeopardy, such as valve settings, which are needed to isolate water crossings or other sections of pipelines
- Preposition personnel and equipment in the event that emergency action is required including, shutdown, isolations or containment
- Extend regulator vents and relief stacks above the level of anticipated flooding as appropriate
- Coordinate with emergency and spill responders on pipeline locations, crossing conditions, and the commodities transported. Provide maps and other relevant information to such responders so they can develop appropriate response strategies

Actions to Consider During a Flood:

- Coordinate with other pipeline operators in flood areas and establish emergency response centers to act as a liaison for pipeline problems and solutions
- Deploy personnel so that they will be in position to shut down, isolate, contain, or perform any other emergency action on an affected pipeline
- Determine if facilities that are normally above ground (e.g., valves, regulators, relief sets, etc.) have become submerged and are in danger of being struck by vessels or debris and, if possible, mark such facilities with U.S. Coast Guard approval and an appropriate buoy
- Perform frequent patrols, including appropriate overflights, to evaluate right- of-way conditions at water crossings during flooding and after waters subside. Report any flooding, either localized or systemic, to integrity staff to determine if pipeline crossings may have been damaged or would be in imminent jeopardy from future flooding
- Have open communications with local and state officials to address their concerns regarding observed pipeline exposures, localized flooding, ice dams, debris dams, and extensive bank erosion that may affect the integrity of pipeline crossings

Asset Mitigation Actions

Actions that can be taken during a flooding event to mitigate a release include:

- Shutting down the lines, etc.
- Isolation of energized systems

Notifications

Notifications in addition to standard emergency notification procedure:

- Safety Coordinator/Officer
- GeoHazards Program representative

Additional References

www.getprepared.gc.ca/cnt/hzd/flds-en.aspx
www.ready.gov/floods
PHMSA Advisory Bulletin Volume 81, Number 11 issued Jan 18, 2016

Personnel Protective Actions

Actions to Consider After a Flood:

- Following floods, and when safe river access is first available, determine if flooding has exposed or undermined pipelines because of new river channel profiles. This is best done by a depth of cover survey
- Where appropriate, surveys of underwater pipe should include the use of visual inspection by divers or instrumented detection. Pipelines in recently flooded lands adjacent to rivers should also be evaluated to determine the remaining depth of cover. You should share information gathered by these surveys with affected landowners. Agricultural agencies may help to inform farmers of potential hazards from reduced cover over pipelines
- Ensure that line markers are still in place or are replaced in a timely manner. Notify contractors, highway departments, and others involved in post-flood restoration activities of the presence of pipelines and the risks posed by reduced cover

Site Control & Safety

ADDITIONAL FLODDING SAFETY

- Watch for high water, be aware of sudden changing water conditions and/or increased flow rates

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Actions Before/During a Tornado

- All employees must proceed immediately to the closest storm shelter. See building site maps and terminal evacuation map for shelter locations.
- If you are accompanied by visitors, bring them to your designated shelter.
- If you are caught outside with no shelter:
- * Lie flat in a nearby ditch or depression and cover your head with your hands. Be aware of the potential for flooding.
- * Do not get under an overpass or bridge. You are safer in a low, flat location.
- * Never try to outrun a tornado in urban or congested areas in a car or truck. Instead, leave the vehicle immediately for safe shelter.
- * Watch out for flying debris. Flying debris from tornados cause most fatalities and injuries.
- Consider the use of the emergency shutdown system for the terminals

Additional Notifications

- Facility Integrity Department
- Safety Coordinator/Officer

Actions After a Tornado

- Check for injuries, administer first aid if required and call for assistance
- Check for secondary hazards that may have resulted after the tornado
- Extinguish small fires, shut of the water supply if broke pipes are leaking, shut off the electricity when damage wiring threaten to spark fires, shut of the off the gas if you suspect a leak
- Evacuate the building when any of the above hazards are present or if there is structural damage

Asset Mitigation Actions

Actions that can be taken during a tornado to mitigate a release include:

- Shutting down the lines, etc.
- Isolation of energized systems

Additional References

www.ready.gov/tornados
www.redcross.org/prepare/disaster/tornado
www.getprepared.gc.ca/cnt/hzd/trnfs-en.aspx

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2.4.4.12 Bomb and Security Threats

Security Classification

Security information is received from multiple sources. They include employees, industry, public, local policing, provincial/state, federal organizations, This intelligence, normally delivered via phone, email, mail and/or media channels is to be assessed by the Enterprise Security. Once information is examined, subsequent advisories or notifications are issued globally or to the regions affected.

Level 1 Security provides guidelines on minimum requirements for facilities. These include access control, fencing, gates, security guards, employee awareness, communications, facility lighting, intrusion detection, closed-circuit video and general policies/practices.

Level 2 Security provides direction in the event security measures require elevating. Changes typically include tighter perimeter control, visitor restrictions and increased perimeter checks.

Level 3 Security provides direction in the event that security measures require elevation based on a credible, imminent threat. Changes typically include Level 2 Security plus further personnel and vehicle restrictions, the use of security guards, more frequent and random perimeter checks, work restrictions and potentially operational restrictions.

Although most anonymous security threats are hoaxes intended to create an atmosphere of anxiety and panic in order to interrupt normal operational activities, all threats must be taken seriously.

Suspicious Activities

If any of the following are observed at company facilities, immediately notify the regional management/on-call person:

- Unknown personnel;
- Unidentified vehicles or vehicles operated out of the ordinary;
- Abandoned parcels or packages; and/or
- Suspicious activities (e.g., loitering).

Initial Response

Based on the threat assessment, consider the following initial response options:

- General facility evacuation (i.e., if the threat is confirmed or considered credible and serious).
- Do not evacuate (i.e., if the threat is considered a hoax and not credible).

Bomb Explosion, Confirmed or Credible Threat cont.

Bomb Threat Received by Hand Written Note (In addition to above procedures)

- Contact Supervisor immediately
- Handle note as minimally as possible.

Bomb Threat Received by E-Mail (In addition to above procedures)

- Contact Supervisor immediately
- Do not delete the message.

Protestors

Protestors

Do not approach protestors if they seem angry or violent in any way. When dealing with protestors:

- Show concern for their cause.
- Be cordial.
- Be empathetic.
- Advise them they will receive a quick response.

Maintain crowd control using either onsite security officers, or if necessary, police intervention. If safe, speak to the group leader to gather information about the protestors. Share information with police as appropriate. Before issuing an initial response statement, wait for direction from Public Affairs.

Bomb Explosion, Confirmed or Credible Threat

If (a) there is a bomb explosion, or (b) a security threat is confirmed or considered credible and serious, the regional management/on-call person is responsible to:

- Be pro-active and activate ICS.
- Evacuate workers and visitors from the area according to the regional Emergency Procedures and Evacuation Plan.
- Secure the area to ensure the safety of workers, visitors, and the public.
- If firefighting or other medical response becomes necessary, activate the ICS and mobilize response personnel and equipment.

The Company has developed procedures to be used in responding to bomb threats, identifying strangers in the work place, or other suspicious communications, some of which may be related to acts of terrorism or abductions.

Bomb Threat Call Procedures

Bomb threats or warnings will usually be given by telephone; anyone on site could receive such a call. The individual receiving the bomb threat should obtain as much information as possible. The use of the Bomb Threat Information Form is highly recommended. (See Section 4 – Forms)

- The person receiving the call should, if possible, attempt to have someone else notify a supervisor while the bomb threat call is in progress.
- Remain calm; Keep the caller on the line for as long as possible. Try to keep the caller talking to learn more information. DO NOT HANG UP, even if the caller does.
- Listen carefully, be polite, and show interest.
- If your phone has a display, copy the number and/or letters from the display.
- Once the caller has terminated the call; DO NOT HANG UP, but from a different phone contact the supervisor immediately with information and await instructions.
- The supervisor will notify local authorities and company management. Police will want to speak with the person who received the call directly, thus should remain available to provide details to police.
- Secure access and evacuate the facility until the local authorities have cleared the facility for re-entry.
- A complete written record of each incident shall be retained by the supervisor and any photographs or physical evidence shall be preserved until further disposition of the incident by the company.
- The supervisor should ensure that a follow up investigation into the incident has been conducted and appropriate additional security measures, if any, have been established and any identified issues have been resolved.

Unconfirmed Threat

If unable to confirm a security threat, the Regional Management/on-call person is responsible to advise employees, the police and the Control Center, and return to normal operations.

Suspicious Package

If a threat is received in the mail, (a) place all letters and envelopes associated with the mail in a bag or large envelope, and (b) immediately notify the management/on-call person and local law enforcement.

Indicators of suspicious mail/packages might include:

- No return address, or a return address that does not make sense;
- Unusual rigidity, bulk, or irregularity;
- Handwritten or poorly typed addresses or labels;
- Peculiar odors, especially sweet smells;
- Excessive binding, taping, or tying material;
- Excess postage, lack of postage, or un-canceled postage;
- Mismatching postmark and return address;
- Foreign writing, address, or postage;
- Incorrect spelling of common names, titles, or places;
- Leaks or stains; and/or
- Protruding wires, string, or tape.

If suspicious mail/package is received in the mail or observed at company facilities:

- Immediately notify management/on-call person who in turn should notify local law enforcement.
- Leave the suspicious package in its present location.
- Do not open or physically handle the package, or allow anyone to touch or move the package.
- Do not use two-way radios and cellular telephones within 300 feet of the package.
- Do not cover the package.

Threat Assessment

Upon notification of a bomb threat or other security threat, the Regional Management/on-call person is responsible for:

- Assessing the seriousness of the threat;
- Determining the appropriate level of response;
- Ensuring the police have been alerted;
- To assess the seriousness of a threat, consider:
  - Is the information credible (e.g., identity of the caller, likelihood of facility access to place the explosive device)?
  - Is the information corroborated (e.g., were suspicious activities or personnel observed)?
  - Is the threat specific (e.g., detonation time, location, type of explosive device, intended target)?
  - What are the potential consequences?

Procedures

- Person in Charge – Call 911 and activate fire alarm.
- Eliminate all ignition sources.
- Begin Emergency Shut-Down if necessary.
- If person(s) down, refer to Medical Emergency Checklist.
- When fire is noticed at any facility, secure the source if safe to do so.
- Account for all personnel in the unit or area where the fire occurred.
- Evacuate all non-essential personnel, if necessary.
- Establish communications. Contact PIC.
- Search for and rescue missing or injured personnel as directed by appropriate authority.
- Use the buddy system.
- Ensure the Facility Operators control the process.
- Conduct air monitoring to ensure safety of personnel and appropriate PPE is required to respond. (For additional information, see the Site Safety and Health Plan and/or the Safety Coordinator.)
- Conduct initial firefighting by personnel (trained in the use of firefighting equipment and PPE), which may include use of monitors, deluge systems, and portable fire extinguishers.
- Coordinate evacuation of nearby residents with local responders.

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2.4.4.13 Radioactive Source Emergencies

In the event of an accident (e.g. fire, explosion), damage or any other incident that may affect the integrity of a radiation source (e.g. nuclear densitometers, either portable or fixed):

- Stop all activity in the immediate area
- Evacuate the immediate vicinity of the source head and clear personnel within a 6 meter radius perimeter around the source head
- Notify local Operations personnel and/or call the 24-hour emergency number shown on the warning sign
- Do not allow workers to re-enter the area until a radiation survey is completed by a radiation specialist
- If the device has sustained physical damage, contact a radiation specialist to leak test the device
- Follow company procedures for required initial notifications
- Notify the CNSC 24 hour Duty Officer and inform them of the incident at 613-996-0479.

2.4.5 Volunteer Plan

Normally, the Company will not hire and/or train volunteers for work on an oil spill response incident. Consequently, the Company will refer volunteers to appropriate provincial/state and/or local agencies or organizations that are set up to handle volunteers.

If the scale of the incident requires, the Company will confirm status of volunteer use under provincial/states legislation as some jurisdictions afford the same protections and regulations to volunteers as workers under Labour codes and regulations as volunteers are the responsibility of the company and as such are to be afforded the same level of health and safety training, tools and protective equipment in accordance with provincial/states legislation.

2.4.6 Environmental Response

This section provides key information related to environmental response activities associated with an emergency response to a release. The discovery of a historical release (i.e. a release that occurred in the past that is not considered to be a new or ongoing release) may result in the need to initiate some or all of the activities described in the following sections of this Environmental Response section.

As a precaution, the Company's Environment Department should ensure the Federal and Provincial/State Environmental Regulatory Agencies have been contacted.

In the event of a release that requires an environmental response, the Environment Unit Leader ("ENVL") will immediately mobilize a preferred environmental consultant or consultants if necessary. The Company's Environment Department will staff the Environment Unit within the ICS organizational structure and at a minimum manage the following environmental related response activities:

- Spills to groundwater
- Monitoring / sampling activities
- Wildlife management
- Natural Resource Damage Assessment
- Environmental compliance
- Environmental documentation
- Site investigation and remediation
- Waste management.

2.4.6.1 Spills to Groundwater

Spills to bare ground may initially spread laterally on the surface and then begin migrating downward through the soil and, depending on a variety of factors and circumstances, could reach groundwater. During vertical migration, the spill may spread laterally to some degree and a portion of the oil may be absorbed by the soil particles or become trapped in small pores eventually immobilizing the spill.

In general, oil may continue migrating downward until:	
✓	Residual saturation is reached (all of the oil is absorbed by the soil)
✓	Impenetrable layer (silt, clay, sandstone, rock) is encountered
✓	Groundwater is reached.

If a spill does reach groundwater, the oil may begin to spread radially but preferentially in the direction of groundwater flow. In general, the following behaviors may occur:

- For higher groundwater velocities, a narrow plume elongated in the direction of groundwater flow may form; and/or
- For lower groundwater velocities the plume may broaden and assume a more circular pattern.

The timeline for this process may be days to months to years, depending on the circumstances of the spill, site specific hydrogeology, and remedial action taken.

The thickness of the plume or layer of oil may decrease with distance from the source. As with vertical migration, a portion of the oil may adhere to soil particles and become trapped in small or water filled pores eventually becoming immobilized.

Response Actions

In the event of a spill to bare ground, there are a number of actions that should be taken to assess the spill and, if groundwater is impacted, initiate recovery and limit the extent of impact. If a response is likely to have groundwater impacts, the Environmental Unit should implement a sampling/monitoring plan to check for impacts and provide Operations with possible response/remediation actions.

Containment and Recovery

Rapid and efficient containment and recovery of free product reduces the potential for impacts to groundwater or other environmental receptors.

Groundwater Impact Potential

Once the initial assessment is completed, the potential for the spill to impact underlying groundwater should be determined and generally requires some knowledge of the local hydrogeology including soil type/permeability and depth to groundwater, and groundwater flow direction. The common factors, along with selected examples, that contribute to a spill having a higher potential to impact groundwater are:

Higher Potential	
✓	Shallow Groundwater (generally <20 ft/6 m)
✓	Low Viscosity Oil (gasoline)
✓	Dry Soil with Low Oil Retention Capacity
✓	Highly Permeable Soils (sand, gravel, coarse grained mixed sediment)
✓	Large Volume of Groundwater
✓	Pooled Oil (creates hydraulic head that enhances penetration)
✓	Response Time (several hours before pooled oil recovery begins).

Supplemental Assessment

If the potential exists for a spill to reach groundwater, additional assessment activities should be conducted to confirm if groundwater has been impacted and, if so, assess the extent of impacts. The Company's Environment Unit will work with third party Environmental Consultants to conduct subsequent assessment activities and characterize any impacts.

These activities commonly include:	
✓	**Backhoes or Excavators** – excavate pits/trenches to determine penetration depth/groundwater impacts (limited to depths of 10–20 ft / 3-6 m)
✓	**Hand or Power Augers** – install borings to collect soil/water samples and which can also be used to install temporary wells (often limited to 15-30 ft / 4-9 m)
✓	**Direct Push Drilling Rigs –** install borings to collect soil/water samples and which can also be used to install temporary wells (often limited to 50-100 ft / 15-30 m)
✓	**Hollow Stem Auger ("HAS") or rotary drill rigs -** install borings to collect soil samples and wells for groundwater samples (limited to 100-500 ft / 30-150 m .).

The method used often depends on equipment availability, depth to groundwater and access to the spill area. For areas with shallow groundwater and good access, backhoes or excavators are often the most expedient means of determining penetration depth and groundwater impacts. If access is limited, such as in many tank farms, hand or power augers can be used to advance borings and collect samples. Direct push (Geo-probe) rigs can get into many areas but are generally truck mounted and will need road access. For areas with good access and where groundwater is deeper, hollow stem augers or rotary drill rigs are often the best equipment for subsequent assessment.

If groundwater impacts are confirmed or expected, additional sample points or wells should be installed by stepping out laterally from the spill area until the groundwater impact area is delineated.

It is important to note that if intrusive activities (excavation, drilling, hand augers, etc.) are necessary, additional air monitoring of the excavation and breathing zone around the activities should be conducted to ensure additional hazards are not created by the activities. In addition, if excavation activities are conducted and it is necessary for workers to enter the excavation, confined space permitting and/or shoring regulations may apply.

Care must be taken during the groundwater assessment not to create additional pathways for impact movement. The Environment Unit and third party Environmental Consultants will determine appropriate assessment methods and locations.

Recovery/Remediation

In the event a spill does reach groundwater, recovery or remediation activities may need to be conducted to mitigate the impacts. The impacts could be limited to low concentrations of hydrocarbons that have dissolved into the groundwater or, for larger spills, involve a layer of oil/product floating (separate, or non-aqueous, phase hydrocarbons) on the groundwater surface accompanied by elevated concentrations of dissolved (aqueous phase) hydrocarbons in the groundwater.

Common groundwater remediation techniques include:	
✓	Pump and Treat
✓	Excavation
✓	Bio-remediation
✓	Air Sparging/Vapor Extraction
✓	In-Situ Oxidation
✓	Monitoring Natural Attenuation

Selection of the most appropriate remediation technique will depend on a number of factors including product type, soil type, depth to groundwater, access, extent of impacts, current groundwater use, etc. The Company will utilize experienced remediation contractors to select and implement the most appropriate remediation technique(s)

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2.4.6.2 Monitoring/Sampling Activities

Air Monitoring & Groundwater

In defining an acceptable response to a spill incident, it is necessary to know certain physical and chemical characteristics of the spill material. If positive identification of the spilled material can be made without testing, product data may be obtained from a SDS found in Section 2.11.10, product specification information, and/or records of product physical and chemical properties.

Occasionally a spill may occur in which the spilled material is not readily identifiable. Typically, laboratory analytical data for spill event samples will not be instantaneously available during an emergency. Therefore, it is necessary and desirable to field-categorize oils as the product reacts and changes in the environment. Although varying widely in physical and chemical properties, oil products have common basic features that permit their grouping for predictive evaluation of environmental effects and determination of control actions. In addition, as petroleum products react and change (e.g., weather) when exposed to the environment, the laboratory data may not be representative of "real-time" conditions; rather the data may instead reflect the chemical characteristics of the spilled material(s) at the time of sample collection.

Monitoring of the following media may be required, depending on the nature and location of the release:

- Air
- Surface water
- Groundwater
- Sediment
- Soil.

Air Monitoring

Air monitoring will assess real-time hydrocarbon related compound concentrations and background air quality conditions as needed.

- A site action level will trigger the collection of confirmation analytical testing.
- Real time air monitoring

Groundwater

Groundwater samples will be collected as necessary from onsite public and private wells (residential, public utility, commercial and industrial) within a specified potential receptor zone around the site.

- State, province or county databases will be used to identify wells.
- Ground survey may also be conducted to ensure all area wells are identified.
- Groundwater samples will be analyzed for laboratory and field parameters that will be determined on a site specific basis.

Surface Water and Sediment

Surface Water

Surface water sampling and monitoring procedures will be utilized to assess visible product and/or hydrocarbon sheen that may affect navigable waterways as well as to document background conditions within the waterways.

- Surface water samples will be collected periodically at each sample location to establish concentration changes over time.
- Surface water samples will be collected at various depths within the water column periodically at each sample location to establish concentration changes over time.
- GPS coordinates will be collected for sample locations to assist in re-sampling.
- Location and frequency of the sample collection activities will be determined on a site-specific basis.
- Surface water samples will be analyzed for laboratory and field parameters that will be determined on a site specific basis.

Sediment

Sediment samples will be collected periodically to provide a baseline evaluation of current conditions and confirm the presence or absence of hydrocarbon impacts.

- Sample locations will be selected in the field based on topography, erosion features, water depth, water velocity and other indicators of sediment deposition.
- GPS coordinates will be collected for sample locations to assist in re-sampling.
- Shallow sediment samples (e.g. 0 to 2", approximately 50-mm depth) will generally be collected from areas of low potential for sediment deposition (i.e. straight, narrow and/or swiftly moving waterways).
- Deeper sediment samples (e.g. 0 to 6", approximately 150 mm depth) would generally be collected at locations with a high potential for sediment deposition (i.e. meandering, broad, and/or slowly moving waterways).
- Sediment samples will be analyzed for laboratory and field parameters that will be determined on a site specific basis.

Oil Sampling Procedures

Oil Sampling Procedures

The following is a list of procedures to follow when obtaining an oil sample:

- Always wear latex or rubber gloves when taking samples. This protects the sample from your hands and your hands from the sample.
- Use a laboratory supplied clear glass jar for sampling. Four or six-ounce jars are sufficient. Dip or lower the jar (using string if necessary) into the oil or oily water at about a 30° angle. This may allow more oil and less water to flow over the lip of the jar. Do not fill the jar more than 2/3 full.
- If sampling a small amount of light oil, such as a sheen, the oil can be collected more easily using a Teflon strip or sorbent pad that is transferred to a sample jar. Do not use anything containing organic fibers such as rag, cotton, cheesecloth, etc.; these may contaminate the sample, thus, giving improper analysis results.
- Decanting the water may be necessary to get enough oil for analysis. To decant, fasten the lid on securely and turn the jar over allowing the water to settle towards the lid. Then unscrew the lid just enough to allow the excess water to slowly escape.
- Fasten the lid after lining it with aluminum foil or Teflon to obtain a good seal.
- Affix the documentation label to the jar after wiping it clean and dry for the label to adhere. The label should identify the following information:
  - Date and time of sampling
  - Source/location of sample (be specific and include GPS coordinates)
  - Name of person who took the sample
  - Sample designation using a sequential numbering or lettering system
- Samples should be delivered to a laboratory immediately for analysis. If samples cannot be delivered immediately, they should be temporarily stored in a refrigerator or a cool dark place since exposure to heat and light could affect the analysis. Samples should be transported in waterproof containers or wrapped in enough sorbent material to soak up the entire contents of the jar in case of leakage or breakage.

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2.4.6.3 Wildlife Management

In the event of a release where impacts to wildlife are present or expected, the Environment Unit will immediately mobilize a preferred wildlife response consultant or consultants.

The following actions should be taken to minimize or prevent additional damages to wildlife:

- Immediately secure the release area and install appropriate wildlife deterrence measures to discourage wildlife access to the site;
- Conduct an initial assessment of wildlife and wildlife habitat in the area of the release to establish the potential for wildlife impacts;
- Avoid collecting any dead or injured wildlife in the impacted (oiled) areas until the wildlife response team arrives unless it impedes operations or is a threat to human health and safety. However, if there is concern that injured or deceased wildlife might attract scavenging or predatory wildlife to the impacted areas, consult with the Environmental Unit for a proper and authorized course of action.; and
- Contact the appropriate regulating authority. Wildlife rescue and rehabilitation can only be conducted with appropriate permits and under the direction of the ENVL.

A site specific wildlife management and response plan may be developed for the site. The plan may include, but is not limited to:

- Additional wildlife deterrence strategies.
- Wildlife response permitting and approval requirements.
- Wildlife assessment procedures.
- Wildlife capture and collection procedures.
- Wildlife cleaning and rehabilitation procedures.
- Documentation protocols.

Dead and injured wildlife found during response operations must be collected by trained and authorized personnel and properly documented. An inventory of dead, injured, rehabilitated and released wildlife needs to be maintained as a component of the Natural Resources Damage Assessment in the U.S.

2.4.6.4 Natural Resource Damage Assessment

Under the provision of CERCLA, the Oil Pollution Act of 1990, and numerous state statutes, cost recovery can be obtained from industry for natural resource damage caused by the release of oil or hazardous substances to the environment. Natural resources are defined as land, air, biota, groundwater, and surface water. A Federal or State government entity, Indigenous groups or another nation acting as a public trustee of a natural resource may file claims for damages to natural resources.

An assessment is often conducted by a third party used to determine damages for residual natural resource injuries. This assessment is often conducted by the public Trustee, the potential responsible party or both. During the assessment, the injured natural resources are

identified, the extent of the injury is quantified and the extent of the economic damage resulting from the loss of services provided by the resources is determined. In addition, the assessment also determines the cost of restoration or replacement of the injured natural resource.

The assessment contains injury to natural resources and the loss of "services" (i.e., physical and biological functions provided by the resources) as a result of the petroleum release. If issues are anticipated, the type and condition of the natural resources before being impacted by the release will be determined by collecting soil and water samples as soon after the release as possible. These samples should be collected from areas that are threatened by spreading product, areas recently impacted by the product, and in the area of the release. Listed below, in descending order of importance, are locations typically sampled after a hydrocarbon release:

- River reaches immediately downstream (ahead) of the product plume (water and sediment samples).
- Wetlands and backwaters adjacent to and downstream of the product plume.
- Areas freshly affected by the release.
- The area adjacent to the release location (source area samples).
- Upstream areas unaffected by the release.

Over the course of the response actions, the above locations may be re-sampled to evaluate the following:

- Changing extent and severity of impacts.
- Fate and degradation of the hydrocarbon product over time.
- Changing site conditions.

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2.4.6.5 Environmental Compliance

Environmental compliance includes, but is not limited to, preparing and submitting permit applications and completing associated field inspections. Permits and other compliance requirements that may be required during a release response may include but are not limited to:

- Permit applications to discharge treated water, trench dewatering, stormwater impacted by construction activities in some states, and/or hydro-test water.
- Applicable Wetland plans and permits.
- Joint Permit Application for wetland disturbances.
- Air Emissions Inventory and Air Permit.
- Local Authority Soil Erosion and Sediment Control Permit and associated inspections.
- Local Authority - Road and Drain Permits.
- Wildlife Research and Collection Permit.
- Wildlife Rehabilitation Permit.
- Application of the "Recovered Oil" vs. "Recovered Fuel" exemptions or exclusions.
- Clean Water Act emergency response actions.
- Permits for disturbance of areas outside of existing ROW.
- Other permits or approvals as necessary based on event circumstances.

Additional permitting or regulatory compliance requirements will be determined based on the regulatory jurisdiction and specific circumstances of the release.

2.4.6.6 Environmental Documentation

In addition to the general documentation activities listed in Section 2.0, Environmental documentation activities also include: collecting and retaining site records; initial site survey; preparation of site figures; and preliminary reporting. Site Records include:

- Field notebooks;
- Daily weather conditions (include wind direction and speed); and
- Initial release information including initial site survey:
    - Incident characteristics, product properties, extent of impacts, and site conditions
    - Protection Priorities for natural resources
    - Natural Resources that are affected or threatened by the release Wildlife injury and impacts
    - Sample locations and access areas

Regulatory Communication

- Records of all notifications should include: time, date, agency, telephone number, individual contacted, and a summary of the conversation.
- Establish and distribute a general Enbridge email account to be copied on all emails to Federal, State/provincial and local regulators.
- Maintain a log of on-site agency personnel.

Photos

- Include a description of the site and the cardinal direction the photographer is facing when the photograph was taken. Photographs taken with a camera equipped with or synchronized to a GPS are preferred.

Laboratory Data

- Establish a standard protocol for sample naming at the onset of the response (e.g. Sampling and Analysis Plan).
- Establish quality assurance (“QA”) and quality control (“QC”) objectives.
- Includes Chain of Custody and laboratory reports.
- Collect and maintain post-processed GPS data of sample locations.

Site information to produce early in the project may include:

- Site/Release Location and Site Access (i.e. release location, extent of visual impacts, access roads, boat launches, boom deployment areas, safety zones, sign-in and security gates).
- Receptor Survey (may include: residential, commercial and industrial wells, residences, surface water intakes, and threatened and endangered species).

Preliminary reporting activities may include:

- Estimated volume of release
- Response activities
- Data presentation.

2.4.6.7 Site Investigation and Remediation

Site investigations will generally include determining the horizontal and vertical extent of the impacts. Equipment used to complete site investigation activities may include hand tools, drilling equipment and earth-moving equipment. Soil sampling for field screening and laboratory analysis may also be required.

Based on the results of the site investigation, a site specific remedial action plan may be prepared to address the impacts. The remedial action plan may include:

- Description of impacted areas
- Remediation criteria and end points
- Remediation methodology
- Approvals and permits required for remediation
- Site reclamation methodology.

2.4.7 Waste and Disposal

The management of the wastes generated in clean-up and recovery activities must be conducted with the following overall objectives:

Overall Objectives	
✓	Worker Safety
✓	Waste Minimization
✓	Minimization of Environmental Impacts
✓	Proper Disposal
✓	Minimization of present and future environmental liability

2.4.7.1 Waste Management and Disposal Plan

The ENVL may develop a site specific waste management and disposal plan including procedures for the proper storage, characterization, treatment, disposal, and record-keeping of hydrocarbon impacted soil, water and investigation-derived waste.

Standard Operating Procedures ("SOPs") should be established within the site specific waste management and disposal plan and may include, but are not limited to:

- Maintaining a waste management hotline to provide a resource for contractors for larger releases that have multiple staging or waste accumulation areas.
- Establishing uniform procedures for segregation of waste and proper disposal of non-regulated and regulated solid waste.
- Providing guidance on waste sampling activities.
- Staging areas and temporary storage requirements.
- Waste manifesting and record keeping requirements.
- Site specific disposal plan for each waste stream.
- Handling and personnel safety requirements for different waste streams

To minimize handling of waste materials suitable and sufficient containers will be used.. Waste streams will be segregated based on their physical characteristics and disposal requirements. New waste will not be combined with waste previously characterized and designated for disposal unless directed to do so by the ENVL. Waste suitable for product recovery or remediation will be kept separate from other waste.

Wastes will be transported from the collection site to designated secure areas (lined, bermed temporary storage areas, lined pits, or tanks) for storage, segregation, characterization, permitting, and packaging. Once this process is complete, the waste will be transported to an approved facility for required disposal or recycling.

Oil will be recovered and processed for re-use or disposal as appropriate. Water recovered may be disposed of or treated as per local requirements.

Transportation of waste from the release site will comply with applicable government regulations. Any waste or recovered product removed from a release site will be properly documented The ENVL, in consultation with the IC, will establish appropriate procedures for waste tracking and transportation.

The following steps will be taken prior to transporting wastes for disposal:

- Waste characterization is complete and accurate;
- Waste manifests are complete;
- Procedures for tracking waste volumes and product recovery are in place;
- Regulations are being met for transportation (e.g., placards are available and in place and carrier is registered, manifest completed, etc.); and
- Transport equipment is suitable for materials being transported (e.g., sealed bins/end gates, adequate tarps, tank trucks suitable for liquids, and drivers have adequate training).

Waste disposal methods vary depending on the type of waste, release location, regulatory requirements, etc. These disposal options will be dependent upon laboratory analysis per current Federal, Provincial, State and local regulation.

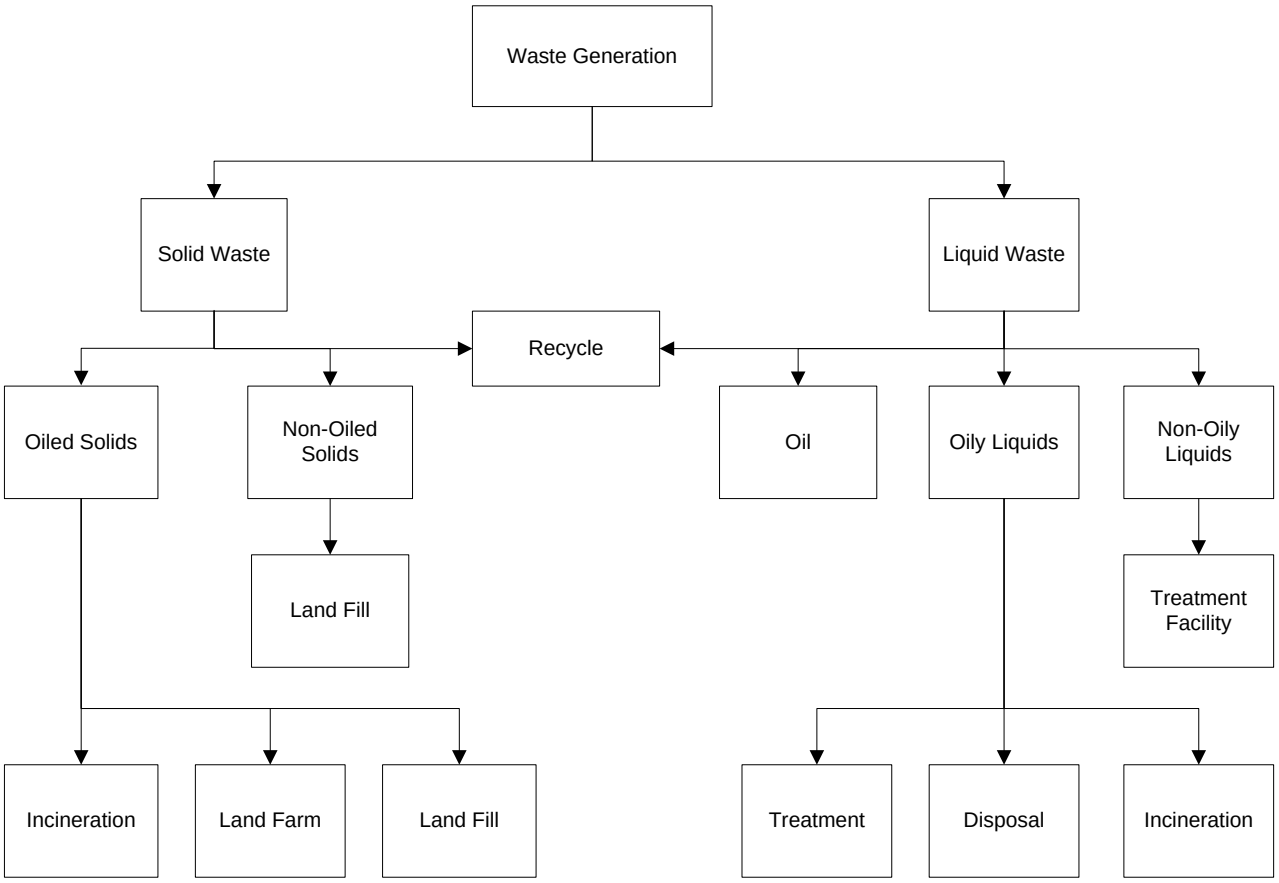
Disposal options may consider remediation techniques such as the following to help minimize waste volumes and recover resources (soil, water, oil):

- Phase separation (gravity, centrifuge)
- Bioremediation
- Thermal desorption
- In-situ burning
- Chemical oxidation
- Water treatment (chemical treatment, filtering).

In the U.S. the Company has contracted with USCG Certified third party contractors for each ICP Geographical Response Zone (or Region). In Canada the Company would use the services of a spill cooperative. Contact information and response capability for each third party contractor can be found in that particular ICP Geographical *Annex 2*.

The third party contractors that Enbridge has signed contracts with in each Geographical Response Zone are capable of being on site and ensuring planned temporary storage and waste disposal activities are accomplished within the appropriate response times. They will provide sufficient temporary storage to ensure sufficient capacity is available to respond to a significant release, or a Worst Case Discharge (“WCD”) in the U.S.

General flowchart for Waste Management Guidelines



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Temporary Storage Methods

PRODUCT								
Containment	OIL	OIL/WATER	OIL/SOIL	OIL/DEBRIS (Small)	OIL/DEBRIS (Medium)	OIL/DEBRIS (Large)	Capacity (Imperial)	Capacity (Metric)
Drums		X	X	X			.2-.5 yd^3	0.15 - .38 m^3
Bags			X	X	X		1-2 yd^3	0.76 – 1.52 m^3
Boxes			X	X	X		1-5 yd^3	0.76 –3.82 m^3
Open Top Rolloff	X	X	X	X	X	X	8-40 yd^3	6.11- 30.58 m3
Roll Top Rolloff	X	X	X		X	X	15-25 yd^3	11.47 – 19.11 m3
Vacuum Box	X	X					15-25 yd^3	11.47 – 19.11 m3
Frac Tank	X	X					500-20,000 gal	1892.7 – 75708 litres
Poly Tank	X	X					200-4,000 gal	757.08 – 15142 litres
Vacuum Truck	X	X	X				2,000-5,000 gal	7570.8 – 18927 litres
Tank Trailer	X	X					2,000-4,000 gal	7570.8 - 15142 litres
Barge	X	X					3,000+ gal	11356+litres
Berm, 4 ft	X	X	X	X	X	X	1yd^3	0.76 m3
Bladders	X	X					25-1,500 gal	94.63 – 56778.1 litres

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2.4.8 Site Safety and Health Plan

The Site Safety and Control Analysis and the individual Site Safety Plan (ICS 208) are designed to comply with regulations. The Site Safety Plan (ICS 208) form is intended to describe the health and safety guidelines developed for the Response Operations to protect personnel, visitors, and the public from physical harm and exposure to hazardous materials or wastes. The Site-Specific Safety & Health Plan form (ICP 007) is to be used to develop and recommend measures for assuring personal safety, and to assess and/or anticipate hazardous and unsafe situation. The Site Safety Plan (ICS 208) may also be used as a preparation of a site safety plan; including current conditions and hazards. The procedures and guidelines contained herein are based upon the best available information at the time of the form's preparation. Specific requirements will be reviewed and revised when new information is received and/or conditions change.

Enbridge staff and contractors must also complete a Safe Work Permit and Field Level Hazard Assessment. Specifically, this plan provides procedures and information for program administration, safety and health considerations, PPE, medical surveillance, training, site control, industrial hygiene monitoring programs, personal hygiene, sanitation, housekeeping, and the decontamination of both PPE and equipment utilized during the response.

These ICS Forms are located in *Section 4 - Forms*.

Scope

All spill response and remedial activities will be conducted in accordance with established SSHP guidelines. These guidelines will cover all personnel, including Company employees, contractors, subcontractors, government employees, and visitors. The SSHP guidelines will be modified as necessary and where applicable will address multiple work environments. A copy of this program will be posted at all command operations and field centers for the duration of the clean-up activity. It is the responsibility of each manager, supervisor, and crew foremen to be familiar with these guidelines and to assist in their implementation.

The SOFR will develop and administer a SSHP during an emergency response. The SOFR will be available to answer questions regarding effective implementation of the Plan. The SOFR is supported by other staff personnel advisors in Safety, Industrial Hygiene, Occupational Medicine, Environment, Operations and Legal.

It is the responsibility of the SOFR to monitor the effectiveness of the SSHP and to contact the appropriate support staff for guidance if changes to the plan are necessary.

All employees who may be directly involved in any clean-up activities are required to be trained and briefed on the contents of this SSHP. All employers and employees will be responsible for adhering to all Federal, Provincial/State, Territorial, and local regulations for clean-up activities.

The SOFR will enforce compliance with the SSHP and all other requirements. Any deviations from the stipulated requirements, which are noted, will be communicated to the

responsible contractor. The contractor will take immediate actions to correct the deviations and prepare a written corrective action report to be submitted to the SOFR.

Daily Safety Briefings

Site safety meetings/briefings are the first step in maintaining site safety. Daily meetings will be held at the start of each shift to ensure that all personnel understand site conditions and operating procedures, to ensure that PPE is being used correctly, to address worker health and safety concerns and to communicate any changes or revisions to the SSHP.

Briefing Attendance Forms shall be used to document that individuals working in the Response Operation recognize the hazards present and the policies and procedures required to minimize exposure or adverse effects of these hazards.

Visitor Policy

All visitors must provide all required training documentation prior to arrival on-site, if applicable. The IC and/or OSC and the PIO must approve the site visit and shall coordinate visitor tours with the Operations Section. The SSHP shall designate a safe route through the site and away from the on-going operations, and provide for visitor escorts. The OSC and applicable Branch or Group Supervisors must be notified when the visitor approaches. The OSC and applicable Branch or Group Supervisor shall acknowledge visitor arrival onsite and communicate approval of the visit and acceptable duration for the visitor onsite.

Visitors are expected to dress appropriately for a field visit and when required, shall wear PPE consistent with that used by workers at the Response Site.	
✓	All visitors shall be approved prior to arrival at the Incident Site
✓	All visitors are to be escorted.

Site Safety During Initial Response

During the initial response phase the ICS 201-5 form is used to ensure hazards are identified, evaluated and managed, and this form would also typically be used for a Tier 1 response. The ICS 201-5 form can be supported by attachments such as the released product SDS and other topics at the SOFR's discretion. In a Tier 1 response the SOFR transitions to the ICS 208 form at their discretion.

A Tier 2 response would typically use the SDS, ICS 208 Site Safety Plan and Medical Plan forms. The ICS 201-5 form would be in place until the Tier 2 Safety team transitions from the Tier 1 team. The ICS 208 and ICS 206 form can also be supported with attachments of SDS and Medical Plan, at the SOFR's discretion. SDSs are located in *Annex 1*. When a response has transitioned to the "project phase" the project is usually turned over to a remediation project group. At that time a SSHP will be developed based on Company safety and health procedures.

Site Name:	Date / Time:

	A. Monitoring Plan
✓	Air monitoring at the spill site and surrounding areas will be done to ensure site worker and community safety
✓	Air monitoring will be done during work shift site characterization and on each work shift during clean-up activities until results indicate no further monitoring is required
✓	All monitoring done at the clean-up site will be documented and the data maintained by qualified personnel on site
✓	Monitoring will be done: ❒ During initial site entry and characterization ❒ If a new potential inhalation hazard is introduced into the work area ❒ During clean-up activities, on each work shift ❒ If a new task is begun that may involve potential inhalation exposure.
✓	Noise monitoring and radiation monitoring will be conducted as needed.
	B. Initial Site Monitoring
✓	Instruments will be calibrated prior to and following use
✓	Monitoring will be done during initial site entry. The monitoring will include checking for: ❒ Oxygen (O_2) deficiency using a direct reading oxygen meter; ❒ Flammable atmospheres (%LEL) using a combustible gas indicator; ❒ Benzene, hydrogen sulfide, hydrocarbons, and combustion by-products (SO_2, CO), as needed, using direct-reading instruments, colorimetric indicator tubes, and/or other valid methods
✓	All monitoring will be documented (*Section 4 – Forms, ICP 006: Site Monitoring Template).*
	C. Post-Emergency Monitoring (On-Going)
✓	Monitoring for benzene, hydrogen sulfide, hydrocarbons and combustion by-products will be done during each work shift on an on-going basis, as needed. Repeat initial site monitoring if any significant changes occur (i.e., temperature increases, more material released, wind direction changes, etc.)
✓	Checks for oxygen deficiency and flammable atmospheres will be made if confined spaces are encountered, or as required
✓	Exposure monitoring shall be done as necessary. Personnel samples will be collected under the direction of the industrial hygiene personnel. Samples will be analyzed by an accredited laboratory
✓	Results of site monitoring will be made available to site workers' supervisors for informing all affected employees. Results will be made available to the Command Center for review by regulatory agencies.

Site Safety and Health Plan Evaluation Checklist

See *Section 4 - Forms* for the SSHP Evaluation Checklist

2.4.9 Protection, Containment and Recovery

Protection refers to the action of preventing harm and/or suffering from someone or something. Containment and recovery refers to the techniques or methods that can be employed to contain and recover petroleum spills on water or the containment of petroleum spills flowing overland. Recovery of terrestrial spills is often very similar, or uses the same techniques as shoreline clean-up. Other techniques, such as ice tactics and open water recovery, are covered in the Inland Spill Response Tactics Guide; the techniques described in the Integrated Contingency Plan are most commonly used.

Control Points contain detailed site-specific information including recommended tactics for spill response actions to provide the highest probability for properly establishing containment/recovery and to ensure that sensitive resources are protected. Control Points contain detailed tactics that are identified for strategic locations along the Company's system. These plans provide fast and effective site-specific response tactics to ensure that sensitive resources are protected. The tactics are flexible to accommodate for varying conditions. The types of tactics that may be used can be found in the Inland Spill Response Tactics Guide.

The following considerations should be taken into account when planning or implementing containment and recovery operations:	
✓	Containment is most effective when conducted near the source of the spill where the oil has not spread over a large area and the contained oil is of sufficient thickness to allow effective recovery and/or clean-up
✓	Feasibility of containment is generally dependent on the size of the spill, available logistical resources, implementation time, environmental conditions and the nature of the terrain in the spill area
✓	Aquatic (water) containment is primarily conducted through the use of oil spill containment booms (this is a key tactic to control the water discharged from upstream impoundments)
✓	Skimmers are usually the most efficient means of recovery of aquatic spills, although pumps, vacuum systems, and sorbents can also be effective, particularly in smaller waterways
✓	Terrestrial (land) containment typically involves berms or other physical barriers
✓	Recovery of free petroleum from the ground surface is best achieved by using pumps, vacuum sources, and/or sorbents.

2.4.9.1 Inland Spill Response Tactics Guide

The Inland Spill Response Tactics Guide is a Company document that can be used as a quick reference by Enbridge first-on-scene responders to select and implement containment and recovery tactics with Enbridge-owned oil spill response equipment during the first 72 hours of the response. It illustrates a collection of inland spill tactics that can be applied using obtainable resources to a liquid products release until additional resources and personnel arrive on site.

2.4.9.2 Isolation Protection Technique Selection (Conversion Table located in Section 1: Plan Introduction Elements

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Techniques on Land				
A. Containment / Diversion Berms (3.1.1 in Tactics Guide)	Construct berm (clay, bales, rocks, logs, etc.) ahead of advancing surface spill to contain spill or divert it to a containment area.	Typical Equipment Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting	• Steep Slopes • Porous substrate	• Disturbance to environmental sensitivities, surface soils and vegetation • Increased oil penetration
B. Interceptor Trench (3.1.2 in Tactics Guide)	Excavate ahead of advancing surface/ near-surface spill to contain product. Cover bottom and down gradient side with plastic.	Typical Equipment* Backhoe or set of hand, tools, misc. plastic sheeting	• Slope • Depth to near- surface flow	• Increased oil penetration • Disturbance to environmental sensitivities, surface soils and vegetation • Potential to impact groundwater
C. Trench and Berm (3.1.3 in Tactics Guide)	Construct berm with soil from the trench to stop the advancing surface spill and allow for recovery.	Typical Equipment* Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting	• Steep Slopes • Porous substrate	• Increased oil penetration • Disturbance to environmental sensitivities, surface soils and vegetation • Potential to impact groundwater

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Techniques on Small Watercourses				
D. Stream Dam, Board Weir, Siphon Dam (3.2.1, 3.2.2 and 3.2.5 in Tactics Guide)	Construct dam in drainage course/stream bed to block and contain flowing oil. Cover with plastic sheeting. If water is flowing, install inclined pipes during dam construction to pass water underneath.	Typical Equipment* Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting roll, Aqua Dam, PVC Pipe, Water Gate, Tiger Dam, Water Bag	• Upstream storage capacity	• Increased oil penetration • May increase suspended sediment • Downstream water flow may be restricted
E. Culvert Block (3.2.3 in Tactics Guide)	Block culvert opening with plywood, sediments, sandbags, etc. to prevent oil from entering culvert	Typical Equipment* Misc. hand tools, misc. plywood, sandbags, etc.	• Upstream storage capacity	• Increased oil penetration • Downstream water flow may be restricted
F. Filter Fence - Debris Exclusion (3.2.4 in Tactics Guide)	Install fence barrier upstream of containment site to exclude debris/ice	Typical Equipment* Misc. hand tool, fence posts, fence, fasteners, chicken wire, support lines, bales, sorbent materials etc.	• Soft substrate	• Minor substrate disturbance at post an anchor points

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Techniques on Small Watercourses				
G. Sorbent Barriers / Filter Fence (3.2.4 in Tactics Guide)	A barrier is constructed by installing two parallel lines of stakes across a channel, fastening wire mesh to the stakes, and filling the space between stakes with sorbents.	Typical Equipment* Misc. hand tools, boats, fence posts, wire mesh, sorbents, misc. fasteners, support lines, stakes, etc.	• Soft substrate	• Minor substrate disturbance at post and shoreline anchor points • High substrate disturbance if boat is not used
Techniques on Larger Watercourses				
H. Diversion Booming (3.3.3.3 in Tactics Guide)	Boom is deployed from the shoreline at an angle towards the approaching slick and anchored or held in place with a work boat. Oil is diverted towards the shoreline for recovery.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Sensitive shorelines	• Minor substrate disturbance at anchor points • Heavy oiling at shoreline anchor point
I. Narrow Channel Containment Booming (3.3.3.3 in Tactics Guide)	Boom is deployed across entire river channel at an angle to contain floating oil passing through channel.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Sensitive shorelines	• Minor substrate disturbance at anchor points • Heavy shoreline oiling at downstream anchor point
J. Exclusion Booming (3.3.3.1 and 3.3.3.2 in Tactics Guide)	Boom is deployed across or around sensitive areas and anchored in place. Approaching oil is excluded from area.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.		• Minor substrate disturbance at anchor points

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
K. Deflection Booming (3.3.3.1 and 3.3.3.2 in Tactics Guide)	Boom is deployed from the shoreline away from the approaching slick and anchored or held in place with a work boat. Oil is deflected away from shoreline.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Onshore winds	• Minor substrate disturbance at anchor points • Oil is not contained and may contact other shorelines
L. Boomvane Deploying Containment / Recovery / Deflection modes (3.3.3.4 in Tactics Guide	BoomVanes can be used in place of ground tackle when deploying deflection and diversion booms.	Typical Equipment* Hard boom, BoomVane(s), control line, mooring line,boom/shore anchor line, tow bridles, shore anchor pins.	• Requires access to multiple shoreline locations (if mooring line is to be used) • Requires a current (not for still water use)	• Minor disturbance of trees if using as an anchor point.

[1] In addition to implementation and accessibility.
* Need to establish a safe perimeter and follow safety precautions as appropriate before work begins.

2.4.9.2 Cont. Isolation Protection Technique Selection *(See Conversion table located in Section 1: Plan Introduction Elements)*

Technique	Description	Logistical Requirement Examples	Use Limitations[1]	Potential Environmental Effects
Spills on Water (Cont'd)				
K. Deflection Booming (3.3.3.1 and 3.3.3.2 in Tactics Guide)	Boom is deployed from the shoreline away from the approaching slick and anchored or held in place with a work boat. Oil is deflected away from shoreline.	Typical Equipment* Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	• Onshore winds	• Minor substrate disturbance at anchor points • Oil is not contained and may contact other shorelines
L. Boomvane Deploying Containment / Recovery / Deflection modes (3.3.3.4 in Tactics Guide	BoomVanes can be used in place of ground tackle when deploying deflection and diversion booms.	Typical Equipment* Hard boom, BoomVane(s), control line, mooring line,boom/shore anchor line, tow bridles, shore anchor pins.	• Requires access to multiple shoreline locations (if mooring line is to be used) • Requires a current (not for still water use)	• Minor disturbance of trees if using as an anchor point.

[1] In addition to implementation and accessibility.
* Need to establish a safe perimeter and follow safety precautions as appropriate before work begins.

2.4.9.3 Technique Selection - Terrestrial Containment and Recovery

The primary factors influencing terrestrial containment and recovery are:	
✓	**Size** - Most containment techniques provide limited storage capacity
✓	**Slope** - Berms and barriers are generally less effective on steeper slopes and accessibility may be limited
✓	**Surface texture** - Rough surfaces with natural ridges and depressions enhance containment and should be taken advantage of whenever possible
✓	**Substrate permeability** - Highly permeable sediments will allow rapid penetration of oil into the substrate, thus complicating containment and recovery
✓	**Topographical Low Areas**- Oil is more easily contained and recovered if it is flowing within, or can be diverted to, existing natural or manmade topographical low areas
✓	**Stormwater runoff** - Runoff generally requires the containment of larger quantities of liquids and complicates oil recovery.

2.4.9.4 Technique Selection - Aquatic Containment and Recovery

Selection of an appropriate aquatic containment, protection and recovery technique depends on a number of factors including:	
✓	**Current speed** - Surface currents greater than 1 knot may cause boom failure or entrapment of oil beneath the boom when the boom is deployed perpendicular to the current. Boom can be deployed at varying angles as the current increases.
✓	**Water depth** - Depths greater than 50 ft. (approximately 15 meters) can complicate hard boom anchor placement within the watercourse. Shorelines anchors or systems such as the Boom Vane may be more applicable. Depths less than 2 feet (approximately 0.5 meters) can preclude effective hard boom use. Sorbents booms, dams and filter fences may prove more effective.
✓	**Channel width** - The width of a watercourse will determine if multiple sections of boom need to be installed. One method is cascading boom. Single boom deployments across wider channels have a greater change of failing as current increases.
✓	**Slick thickness** - Recovery effectiveness with pumps/vacuum systems and skimmers decreases as slick thicknesses decline, becoming relatively ineffective for very thin slicks or sheens
✓	**Shoreline access** - Obstacles (rocks, debris, man- made structures, etc.) in the water or steep or densely vegetated shorelines could restrict access and present safety and operational problems
✓	**Anchor points** - Soft bottom substrates can complicate boom anchor placement
✓	**Safety** - High currents and winds, large obstacles, and other dangerous conditions could present safety hazards and preclude certain techniques.

The objective of mechanical recovery is to collect contained and concentrated oil and to transfer the oil to temporary storage for subsequent disposal. Spills that have been contained by a boom, a berm or in slots cut into the ice can be skimmed and pumped into storage containers.

Three basic types of skimmers are used to recover oil:

- Advancing systems
- Stationary skimmers
- Vacuum units.

There are a wide variety of collection principles and varieties of stationary skimmers on the market than can be used to recover hydrocarbons from the water's surface. Operational factors such as oil viscosity, oil thickness, debris and temperature all play an important role in the selection of skimmers. At temperatures below freezing, some skimmers may become difficult to operate; however, the additions of steam, hot water and pressure, or heating elements are sometimes considered for skimmers in cold conditions.

Vacuum systems can include portable vacuum units or a conventional vacuum truck with skimmer head. Vacuum systems can provide a quick and effective method for recovering large volumes of oil and are capable of handling a wide range of fluid viscosities and a variety of small debris.

The third party contractor(s) contracted to respond in each ICP Geographical Annex is capable of being on site and ensuring spill containment activities are accomplished within the appropriate response times. They will provide sufficient containment equipment to ensure enough capacity is available to respond to a WCD.

Submerged Oil Content

Enbridge's tariff restricts products on the system to those with a density of no greater than 940 kg/m^3. All products shipped on the Enbridge system are floating oils, including dilbits and synbits.

Enbridge acknowledges that, under certain environmental conditions, some fraction of oil released into a water body may become entrained in the water column, submerge or sink, in freshwater environments. This is the case irrespective of whether the product is diluted bitumen, synthetic crude, or conventional crude oil. This is not an issue that is limited to diluted bitumen.

The primary mechanisms that may lead to submergence of petroleum products are:

- Product weathering – Note that products shipped on the Enbridge system are not expected to weather to a point whereby their density would be greater than the density of water;
- Interactions and agglomeration onto sediment, which can cause oil particles to submerge or sink; and
- Emulsification due to the dynamic properties of the water body.

Practically, for products shipped on Enbridge's system, it is the combination of these processes, under specified environmental conditions, that can lead to the submergence and sinking of a percentage of released products.

Unless the released product has a density (specific gravity) > 1.0 (typical for freshwater), it will not sink en-mass.
Enbridge considers the potential for sinking and submerged oil as part of our Emergency Response

plans and in the execution of such plans. In the unlikely event of a spill, Enbridge would work with regulatory agencies to determine the appropriate response and remedial actions given the specific circumstances of the event. This would include decisions regarding the short term emergency response as well as subsequent clean-up of residual amounts of submerged oil.

2.4.9.5 Shoreline and Terrestrial Operations

In the event that terrestrial sediments do become oiled or that petroleum contacts and becomes stranded on a shoreline, clean-up operations should be undertaken to minimize the environmental effects of the petroleum. In most instances, clean-up efforts are not subject to the same time constraints as containment, recovery and protection operations. As a result, better planning and greater attention to detail is possible. The exception is where there is a high probability of stranded oil becoming remobilized and migrating to previously unaffected areas. In this case, clean-up operations should be implemented immediately.

The following items should be considered in detail:	
✓	Documentation of the location, degree and/or extent of oil conditions
✓	Evaluation of all environmental, cultural, economic, and political factors
✓	Clean-up technique selection
✓	Mitigation of physical and environmental damage associated with clean-up technique implementation
✓	Cost-effectiveness.

The shoreline or terrestrial area that has been impacted by the oil conditions can range from those that require immediate and thorough clean-up to lightly oiled areas where no action may be the most environmentally sound option. The amount and type of oil, shoreline sensitivity, substrate or shoreline type, intrusive nature of the direction flow, and shoreline exposure are all factors that influence technique selection in spill clean-up operations.

Clean-up Technique Selection – Shoreline

The selection of an appropriate shoreline clean-up technique is primarily dependent on the following factors:	
✓	**Substrate type** - Finer-grained sediments typically require different techniques than coarse- grained sediments
✓	**Oil conditions** - Heavier oil conditions and larger areas may require more intrusive or mechanical methods, whereas lighter conditions may not require clean-up. For example, removing lighter oils in a marsh area or wetland may cause more harm to the environment than allowing for natural attenuation and biodegrading
✓	**Shoreline slope** - Heavy equipment may not be usable on steeper shorelines
✓	**Shoreline sensitivity** - Intrusive techniques may create a greater impact than the oil itself
✓	**Oil penetration depth** - Significant penetration can reduce the effectiveness of several techniques.

Clean-up Technique Selection - Terrestrial

The selection of an appropriate terrestrial clean-up technique is primarily dependent on the following factors:	
✓	**Size** - Larger areas will generally require the use of mechanical methods, whereas manual techniques can be used for smaller areas
✓	**Slope** - The use of heavy equipment is often restricted to gradually sloped areas, and manual techniques may be considered unsafe if used on steep terrain
✓	**Soil type** - Softer soils may reduce traffic ability for heavy equipment and the presence of coarser sediments and bedrock could also restrict the use of certain types of heavy equipment
✓	**Oil penetration depth** - Significant penetration may require the use of heavy equipment or special subsurface remediation techniques
✓	**Impacted groundwater** - Special subsurface remediation techniques would likely be required.

The third party contractor(s) contracted to respond are located in each ICP Geographical, *Annex 1* **Facility and Locality Information**. Contractors are capable of being on site and ensuring spill recovery activities are accomplished within the appropriate tiered response times. They will provide sufficient recovery equipment to ensure enough capacity is available to respond to a WCD.

Non-Mechanical Response Options

Non-mechanical response options that could be used in responding to a spill include:	
✓	Chemical treatment
✓	Bioremediation
✓	In-situ Burning

Although the physical control and recovery of spilled oil is advocated and generally preferable, such actions are not always possible or practical because of factors including safety hazards, remote spill sites, or weather. When non-mechanical methods can result in reduced human hazard or environmental damage, consideration of their use is appropriate, but will require regulatory approval. In Canada, chemical treatments / dispersants are not a commonly used tactic on inland waters and would only be considered after consultation and approval from the Department of Fisheries and Oceans and other applicable regulatory stakeholders.

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2.4.9.6 - In-Situ Burning*

In-Situ Burning

When mechanical recovery (the preferred cleanup method) of spilled oil is not feasible, in-situ burning may be considered. Since burning presents a potential safety and air pollution hazard to the surrounding area, approval from appropriate regulatory agencies is required.

In-situ burning alters the composition of the spilled oil by eliminating anywhere from 90 to 99 percent of the original volume of oil provided it is controlled within a fire resistant boom or other containment system. A portion of the original oil is released into the atmosphere as soot and gaseous emissions. Solid or semi-solid residues typically remain following a burn, but are relatively easy to retrieve. They can be further reduced in volume through repeated burns, and ultimately are collected and removed from the environment.

Evaluation

The potential for implementing a successful burn depends upon the knowledge and experience of those responsible for the assessment of the spill situation. Review of the spill conditions, together with the spill checklist below, will ensure that the safety issues, the benefits, and the environmental impacts will have been examined carefully. While steps may be taken to move critical equipment into position for a possible burn, there should be no attempt to ignite spilled oil without prior authorization from federal, provincial, state and local authorities.

Decisions to burn or not to burn oil in areas considered case-by-case are made on the basis of the potential for humans to be exposed to the smoke plume, and pollutants associated with it.

Before a spill is ignited, consider:

- Regulatory permits and approvals specific to the jurisdiction.
- Appropriate monitoring is in place to limit particulate matter (PM-10) exposure to 150 micrograms per cubic meter.
- Smoke plume modeling is done to predict which areas might be adversely affected.
- Aerial surveys are also conducted prior to initiating a burn to minimize the chance that concentrations of mammals, turtles and birds are in the operational area and affected by the response.
- Sampling should be conducted for particulates at sensitive downwind sites prior to the burn (to gather background data) and after the burn has been initiated. Data on particulate levels are recorded and the data and recommendations are forwarded to the Incident Commander (IC).
- Oil type, amount and condition
- Environmental conditions
- Availability of personnel and equipment
- Timing
- Human safety
- Danger of fire spreading
- Presence of explosive vapors
- Damage to nearby habitats that may prolong natural recovery

Request Process

When a request for an in-situ burn is made:

- Complete In-Situ Burn Plan Template Form ISP 009 – *ICP Core Section 4* or similar plan required by federal, state/provincial, & local authorities.
- The burn must be outside the corporate city limits, except as deemed necessary by the local fire department.
- Wind direction should move the smoke away from the city and/or populated areas.
- Burning must be at least 300 feet (91.44 meters) from any adjacent properties.
- Burning should commence during daylight, typically between the hours of 9:00 am and 5:00 pm
- Wind speed should be between 5 mph (8.052 km/h) and 20 mph (32.19 km/h) (IAW SMART recommendations) during the burn period.
- Burn should not be conducted during persistent atmospheric thermal inversions.

Approval Procedure

Approval for the burn must be obtained from regulatory bodies and other stakeholders. The approval required to conduct a burn will vary in each jurisdiction.
The following steps outline the approval process for in-situ burning as a tactic:

- The need to carry out an in-situ burn is documented in the Incident Action Plan (IAP) during the Planning Cycle process
- Incident Commander (IC) reviews and approves the request
- The request is then presented to the Federal On Scene Coordinator (FOSC) for approval

The FOSC will submit a burn plan to Federal, State and local regulatory entities/ stakeholders for review and approval.

National Response Center (NRC) 1-800-424-8802

Plume Dispersion Modeling

It may be necessary to conduct a plume trajectory assessment to determine public health safe distances for the following reasons:

- Regulatory requirements to obtain approval to burn;
- Local terrain not (relatively) flat;
- Winds exceed 18 km/hr (11 mph);
- Close proximity of populated areas (for safety or perception considerations); and
- The presence of unusual meteorological conditions (e.g., temperature inversions)

The wind speed of 35 km/hr (21 mph) is the established upper limit at which fire behavior can be predictably managed.

The Planning Section will be responsible for leading the assessment. The Incident Commander must be made aware of the assessment results and the results should be included in the In-Situ Burn Plan.

Monitoring

In-situ burning generates a thick black smoke that contains primarily particulates, soot, and various gases (carbon dioxide, carbon monoxides, water vapor, nitrous oxides and Polycyclic Aromatic Hydrocarbons (PAH's). The components of the smoke are similar to those of car exhaust. Of these smoke constituents, small particulates less than 10 microns in diameter, known as PM-10, are considered to pose the greatest risk to humans and nearby wildlife. Due to these potential affects monitoring before, during and after a burn may be required.

In general, SMART* is conducted when there is a concern that the general public may be exposed to smoke from the burning oil. It follows that monitoring should be conducted when the predicted trajectory of the smoke plume indicates that the smoke may reach population centers, and the concentrations of smoke particulates at ground level may exceed safe levels. When impacts are not anticipated, monitoring levels will be decided by the federal, provincial, state and local authorities.

The Planning Section will be responsible for developing and monitoring plan for the burn.

Execution of in-situ burning has a narrow window of opportunity. It is imperative that the monitoring teams are alerted of possible in-situ burning as soon as burning is being considered, even if implementation is not certain. This increases the likelihood of a timely and orderly burn process.

The monitoring teams are deployed at designated areas of concern to determine ambient concentrations of particulates before the burn starts. During the burn, sampling and continues readings are recorded both in the data logger of the instrument and manually in the recorder data log.

After the burn has ended and the smoke plume has dissipated, the teams remain in place for some time (15-30 minutes) and again sample for and record ambient particulate concentrations. During the course of the sampling, it is expected that the instantaneous readings will vary widely. However, the calculated time-weighted average readings are less variable, since they represent the average of the readings collected over the sampling duration, and hence are a better indicator of particulate concentration trend. When the time-weighted average readings approach or exceed the Level of Concern (LOC), the team leader conveys this information to the IC.

Monitoring activities should be directed by the Operations Section Chief in the Incident Command System. It is recommended that a "group" be formed under the Operations Section that directs the monitoring effort. (e.g. Monitoring Group Supervisor.) Under each group there are monitoring teams, at a minimum, a monitor and assistant monitor. An additional team member could be used to assist with sampling and recording. The teams report to the Monitoring Group Supervisor who directs and coordinates team operations, under the control of the OSC.

Communication of monitoring results should flow from the field (Monitoring Group Supervisor) to those persons in the ICS/UC who can interpret the results and use the data. Typically, this falls under the responsibility of a Technical Specialist on in-situ burning in the Planning Section of the command structure. The Technical Specialist or his/her representative reviews the data and, most importantly, formulates recommendations based on the data. The Technical Specialist communicates these recommendations to the ICS/UC. Quality assurance and control should be applied to the data at all levels. The Technical Specialist is the custodian of the data during the operation, but ultimately the data belongs to the ICS/UC incident files. This will ensure that the data is properly archived, presentable, and accessible for the benefit of future monitoring operations.

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* *These procedures reflect Special Monitoring for Applied Response Technologies (SMART) protocols developed by NOAA, US Coast Guard. Full procedures for reference can be found online at http://response.restoration.noaa.gov/sites/default/files/SMART_protocol.pdf*

Product Characteristics

- Refined product or light to medium crude will burn more efficiently and leave less residue to recover compared to heavier product.
- Heavy oil requires longer heating times and a hotter flame to ignite than lighter oils.
- Product that is relatively fresh (less than 3 days of exposure to the elements) will burn more efficiently than weathered product.
- Burn duration can be estimated based on known burn rates for different product types (e.g., 2-4 mm [1/10 in.] of depth per minute for medium crude).

Soil and Vegetation

Saturated or frozen soil reduces the extent of damage to vegetation root systems and the soil itself in the containment area and in adjacent areas. Optimally, the containment and adjacent areas are mostly un-vegetated (e.g., dry roads, ditches, dry streambeds or idle cropland).

Herbaceous vegetation (grasses) are generally more fire tolerant to an adjacent burn than woody vegetation (shrubs and trees), although some woody species are also fire tolerant. In highly vegetated areas, fire behavior and forestry specialists will be consulted.

Dormant vegetation (not during the growing season) is generally more resilient in response to fire damage than actively growing vegetation. Dense wetland vegetation can slow evaporation and prolong the opportunity for conducting an efficient in-situ burn.

Wetlands

A layer of water at least 2.5 mm to 10 mm (1 in. to 4 in.) under the burning product will provide protection to vegetation root systems from heat stress.

Burned areas should not be flooded with high water levels shortly after the burn. The remaining root systems require oxygen from the air or soil until new vegetation emerges.

On Water (Open or in Broken Ice)

Adequate containment (fire boom, ice or bank) is necessary and must result in the minimum product depth of 2 - 3 mm (1/10 in.) to sustain ignition. Wave conditions that exceed 3 ft. can result in higher emulsion rates and splash-over, and make containment difficult. A sustained burn is more likely if the oil has not significantly emulsified (<25%).

In broken ice, ice coverage of 30% to 65% will slow slick movement and may allow for a slow moving semi-contained burn attempt. Ice coverage of 65% or higher may provide natural containment via floes touching. Currents higher than 1.4 km/hr (0.9 mph) may result in the escape of product under the ice.

Ignition Considerations and Procedures

After completing all the pre-burn requirements, the in-situ burning program should be implemented, taking the following into consideration:

- every in-situ burn is unique
- ignition procedures vary with prevailing conditions and available equipment, manpower and emergency resources.
- ongoing monitoring of local weather conditions and long range forecasts are essential to permit a safe and effective burn.

Determine the appropriate time and conditions for igniting the spill .

- Use experienced personnel to oversee the burning activities and monitor the burn plan.
- The area around the spill site should be monitored using an explosive / toxic gas meter to determine any explosive / toxicity hazards.

The spill should be approached from upwind during all phases of the operation by personnel who are properly equipped and trained to monitor the conditions.

- Continually monitor weather conditions.
  - burning should occur only when wind conditions are low
  - weather should be stable
- Ignition should not occur until entire area is secured.
- Ensure there is a sufficient supply of the following on-site (actual numbers will be determined based on the individual spill conditions)
  - fire-fighting equipment
  - personnel (workers and emergency staff)
  - water supplies
- If potential exists for secondary fires, ignition should take place during low burning period (i.e. 1800 to 1000 hrs).
- If the product is heavy oil, or it is severely weathered, it may be advantageous to burn during the heat of the day in order to assist with ignition, if safe to do so.

Determine what method of ignition will work the best while still allowing for safe implementation

- Ignition procedures should be designed to allow the response team to be well back of the site when the spill is ignited. Individual companies may have their own ignition procedures based on the type of product and ignition devices available.
- Ensure the oil at point of ignition is between 2-3 mm thick to create a sustained burn. Ignition source should generate sufficient heat long enough to cause the oil to ignite.
- Spills that contain light ends will probably ignite without the assistance of an auxiliary fuel source. A flare shell propelled from a safe distance should be adequate**.**
- Spills that contain a high percentage of heavy ends may require the use of an auxiliary fuel or ignition promoter
- Auxiliary fuel usually consists of diesel, kerosene and gasoline but can also be in the form of dry straw, etc.
- Diesel and kerosene are considered to be the best ignition promoters as the flame temperature is higher
- Lighter products, such as gasoline, evaporate much faster than diesel which results in faster cooling of the slick
- Dry straw can be effective but application must be able to be done in a safe manner
- Ignite the outer edge of the spill and allow the fire to burn from the outside in (helps to reduce chances of fluid migration).

Ignition Considerations and Procedures *continued*

Determine what method of ignition will work the best while still allowing for safe implementation, *continued*

- Use multiple ignition points, where possible, to encourage the spreading of flames throughout the spill area and improve burn efficiencies.
- Ignition devices may include:
  - flare shells
  - gelled gasoline
  - diesel or kerosene
  - mixtures of gasoline and diesel fuel
  - crude oil
  - organic matter such as peat moss or straw
  - canister igniters
  - aerial ignition devices
  - dry straw
  - propane torches.

Ignite the spill.

- Determine flammability / toxicity around the spill using an explosive / toxic gas meter.
- Apply the auxiliary fuel agents (if necessary) to the determined ignition areas.
- Approach the ignition points from upwind.
- Ensure ignition workers are in a safe zone by continuously monitoring for explosive / toxic mixtures.
- Ignite all sites of the spill at the same time, using the selected method.
- Allow initial burn to complete without adding any additional fuel.

Monitor the spill site during the burn period to ensure that no hazards exist.

- Monitor the weather conditions on a regular basis.
- Be prepared to implement the emergency plan should the conditions change for the worse.
- Ensure the workers are in a safe area.
- Monitor the success of the burning procedures as they are implemented and at completion of the burn.
- For larger spills, burning may continue over an extended period of time, involving night-time conditions.
- Maintain security until the hazards have been totally eliminated.
- Utilize a fire guard crew on the entire perimeter to ensure no secondary fires occur.
- Monitor the site for black smoke.
- Ensure that regulatory agencies, land owner(s), stakeholders, the public, and media are kept informed.
- Ambient air monitoring programs should be implemented as required.

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2.4.9.7 Bioremediation

Bioremediation and would be considered when mechanical disturbance is not warranted or would cause additional damage based on a Net Environmental Benefits Analysis.

Bioremediation is the process of applying nutrients (fertilizer containing nitrogen and phosphorus) or genetically engineered bacteria to oiled terrestrial or shoreline areas to accelerate the natural biodegradation process. During this process, micro-organisms (bacteria) oxidize hydrocarbons, ultimately converting them to carbon dioxide and water. Biodegradation occurs primarily at the oil/water or oil/air interface and is limited by oxygen, moisture, and nutrient availability. It is also sensitive to temperature; the lower the ambient temperature, the lower the rate. If nutrients are used, they must be supplied in such a way that they will not be washed away by tides or any water runoff.

Bioremediation Evaluation

The decision to use bioremediation treatment should be based on the type of spill, the character of the area impacted. In some cases, other forms of clean-up may be required in conjunction with nutrient addition to achieve the desired enhancement rate. As in the case of other oil spill response chemicals, approval must be obtained from the U.S. FOSC and U.S. State On-Scene Commander ("SOSC ") or applicable Canadian regulatory stakeholders before the nutrients are applied and the products must be listed on government product schedules where required. An expert should be consulted.

Under the U.S. Regional ACP and NCP, options for the authorization of biological agents are outlined for use under certain conditions and in certain locations. Consultation with the FOSC should take place to determine authorization/preauthorization requirements for approval.

The IC will be responsible for providing incident specific information needed to approve the use of bioremediation operations.

Bioremediation Approval

The physical containment and recovery of oil is the preferred clean-up technique.

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Biological Disinfection

Biological disinfection is the systematic reduction in the probability of spreading invasive biological organisms between freshwater environments.
Applying the practices in the procedure will reduce the probability of spreading invasive biological organisms between freshwater environments by way of Enbridge Pipelines Inc.'s, Enbridge Energy Partners, L.P. (Enbridge) or contractor equipment, material or operations used during a response or exercise. The procedure incorporates the requirements of the jurisdictions (state, province, territory and country) in which Enbridge operates.

The disinfection procedures included in this document may not be suitable in all situations or for all potential biological organisms. If more information is required regarding which disinfection procedure should be used, an appropriate environmental professional or environmental regulator should be contacted.

If required, the ENVL is responsible for development of the detailed Biological Disinfection Plan.

- Once items are disinfected, they should not come into contact with infected waters or other materials.
- Avoid touching absorbent materials with other absorbent materials during disinfection.

INSPECTION

To help determine if equipment need to undergo disinfection, either prior or post deployment, a full inspection of the equipment is needed. The inspection should be focused on any attached mud, plants, and other organisms. If debris is found, the equipment must undergo disinfection procedures. All inspections should be documented on the *Enbridge Invasive Species Inspection and Certification Form.* Further information on how inspection should be conducted can be found in the *Emergency Response Aquatic Invasive Species Inspection Procedures.*

General Guidelines

General guidelines that will assist in implementation of this SOP follow:

- Use a tagging system to identify infected from disinfected equipment.
- Look in cracks/crevices that may otherwise go unnoticed and hide unwanted organisms.
- Use rubber waders, gloves and boots where possible, as neoprene waders and gloves as well as felt soled boots retain moisture and organism such as Rock Snot and whirling disease. Neoprene and felt soles are also harder to disinfect.
- Allow equipment to dry completely and for the recommended times between uses.
- To help prevent transfer of aquatic invasive species, in addition to the above mentioned disinfection methods, where possible efforts should be made to designate equipment and personal gear to a single waterbody

The following should be considered when setting up disinfection stations:

- Weather conditions
- Proximity to water bodies or means by which water and cleaning solutions could enter water bodies.
- Disinfection stations will be constructed with secondary containment to collect wash water. Wash water will be collected and disposed of as per the site-specific waste management plan.
- Wherever possible, draining water from equipment (e.g. bilge water) should be done in the waterbody in which work was conducted.
- Type and quantity of PPE, clothing, heavy equipment and vehicles to be disinfected.

Equipment

WORKERS AND PERSONAL PROTECTIVE EQUIPMENT

When using chemicals, the appropriate PPE is to be used (e.g., appropriate gloves, safety glasses and clothing), and the SDS are to be reviewed and available.

Recommended cleaning supplies and equipment for disinfecting workers and their PPE will depend on the method of disinfection that is determined to be appropriate and may include:

- Heavy gauge plastic drop cloths for larger pieces of equipment, personal clothing/ technical equipment (i.e., waders, wader boots, rubber boots, motors, etc.).
- Assorted long and short handles soft bristled brushes to scrub equipment, parts and boots.
- Buckets for wash and rinse solutions.
- Tubs, stock tanks, or containers large enough and sturdy enough to contain water above 60ºC (140ºF).
- Plastic tubs for workers to submerge equipment and clothing.
- Methods for containing waste water.
- Methods for disposing of waste water (e.g. bilge water etc.).
- Bleach solutions:
  - 2% bleach solution (200 mL and water added to make 10 liters) for general disinfection
  - if targeting whirling disease specifically, a 10% solution should be used
  - if Viral Hemorrhagic Septicemia (VHS) is targeted a 20% chlorine bleach solution should be used.

Bleach can be corrosive to aluminum and hot water can delaminate Gore-Tex® fabric and other sensitive clothing or fabrics.

- 5% salt solution.
- 5% antiseptic hand solution.
- Full strength cleaning agents with quaternary ammonium compound alkyl dimethyl benzyl ammonium chloride (ex Parvasol ® and Kennelsol ® or Formula 409® and Fantastic ®).
- A 5% Household detergent (dishwashing detergent) solution.

Disinfection of workers and PPE must be completed in one of the on-site disinfection stations. These stations are to be separate from the on-site decontamination stations.

The following is recommended for disinfecting heavy equipment and vehicles. These should be used in addition to the previously listed materials and solutions.

- Pressure washer with at least 250 psi strength.
- Pumps for collecting wash solutions and emptying boats and other vessels
- Brooms and brushes for cleaning operator areas inside vehicles and equipment.
- Disposal receptacles for disposable cleaning materials and for any biological materials removed from equipment (e.g., plants, bait fish, paper towels or other disposable cleaning materials used).
- Methods for containing waste water.
- Methods for disposing of waste water (e.g. bilge water etc.).

Disinfection of heavy equipment and vehicles must be completed in one of the on-site disinfection stations. These stations are to be separate from the on-site decontamination stations. Decontamination is to occur prior to disinfection. If heavy equipment and vehicles require disinfection following decontamination, the equipment is to be brought directly from the decontamination station and is not to be re-used until disinfection has been completed.

Where possible, potentially infected equipment should be disinfected in one of the on-site disinfection station, rather than transported off-site for disinfection.

If on-site disinfection is not feasible, PPE and clothing should be removed as per the site-specific decontamination plan, bagged and not used on other sites before being disinfected off-site.

Disinfection Procedures

Disinfection methods should be matched to best suit the type of equipment being used. Refer to Spill Response Freshwater Biological Disinfection Procedures for detailed disinfection procedures.

It is illegal to transport live fish, bait or other organisms from one body of water to another. If none of the disinfection procedures are feasible for certain equipment, restrict use of equipment to a single water body.

DISINFECTION

Disinfection procedures may vary depending on whether particular organisms are being targeted, as well as what may be most suitable, based on what the equipment is made of, how readily some supplies are, and the feasibility of obtaining large enough quantities of cleaning solutions in the field.

DRYING

Drying can be used as a disinfection process if the following procedure can be followed:

- Some aquatic invasive species can survive out of water for more than two weeks. It is important to know potential species to which equipment may have been exposed. Equipment should be dried before transporting to another body of water, according to the site-specific species of concern.
- If targeting adult zebra mussels, 10 days may be required to kill organisms in cool or humid weather.
- If targeting *Didymosphenia geminate* (commonly referred to as Didymo or Rock Snot), equipment must be dried completely inside and out, and then for an additional 48 hours. Freezing items solid will also kill Didymo cells. Freezing overnight should work in most instances.
- Porous materials should be soaked in cleaning solutions for longer than non-porous materials and dried for longer periods of time than non-porous materials. Materials should be dry to the touch both inside and out, and allowed to dry for at least an additional 48 hours prior to entering a different waterway.

ACTIVE CLEANING

If drying cannot be implemented, an active cleaning method of disinfection will be required to limit the potential of transporting biological organisms from one fresh water environment to another.

Non Absorbent Items

Soak and scrub non-absorbent items for at least one minute (unless otherwise specified below) in one of the following solutions:

- 5% solution of dishwashing liquid (500 mL or 2 cups and water added to make 10 liters).
- 2% solution of bleach (200 mL and water added to make 10 liters).
- 5% solution of salt (500 ml or 2 cups and water added to make 10 liters).
- 5% antiseptic hand cleaner (500 mL or 2 cups and water added to make 10 liters).
- A dilute solution of 7% hydrogen peroxide mixed in a 64 ml (hydrogen peroxide):1litre (water) ratio. Can be applied using spray equipment. Infected equipment should be completely covered with the solution and allowed to sit for approximately 60 minutes before rinsing with clean water.
- Iodophor solution of 100 mg/L for moving equipment out of Viral Hemorrhagic Septicemia (VHS) management zones.
- Vinegar Dip (100% vinegar for 20 minutes).
- 1% salt solution in place of the vinegar dip for 24 hours.
- Full strength cleaning agents with quaternary ammonium compound alkyl dimethyl benzyl ammonium chloride (ex Parvasol ®and Kennelsol ®or Formula 409® and Fantastic ®)
- These can also be used in a 2:1 water to disinfectant ratio
- Soak all equipment for a minimum of 10 minutes

When deciding on the appropriate active cleaning methodology for non-absorbent items, the following should be considered:

- Disinfection with chemicals is not effective against killing spiny water fleas resting eggs.
- Disinfection with chlorine or iodophor must be used if fieldwork is conducted within and outside of the VHS management zones.
- Water-based solutions should be at least 60ºC (140ºF) and soaked for at least 20 minutes in hot water kept above 45ºC (113ºF).
- For equipment that cannot be submerged, solutions may be applied by either washing with a pressure washer, or with a pressurized garden hose. Pressure washers should reach at least 250 pounds per square inch (psi). Pressure washers may not be appropriate for all equipment and may damage some equipment.

ABSORBENT ITEMS

Absorbent items (e.g. felt-soled waders and diving suits) will require longer soaking times than non-absorbent items, to allow thorough saturation.

Soak absorbent items in the following solutions:

- At least 40 minutes in hot water kept above 45ºC
- At least 30 minutes in hot water kept above 45ºC containing a 5% dishwashing detergent solution
- For SCUBA gear, the following solution and soak times may also be used:
- Submerge and wash the suit and equipment (including inside of buoyancy compensator with hot water that is at least 40ºC (or 104ºF);
- Submerge/wash suit and equipment in a tub/tote with a salt solution (1/2 cup salt dissolved in 3.4 liters of water), then rinse with clean water

DISPOSAL

- Materials and solutions used in the disinfection process will be contained, and managed as outlined in the site-specific Waste Management Plan.

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Decontamination

Decontamination is the systematic removal of residual chemicals from personnel and equipment after exposure to toxic, flammable and/or hazardous products.

The SOFR is responsible to establish work areas which will be divided and identified (i.e. signs and/or barrier tape) into three zones as stated in the ICS 208- Site Safety Plan.

Each time clean-up workers exit the Hot Zone they will undergo decontamination (decon) procedures at stations within the Warm Zone. The SOFR will determine the decon level, measures and set-up of the decon corridor as part of the Site Safety Plan. If required, the ENVL is responsible for development of the detailed Decontamination Plan.

To determine the scope of decontamination stations needed, consider:

- Weather conditions
- Site conditions (e.g., access to utilities, space)
- Size of the emergency
- Quantity of PPE (e.g., boots, gloves, coats, coveralls, headwear, air monitoring devices, respiratory protective equipment)
- Amount of tools and equipment (e.g., shovels, axes, picks, pumps, chainsaws, compressors, light plants, backhoes, dozers, cranes, vacuum trucks, welding and boom trucks)
- Sensitive areas (natural areas, wildlife habitat)
- Natural drainage pattern
- Logistics of decontamination waste disposal

Non-Emergency/Routine vs. Emergency Decontamination

Routine decontamination is designed to reduce the amount of residual product on the clothing until safe and acceptable levels are achieved.

Emergency decontamination is designed to remove the patient from the hazardous area, remove contaminated clothing and flush the product off the patient. This will be accomplished taking into account any medical considerations. Water should be used to perform the emergency decontamination of the patient. There is less regard for runoff retention, and the emphasis is to expedite emergency medical treatment.

Factors Influencing Methodology

Product(s) involved
Hazards associated with the product(s)
Degree or extent of contamination
Physical and chemical properties of the product(s)

Decontamination Procedures

- All emergency response personnel will be briefed on decon procedures before entering the decon corridor.
- The decon corridor will be clearly identified by yellow tape or other highly visible method with clearly identifiable entry and exit points.
- The decon corridor will be established upwind of the Hot Zone or in a location where vapors from the Hot Zone will not significantly impact the corridor.
- If possible, the decon corridor will be set up close to services (water, electricity, road access etc.).
- The floor of each station will be covered with PVC sheets/10 mil poly to prevent contamination of the soil. The rest of the decon corridor will be lined with non-slip sorbent surface and bordered with sorbent rolls, pylons and barrier tape.
- Decon corridor entry and exit will be identified and located within the Warm Zone.
- Runoff water will be contained and removed either by portable pump or buckets into drums or other suitable containers for subsequent hazardous waste removal.
- Tents or plastic barriers will be set up for protection from inclement weather and also for privacy during disrobing. If emergency response personnel include men and women, establish separate disrobing tent/barrier stations per gender.
- Chairs will be set up where needed to assist in PPE removal and boots/booties.
- Decon pools for primary wash/rinse and wading pools for secondary wash/rinse will be established.
- A tool drop will be set up just outside the decon corridor entry point (wading pool and/or other suitable containment).
- All water used in the Hot Zone will be treated as hazardous waste (minimize water use as much as possible).
- Heavily contaminated PPE, clothing/equipment considered to be a hazardous waste may be disposed of without decontamination as required.
- Cleaning solutions must have adequate grease cutting properties and be evaluated by the degree of hazard for workers and the environment, (reference the Waste Management Plan). Brushes must be effective in removing contamination, but not damage clothing or PPE or cut/injure personnel.
- Wiping down personnel will always be done in a downward motion, away from the facial area (goggles should be left on until personnel enter the Cold Zone). Gloves off last!
- Adequate hazardous waste containment will be on hand and set up along the corridor. Once filled, containers will be closed, sealed and marked as hazardous waste before being removed to a collection area.
- Where hazardous waste is disposed of in plastic (garbage) bags, these will be collected and stored in a marked waste bin or other protective secondary containment.
- PPE items that may be reused after decontamination (e.g. rubber suits, rubber boots) will be collected and stored near the Cold Zone and made available to responders as required.
- A supply of fresh respirator cartridges will be available to responders. Used contaminated cartridges will be collected and stored in an identified container.
- A supply of facial wipes, paper towels and clean water will be maintained outside the Cold Zone for final, personal cleaning. A shower facility (if possible) should be available at this location.
- At demobilization, all materials used in the decon corridor will be marked and placed in suitable containment, including inner packaging and outer packaging, as required for further decontamination before final storage.
- Any tools and equipment that can be decontaminated will be decontaminated to allow future use and to reduce replacement cost.
- Any tools and equipment considered of no further use will be properly disposed of.

Heavy Equipment and Vehicles

Recommended equipment for decontaminating heavy equipment and vehicles include:

- Long-handled brushes for general exterior cleaning.
- Long-handled brushes, rods, and shovels to dislodge contaminated soil from tires and the undersides of vehicles and equipment.
- Wash and rinse buckets for decontaminating interior and exterior of vehicles and equipment.
- Brooms and brushes for cleaning operator areas inside vehicles and equipment.
- Containers or plastic-lined area to hold contaminated soil removed from vehicles and equipment (this can be included in overall cleanup of the Hot/Warm Zones).
- Wash solutions to remove and reduce the hazards associated with the contaminant.
- Rinse solutions to remove contaminants and contaminated wash solutions.
- Pumps for collecting wash and rinse solutions.
- Storage containers for temporary storage of contaminated solutions.
- Pressure and/or steam sprayers for washing and rinsing equipment or truck undercarriages, if applicable. Wash heavy equipment and vehicles in designated areas (e.g., lined areas, on contaminated soil) to prevent further contamination of the site.
- Containers for disposing of contaminated solutions.

Decon Corridor Equipment

Recommended equipment and cleaning supplies for establishing a decon corridor include:

- Barrier tape and pylons;
- Heavy gauge plastic drop cloths or containers with plastic liners for heavily contaminated tools, light duty equipment, duct tape and protective clothing;
- Sorbent industrial rugs to put down on walking surfaces to absorb oil and provide non-slip surface;
- Assorted long handled, soft bristled brushes to remove and rinse off contaminants;
- Buckets for wash and rinse solutions;
- Tubs, livestock tanks, or children's wading pools large enough to hold wash and rinse solutions, if applicable (size depends on the situation, but should be large enough to place a booted foot. If liquid solutions are used, these may need to be bermed/diked. Consider disposal (drains) for waste water generated);
- Lined pit or box with absorbent pads to wipe off gross contaminants and liquid contaminants;
- Containers for clothing that require laundering, and for containing waste and solutions generated by the decontamination process (e.g., plastic or metal drums, plastic-lined trash cans);
- Chairs to assist with PPE removal;
- Baby oil to be used for safely dissolving heavy oils or tar from skin and hair;
- Spray bottles, small hand operated and or bug type sprayer for applying mild detergent and water mix and/or for rinsing;
- Decon solutions or detergent and water to remove the contaminants;
- Rinse solutions to remove the contaminants and contaminated wash solutions;
- Paper or cloth towels for drying protective clothing and equipment;
- Heavy duty cleaner (Gojo, Lava or other industrial hand cleaner), soap or wash solution, wash cloths, and towels for workers;
- Paper towels, facial wipes and clean water in the Cold Zone;
- Fresh respirator cartridges, outer gloves, boot covers and tape if worker returns to duty; and
- Tents or temporary facilities for the final staging area and during extreme weather provide tents for cool-down or warming area.

Decontamination Trailers

When using a decon trailer:

- Fill fresh water tanks onsite.
- Do not tow the trailer with full water tanks.
- A licensed contractor must pump waste water tanks onsite and waste water must be disposed of in an acceptable manner.
- Ensure the trailer is located on firm stable surface.
- Fill fuel tanks onsite, and maintain a generator onsite, if needed.
- Organize electric and water hookups, if available.
- Arrange for laundering clothing offsite.
- Level the trailer to ensure its components function properly.
- Stock with personal hygiene articles (e.g., soap, shampoo, towels).
- Complete and record trailer maintenance.

Trailer Decontamination:

- Follow decontamination procedure.
- Enter decontamination trailer and remove all other personal clothing.
- Place clothing into designated area.
- Shower.
- Redress in designated area.
- Exit decontamination area without passing through the undressing area.

General Mitigation Measures for Equipment and Tools

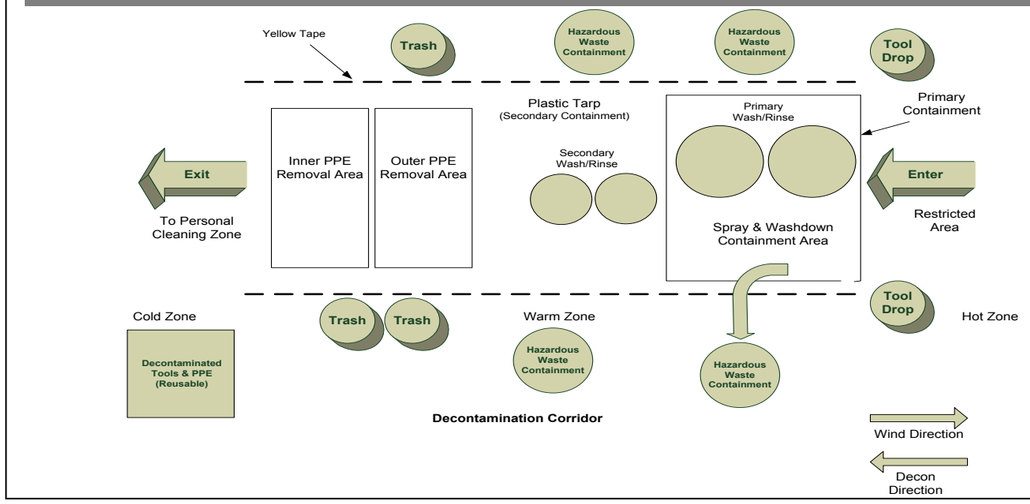
To prevent spreading contamination from equipment and tools outside the Warm Zone:

- Remove contaminated soil caught in tires and the undersides of equipment and vehicles as much as possible.
- Use pressure washers to clean the outsides and undersides of vehicles, boats (protection from invasive species and contamination) and equipment. When pressure washers are not feasible, use brushes and buckets with a cleaning solution.
- Ensure containers for storing contaminated materials are available.
- Dispose of all waste generated by cleaning equipment in an acceptable manner.
- Build bermed or lined areas to contain runoff or surface water.

Minimize waste generated from cleaning equipment as much as possible but not to the extent that it compromises adequate decontamination.

If large equipment must be moved offsite or from one location to another for more thorough cleaning, inspect the equipment to ensure contamination will not occur during transport and ensure the alternate location is pre-approved by IC.

Decontamination Corridor Diagram



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2.5 Demobilization

ALL Enbridge staff, contractors and sub-contractors are required to go through the demobilization process.

All Enbridge employees and contractors assigned to [Incident Name] are required to follow the demobilization process. Below are guidelines for completing the Demobilization form ICS-221 located in *Section 4 - Forms.*

Page 1

- Please indicate if you are an Enbridge employee, contractor or sub-contractor.
- Complete Section 1 by adding your personal information and, if applicable, the information you know about your replacement.
- Indicate the team you worked with during the response.

Page 2

- If you are an Enbridge employee enter the information about your usual office location. The two acknowledgement check boxes should be completed when you see HR during the Demobilization.
- In order to help review the incident, please add any thought about how well things went or where improvements can be made for incident response.

Page 3

- Section 2: Documentation Demobilization, and Section 3: Information Technology Demobilization, are to be completed by a Documentation Unit team member.

Page 4

- Section 4: Demobilization Acknowledgement & Approvals will require you to have your supervisor sign, and provide their title and phone number, under the appropriate section. The Documentation Unit will work with both the Information Technology and Human Resource groups to obtain their signatures.

If you have any questions about the demobilization process, or document handling procedures, please:

- Visit the Demobilization Unit at the Incident Command Center.
- Call the Demobilization Unit at [telephone].
- Call the Demobilization Unit Lead at [telephone].

Before demobilization of the IMT can occur the following must be done:	
✓	Incident has been contained (the threat has been removed)
✓	ICS established
✓	Containment in place and effective
✓	The visual extent of impact has been identified
✓	Clean up resources are in place
✓	Stakeholder notification conducted (Including Indigenous representatives)
✓	Other plans have been considered and drafted: e.g. monitoring and sampling plan, remediation plan, wildlife mitigation plan, communications plan and waste management plan
✓	Transition Plan developed and agreed on by Incident Command/Unified Command

The demobilization should consider both the priority of release, and how activities will be transferred fully and effectively to regional operations, project teams, and/or other supporting business departments.

Resources no longer required for the response to the incident will be demobilized as rapidly as is feasible. They will be released in the following general priority.

Priority I -- Resources required to be returned to emergency services.
Priority II -- Resources mobilized from off-site
Priority III -- Local resources

Personnel:

- As appropriate, personnel demobilizing from the incident should check with their third-party contractors or Agency logistics contact for return of the radios, vehicles, materials, etc., that have been issued to them for use on the incident.
- When necessary, notify their respective third-party contractors or Agency logistics contact of their checkout from hotel/accommodations.
- As part of the demobilization process, all personnel will be required to complete a Demobilization Form that assists with the checkout process/transitioning in replacement staff and gathers insight to be used in the after-action review.
- The Documentation Unit Leader will direct all personnel to IT. IT will copy all electronic records from electronic devices and file as per records management policy.
- These steps will require sign off by the appropriate Section Chief before leaving the incident site/command post.

2.5.1 Equipment Inventory, Return and Restock

Emergency Response Equipment

This section outlines the deployment of equipment for tiered responses and inspection of Company owned equipment.

The Company owns and maintains spill response equipment, which is listed in *Annex 1*. Periodic inspection and maintenance is performed on each piece of equipment in accordance with recommendations from the manufacturer. After an equipment deployment exercise, or actual response, each piece of deployed equipment is inspected to assess the condition and determine if any repairs need to be made. Equipment found to be defective will be repaired or replaced.

Inspection and maintenance activities are tracked on the *Facility-Owned Equipment Inspection Log found in Section 4 – Forms* as per Maximo.

General Equipment Inspection/Tests should include:

- Visual
- Operability of moveable components
- Operability of running equipment
- Seals, valves and connector integrity
- Lubrication and fluid checks.

Equipment Considerations:

- Rental Vehicles – Clean out and refuel. Return to third party contractors, Agency, or appropriate rental company if individually rented.
- Contractor equipment, as required, will be decontaminated at the appropriate Decon facility. Once Decon is completed the equipment will be returned to the contractor/owner.
- Local equipment will be the responsibility of the contractor to remove from the site. Resources requiring transport to other locations will be coordinated through Operations and Logistics. Resources will normally be transported via the most cost effective means as appropriate.
- Agency equipment, as required, will be decontaminated at the appropriate Decon facility. Agency equipment will then be returned to the appropriate agency and transportation support will be provided by logistics as necessary.

2.5.2 After-Action Review

Post emergency activities are divided into three phases: debriefing the incident, post-incident analysis ("PIA"), and critiquing the incident response. The extent to which these phases are undertaken depends on the nature and magnitude of the spill or release. Even a small product release could elicit very detailed termination activities, such as a release of H_2S resulting in subsequent employee, or public, negative impact. Additionally, some spills or releases trigger outside agency reporting. These events would trigger the formal termination procedures outlined in this section.

Of particular importance during the After Action review is any spill that may have occurred in a high population area. Causes of the accident along with potential recurrences must be fully analyzed in order to preclude the same accident from happening again.

After termination activities, the Company can begin the planning process of safely restoring any service that has become out of service, due to the incident.

2.5.2.1 Debriefing the Incident

Debriefings should begin as soon as the "emergency" phase of the operation is completed. Ideally, this should be before Enbridge responders leave the scene, and it should include the key players such as the PIO and agency representatives who the IC determines would benefit from being involved.

Debrief Checklist		
☐	Use safety meeting attendance forms and other memoranda to document the debriefing	
☐	Inform responders exactly what hazardous materials they were (possibly) exposed to and the signs and symptoms	
☐	Identify equipment damage and unsafe conditions requiring immediate attention or isolation for further evaluation	
☐	Assign information-gathering responsibilities for a PIA and critique	
☐	Summarize the activities performed by each sector, including topics for follow-up	
☐	Reinforce the positive aspects of the response	
☐	Assign information-gathering responsibilities for a PIA and critique	
☐	Summarize the activities performed by each sector, including topics for follow-up	
	Debrief Performed By:	Date/Time

2.5.2.2 Post-Incident Analysis

Post-Incident Analysis:	
✓	PIA is the detailed, step-by-step review of the incident to establish a clear picture of the events that took place during the incident. It is conducted to establish a clear picture of the emergency response for further study
✓	The PIA is not the same as investigations conducted to establish the probable cause of the accident for administrative, civil, or criminal proceedings. Those are usually conducted utilizing root cause or hazard and operability methodologies. One person (or office) should be designated to collect information about the response during the debriefing. Additional data may be obtained from Incident Command Post logs, incident reports and eyewitness interpretations.
✓	Once all available data has been assembled and a rough draft report developed, the entire package should be reviewed by key responders to verify the available facts are arranged properly and actually occurred. The PIA should focus on four key topics: *Command and Control, Tactical Operations, Resources and Support Services.*
✓	*Command and Control* – Was command established and were sectors organized? Did information flow from operations personnel through Sector Officers to the IC? Were response objectives communicated to the personnel expected to carry them out?
✓	*Tactical Operations* – Were the tactical operations ordered by the IC and implemented by emergency response personnel effective? What worked? What did not?
✓	*Resources* – Were the resources adequate for the job? Are improvements needed to apparatus and/or equipment? Were personnel trained to do the job effectively?
✓	*Support Services* – Were the support services received from other organizations adequate? What is required to bring support to the desired level?

2.5.2.3 Critiquing the Incident

Critiquing the Incident Response	
A commitment to critique an all hazardous material response will improve IMT performance by improving efficiency and pinpointing weaknesses. Use the tool as a valuable learning experience (everyone came to the incident with good intentions). A good critique promotes:	
✓	Trust in the response system as being self-correcting
✓	Willingness to cooperate through teamwork
✓	Continuing training of skills and techniques
✓	Pre-planning for significant incidents
✓	Sharing information between response agencies.

Critique Format:	
A critique leader is assigned. This can be anyone who is comfortable and effective working in front of a group. The critique leader should:	
✓	Control the critique. Introduce the players and procedures. Keep it moving and on schedule
✓	Ensure that specific questions receive detailed answers
✓	Ensure that all participants follow the critique rules
✓	Ensure that each operational group presents their observations
✓	Keep notes of important points
✓	Sum up the lessons learned
✓	Follow up
✓	Following the critique, forward the written comments to management. They should highlight suggestions for improving response capabilities and alternative solutions
✓	When larger incidents are involved or injuries have occurred, formal reports shall be circulated so that everyone in the response system can understand the “lessons learned.”

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Section 3 – Table of Contents Page

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3.0 Training

Experienced, well-trained people are essential for successful implementation of this ICP. All Company employees attend Safety Orientation for New Employees at hire where they receive information on:

- The content of the information summary of the ICP (Response Plan);
- Their responsibilities under the ICP (as per the defined training matrices below); and
- Required safety training (as per the Company's safety program).

Other internal awareness and training programs include:

- Public Awareness Campaigns.
- Call Before You Dig Program.
- Annual Emergency Preparedness Week Bulletin.
- ICS Awareness Online Training.
- Security Awareness Online Training.

Specific information that is reviewed in training includes:

- The procedures for contacting the respective Control Centers, in their area, on a 24-hour basis.
- U.S reporting to the National Response Center ("NRC"), which is the sole federal point of contact for reporting oil and chemical spills. The NRC can be contacted toll-free at 1-800-424-8802 or at 202-267-2675.
- Canadian Reporting – the regulatory authority having jurisdiction (*See Annex 2*).

The training contained within this section compliments the existing safety training program.

Exercises are performed to check the effectiveness of the training, to test the Plan and refresh skills and knowledge obtained through training. Ongoing training and exercises are conducted within each Response Zone. In addition to training on the ICP, the training and exercise program provides members of the FRT with the basic knowledge, skills, and practical experience necessary to perform safe and effective spill response operations in accordance with the Plan.

The Training Coordinators, with advice from the ER Coordinators and relevant staff, will devise a training plan and schedule in response to governmental regulations and the specific requirements of the Company. The regional training plan will include a regional training matrix based off of the matrix in this plan. The regional training plan will be implemented in cooperation with local oil spill response co-ops and selected contractors. Representatives of governmental agencies and other interested parties may be invited to observe or participate in these activities as determined appropriate.

ER Training matrices information is located in the ER Training Syllabi found in Governance Document Library.

3.1 Response Training

The Company has developed a program for facility response training.

Regional Training Coordinators are responsible for overall coordination of emergency response training identified in the table that follows, including:

- Annually identifying emergency response training needs;
- Scheduling emergency response training;
- Ensuring training records are maintained and up-to-date;
- Ensuring training missed by employees who are absent is re-scheduled;
- Summarizing mandatory emergency response training for employees annually that compares scheduled training to actual training received; and
- Reviewing training with employees at least once per calendar year.

Records

Regional Training Coordinators will retain training records in the regional/field office permanently (in accordance with that region's training record retention standard) and in the Company's Learning Management System ("LMS").

TRAINING MATRICES

Table 1

Emergency Response Training Matrix- Regional Personnel

ICS TRAINING	Duration	Recertification	Source	All Personnel [1]	Safety Coordinator [2]	Compliance Coord [2]	Terminal Staff [3]	PLM / Field Staff [3]	Regional IMT	Office Employees	Other Response Personnel *
ICS Awareness	1	every 3 yrs	internal	R							
ICS 100/200	8	one-time	vendor		O	R	O	O	R	O	
ICS 300	16	one-time	vendor		O	R	O	O	R	O	
ICS 320	24	one-time	vendor		O	O	O	O	O	O	
HAZWOPER TRAINING +											
HAZWOPER 24hrs	24	one-time	internal or vendor		R		N/A	N/A	O		
HAZWOPER 40hrs	40	one-time	internal or vendor		O		R	R	O		
HAZWOPER Refresher 8hrs	8	annual	internal or vendor		R		R	R	O		
OPERATIONAL/TACTICAL TRAINING											
Basic Boat Operations	3-4	One-time	vendor		R	O	O	R	O		
Boat Handling Operations	8	every 3 yrs	vendor		R	O	O	R	O		
Boom Deployment	8-16	every 3 yrs	vendor		R	O	R	R	O		
Enbridge Responder Awareness	1	every 3 yrs	internal		R	O	R	R	N/A	O	
NGL Planned Ignition	8	every 3 yrs	internal		R	O	R	R	O		
Oil Recovery Under Ice (Ice Slotting)	12-16	every 3 yrs	vendor		R	O	O	R	O		
Skimmer Operations	6	every 3 yrs	vendor		R	O	O	R	O		
Tank Fire Awareness	1	annual	vendor or internal		R	O	R	O	O		
Tank Rescue	4	annual	vendor		R	O	R	R	O		
VHF Radio Operators **Canada Only**	6	one-time	vendor		O	O	O	O	O		
INSTRUCTOR/TRAINER											
Inland Oil Spill Response	24-40	one-time	vendor		O	O	O	O	O		
Cold Weather Oil Spill Response	24-40	one-time	vendor		O	O	O	O	O		

NOTES: **R = Required attendance** (Mandatory training may not apply to all employees within the same job classification. Attendance is determined by regional management depending on the requirements of the job function).

O = Optional attendance – to be determined by regional or departmental management. Supervisors are included in the same training as the workers within their area of responsibility.

¥ = Required only for PLM Supervisors that will be in charge of on-scene clean-up operations

Ŧ = required for all U.S. personnel, and only required Canadian personnel that may respond in the U.S., for a release incident and work in the hot or warm zones

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* Other response personnel, including volunteers and casual workers (This group will not be used unless there is a prevalent need at the time of an incident. If used, all personnel will be trained onsite with the required OSHA standard).

Regulatory Terminology:
[1] = All Personnel
[2] = Reporting Personnel
[3] = Response Personnel

The titles of the groups are high-level and should be synthesized by each department and/or regional management to determine appropriate attendance based on the employee's job function during an emergency. Other departments or employees may attend if deemed they will respond to an incident.

Table 2
Emergency Response Training Matrix- Business Support Personnel

				All Personnel [1]	Health & Safety [3]	Emergency Management	Environment	Other Response Personnel *
ICS TRAINING	**Duration**	**Recertification**	**Source**					
ICS Awareness	1	every 3 yrs	internal	R				
ICS 100/200	8	one-time	vendor		O	R	R	
ICS 300	16	one-time	vendor		O	R	R	
ICS 320	24	one-time	vendor		O	O	O	
HAZWOPER TRAINING ŦF								
HAZWOPER 24hrs	24	one-time	internal or vendor		O	N/A	O	
HAZWOPER 40hrs	40	one-time	internal or vendor		O	R	R	
HAZWOPER Refresher 8hr	8	annual	internal or vendor		O	R	O	

NOTES: R = Required attendance –(Mandatory training may not apply to all employees within the same job classification. Attendance is determined by regional management depending on the requirements of the job function).

O = Optional attendance – to be determined by regional or departmental management. Supervisors are included in the same training as the workers within their area of responsibility.

Ŧ = required for all U.S. personnel, and only required Canadian personnel that may respond in the U.S., for a release incident and work in the hot or warm zones

* Other response personnel, including volunteers and casual workers (This group will not be used unless there is a prevalent need at the time of an incident. If used, all personnel will be trained onsite with the required OSHA standard.)

Regulatory Terminology:
[1] = All Personnel
[2] = Reporting Personnel
[3] = Response Personnel

The Company's titles of the groups, expressed in the table above are high-level and should be synthesized by each department and/or regional management to determine appropriate attendance based on the employee's job function during an emergency. Other departments or employees may attend if deemed they will respond to an incident.

3.2 Incident Command System

The Company's ICS program follows the National Incident Management System.

3.2.1 Enbridge Responder Awareness Course

Abstract	This course provides identified responders with guidance and tools when first on-scene at a potential incident.
Target Audience	Identified responders as per the matrices
Frequency	Every 3 years
Description	• Responder and public safety • Identifying hazards • How to report an incident • Reporting phone numbers for the Company and regulatory agencies • Becoming familiar with Regional ER information • Understanding roles and responsibilities within the Company • Documentation
Estimated Duration	1 hour
Recertification	3 years
Material/Delivery Type	Interactive online, test requiring 80% completion, ICS 214 and ICS 201 packet

3.2.2 Incident Command System ("ICS") Awareness Course

Abstract	This course provides the employee with an introduction to the ICS and is not intended to supersede ICS 100/200. This course outlines the basics behind activation of the ICP. This program can be used as an ICS 100/200 refresher.
Target Audience	All staff
Frequency	Every 3 years
Description	• ICS definitions • ICS organization • Roles and responsibilities • Integrated Contingency Plan • Crisis Management • Documentation
Estimated Duration	1 hour
Recertification	3 years
Material/Delivery Type	Interactive Online, test requiring 80% completion and ICS 214

3.2.3 ICS 100/200 Course

Abstract	This intermediate level course provides identified responders with an introduction to the ICS.
Target Audience	Identified responders as per the matrices
Frequency	One time
Description	• ICS terminology and facilities • ICS organization • ICS tools • ICS 201 incident briefing packet
Estimated Duration	8 hours
Recertification	N/A
Material/Delivery Type	Instructor led, PowerPoint slide deck handout, test requiring 80% completion, ICS 201 packet, USB (with ICS forms/reactive and proactive phase), Incident Management Handbook (“IMH”)

3.2.4 ICS 300 Course

Abstract	This intermediate course provides identified responders with an expanded understanding of the basic ICS 100/200 course and provides an in-depth description of how the NIMS Command and Management System supports the management of expanding incidents.
Target Audience	Identified responders as per the matrices
Frequency	One time
Description	• Understanding the planning cycle • Developing an initial response organization • Conducting a planning meeting • Developing a detailed incident action plan
Estimated Duration	16 hours
Recertification	N/A
Material/Delivery Type	Instructor led, PowerPoint slide deck handout, in class exercise assessment, ICS 201 packet, USB (with ICS forms/reactive and proactive phase), IMH

3.2.5 ICS 320 Course

Abstract	This intermediate level course provides identified responders with an understanding of the ICS planning process within an incident. This course includes the integration of external stakeholders, agencies, and non-government organizations.
Target Audience	Identified responders as per the matrices
Frequency	One time
Description	• Step by step incident procession from the reactive through the proactive phases • Integrate ICS theory, tools, processes, and workshops with each step of the planning cycle of an incident • Key outcomes of each work period and meeting through all phases of an incident • Incident management team roles and responsibilities
Estimated Duration	24 hours
Recertification	N/A
Material/Delivery Type	Instructor led, PowerPoint slide deck handout, in class exercise assessment, ICS 201 packet, USB (with ICS forms/reactive and proactive phase), I M H

3.3 Operational Training

This section will address the operational training that is conducted by the Company in relation to established safety standards. The Company does not train to fight tank fires. Terminal personnel are trained to recognize tank fires and activate response. The course descriptions below provide detail regarding the content of the tank courses.

3.3.1 Tank Fire Response/Strategies Course

Abstract	To familiarize personnel with response strategies, equipment and resources.
Target Audience	All field staff that would respond to a tank fire.
Frequency	Every 3 years
Description	The purpose of this course is to provide personnel with the knowledge and tools to recognize and to safely deal with tank fires, within established Enbridge guidelines. Responders to tank fires must have the ability to recognize the hazards of an emergency situation and recognize when it is unsafe to be present in the situation. • Identify a minimum of three codes related to tank construction / fire safety. • Identify the consequence of inadequate ventilation of a tank exposed to fire. • Define the terms flammable and combustible liquids. • Define flash point, burning point, auto ignition point, boiling point; vapor pressure, vapor density, specific gravity. • Define boilover, frothover, slopover, BLEVE. • Explain the relationship of LEL/UEL. • Describe the difference(s) between vent fires, seal fires, fully involved fires, and spill fires. • Given a specific type of tank, explain its fire safety features and its fire hazards. • Identify a minimum of three benefits to site specific planning. • Identify the five steps involved in pre-planning. • Explain the potential fire hazards associated with tank confinement. • Describe the potential fire hazards associated with ancillary tank equipment. • Define the three types of fire suppression systems utilized in tank fires. • Given a tank fire scenario and utilizing the site specific Pre-Fire Plan, implement Enbridge's ICS. • Given a tank fire scenario, identify the type of and the application methodology of the site specific required foam.
Estimated Duration	4 hours
Recertification	3 years
Material/Delivery Type	Instructor led, student handbook, PowerPoint presentation, Terminal Pre Fire Plans, tank information sheets, product MSDS, terminal map/layout, Book 2 – Evacuation Zones

3.3.2 Tank Rescue Course

Abstract	To ensure that workers who conduct safety watches are trained on the engineered systems used by Enbridge.
Target Audience	Operational, field staff and on-call employees
Frequency	Annually
Description	The purpose of this course is to provide personnel with the knowledge and tools to recognize and to safely deal with tank rescue, within established Enbridge guidelines. Responders must have the ability to recognize the hazards of an emergency situation and recognize when it is unsafe to be present in the situation. • Prepare safety watch to retrieve entrant • Rescue pre-plan • The safe use of rescue equipment • Recognize and manage risk during rescue • Use of engineered, swing davit arm
Estimated Duration	4 hours
Recertification	Annually
Material/Delivery Type	Instructor led, student handbook, PowerPoint presentation, hands-on practice with rescue equipment

3.4 HAZWOPER Training

OSHA's Hazardous Waste Operations and Emergency Response (U.S.) sets minimum training and/or competency requirements for responders who are exposed to or potentially exposed to hazardous substances including hazardous waste.

Canadian employees will be required to complete the appropriate training course based on their potential job duties for a cross border response. This may also occur at the destination in the US.

The table below provides an overview of responsibilities for the training program.

Emergency Management Department	• Establishing and maintaining the HAZWOPER standard • Approving all vendors and in-house training in accordance with OSHA standards in *29CFR§1910.120* and the OSHA recommendations for instructors in *29CFR§1910.120*; Appendix E "*Training Curriculum Guidelines*"
Operational Training Department	• Tracking training records for all participants • Maintaining computer based training modules • Developing curriculum for in-house training
Regional Training Coordinators	• Ensuring competent external vendors provide training • Ensuring training records are maintained and are up-to-date • Annually identifying employees that are required to attend training • Scheduling "HAZWOPER" training • Ensuring employees absent from scheduled training are re-scheduled • Responsible for the overall coordination of the delivery of HAZWOPER courses • Ensuring the initial training program will be no less than the 24 hour or 40 hour course time requirement, and no less than one-third (⅓) of the hours will be dedicated to hands-on training • Regional Training Coordinators will retain training records in the regional/field office permanently (in accordance with that region's training record retention standard) and in the Company's Learning Management System ("LMS")". • Determine the courses/topics that will be covered as part of the annual 8 hr HAZWOPER refresher in conjunction with the Regional Emergency Response Coordinator.

The table below outlines response personnel HAZWOPER responsibilities.

Contractors	• All contractors responding to a spill/release that involves the Company will be required, by their contracts, to satisfy the HAZWOPER training requirements of *29CFR§1910.120* for their positions.
New Employees	• New employees that can provide a certificate of completion of a previous HAZWOPER course along with records of annual 8 hr refresher courses are not required to complete the initial training again. The previous training must be from an instructional company/institution that is currently
Current Employees	• Previous work experience and/or training that an employee has had equivalent to the initial training required in this standard, shall be considered as meeting the initial training requirements. Equivalent training includes the training that existing employees might have already received from actual site work experience. Current employees are still required to attend annual eight hour (8) refresher training. Approval for previous work experience and/or training is the responsibility of the QI/Management or designee.
Casual Labourers	• Casual laborers will generally not be hired, but may be employed by the Company's response contractors or other response organizations. Contractors will be responsible for providing the appropriate HAZWOPER training to these laborers prior to their involvement in response operations.
Volunteers	• Normally, the Company will not hire and/or train volunteers for work on an oil spill response incident. Consequently, the Company will refer volunteers to appropriate provincial/state and/or local agencies or organizations that are set up to handle volunteers. In addition, the Company will refer volunteers to appropriate wildlife rescue agencies or contractors, such as the International Bird Rescue Research Center, which may be contracted by the Company to work on the spill cleanup. • In the event that the Unified Command approved "volunteers", the IAP will include them as resources with scope of work, training and PPE as required.
Specialist Employees	• Specialist employees are experts who would provide technical advice or guidance during response to a spill incident. Examples of such specialists might include chemists, biologists, industrial hygienists, physicians, or others with skills useful during a spill response operation. Such persons must receive appropriate training or demonstrate competency in their specialty annually. There are no specific requirements on training content or hours of training for these persons except that they must have whatever training is necessary to maintain competency in their specific area of expertise. Training and demonstration of competency for skilled support personnel and specialists should be documented.
Waste Handling Training	• Field operations personnel receive extensive regulatory-required training in HAZWOPER, HAZCOM, emergency response, firefighting, and other areas as described in this section. Employees at sites which generate hazardous waste receive additional orientation and training specific to hazardous waste regulatory requirements, and hazardous waste emergency response. Site emergency coordinators (qualified individuals) also receive additional training on incident command systems.

3.4.1 HAZWOPER Course Descriptions

The table on the following page describes the overview of the HAZWOPER courses as well as the annual refresher topics.

	24 HOUR INITIAL HAZWOPER COURSE	40 HOUR INITIAL HAZWOPER COURSE
Abstract	This classification is considered the Enbridge Responder Operations Level training. Individuals are trained to respond in a defensive fashion without actually trying to stop the release. Their function is to contain the release from a safe distance, keep it from spreading and prevent exposures.	This classification is considered the Hazardous Materials Technician Level training. Individuals with this training will assume a more aggressive role than an Enbridge responder at the operations level in that they will approach the point of release in order to plug, patch or otherwise stop the release of a hazardous substance.
Target Audience	For individuals who respond to releases or potential releases of hazardous substances as part of the initial response to the site for purposes of protecting nearby persons, property or the environment from the effects of the release.	For individuals who respond to releases or potential releases for the purpose of stopping the release.
Frequency	One time	One time

Description	Includes:
	• Legal rights and responsibilities;
	• Hazardous materials regulatory overview;
	• Principles of toxicology;
	• Hazard and risk assessment;
	• Hazardous materials classes and physical hazards;
	  ◦ Characteristics and hazards of an oil spill
	• Identification systems;
	  ◦ Control and mitigation strategies of an accidental release (fire, explosion, toxicity, environmental damage, etc.)
	• Associated physical hazards;
	• Respiratory protection;
	• Personal protective equipment; and
	• Principles of decontamination
		Includes:
		• All of the 24 hour initial training program topics and;
		• Air and environmental monitoring;
		• Site control, supervision and incident management;
		• Response and site operations;
		• Review of conditions that are likely to worsen emergencies such as facility malfunctions or failures and appropriate corrective actions;
		• Hands-on practice of a minimum of decontamination, material handling, and source control (plugging/patching/over-packing, etc.)

Estimated Duration	24 hours and includes one day of actual field experienced directly supervised by a trained, experienced supervisor.	40 hours and three days of actual field experienced directly supervised by a trained, experienced supervisor.
Note	Supervised Days for Initial Training: Personnel that complete either the 24 hour or 40 hour initial training must complete the specified supervised days of field work. Those days shall be recorded on a form created and maintained by the Operations Training Department and stored in the company LMS. The activities that qualify for inclusion in the supervised days can be any of the topics listed in each of aforementioned course topics listed	
Re-certification	**ANNUAL REFRESHER** Each employee is required to attend an eight (8) hour refresher annually to include the above listed topics. No more than three topics of the 40-hour initial course may be duplicated in any given two year training cycle unless there has been a change in operations, for example; a change in air monitoring, respiratory or hearing protection equipment. Refresher training should include, at a minimum, the following topics and procedures: • Review of and retraining on relevant topics covered in the 40-hour course; • Update on developments with respect to material covered in 40-hour course; • Review of changes to EPA or OSHA standards or laws; • Introduction of additional subject areas as appropriate; • Hands-on review of new or altered PPE or decontamination equipment or procedures; • Review of newly developed air and contaminant monitoring equipment; and • Critique of the past year's incidents that can serve as training examples for future work situations.	
Material / Delivery Type	All HAZWOPER COURSES: Trainer led, Participant Handbook, appropriate certification (classroom and practical evaluation)	

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3.5 Response Exercise Program

Experienced, well-trained people are essential for successful implementation of this ICP. The exercise program is intended to provide employees of the Company with the basic knowledge, skills and practical experience necessary to perform safe and effective incident response operations.

The Company response exercise program is designed to be consistent with the exercise requirements as outlined in the PREP Guidelines, with guidance using the LP Emergency Management Exercise Design Guide (modelled after the HSEEP version). Refer to the LP EM Exercise Design Guide for the use of some HSEEP Core Capabilities. Participation in this program ensures that the Company meets all federal exercise requirements as this guideline has been adopted by Enbridge in the U.S. and Canada. The Exercise Design Guide includes the use of Core Capabilities, which are distinct critical elements necessary to achieve the specific mission areas of prevention, protection, mitigation, response, and recovery, especially for local authorities in the US. All LP Regions are encouraged to include them in exercise design.

The primary elements of the Company exercise program are outlined below in the "*Quick Reference Guide*".

All exercises and actual responses will be critiqued by the Exercise Director or Incident Commander or their designee. If appropriate, the information derived from the post-exercise or post-event evaluation After-Action Report/Improvement Plan ("AAR/IP") will facilitate ICP revisions as necessary. Recommended revisions will be forwarded to the LP Emergency Management (LP EM) Department lead.

A single actual response or exercise may satisfy more than one type of exercise requirement (i.e., an actual response could give credit for an unannounced exercise, an equipment deployment, internal notification, and qualified individual notification).

Key Program Elements:

- The exercise year for all Company facilities will be from January 1 to December 31.
- All Regions must exercise all 15 core components outlined in the PREP Guidelines at least once during each triennial cycle.
- Regions will employ a "crawl-walk-run" exercise progression, using discussion-based exercises prior to operations-based exercises
- Ensure site sensitivity analysis has been completed. This requires significant warning time to the Environment Department
- LP will satisfy regulatory requirements on both sides of the border. For example, the NEB requires a full scale exercise every three years. This will be achieved by all regions, with an FSE schedule coordinated by LP EM
- Canadian regions will update their exercise information in the exercise database at least 60 days prior to the conduct of an exercise (in accordance with NEB Order SO-E101-003-2013) and thereafter, for all regions, every quarter.

3.5.1 Exercise Format and Procedures

When conducting exercises it is strongly recommended that the Exercise Planning Team invite external organizations to observe and/or participate once the region feels confident in doing so, employing the "crawl-walk-run" progression in training and exercise conduct. Example organizations are listed below:

The following is a list of suggested organizations that should be invited to exercises:	
✓	Federal Agencies having jurisdictional responsibility during a spill or emergency
✓	Provincial/State/Territorial agencies having jurisdictional responsibility during a spill or emergency
✓	Local agencies having jurisdictional responsibility during a spill or emergency
✓	Other interested entities that may play a critical role during a spill or fire (e.g. Indigenous Representatives, Local Utilities, other pipeline companies, spill contractors)
✓	Evaluators provide an unbiased observation of the exercise and document their observations accordingly. Evaluators should avoid interaction with exercise participants. Evaluators can be internal from the company or can be from any of the agencies listed above.

3.5.2 Company Facility Requirements

Emergency exercises and drills for training and regulatory requirements are required to be conducted at facilities as outlined in the PREP Guidelines that the Company follows; please see *3.6.8 Quick Reference Guide* for type and frequency of exercises required. Security exercises requirements are contained in the LP Security Management Plan.

3.5.3 Types of Exercises

	Exercise Type	Description
Discussion - Based	Seminar	Provides presentation of new or current plans, resources, strategies, concepts, procedures or tactics.
	Workshop	Achieves specific goal or builds upon a policy or guideline (e.g. exercise objectives, standards, policies, plans).
	Tabletop Exercise ("TTX")	Validates plans and procedures and provides experience for participants by using a scenario to drive discussions.
	Game	Explores decision-making process and examines consequences of those decisions. Infrequently used by Enbridge.
	Drill / Equipment Deployment	Focuses on a single operation or function of an agency or several agencies. Maximizes on-the-job training benefits.

Operations - Based	Functional Exercise ("FE")	Evaluates plans, functions, capabilities, and staffs of Incident Command, Unified Command, intelligence centers, or other multi-agency coordination centers. (e.g. Emergency Operations Centers, incident command posts, etc.). This type of exercise does NOT incorporate "boots-on-the-ground" activities.
	Full-Scale Exercise ("FSE")	Same as FE, but with actual deployment of field personnel; includes mobilization of operational and support resources, conduct of operations and integrated elements of exercise play.

3.5.4 Exercise Design Guide

This document, which is aligned with the HSEEP model, explains the suggested process to design any exercise in the Company. Included are job-aids for exercise designers to use and sample exercise packets. This guide may be used on all exercises regardless of size or complexity.

3.5.6 Regional Management

Regional Management is accountable for ensuring emergency response exercises are conducted in accordance with the table below *(3.5.8 Quick Reference Guide).*

3.5.7 Oil Spill Removal Organization Exercise Record

The QI/Regional Management or designee shall contact their contracted certified OSRO and ensure that **one** of the following has taken place:

- The OSRO has completed the required exercise(s) per the OSRO Classification Program and provided copies of the exercise(s) to the region; or

- If the Company has exercised with the OSRO for the minimum requirements set forth in the most current version of the PREP Guidelines. It is expected that each region shall exercise with their recorded OSRO at least one time in the triennial period.

Documentation provided to the regions for OSRO-conducted exercise(s) shall be maintained by the Regional Training Coordinator permanently in a manner for ready access. A copy of this documentation is to be forwarded to LP EM each year.

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3.5.8 Exercise Quick Reference Guide

Exercise Type	Frequency	Required Participants	NPREP Reference and Remarks
		Discussion Based	
Qualified Individual/Regional On-call Notification Exercise	Quarterly	QIs, Regional On-call staff (Canada)	• Paragraphs 2.3.1., and 2.3.8.2. • QIs are not mandated in Canada, therefore regional on-call staff will be called • At least 1 exercise/year will occur outside normal business hours
Table Top Exercise (TTX)	Annual	Regional IMT	• Paragraph 2.3.8.2. • Completion of PREP components over a triennial cycle • Minimum of one IMT exercise in a triennial cycle will involve the simulation of a worst case scenario • 75% of IMT as defined in ICP will be exercised • FRT TTXs are optional
Unannounced Exercise	Annually	IMT Functional Exercise and/or TTX and/or FRT Equipment deployment	• Paragraph 2.3.7. and 2.3.8.2. • **T**his may also include a Government-Initiated Unannounced exercise; • A real incident is acceptable; • 75% of IMT as defined in ICP, or FRT, will be exercised
		Operational	
Equipment Deployment	Annually/FRT	Field Response Team	• Paragraph 2.3.6., 2.3.6.6, and 2.3.8.2. • Regions to confirm number of FRTs; • Minimum 75% participation of FRT; • Key ER equipment to be used, including dedicated ER equipment. May also include OSRO equipment; • Maximo to be updated as proof of "test" of dedicated ER equipment
Full Scale Exercise (FSE)	Once/3 years/Region	IMT, FRT, Support department staff (latter as required)	• Scheduling of FSEs to be coordinated by LP Emergency Management • 75% of IMT, as defined in ICP, and FRT will be exercised
Security	Once annually per region/per critical site	Staff from Critical site	• This is an LP requirement as indicated in the LP SMP, • One exercise will suffice if personnel from all Critical Facilities in a region attend • Cyber-security is out of scope
Exercise Type	**Frequency**	**Required Participants**	**NPREP Reference and Remarks**

Environmental Emergency (E2) Exercise	Annually	IMT and/or Terminal Staff and/or FRT	• Only those regions with a Schedule 1 product designated under Enviro Canada E2 regulation
			• 1 exercise/site/year, ensuring a component of the E2 plan is exercised each year;
			• At the end of the 5 year cycle, all components of the E2 plan need to be exercised.
			• Exercise Type: The exercise can be an Equipment Deployment with a Command & Control component, or a Full Scale Exercise. The exercise will include:
			  o Scope: Area Operations-run (or equivalent);
			  o On-call Area Operations Chief (or equivalent) is the IC;
			  o Activities:
			  ▪ Notification,
			  ▪ Activation,
			  ▪ Deployment of ER equipment and others by PLM/FRT, and
			  ▪ Evacuation of staff
			• E2 exercise could be included as part of Terminal Evac Drill (regional decision);
			• The E2 exercise can also satisfy the NEB-required FSE (see FSE requirements)

US Only – Operational cont.			
Exercise Type	**Frequency**	**Required Participants**	• **NPREP Reference and Remarks**
Area Exercise	Upon Request by US regulator	IMT and/or FRT and/or E3RT	• Paragraph 2.4; • Goal of the PREP is to conduct an Area FE/FSE for each ACP during quadrennial cycle; • An industry plan holder that participates in an Area FE/FSE should not be required to participate in another Area FE/FSE for a minimum of six years; Exercises that cross an Enbridge regional boundary, or that cross the international border, will be coordinated by LP EM.
Exercise Type	**Frequency**	**Required Participants**	**NPREP Reference and Remarks**
Government Initiated Unannounced Exercise (GIUE) (Functional Exercise and/or Equipment Deployment)	Not more than once/36 mo	TBC by PHMSA	Paragraph 2.3.7.2.

NOTE: After an equipment deployment exercise each piece of equipment is inspected to assess the condition and determine if any repairs need to be made. Preventive maintenance is performed on each piece of equipment in accordance with recommendations from the manufacturer and the LP EM Preventative Maintenance Guide. Equipment found to be defective will be repaired or replaced.

3.5.9 Emergency Response Exercise Report

All exercise records will be maintained in the LP Emergency Response exercise database. See paragraph 3.6 for the updating of exercise information on the exercise database. This includes the completion of records indicating the completion of core components identified in the National Preparedness for Response Exercise Program Guidelines in the EGRET.

3.5.10 Internal Exercises

Internal exercises are those that are conducted wholly within the Company. The internal exercises test the various components of the response plan to ensure the plan adequately meets the PREP Guidelines requirements for spill response which fall under *OPA '90* in the U.S. and surpass the requirements outlined by the *NEB Onshore Pipeline Regulations* in Canada

All of the internal exercises, with the exception of the U.S. Government-Initiated Unannounced Exercises ("GIUE"), will be self-evaluated and self-certified.

3.5.11 External Exercises

The external exercises go outside the Company to test the interaction of the Company with the response community. The external exercises will test the Company's entire plan and the coordination with members of the response community necessary to conduct an effective response to a pollution incident.

External exercises include area exercises and government-initiated unannounced exercises.

An area exercise is conducted by the EPA, USCG, DOT/PHMSA and industry working in cooperation to exercise the ICP. This is a large-scale exercise that is planned and evaluated by all parties involved. All area exercises will be coordinated by LP EM.

Government regulatory agencies have the authority to direct the Company to participate in a GIUE. The Company must comply unless such an exercise would result in safety hazards. The cost of the GIUE is the responsibility of the Company.

3.5.12 Credit for Actual Response

Enbridge may take credit for responses to actual spills or releases, or to significant threats of a spill, instead of conducting exercises. The response must be evaluated using guidance in the Exercise Design Guide. The lead evaluator must determine which exercise requirements were met during the response. This determination should be based on whether the response effort would meet the objectives of the exercise requirements as listed in the PREP Guidelines.

For regions in Canada taking credit for an actual incident for the purposes of reporting against NEB performance measures, the incident must take the place of a planned exercise in the applicable region in order to take credit for an NEB Performance Measure.

Credit may also be taken for a non-spill incident but only if:
• The IMT was activated;
• The incident had the significant threat of a release. e.g. a wildfire, tornado etc.

For non-spill incidents, the same requirements above apply.

Documentation for credit purposes will include (but not be limited to):

	Documentation for credit purposes will include (but not be limited to):
✓	ICS 201 Packet • Type of exercise/incident • Date and time • Description of exercise/incident • Objective of exercise/incident
✓	Incident Action Plan(s) (if applicable)
✓	Hot Wash Meeting Minutes
✓	Participant (Responder) Feedback/Critique Forms • Company Personnel • Contractor Personnel (if available)
✓	After Action Report (AAR)/Improvement Plan (IP) • Facility-Owned Equipment Inspection Log (drills and full scale exercises)
✓	PREP Components Evaluation Worksheet
✓	Signature of IC or designee completing reporting

3.6 Third-Party Awareness Training

The Company considers various stakeholders when designing and conducting training across the pipeline system.

Target Audience within counties of operations	
✓	Fire departments' training officers and chiefs
✓	Police departments' training officers and chiefs
✓	Sheriff's departments' training officers and chiefs
✓	County Emergency Management training officers and chiefs
✓	Local Emergency Planning Committees /Community Emergency Managers
✓	911 Dispatch Centers/Public Safety Answering Points ("PSAPs")

3.6.1 U.S. Third-Party Training

Enbridge's emergency responder education program was developed to improve interactive, engaging, industry leading training for third-party emergency responders in close proximity to the companies' areas of operation. This education program aims to arm responders with the information they need to effectively and safely respond to a pipeline emergency involving an Enbridge Pipeline or facility.

Content addresses the following API RP 1162 elements:	
✓	Pipeline purpose and reliability
✓	Awareness of hazards and prevention measures
✓	Emergency preparedness communication
✓	Potential hazards
✓	Pipeline location information and availability of National Mapping Pipeline System 
✓	How to get additional information

3.6.2 Canadian Third-Party Training

Emergency Response agencies are those that have the potential to respond to an incident or emergency involving an Enbridge facility. Specific agencies targeted include fire departments, police, emergency responders, hospitals, EMS and municipal emergency response coordinators.

Enbridge meets with these stakeholders face-to-face on an annual basis. During these meetings, Enbridge representatives update the Public Awareness Contact Form- Emergency Response Agencies. As well, a list of important information is discussed and documented in a checklist. At these meetings, emergency responders are supplied with a letter from the Region, the Enbridge "Pipeline safety and emergency information for emergency responders" brochure, the Emergency Responders Online Education Program brochure, the "Pipeline safety and emergency information for healthcare providers" sheet (medical facilities only), the Pipeline to Safety Video, and promotional items with pipeline safety contact information.

During face-to-face visits, the Company encourages emergency responders to undertake the Emergency Responders Online Education Program, as well as to have other responders at their agency take the course as well. Enbridge is currently rolling out the 911 dispatchers training module which will be offered to 911 dispatchers in Canada.

Section 4 – Table of Contents

The forms and templates have been developed by the Company for use during an emergency response where applicable.

Section 4 – Table of Contents

ENBRIDGE	Receiving Emergency Information	ICP 001

Purpose: To be used by any employee receiving emergency information on a potential incident or in preparation to attend the emergency location as an early responder.

Notification		
Date and Time of Notification:		
Name of the Employee Receiving Call:		
Caller		
Name of Person Reporting :		
Caller's Location:		
Caller's Telephone # *(next 2 hours)*		(Home):
Caller's Address:		
Emergency Description		
Condition Observed *(spill, cloud, odor, etc):*		
Facility Involved, Location or Land Description:		
Date and Time Incident Observed:		
Nearest Community:		
Local Directions to Site:		
Nearest River, Stream, Lake *(direction & distance):*		
Other Helpful Information *(weather, wind, roads, public interest, injuries):*		
Emergency Reporting		
Did Caller Notify Community Emergency Responders or Other Agencies:		(Time of Call):
Are other Emergency Response Agencies On-Site or En-route *(provide details):*		

Internal Reporting	
If this is a potential emergency and you are the first Enbridge point-of-contact, call the Control Centre at:	
US Regions 1-800-858-5253	**Cushing Control Centre** 1-918-223-2461
CND Region 1-877-420-8800	**Enbridge Media Hotline Canada** 1-888-992-0997
Athabasca and Western Region 1-888-813-6844	**Enbridge Media Hotline U.S.** 1-800-496-8142
In Quebec 1-780-420-8899	
North Dakota Region 1-888-838-4534	

Other Information	
Give Warning Information for NGL/Crude oil if appropriate *(see Form B – Warning Information)*	

ENBRIDGE	Initial Response Checklist	ICP 002

Purpose: To be used when exploring a suspected or reported emergency. Safe work practices will be followed per the following guidelines (the order of these actions will depend on the situation).

EXPLORE- To be reviewed by the First Responder prior to taking any immediate action.	
☐	Notify Senior staff on-site immediately if a pressure drop has been observed or a leak is suspected and stop all product transfers. Close all automatic isolation valves, if available.
☐	Conduct a field level hazard assessment to identify and mitigate all hazards including potential for fire, explosion, and hazardous toxic vapors. • Determine the wind direction and approach cautiously from upwind. • Explore the suspected release area only when wearing appropriate PPE using the buddy system if possible. • Ensure safety of personnel in the area. • Eliminate or shut off all potential ignition sources in the immediate area • Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).
☐	If appropriate, request surveillance fly-over to determine: • If there is any abnormal activity and dead vegetation in the vicinity of a pipeline; • Size and description of oil slick; • Direction of movement; • Coordinates of leading and trailing edge of oil slick; • Sensitivities endangered; and • Areas of population that are threatened. If radio contact cannot be made; the line flyer will report to Company management by telephone
☐	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person
APPROACH	
☐	If hazards cannot be safely mitigated, move to a safe upwind location, monitor the incident, and keep people out the hot zone.
☐	Are people injured or trapped? Are there outside people involved in rescue or evacuation?
☐	Are there immediate signs of potential hazards such as: • Electrical lines down or overhead? • Unidentified liquid or solid products visible? • Vapors visible? • Smells or breathing hazards evident? • Fires, sparks or ignition sources visible? • Holes, caverns, deep ditches, fast water or cliffs nearby? • Is local traffic a potential problem? • Ground conditions (select one) ☐ Dry ☐ Wet ☐ Icy
CONFIRM & CONTROL	
☐	Begin a 214A Individual log when notified of an incident and continue documenting key actions throughout the response.
☐	Determine level of response needed, hazards of product(s) involved and proper response guidelines to be followed. Confirm identification of spilled material and check the SDS sheets. Consider the following: • Assess the spill threat, site safety, and parameters such as spill volume, extent and direction of movement. • Has pipeline(s) been shut down? • Has wind direction been confirmed and windsock erected? • Has the public been protected or evacuation considered if necessary? • Have all ignition sources been identified and eliminated? • Have personal protection and safety requirements been established and communicated? • Is adequate fire protection equipment available and in place? • Are tank and VAC-truck electrical equipment properly grounded? • Have decontamination sites and procedures been established? • Are activities and events being logged/ documented? • Eliminate sources of vapor cloud ignition, consider the ignition of NGL. Shut down all engines and motors. • Establish Exclusion zone and Safe Work Areas (Hot, Warm, and Cold).
☐	If on water, consult Control Point and HCA maps for appropriate response strategies for incoming resources. • Review pipeline alignment sheets to become familiar with the location of mainline valves and elevation characteristics. • Review ESA maps for the location of any sensitive area that may be impacted (Annex 3).
☐	Once support has arrived conduct transfer of command and start preparing for tactical and planning meetings.
COMMUNICATION/NOTIFICATIONS	
☐	Initiate actions to notify government agencies including local authorities of area affected or at risk areas via the Control Centre, Regional Management or designate. • Complete notifications for emergency call-out, including regulatory agencies. This will be done by Regional Management or designate. • If excavating, has One-Call agency been notified? • Has a Preliminary Incident Report been issued? • Has a radio channel been established for communication between the site and other personnel in field? • Notify External Emergency Services as appropriate. Work with local law enforcement to make sure all personnel/citizens are a safe distance away from the hazard area. • Notify the appropriate Company management. • Advise neighboring property owners and operators of any threat to their property or personnel. • Notify appropriate federal, state and local government agencies, including local utilities.
INCIDENT COMMAND	
☐	Once it has been determined to activate the ICS, the IC will initiate the following actions: • Confirm that containment equipment and oil spill contractors have been deployed. • Integrate local evacuation plans into the Unified Command decision-making process. Work with response team once they arrive on site to establish a workable Incident Command Post and Communications Center. • Direct initial response actions • Begin development of an initial incident action plan (ICS 201 Forms).
EMERGENCY SHUT DOWN PROCEDURES	
☐	The following emergency shutdown procedures should be initiated if company personnel are threatened by the release of product from a pipeline to the environment or when coordinating activities for prompt and safe repair of the pipeline and the return to normal operating conditions: • Shutting in the line at the nearest block valves. • Notifying the nearest pump station and/or the appropriate Control Center. • Maintenance crewmembers should notify their immediate supervisor who will in turn notify appropriate Company contacts. • If the exact location of the leak is unknown, the immediate supervisor will request a line flyer, or if it is at night, manpower might be used to walk the line. Once a leak site has been located, the following information should be obtained: • Have all ignition sources been eliminated? • Are any water intakes at risk? • Are any schools, homes or commercial properties at risk and should they be evacuated? • Should access to the area be restricted (roads blocked)? If so, assistance should be requested from law enforcement agencies. • Have local response agencies been advised of the product's characteristics and handling precautions which are described in the SDSs? • Are railroads or utility companies in the area and have they been notified? • Will product flow into any waterways or roadways? • In the U.S. work with Company Environmental Department to conduct a Natural Resource Damage Assessment. The Control Center should be notified following an assessment of the release site; an evaluation should be made regarding the effect of downtime on product scheduling. Appropriate report, logs & notifications will be made.

Incident:	**Incident Date/Time:**
Person Reporting Incident:	**Prepared:**
Person Contact Number(s):	**Version:**

Pipeline Information and Points of Contact

Pipeline Name:	
Contact:	**Phone:**
Owner:	**Phone:**
Operator:	**Phone:**

Pipeline Specific Information

Type(s) of Product:		
Equipment Involved:		
P/L Marker of Release	**Nearest Upstream Block Valve**	**Nearest Downstream Block Valve**

Incident Information

Incident Location:	**Latitude:**	**Longitude:**
Type of Casualty:		
Total Capacity of Pipeline:	**Potential for Additional Spillage:**	
Material(s) Spilled:	**API Gravity:**	
Estimated Quantity Spilled:	**Classification:**	
Source Secured?:	**If not, Estimated Spill Rate:**	
Notes:		

Incident Status

Injuries/Casualties:		
Fire:	**Fire Status:**	**Fire Assistance:**
Holed:	**Hole Location:**	**Hole Size:**
Notes:		

General Incident Report (Pipeline)	

Incident:	**Incident Date/Time:**
Person Reporting Incident:	**Prepared:** **at:**
Person Contact Number(s):	**Version:**

Facility Information and Points of Contact

Facility Name:	
Type of Facility:	
Number of People at Facility:	
Contact:	**Phone:**
Owner:	**Phone:**
Operator:	**Phone:**

Facility Specific Information

Type(s) of Product:	
Equipment Involved:	

Incident Information

Incident Location:	**Latitude:**	**Longitude:**
Type of Casualty:		
Total Capacity of Common Container:	**Potential for Additional Spillage:**	
Material(s) Spilled:	**API Gravity:**	
Estimated Quantity Spilled:	**Classification:**	
Source Secured?: Yes ☐ No ☐	**If not, Estimated Spill Rate:**	
Notes:		

Incident Status

Injuries/Casualties:		
Fire: Yes ☐ No ☐	**Fire Status:**	**Fire Assistance:**
Notes:		

General Incident Report (Facility)	

ENBRIDGE	Threat Checklist	ICP 005

Date: _____

Person receiving threat/suspicious package: _____

Time received: _____

If by phone, time call terminated: _____

Phone number displayed by Caller ID: _____

Work location of person receiving threat/suspicious package:_____

EXACT WORDING OF THREAT

SUSPICIOUS PACKAGE/MAIL

Time delivered/discovered: _____

Location of delivery/discovery: _____

Who/how delivered or discovered:_____

Characteristics of package/mail (Select all that apply)

- ☐ Actual threat message
- ☐ Marked with any threatening
- ☐ Inappropriate or unusual labeling
- ☐ Strange or no return address
- ☐ Misspelled common words
- ☐ City of postmark does not match return address city
- ☐ Oil stains, discoloration or odor
- ☐ Lopsided/uneven package or envelope
- ☐ Excessive tape, string, or packing materials
- ☐ Incorrect titles or title without a name
- ☐ Handwritten or poorly typed address
- ☐ Protruding wires or aluminum foil
- ☐ Excessive postage
- ☐ Excessive weight
- ☐ Ticking sound

CALLER/SUSPECT VOICE AND DESCRIPTION (select all that apply)

Gender: ☐ Male ☐ Female

Age: ☐ Child ☐ Teen ☐ 20-29 ☐ 30-39 ☐ 40-49 ☐ 50-59 ☐ Older

Voice characteristics: ☐ Loud ☐ Soft ☐ Deep ☐ Whisper ☐ Stutter ☐ Lisp ☐ Fast ☐ Slow ☐ Normal ☐ Nasal ☐ Slurred ☐ Broken ☐ Disguised ☐ Squeaky

Accent: ☐ **Other:** ☐

Manner: ☐ Angry ☐ Excited ☐ Giggling ☐ Crying ☐ Sincere ☐ Stressed ☐ Calm

Language: ☐ Well-spoken ☐ Incoherent ☐ Irrational

BACKGROUND NOISE

Street noises:

House/residence noises:

Aircraft:

Voices:

Music:

Machinery:

Bar/Tavern:

Other:

BOMB THREAT QUESTIONS

When is the bomb going to explode?

Where did you put the bomb?

Where is it right now?

Did you place the bomb? Why?

Do you know who placed the bomb?

What does it look like?

What kind of bomb is it?

What will make the bomb explode?

What is your name?

Where are you calling from?

What is your address?

Have you noticed anyone else?

Whom do you represent?

Do you know that there are innocent people in the building that may be injured or killed? ☐ Yes ☐ No (select if either is confirmed)

NOTES

ENBRIDGE	Site Monitoring Template	ICP 006

Date:	Time:	Wind Dir.	Wind Speed	Temp.
Event Description:				

Location Description	Time	PID / FID	H_2S	SO_2	CO	LEL	O_2	Benzene	Other	Comments
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										
9.										
10.										

For spill response operations (as opposed to those that start from a remedial action) these plans will vary in detail as the response progresses. During the initial emergency phase, responders rely on generic emergency response plans - contingency plans - while a site-specific plan is being developed. As the response progresses into post-emergency phase recovery operations, a basic site-specific plan is used and may become quite detailed for prolonged or large cleanups. Finally, a spill response may become a fully controlled site cleanup (e.g., remedial cleanups) where a fully developed site-specific plan is developed, including detailed emergency response plans for on-site emergencies.

General – Identify and/or specify:

☐	Risks for each task in work plan	☐	Employee training assignments
☐	Protective equipment for each task/objective	☐	Medical surveillance requirements
☐	Frequency and types of air monitoring	☐	Frequency and types of personnel monitoring
☐	Sampling techniques	☐	Air monitoring instruments to be used
☐	Maintenance and calibration for instrumentation	☐	Site control measures
☐	Site map	☐	Work zones
☐	Use of “buddy system”	☐	Alerting means for emergencies
☐	Safe working practices	☐	Nearest medical assistance
☐	Decontamination procedures	☐	Emergency response plan
☐	Confined space entry procedures	☐	Spill containment program
☐	Pre-entry briefings	☐	Provisions for continual evaluation of plan

Site Characterization and Analysis:

☐	Spill sites shall be evaluated to identify specific site hazards and determine appropriate safety and health controls.

Preliminary Evaluation – Performed by a qualified person, prior to site entry, to identify and/or specify:

☐	Protection methods and site controls	☐	All inhalation/skin hazards
☐	Location and approximate size of site	☐	Description of response activity
☐	Duration of response activity	☐	Site topography and accessibility (include air and ground accessibility)
☐	Safety and health hazards anticipated	☐	Pathways for hazardous substance dispersion
☐	Status of emergency response units (rescue, fire, hazmat)		

Risk Identification

☐	Employees on site are informed of identified risks	☐	All information concerning chemical, physical and toxicological properties of each substance available to the Company are made available to the responders

Detailed Evaluation

☐	Immediately after preliminary evaluation, a detailed evaluation is conducted to determine safety controls and protection needed.

Monitoring

☐	Monitoring performed during initial entry	☐	Monitoring performed periodically
☐	Personnel monitoring performed		

	Illumination Requirements
☐	Areas accessible to employees are lighted to levels not less than the intensities outlined below:

Foot-candles	Area of operations
5	General site areas.
3	Excavation and waste areas, accessways, active storage areas, loading platforms, refueling, and field maintenance areas.
5	Indoors: Warehouses, corridors, hallways, and exitways.
5	Tunnels, shafts, and general underground work areas. (Exception: Minimum of 10 foot-candles is required at tunnel and shaft heading during drilling, and scaling. Mine Safety and Health Administration approved cap lights shall be acceptable for use in the tunnel heading.)
10	General shops (e.g., mechanical and electrical equipment rooms, active storerooms, barracks or living quarters, locker or dressing rooms, dining areas, and indoor toilets and workrooms.)
30	First aid stations, infirmaries, and offices.

Sanitation Requirements			
☐	Potable/ Non-potable water	☐	Toilet facilities
☐	Washing facilities	☐	Shower and change rooms
Purpose is to prepare for anticipated emergencies:			
☐	Plan is written and available for inspection		
Elements to be specified			
☐	Pre-emergency planning		
☐	Personnel roles, lines of communication		
☐	PPE and emergency equipment		
☐	Emergency recognition and prevention		
☐	Safe distances and places of refuge		
☐	Site security and control		
☐	Evacuation routes and procedures		
☐	Emergency medical treatment and first aid		
☐	Emergency decon procedures		
☐	Emergency alerting and response procedures		
☐	Critique of response and follow-up		
Additional Elements			
☐	Site topography, layout and prevailing weather conditions		
☐	Procedures for reporting incidents to: local, provincial/state, and federal government agencies		
☐	Employee alarm system is installed to notify persons of an emergency situation		
Additional Requirements Emergency Response Plan shall be:			
☐	A separate section of Site Safety and Health Plan		
☐	Compatible with federal, provincial/state and local plans		
☐	Rehearsed as part of on-site training		
☐	Current		

ENBRIDGE	Demobilization Checklist	ICP 008

Enbridge Employee ☐ Contractor ☐ Sub-Contractor ☐

Section 1: Personnel Information

General Personnel Information			
Last Name, First Name		Start Date (DD/MM/YY)	End Date(DD/MM/YY)
Email Address	Site Phone/Cell No.	Planned Return (DD/MM/YY)	Planned End (DD/MM/YY)
Prime Contractor: N/A ☐		If You're a Sub-Contractor, Your Company Name: N/A ☐	
Location of Work Performed (specific site):		Position While Performing Work:	
Replacement's Name (if known):		Replacement's Phone/Cell No.	Replacement's Email
Replacement's Arrival Date (DD/MM/YY):		Replacement's End Date:	

Team Worked on During Incident Response			
Logistics ☐	Environment ☐	Air Operations ☐	Safety ☐
Finance ☐	IT ☐	Repair ☐	Liaison/Public Information ☐
Operations ☐	Planning ☐	Regulatory/Compliance ☐	
Recovery Branch ☐	Incident Command ☐	Staging ☐	Other _____ ☐

For Enbridge Staff Only (not applicable for contractors or sub-contractors)	
Home Office (City/Region):	Regular Office Phone/Cell No.
Citizenship: US ☐ Canada ☐ Do you have a Visa? ☐	Home Business Unit: LP ☐ MP ☐ EGD ☐ GT ☐ Corp ☐
I have copy of BU coding information for timesheet and Expenses ☐	I Understand Days of Rest ☐

Retention: Retained in the Region Permanently

Incident Participation Review
In your opinion, what are *3 things that went well* during this response?
1.
2.
3.
In your opinion, what are 3 things that could have gone better during this response?
1.
2.
3.

Section 2: Documentation Demobilization

Data Types	Collected Y	Collected N	Network Share Name Where Docs Preserved (eg: LiveLink, Enbridge Email, Network Drive, SharePoint, File Room, Portable drive)	All Items Saved to Enbridge Network Folder		Date to be Collected if not Current Date (DD/MM/YY)
Email	☐	☐		**Y** ☐	**N** ☐	
Files	☐	☐		**Y** ☐	**N** ☐	
Papers	☐	☐		**Y** ☐	**N** ☐	
Phone	☐	☐		**Y** ☐	**N** ☐	
Other E-Devices	☐	☐		**Y** ☐	**N** ☐	
Comments:						

Section 3: Information Technology Demobilization

Enbridge Incident Issued Laptop Returned Y ☐ N ☐	Laptop Serial Number:
User Name:	Password:
List other devices issued to you:	Did you use any portable drives? Please detail.

Section 4: Demobilization Acknowledgement & Approvals

Operations Section N/A ☐	Name:_____ Title:_____	Signature:_____ Phone/Cell No. :_____
Planning Section N/A ☐	Name:_____ Title:_____	Signature:_____ Phone/Cell No. :_____
Logistics Section N/A ☐	Name:_____ Title:_____	Signature:_____ Phone/Cell No. :_____
Command Section N/A ☐	Name:_____ Title:_____	Signature:_____ Phone/Cell No. :_____
Finance Section N/A ☐	Name:_____ Title:_____	Signature:_____ Phone/Cell No. :_____
Documentation Unit N/A ☐	Name:_____ Title:_____	Signature:_____ Phone/Cell No. :_____
Human Resources N/A ☐	Name:_____ Title:_____	Signature:_____ Phone/Cell No. :_____
Information Technology N/A ☐	Name:_____ Title:_____	Signature:_____ Phone/Cell No. :_____

Retention: Retained in the Region Permanently

APPROVAL TO CONDUCT IN-SITU BURN					
Authority	**Name and Organization**	**Approval Signature (if verbal, identify recipient)**	**Date**	**Alternate Point of Contact**	**Phone Number**
Regulatory Authority					
Unified Command					
Incident Commander (Enbridge)					
Other (Specify)					

Confirm that all stakeholders with authority over the ability to conduct an in-situ burn are listed above and have approved the burn.		
Name (Enbridge Incident Commander)	**Signature**	**Date**

INCIDENT INFORMATION	
Incident General Description:	
Product(s) Type:	
Product Description (*general hazards and characteristics*) (GPS/LLD):	
MSDS attached?	☐ YES ☐ NO
Estimated Volume Released:	
Incident Discovery Date/Time:	
Initial Release Date/Time (*estimated*):	
SPILL LOCATION / TRAJECTORY	
Originating Spill Location and Impacted Area General Description:	
Estimated Size of Impacted Area:	

Estimated Potential for Further Migration and Ultimate Area of Impact	
Site Sketch Attached? *(Review Incident Records for sketch components)*	☐ YES ☐ NO
Aerial / Satellite Map Graphic Attached?	☐ YES ☐ NO
Trajectory of Spill Shown on Sketch / Graphic?	☐ YES ☐ NO
IN-SITU BURN ASSESSMENT	
List considerations that support in-situ burning at this location over manual / mechanical recovery and cleanup options:	
Product Thickness (mm)	
Product Likely to Burn? (*conduct test burn as necessary*)	☐ YES ☐ NO
Anticipate oil to remain ignitable (*fresh, not highly emulsified (>25%) or weathered*)?	
WEATHER CONDITIONS	
Weather conditions favorable for in-situ burn?	☐ YES ☐ NO
General Forecast for Next 48 Hours: (*e.g., stormy, clear, overcast, rainy, etc.*)	
Wind Speed and Direction Forecast for next 12 hours:	
Wind Speed and Direction Forecast for next 12 – 48 hours:	
Wind Speed and Direction Forecast for next 24-48 hours:	
Visibility Forecast for next 48 hours: (*sufficient for burn operations/observation is >500 ft (approximately 150 meters), ½ mile horizontal (1 kilometre)*	
IN-SITU BURN OPERATIONAL FEASIBILITY	
Operational Feasibility?	☐ YES ☐ NO
Is an operations plan (*strategy, method, resources*) and site safety plan written ? (*Attach*	☐ YES ☐ NO

Is air support needed? Available?	☐ YES	☐ NO
Are personnel properly trained, equipped with safety gear and covered by a site safety plan?	☐ YES	☐ NO
Is a site communications plan available?	☐ YES	☐ NO
Is the release contained?	☐ YES	☐ NO
Can all necessary equipment be mobilized during the window of opportunity (*e.g., containment, igniter, residue collection equipment, fireguard*)	☐ YES	☐ NO
Can the burn be safely extinguished or controlled? (*Attach contingency plan that identifies and manages potential impacts on surrounding area in case the burn becomes uncontrolled or secondary fires arise*)	☐ YES	☐ NO
Estimated area of proposed burn:		
Attachments / Additional Information / Comments:		

SAFETY AND ENVIRONMENT CONSIDERATION		
Is there probable public safety exposure?	☐ YES	☐ NO
Are there probable environmental impacts?	☐ YES	☐ NO
Can the burn be conducted at safe distance from other response operations and public, recreation and commercial activities?	☐ YES	☐ NO
Can the public be adequately notified of the burn? (*Attach notification / communication plan*)	☐ YES	☐ NO
Are evacuations necessary? (attach proposed evacuation plan)	☐ YES	☐ NO
Is limited shelter-in-place to be done?	☐ YES	☐ NO
Is a plan to manage environmental sensitivities (*e.g., wildlife, land use, groundwater impact)* written or in progress? (*Attach if available*)	☐ YES	☐ NO

Is particulate monitoring available? (*attach if available*)	☐ YES ☐ NO
What is the minimum public health safe distance? (*Attach method used to determine distance,* see *isolation distance table in Section 2).*	

Attach an In-Situ Burn Plan Diagram site sketch or area photo that illustrates:

- ☐ Size of burn area only (*this may or may not be different than the total impacted area*)
- ☐ Projected wind direction over the course of the burn duration
- ☐ Calculated minimum safe distances (shown as a radius around the burn location)
- ☐ Distances to populated areas (private, commercial, public)
- ☐ Evacuation and/or shelter-in-place areas (if applicable)
- ☐ Control measures and fire guard resources
- ☐ Smoke plume monitoring locations (if applicable)
- ☐ Impacted or nearby environmentally sensitive areas
- ☐ Adjacent land use

Attachments / Additional Information / Comments:

ENBRIDGE	Facility-Owned Equipment Inspection Log	ICP 010

Equipment Location:				
Inspected By:	**Print**		**Sign**	
Inspection Date:				
Recovery Capacity (EDRC):	*E.g.: 7,645 bpd x 20% daily recovery rate = 1,529 bpd EDRC (based on a 20% efficiency)*			

Equipment Type	Description - Model, Style, Size, Capacity, Shelf Life	Qty	Operational Status	Last Deployment Date
EXAMPLE: Boom	*50' Acme 6x6 booms*	*100'*	*Good*	*7/01/11*

ENBRIDGE	National Response Centre Questions (For Reference Only)	ICP 011

NRC 24 Hr. Incident Reporting (800) 424-8802 –

Reporting Party	
E-mail Address:	
Phone 1:	Primary | Alternate | Cell | On-Scene | Other
Last Name:	
First Name:	
Phone 2:	Primary | Alternate | Cell | On-Scene | Other
Phone 3:	Primary | Alternate | Cell | On-Scene | Other
Company:	
Organization Type:	***Private Enterprise***
Address:	
City:	
State:	
Zip Code:	
Are you calling on behalf of responsible party:	YES NO
Are you or your company responsible for material released:	YES NO

Incident Description		
Incident Date: DD // MM// YEAR	TIME:	Occurred | Discovered | Planned
Type of Incident: ***PIPELINE***		

Incident Location					
Location Description					
Address Location:					
State:					
County					
Zip Code:					
Nearest City:		Distance from Nearest City:		Units:	Miles | Kilometers
Direction: N NE NNE NWW NW E ENE ESE S SE SSW SSW SW W WNW WSW					
Range:	Section:	Township:			
Latitude: Degrees:	Minutes:	Seconds:	Quadrant:	North | South	
Longitude: Degrees:	Minutes:	Seconds:	Quadrant:	East | West	

Pipeline Details
Pipeline Type: Transfer | Flow | Transmission | Distribution | Service | Gathering | Offshore | Lateral | Highly Volatile Liquid (HVL) | Tank | Station | Load Line | Terminal | Unknown | Other
DOT Regulated: YES NO Unknown
Underwater: YES NO
Covered/Marked: YES NO Unknown
Above or Below Ground: ABOVE / BELOW
Material Involved
Material #1
Material:
CHRIS Code: CAS Code:
Amount Released: Units: Barrel(s) | Gallons | Liter(s) | Unknown
Amount in Water: Units: Barrel(s) | Gallons | Liter(s) | Other | Unknown
Material In Water Information
Body of Water Affected: Offshore: YES NO River Mile Marker:
Tributary of: Water Supply Contaminated: YES NO Unknown
Water Temperature: Units: Fahrenheit Celsius
Wave Condition: Calm | Smooth | Slight | Moderate | Rough | Very Rough | High | Very High | Precipitous | Confused
Speed: Knots MPH
Direction: N NE NNE NWW NW E ENE ESE S SE SSE SSW SW W WNW WSW
Sheen Information
Sheen Length: Units: Feet | Inches | Yards | Miles | Meters | Kilometers
Sheen Width: Units: Feet | Inches | Yards | Miles | Meters | Kilometers

ENBRIDGE	IAP Cover Sheet	ICP 013

Incident Name:	**Operational Period to be covered by IAP:** Period: (/ / to / /)

Approved by:

FOSC: _____

SOSC/Prov: _____

RPIC: _____

Incident Action Plan

Prepared By:	**Prepared Date/Time:**

REDACTED COPY

ENBRIDGE

Notification Status Report

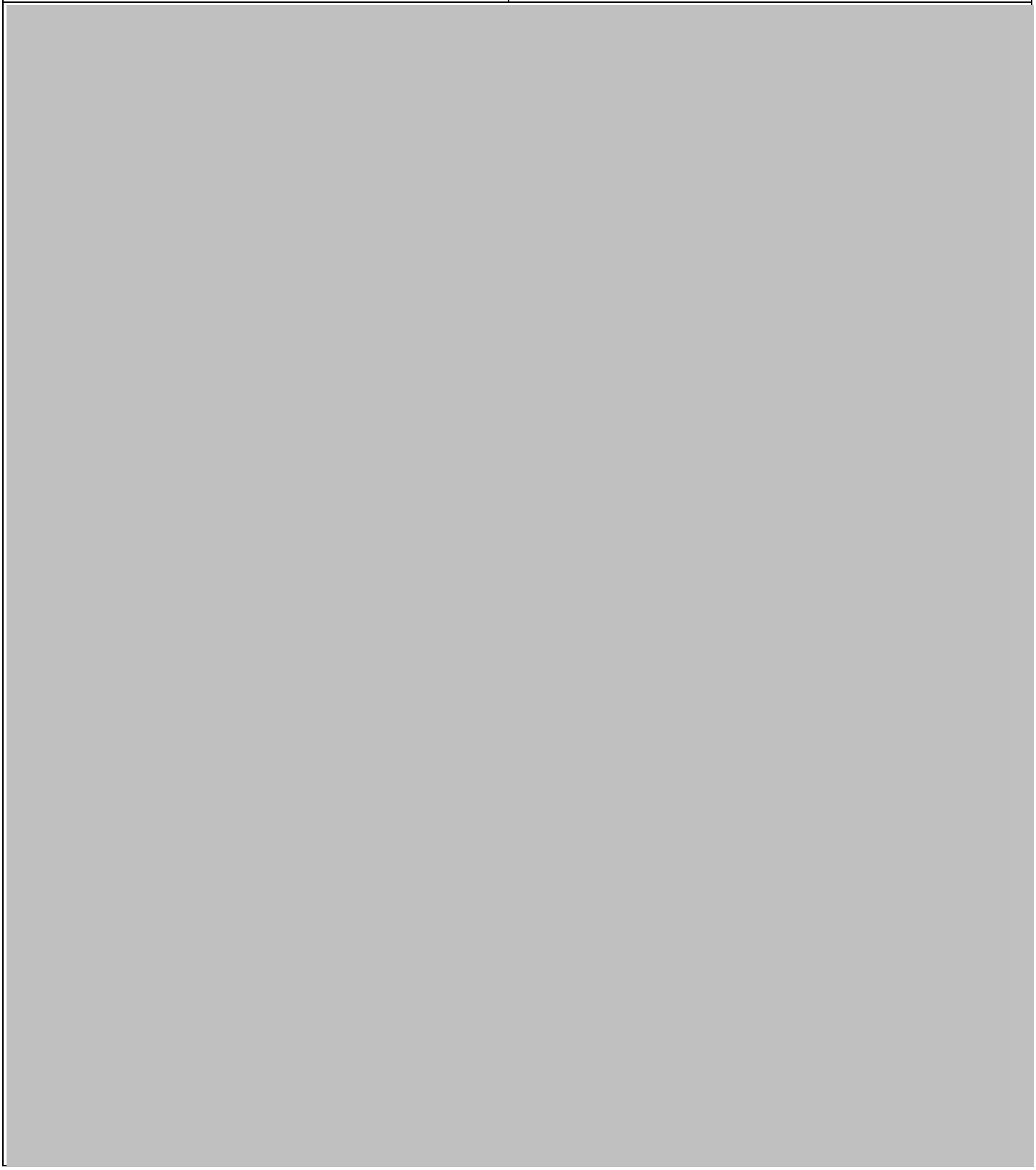
ICP 014

Incident:				**Prepared By:**		**at:**		
Period:		**to**		**Version Name:**				
Organization Notified	**Phone**	**Date /Time Notified**	**Person Contacted**	**Person Contacted Email**	**Case No.**	**Follow Up**	**ETA On Site**	**Notified By**
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								
						☐Y ☐N	HR	
Notes:								

Incident:		**Prepared By:**	**at**
Period:		**Version Name:**	
Present Conditions			
Wind Speed:		Wave Height:	
Wind Direction From The:		Wave Direction:	
Air Temperature:		Swell Height:	
Barometric Pressure:		Swell Interval:	
Humidity:		Current Speed:	
Visibility:		Current Direction Toward:	
Ceiling:		Water Temperature:	
Next High Tide (Time):		Next Low Tide (Time):	
Next High Tide (Height):		Next Low Tide (Height):	
Sunrise:		Sunset:	
Notes:			
24 Hour Forecast			
Sunrise:		Sunset:	
High Tide (Time):		High Tide (Time):	
High Tide (Height):		High Tide (Height):	
Low Tide (Time):		Low Tide (Time):	
Low Tide (Height):		Low Tide (Height):	
Notes:			
48 Hour Forecast			
Sunrise:		Sunset:	
High Tide (Time):		High Tide (Time):	
High Tide (Height):		High Tide (Height):	
Low Tide (Time):		Low Tide (Time):	
Low Tide (Height):		Low Tide (Height):	
Notes:			

ENBRIDGE	Incident Briefing Map/Sketch	ICS 201-1

Incident:	Prepared By:	at:
Period:	Version Name:	



ENBRIDGE	Summary of Current Actions	ICS 201-2

Incident:	Prepared By: at:
Period: to	Version Name:

Incident Information

Initial Incident Objectives

Summary of Current Actions

Date/Time	Action Notes

ENBRIDGE

Current Organization

ICS 201-3 / 207

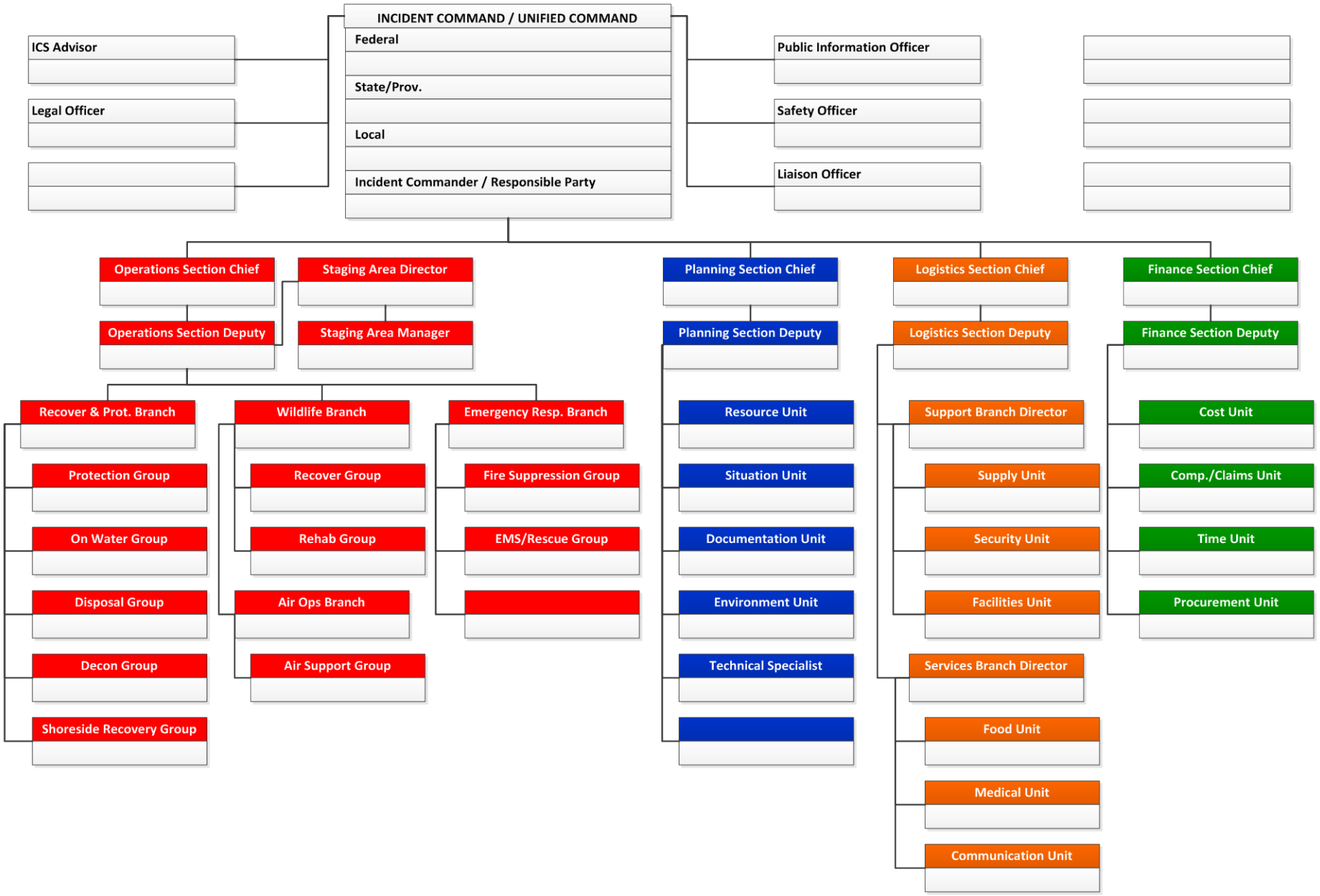
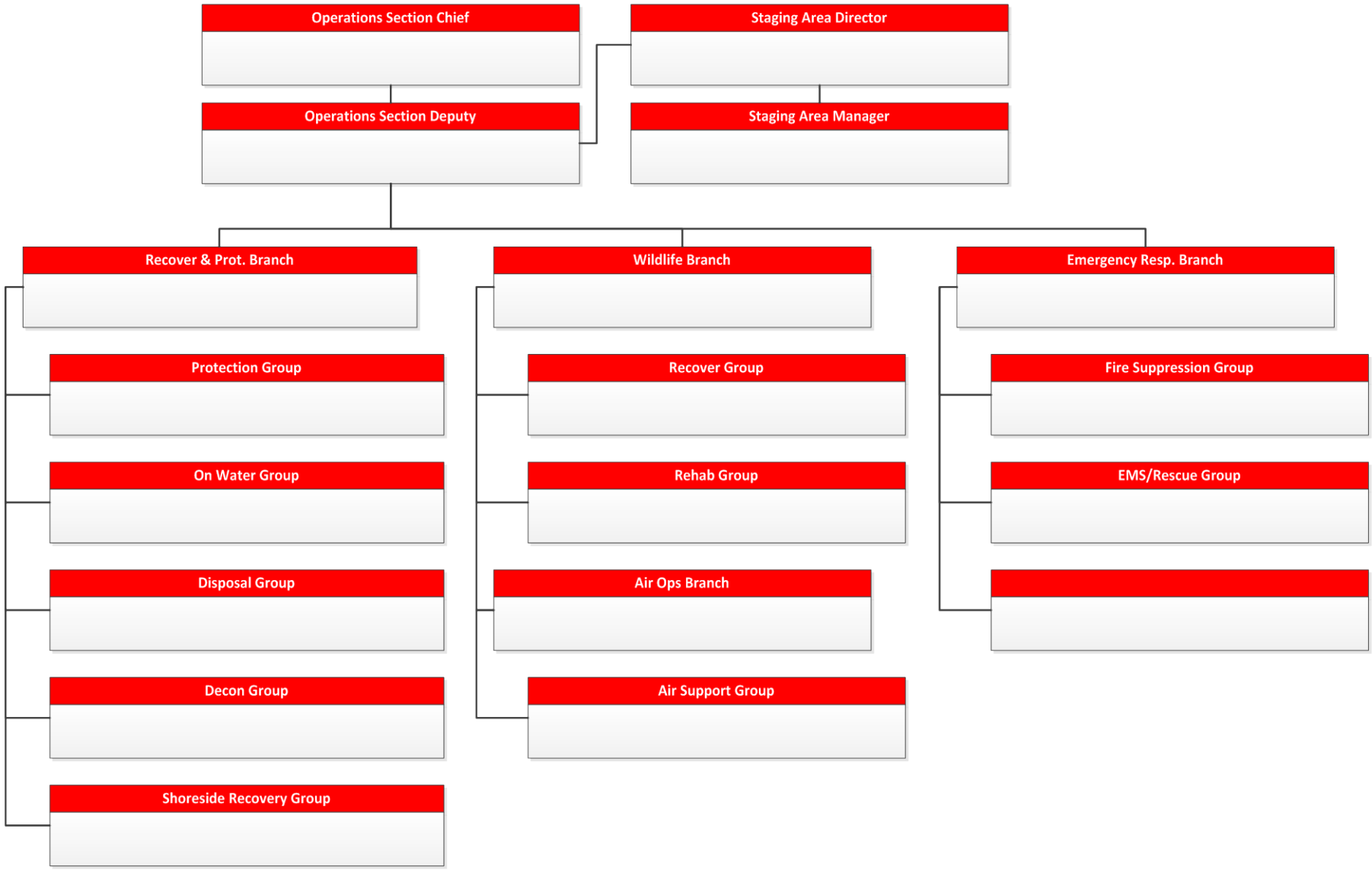


Illustration shows suggested ICS positions. ICS is scalable; the positions are filled according to the needs of the incident.
If positions are not filled, the responsibility is assumed by the Section Chief or Incident Commander.

ENBRIDGE

Operations Section



Incident:					Period:			
ID	Supplier	Resource Type	Description	Quantity	Size	Area of Operation	Status	Status Date/Time

ENBRIDGE	Site Safety and Control Analysis	ICS 201-5

Incident:	**Prepared By:** **at:**
Period:	**Version Name:**

Site Control

1. Is Site Control set up? ☐ Yes ☐ No	2. Is there an on-scene command post? ☐ Yes ☐ No If so, where?
3. Have all personnel been accounted for? ☐ Yes ☐ No ☐ Don't Know	Injuries: Fatalities: Unaccounted: Trapped:
4. Are observers involved, or rescue attempts planned? Observers: ☐ Yes ☐ No Rescuers: ☐ Yes ☐ No	5. Are decon areas setup? ☐ Yes ☐ No If so, where?

Hazard identification, immediate signs of: (if yes, explain in Remarks)

1. Electrical line(s) down or overhead? ☐ Yes ☐ No	2. Unidentified liquid or solid products visible? ☐ Yes ☐ No
3. Wind direction across incident: ☐ Towards your position Wind Speed: ☐ Away from your position	4. Is a safe approach possible? ☐ Yes ☐ No
5. Odors or smells? ☐ Yes ☐ No	6. Vapors visible? ☐ Yes ☐ No
7. Holes, ditches, fast water, cliffs, etc. nearby? ☐ Yes ☐ No	8. Fire, sparks, sources of ignition nearby? ☐ Yes ☐ No
9. Is local traffic a potential problem? ☐ Yes ☐ No	10. Product placards, color codes visible? ☐ Yes ☐ No
11. Other Hazards? ☐ Yes ☐ No	12. As you approach the scene from the upwind side, do you note a change in the status of any of the above? ☐ Yes ☐ No
13. Remarks:	

Hazard Mitigation: have you determined the necessity for any of the following?

1. Entry Objectives:	
2. Warning sign(s), barriers, color codes in place? ☐ Yes ☐ No	
3. Hazardous material being monitored? ☐ Yes ☐ No 3a. Sampling Equipment: 3b. Sampling location(s): 3c. Sampling frequency: 3d. Peak Reading: 3e. Personal exposure monitoring:	
4. Protective gear / level:	4a. Gloves: 4b. Respirators: 4c. Clothing: 4d. Boots: 4e. Chemical cartridge change frequency:
5. Decon 5a. Instructions: 5b. Decon equipment and materials:	
6. Emergency escape route established? ☐ Yes ☐ No Route?	
7. Field responders briefed on hazards? ☐ Yes ☐ No	
8. Remarks:	

Protective Zones: record initial control perimeters (see Figure 1)

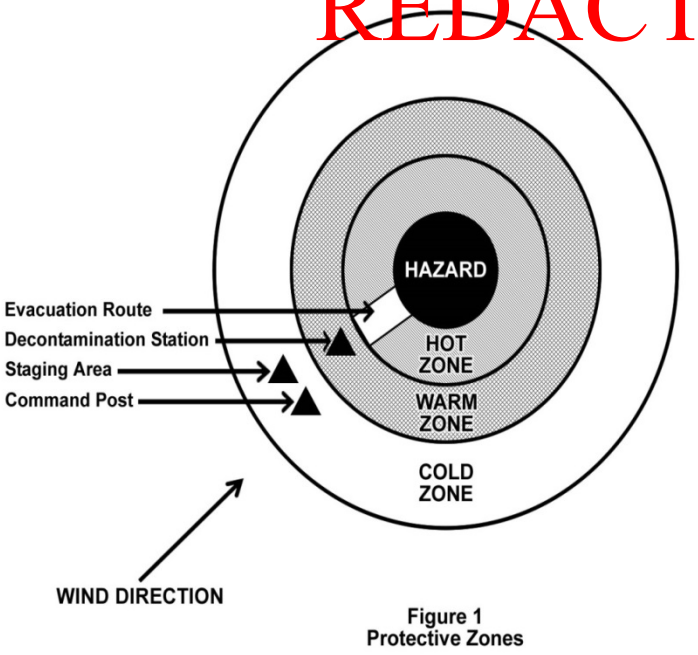


Figure 1
Protective Zones

1. Is there a Hot Zone established? ☐ Yes ☐ No
   If so, where?

2. Is there a Warm Zone established? ☐ Yes ☐ No
   If so, where?

3. Is there a Cold Zone established? ☐ Yes ☐ No
   If so, where?

4. Remarks: (Include any information on evacuation route etc.)

5. Include any site sketches or photos of the protective zones (if available):

ENBRIDGE	General Response Objectives	ICS 202

Incident:	Prepared By:	at:
Period:	Version Name:	

Overall and Tactical Objectives	Assigned to:	Status
1. Ensure the Safety of Citizens and Response Personnel		
☐ 1a. Identify hazard(s) of spilled material		
☐ 1b. Establish site control (hot zone, warm zone, cold zone, & security)		
☐ 1c. Consider evacuations if needed		
☐ 1d. Establish vessel and/or aircraft restrictions		
☐ 1e. Monitor air in impacted areas		
☐ 1f. Develop site safety plan for personnel and ensure safety briefings are conducted		
2. Control the Source of the Spill		
☐ 2a. Complete emergency shutdown		
☐ 2b. Conduct firefighting		
☐ 2c. Initiate temporary repairs		
☐ 2d. Transfer lighter product		
☐ 2e. Conduct salvage operations, as necessary		
3. Manage a Coordinated Response Effort		
☐ 3a. Complete or confirm notifications		
☐ 3b. Establish a unified command organization and facilities (command post, etc.)		
☐ 3c. Ensure local and Aboriginal/tribal officials are included in response organizations		
☐ 3d. Initiate spill response Incident Action Plans (IAP)		
☐ 3e. Ensure mobilization and tracking of resources and account for personnel and equipment		
☐ 3f. Complete documentation		
4. Maximize Protection of Environmentally-Sensitive Areas		
☐ 4a. Implement pre-designated response strategies		
☐ 4b. Identify resources at risk in spill vicinity		
☐ 4c. Track oil movement and develop spill trajectories		
☐ 4d. Conduct visual assessments (e.g., overflights)		
☐ 4e. Develop/implement appropriate protection tactics		

Incident:	Prepared By:	at:
Period:	Version Name:	

Overall and Tactical Objectives	Assigned to:	Status
5. Contain and Recover Spilled Material		
☐ 5a. Deploy containment boom at the spill site and conduct open-water skimming		
☐ 5b. Deploy containment boom at appropriate collection areas		
☐ 5c. Evaluate time-sensitive response technologies (e.g., dispersants, in-situ burning)		
☐ 5d. Develop disposal plan		
6. Recover and Rehabilitate Injured Wildlife		
☐ 6a. Establish oiled wildlife reporting hotline		
☐ 6b. Conduct injured wildlife search and rescue operations		
☐ 6c. Set up primary care unit for injured wildlife		
☐ 6d. Operate wildlife rehabilitation center		
☐ 6e. Initiate citizen volunteer effort for oiled bird rehabilitation		
7. Remove Oil from Impacted Areas		
☐ 7a. Conduct appropriate shoreline cleanup efforts		
☐ 7b. Clean oiled structures (piers, docks, etc.)		
☐ 7c. Clean oiled vessels		
8. Minimize Economic Impacts		
☐ 8a. Consider tourism, vessel movements, & local economic impacts		
☐ 8b. Protect public and private assets, as resources permit		
☐ 8c. Establish damage claims process		
9. Keep Stakeholders and Public Informed of Response Activities		
☐ 9a. Provide forum to obtain stakeholder input and concerns		
☐ 9b. Provide stakeholders with details of response actions		
☐ 9c. Identify stakeholder concerns and issues, and address as practical		
☐ 9d. Provide timely safety announcements		
☐ 9e. Establish a Joint Information Center (JIC)		
☐ 9f. Conduct regular news briefings		
☐ 9g. Manage news media access to spill response activities		
☐ 9h. Conduct public meetings, as appropriate		

ENBRIDGE	Organization Assignment	ICS 203

Incident:	Prepared By:	at:
Period:	Version Name:	

Command Staff

Title	Name	Mobile	Pager	Other	Radio
Federal (FOSC)					
State (SOSC) Prov					
RP(s)					
Incident Commander					
Deputy Incident					
Safety Officer					
Information Officer					
Liaison Officer					
Intelligence Officer					

Operations Section

Title	Name	Mobile	Pager	Other	Radio
Operations Section					
Deputy Operations					
Staging Area Manager					
Recovery & Prot. Branch					
Emergency Resp.					
Air Ops Branch Director					
Wildlife Branch Director					
Branch Director					
Division/Group					
Disposal Group					

Planning Section

Title	Name	Phone	Fax	Other	Radio
Planning Section Chief					
Deputy Planning Section					
Situation Unit Leader					
Resource Unit Leader					
Documentation Unit					
Technical Specialist					
Demobilization Unit					
Check In Recorder					

ENBRIDGE	Organization Assignment	ICS 203

Incident:	Prepared By:	at
Period:	Version Name:	

Logistics section

Title	Name	Phone	Fax	Other	Radio
Logistics Section Chief					
Deputy Logistics Section					
Service Branch Director					
Medical Unit Leader					
Food Unit Leader					
Communication Unit					
Support Branch Director					
Supply Unit Leader					
Facilities Unit Leader					
Ground Support Unit					
Vessel Support Unit					

Finance Section

Title	Name	Phone	Fax	Other	Radio
Finance Section Chief					
Deputy Finance Section					
Time Unit Leader					
Procurement Unit					
Compensation/Claims					
Cost Unit Leader					

ENBRIDGE	Assignment List	ICS 204

Incident:	Branch:
Period:	Division:

Operations Personnel

Title	Name	Affiliation	Contact Number(s)
Operations Section Chief			
Branch Director			
Division/Group/STAM			

Incident Resources – Equipment

Supplier	Resource Type	Description	Quantity	Size	Status

Assignments

Special Instructions for Division/Group

Communications

Name/Function	Radio: Frequency/System/Channel	Phone	Cell/Pager

Emergency Communications

Medical	Evacuation	Other
Prepared by (Resource Unit Leader):	**Approved by (Planning Section Chief):**	**Date/Time Approved:**

ENBRIDGE	Assignment List	ICS 204

Incident:	Branch:
Period:	Division:
Prepared by Signature:	Task Force:
Approved by Signature:	Group:

Tactical Objective
Description of Work
Location of Work
Work Assignment Special Instructions
Special Equipment/Supplies Needed for Assignment
Special Environmental Considerations
Special Site-Specific Safety Considerations
Shoreline Cleanup Assessment Team (SCAT) Considerations

Prepared by (Resource Unit Leader):	Approved by (Planning Section Chief):	Date/Time Approved:

ENBRIDGE	Communications Plan	ICS 205

Incident:	Prepared By: at:
Period:	Version Name:

Phone Listing

Name	Main Phone	Fax	Other No. – Desc.	Other No. – Desc.	Radio

Radio Utilization

System	Channel	Function	Frequency	Assignment	Notes

Incident:	Prepared By: at:
Period:	Version Name:

First Aid Stations

Name	Location	EMT (On-Site)	Phone	Radio

Transportation (Ground and/or Ambulance Services)

Name	Location	EMT	Phone	Radio

Air Ambulances

Name	Location	Doctor/Nurse/EMT	Phone	Radio

Hospitals

Name	Location	Helipad Burn Center	Phone	Radio

Special Medical Emergency Procedures

ENBRIDGE	Site Safety Plan	ICS 208

Incident:	**Prepared by:** **at:**
Period:	**Version Name:**
Revision:	
Applies To Site:	
Products:	(Attach MSDS)

SITE CHARACTERIZATION

Water		Wave Direction	
Wave Height		Current Direction	
Current Speed		Use	
Land		Temp	
Weather		Wind Direction	
Wind Speed			

Pathways for Dispersion:

Site Hazards

☐ Boat safety	☐ Fire, explosion, in-situ burning	☐ Pump hose
☐ Chemical hazards	☐ Heat stress	☐ Slips, trips, and falls
☐ Cold stress	☐ Helicopter operations	☐ Steam and hot water
☐ Confined spaces	☐ Lifting	☐ Trenching/excavation
☐ Drum handling	☐ Motor vehicles	☐ UV radiation equipment
☐ Operational tactics	☐ Noise	☐ Visibility
☐ Electrical operations	☐ Overhead/buried utilities	☐ Weather
☐ Fatigue	☐ Plants/wildlife	☐ Work near water
☐ Other _____	☐ Other _____	☐ Other _____

Air Monitoring

%O2: _____ **%LEL:** _____ **ppm Benzene:** _____

ppm H2S: _____ **Other (Specify):** _____

CONTROL MEASURES

Engineering Controls

☐ Source of release secured	☐ Valve(s) closed	☐ Energy source locked/tagged out
☐ Site secured	☐ Facility shut down	☐ Other _____

Personal Protective Equipment

☐ Impervious suit	☐ Respirator liner	☐ Outer gloves
☐ Eye protection	☐ Inner gloves	☐ Personal floatation device
☐ Flame resistant clothing	☐ Boots	☐ Hard hats
☐ Other _____		

Additional Control Measures

☐ Decontamination	☐ Stations established as needed (e.g. safety or decontamination)
☐ Sanitation	☐ Facilities provided – OSHA 29 CFR 1910.120n
☐ Illumination	☐ Facilities provided – OSHA 29 CFR 1910.120m
☐ Medical surveillance	☐ Facilities provided – OSHA 29 CFR 1910.120fq

ENBRIDGE	Site Safety Plan	ICS 208

Incident:	Prepared By: at:
Period:	Version Name:

WORK PLAN

☐ Booming ☐ Heavy equipment ☐ Other

☐ Skimming ☐ Sorbent pads

☐ Vac trucks ☐ Patching

☐ Pumping ☐ Hot work

☐ Excavation ☐ Obtain appropriate permits

TRAINING

☐ Verified site workers trained per OSHA 29 CFR 1920.120

ORGANIZATION

Title	Name	Telephone/Radio
Incident Commander:		
Deputy Incident Commander:		
Safety Officer:		
Public Affairs Officer:		
Other:		

EMERGENCY PLAN

☐ Alarm system: _____

☐ Evacuation plan: _____

☐ First aid location _____

Notified:

☐ Hospital		Phone:
☐ Ambulance		Phone:
☐ Air ambulance		Phone:
☐ Fire		Phone:
☐ Law enforcement		Phone:
☐ Emergency response/rescue		Phone:

PRE-ENTRY BRIEFING

☐ Initial briefing prepared for each site

INCLUDING ATTACHMENTS/APPENDICES

Attachments

☐ Site Map
☐ Hazardous Substance Information Sheets
☐ Site Hazards
☐ Monitoring Program
☐ Training Program
☐ Confined Space Entry Procedure
☐ Safe Work Practices for Boats
☐ PPE Description
☐ Decontamination
☐ Communication and Organization
☐ Site Emergency Response Plan

Appendices

☐ Site Safety Program Evaluation Checklist
☐ Confined Space Entry Checklist
☐ Heat Stress Consideration
☐ Cold Stress and Hypothermia Consideration
☐ First Aid for Bites, Stings, and Poisonous Plant Contact
☐ Safe Work Practice for Oily Bird Rehabilitation
☐ SIPI Site Pre-Entry Briefing
☐ Personnel Tracking System

ENBRIDGE	Incident Status Summary	ICS 209

Incident:	Prepared By:	at:
Period:	Version Name:	

Type of Incident

☐ Oil Spill	☐ Hazardous Material(s)
☐ Search and Rescue	☐ Serious Incident/Security Threat
☐ Natural Disaster	☐ Fire
☐ Planned Event	☐ Other

Situation Summary as of Time of Report

Future Outlook/Goals/Needs/Issues

Safety Status / Personnel Casualty Summary

Casualty Type	Since Last Report	Adjustments to Previous Op. Period	Total
Responder Injury			
Responder Death			
Public Missing (Active Search)			
Public Missing (Presumed Lost)			
Public Uninjured			
Public Injured			
Public Death			
Total Public Involved			

Property Damage Summary

Property Type	Est. Damage Amount
Vessel	
Cargo	
Facility	
Other	

ENBRIDGE	Incident Status Summary	ICS 209

Incident:	Prepared By:	at:
Period:	Version Name:	

Equipment Resources

Type	Notes	Ordered	Available / Staged	Assigned	Out-of-Service
Aircraft – Fixed-Wing					
Aircraft – Helo					
Pollution Equip – Boom					
Pollution Equip – OSRV					
Pollution Equip – Portable Storage					
Pollution Equip – Skimmers					
Pollution Equip – Tank Vsl/Barge					
Pollution Equip – VOSS/SORS					
Vehicles – Ambulance					
Vehicles – Car					
Vehicles - Fire/Rescue/HAZMAT					
Vehicles – Truck					
Vehicles – Vac/Tank Truck					
Vessels – Boat					
Vessels – Deck Barge					
Vessels – Pilot Boat					
Vessels – SAR/LE Boat					
Vessels – Tug/Tow Boat					
Vessels – USCG Cutter					
Vessels – Work/Crew Boat					

Personnel Resources On Site

Company, Contractor, Federal, Provincial/State, Local and Territorial Agencies	Total # of People
Enbridge	
Total:	

Incident:	**Prepared By:** **at:**
Period:	**Version Name:**

HAZMAT/Oil Spill Status (Estimated)

Common Name(s):

UN Number:	**Source Status:** ☐ **Secured** ☐ **Unsecured**
CAS Number:	**Remaining Potential:**
	Rate of Spillage:

All estimates are in:

	Adjustments to Previous Operational Period	**Since Last Report**	**Total**
Volume Spilled/Released			

Mass Balance – HAZMAT/Oil Budget

Recovered HAZMAT/Oil			
Evaporation/Airborne			
Natural Dispersion			
Chemical Dispersion			
Burned			
Floating, Contained			
Floating, Uncontained			
Onshore			
		Total HAZMAT/Oil Accounted for:	

Comments:

HAZMAT/Oil Waste Management (est., since last report)

Waste Type	**Recovered**	**Disposed**	**Stored**
Oil			
Oily Liquid			
Liquid			
Oily Solid			
Solid			

Comments:

HAZMAT/Oil Shoreline Impacts (Estimated)

Degree of Impact	**Affected**	**Cleaned**	**To be Cleaned**
Very Light			
Light			
Medium			
Heavy			
Total:			

Comments:

HAZMAT/Oil Wildlife Impacts (Since last report)

Wildlife Type	**Captured**	**Cleaned**	**Released**	**DOA**	**Died in Facility**	
					Euthanized	**Other**
Bird						
Mammal						
Reptile						
Fish						
Total:						

Comments:

ENBRIDGE	Change Status	ICS 210

Incident:	Prepared By: at:
Period:	Version Name:

Incident Resources to Change

ID	Supplier	Resource Type	Description	Quantity	Size	Current Location	Current Status

New Status and/or Location

New Status:

New Location:

Date/Time of Change:

Notes (Special Instructions, Safety Notes, Hazards, Priorities)

ENBRIDGE

Check-In List (Personnel)

ICS 211p

Incident:	**Prepared By:** **at:**
Period: **to**	**Version Name:**
Check-In Location ☐ **Command Post** ☐ **Staging Area** ☐ **Other**	**Location Name:**

Personnel Check-In Information

Name (Last, First) & Contact Information	Classification & Company/Agency	Assigned Section & Position	Quantity & UOM	Check-In Date/Time	Check-Out Date / Time Destination

ENBRIDGE

Check-In List (Equipment)

ICS 211e

Incident:	**Prepared By:**	**at:**
Period:	**Version Name:**	
Check-In Location: ☐ Command Post ☐ Staging Area ☐ Other	**Location Name:**	

Equipment Check-In Information

Equipment Description & Identifier	Supplier & Contact Information	Quantity & UOM	Size & UOM	Check-In Date/Time & Assignment	Check-Out Date / Time & Destination

ENBRIDGE	Unit Log	ICS 214

Incident:	Prepared By:	at:
Period: to	Version Name:	

Personnel Roster Assigned

Name	ICS Position	Home Base

Activity Log

Date/Time	Events/Notes

ENBRIDGE	Individual Logs	ICS 214a

Incident:	Prepared By:	at:
Period:	Version Name:	

Activity Log	
Date/Time	Events/Notes

ENBRIDGE	Operational Planning Worksheet	ICS 215

Incident:	Prepared By: at:
Period:	Version Name:

Branch/Division/ Area of Operation	Work Assignments	Resource							Reporting Location	Requested Arrival Date/Time
		Required								
		Have								
		Need								
		Required								
		Have								
		Need								
		Required								
		Have								
		Need								
		Required								
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		Need								
		Required								
		Have								
		Need								

ENBRIDGE

Support Vehicle Inventory

ICS 218

Incident:	**Prepared By:** **at:**
Period:	**Version Name:**
Vehicle Category: ☐ Buses ☐ Dozers ☐ Engines ☐ Lowboys ☐ Pickups/Sedans ☐ Tenders ☐ Other	

Vehicle Equipment Information

Resource Order # / *E* Number	Incident ID #	Vehicle Type	Vehicle Make	Capacity/Size	Agency/Owner	Vehicle License / Rig Number	Location	Release Time

Incident:	Prepared By: at:
Period:	Version Name:

Personnel and Communications

Title/Position	Name	Air/Air Frequency	Air/Ground Frequency	Phone

Planned Flight Information

Type Of Aircraft	Operating Base	Aircraft Company	Passenger Capacity	Purpose	Scheduled Flights

Notes (Special Instructions, Safety Notes, Hazards, Priorities)

ENBRIDGE	Demobilization Check Out	ICS 221

Incident:	Prepared by:
Period: to	Version Name:

Incident Resources to Change

ID	Supplier	Resource Kind	Description	Quantity	Equip ID/Tag#	Size	Original Location

New Status and/or Location

New Status:

New Location:

Release Date/Time:

Changes Processed On: **By:**

Comments

Approved By

You and your resources have been released, subject to signoff from the following:

Position	Printed Name	Signature	Date

	Prepared By:	at / / :
	Page of	

ENBRIDGE	Health and Safety Message	ICS 223

Incident:	Prepared By:	at:
Period:	Version Name:	

Major Hazards and Risks

Narrative

Signature:

ENBRIDGE	Long Term Planning Worksheet	ICS 226

Incident:	Prepared By:	at:
Period:	Version Name:	

ENBRIDGE

Daily Meeting Schedule

ICS 230

Incident:		Prepared By:	at:
Period:		Version Name:	
Meeting Name & Date/Time	**Purpose**	**Attendees**	**Location**

ENBRIDGE	Meeting Description Summary	ICS 231

Incident:		**Prepared By:**	**at:**
Period:		**Version Name:**	

Meeting Information	
Meeting Name:	
Meeting Date/Time:	
Meeting Location:	
Meeting Facilitator:	

Purpose and Attendees	
Purpose:	
Attendees:	

Agenda Outline

Meeting Minutes

ICS 232 – Resources at Risk	Version Name:
Incident Name:	Period: / / : to / / :

Environmentally Sensitive Areas and Wildlife Issues

Site #	*Priority*	*Site Name and/or Physical Location*	*Status*	*Date Completed*
Site Issues				
Notes				
Site Issues				
Notes				
Site Issues				
Notes				
Site Issues				
Notes				
Site Issues				
Notes				

ICS 232 – Resources at Risk	Version Name:
Incident Name:	Period: / / : to / / :

Archaeo-cultural and Socio-economic Issues

Site #	*Priority*	*Site Name and/or Physical Location*	*Status*	*Date Completed*
Site Issues				
Notes				
Site Issues				
Notes				
Site Issues				
Notes				
Site Issues				
Notes				
Site Issues				
Notes				

ENBRIDGE	ACP Site Index	ICS 232a

Incident:	Prepared By:	at:
Period:	Version Name:	

Index to ACP/GRP sites shown on Situation Map

Site #	Priority	Site Name and/or Physical Location	Action	Status
Notes:				
Notes:				
Notes:				
Notes:				
Notes:				
Notes:				
Notes:				
Notes:				
Notes:				

ENBRIDGE

Action Tracker Report

ICS 233

Incident:			Prepared By:		at:	
Period:			Version Name:			
Item Number	Description	Responsible Section/Person	Status	Start Date	Briefed	Target Date

ENBRIDGE

Work Analysis Matrix

ICS 234

Period:	Version Name:

Objectives		
Operations Objectives	**Optional Strategies**	**Tactics/Work Assignments**

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Annex 1 – Table of Contents

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1.0 Owner & Operator

The Owner and Operator of this pipeline system is:

OWNER/OPERATOR ADDRESS	Enbridge Pipelines Inc. 10175 101 St NW Edmonton, Alberta T5J 0H3 1-780-420-5210

24-Hour Contact: **1-877-420-8800** via Edmonton Control Center

This pipeline system is comprised of the following legal entities:

- Enbridge Bakken Pipeline Limited Partnership
- Enbridge Pipelines Inc.
- Enbridge Southern Lights L.P.
- Enbridge Bakken Pipeline Limited Partnership

1.1 Purpose

This Annex is designed to provide field personnel with the information necessary to respond to incidents in a safe and efficient manner in the Central Region Response Zone System, hereafter referred to as the Central Region.

1.2 Interface with Contingency and Company Plans

This Plan has been prepared in accordance with external Contingency Plans. These plans are used to provide a framework for liaison and assistance during an emergency response. The scale of coordination between external agencies and use of contingency plans will vary depending on the necessity of Unified Command outlining areas of concern, such as:

- Identification of environmentally, culturally, and economically sensitive areas potentially impacted by a spill.
- Descriptions of Company's response strategies and responsibilities in accordance with Enbridge Tactical Response Plans and Control Point Maps.
- Integration of Company's response efforts with those of the Federal, Provincial, and local agencies.

1.2.1 Contingency Plans and Tactical Response Plans

Contingency Plans

- Enbridge Community Air Monitoring and Sampling Plan
- Enbridge Shoreline Oiling Assessment Survey Manual
- Enbridge Wildlife Response Plan
- Enbridge Waste Management Plan
- Enbridge Submerged Oil Recovery Plan
- Enbridge Environmental Sensitivity Mapping and QA/QC Protocol Standard
- Enbridge Contaminated Site Assessment and Remediation Program Standard
- Enbridge Contaminated Site Management Program Standard
- Enbridge Incident Management Handbook
- Enbridge Inland Spill Response Tactics Guide
- Enbridge LP/MP Safety Manual
- Aboriginal Affairs and Northern Development Canada--Guidelines for Spill Contingency Planning
- Canada/Saskatchewan Emergency Planning Memorandum of Understanding (January 17, 1985)
- Canada/Saskatchewan Agreement Respecting Administration of the Transportation of Dangerous Goods Act (September 1997)
- Saskatchewan (FA): Administration Agreement for the Control of Deposits of Deleterious Substances under the Fisheries Act (September 1994)

1.3 Management Certification

Management Certification
This Plan is approved for implementation as herein described. Manpower, equipment and materials will be provided as required in accordance with this Plan. The Company is dedicated to the protection of the environment and commits to implement the necessary measures, as specified in the Plan, as necessary in a spill response emergency. In addition to any non-Company resources including Mutual Aid arrangements identified in this Plan, the necessary personnel and equipment resources, owned or operated by the facility owner or operator, are available to respond to a discharge within appropriate response times. The Regional Director has been identified and assumes the role of the Incident Commander. I, the undersigned, attest to the fact that the information contained within this Integrated Contingency Plan is accurate and factual to the best of my knowledge. The listed individuals in this letter are considered, in priority of succession, as Incident Commanders/Qualified Individuals and have full authority to make all necessary decisions in an emergency situation. Such decisions include, but are not limited to, the following: • Activate internal alarms and hazard communications systems; • Activate personnel, equipment, and response organizations' Mutual Aid as needed; • Identify character, source, amount, and extent of release; • Notify and provide information to appropriate Federal, Provincial and local authorities; • Assess interaction of spilled substance with water and/or other substances stored at facility and notify on-scene response personnel; • Assess possible hazards to human health and the environment including both the direct and indirect effects of the release (e.g., the effects of any hazardous surface waters runoffs from water or chemical agents used to control fire and heat-induced explosion); • Assess and implement prompt removal and containment actions; • Coordinate rescue and response actions with response personnel; • Activate and direct cleanup activities with emergency response contractors; • Act as a liaison with the regulatory authorities; and • Designate any funds required to carry out all required and directed oil spill response, mitigation and clean-up activities. This Plan has been prepared in accordance with and is consistent with applicable contingency plans for the facilities covered by this Plan.
[redacted] CERTIFICATION SIGNATURE: [redacted], Regional Director, Prairie Region (Central) NAME & TITLE 02/13/2018 DATE

1.4 Incident Commanders (Qualified Individuals)

The Regional Director has been identified as the Incident Commander and assumes the role of the Qualified Individual.

The Minimum Duties Required Of The QI /IC or designee Include:	
✓	Activate response personnel and response organizations' Mutual Aid as needed.
✓	Notify and provide necessary information to appropriate Federal, Provincial, and local authorities with designated response roles. See *Annex 2 – Notification Procedures*.
✓	Assess the possible hazards to human health and the environment as a result of the release. This assessment must consider both the direct and indirect effects of the release (e.g., the effects of any hazardous surface waters runoffs from water or chemical agents used to control fire and heat-induced explosion).
✓	Assess and implement prompt removal actions to contain and then remove the substance released.
✓	Coordinate rescue and response action as previously arranged with all response personnel.
✓	Use authority to immediately access Company funding to initiate response, mitigation and clean-up activities.

Central Region – Incident Commander/Qualified Individual

Primary		
Name	**Title**	**Contact Info**
[redacted]	Regional Director, Prairie Region	[redacted]
Alternates		
Name	**Title**	**Contact Info**
[redacted]	Manager, Regional Services	[redacted]
[redacted]	Supervisor, Maintenance Management Services	[redacted]

1.5 Response Zone Description (Information Summary)

1.5.1 Central Region

The Central Region is under Enbridge Pipelines Inc. entity ownership. The region includes Lines 1-4, 13, and 67 beginning at the Loreburn Station (~Km 538/MP 334) and traversing southeast through Regina and Cromer Stations to the Canadian/U.S. border at Gretna, Manitoba (~Km 1245/MP 772). Line 67 deviates around the City of Regina at MP416 and rejoins the mainline at MP464. Line 65 starts at the Cromer Terminal and follows the above right-of-way to the US border.

Tables below list the assets within this region by pipeline, station and tank terminals. Further Regional descriptions follow.

Bakken Expansion Pipeline

In March 2013, the Bakken Expansion Pipeline (BEP) went into service. A joint venture with Enbridge Energy Partners, BEP enables delivery of growing crude oil production in North Dakota to the Enbridge Inc. mainline at Cromer, Manitoba. BEP increased takeaway capacity from the Bakken region by 145,000 barrels per day and is predominantly underwritten by take-or-pay contracts.

1.5.2 Pipeline Information

The Central Region includes 9 pipelines with approximately 4,540 kilometers of pipeline, with pipe diameters ranging from 12 inches to 48 inches.

Line Diameter	Pipeline Section	Begin Lat	Begin Long	Begin KM	End Lat	End Long	End KM
Line 1 (20") NGL*, Refined Product	Loreburn Station to CA/US Border at Gretna, MB	51.19958	-106.58599	538.03	49.00052	-97.53221	1245.18
Line 2 (24") CO** & Synthetic Products	Loreburn Station to CA/US Border at Gretna, MB	51.19940	-106.58599	538.05	49.00052	-97.53227	1245.20
Line 3 (34") CO	Loreburn Station to CA/US Border at Gretna, MB	51.19947	-106.58599	538.03	49.00052	-97.53239	1245.18
Line 4 (36"/48") CO	Loreburn Station to CA/US Border at Gretna, MB	51.19925	-106.58599	537.35	49.00052	-97.53260	1245.18
Line 13 (16"/1820"") Diluent	Loreburn Station to CA/US Border at Gretna, MB	51.19947	-106.58599	538.04	49.00052	-97.53234	1245.18
Line 26 (12"-CO)	US/CA Border at Portal, SK to Steelman Bakken Pump Station	48.999108	-102.57108	no MP at this time	49.28444	-102.63722	85.07 MP
Line 26 (16"-CO)	Steelman Bakken Pump Station to Cromer Terminal	49.28444	-102.63722	85.07 MP	49.75417	-101.23892	162.31 MP
Line 65 (20") CO	Cromer Terminal to CA/US Border at Gretna, MB	49.75556	-101.24167	0.00	49.00068	-97.53223	287.84
Line 67 (36") CO	Loreburn Station to CA/US Border at Gretna, MB	51.19799	-106.58597	364.81	49.00036	-97.53174	1080.89

**NGL- Natural Gas Liquid*
***CO- Crude Oil*

1.5.3 Terminal/Station Information

The Central Region has 3 terminals and 14 stations located along its pipeline system as listed below:

Pump Station	Lines Serviced	Site Number	Call Sign	MP	KP	Coordinates	
Loreburn Station	Ln 1-4, 13, 67	40	ZP	334.35	538.08	51.19861	-106.58250
Craik Station	Ln 2-4, 13, 67	45	CK	367.03	590.67	50.93528	-105.96167
Bethune Station	Ln 1-4, 67	47	BU	405.72	652.95	50.62028	-105.24194
Stoney Beach T.O		48	SB	410.68	660.93	50.58251	-105.14751
Regina Terminal	Ln 1-4, 13	50	QU	437.57	704.20	50.48167	-104.58472
Rowatt Station	Ln 67	51	RT	441.40	ER710.37	50.38333	-104.57083
White City Station	Ln 1-2	52	WC	455.17	732.52	50.40222	-104.21556
Odessa Station	Ln 1-4, 13, 67	55	OD	473.47	761.97	50.29750	-103.83722
Glenavon Station	Ln 1-4, 13, 67	60	AP	504.60	812.07	50.18500	-103.16306
Langbank Station	Ln 1-4, 13, 67	65	LB	543.79	875.15	50.04861	-102.31111
Cromer Terminal	Ln 1-4, 13, 26, 65, 67	70	CM/QC	596.80	958.84	49.75556	-101.24167
West Souris Station	Ln 1, 3, 67	74	SW	640.99	1031.57	49.65809	-100.26036
Souris Station	Ln 2, 4, 13	75	SP	646.23	1040.01	49.64278	-100.14556
Glenboro Station	Ln 1-4, 13, 65, 67	80	LP	685.55	1103.29	49.53917	-99.28778
St. Leon Station	Ln 3, 4, 13, 67	83	LO	718.08	1155.63	49.34583	-98.63444
Manitou Station	Ln 1, 2, 65	85	XP	723.93	1165.05	49.30500	-98.52167
Gretna Terminal	Ln 1-4, 13, 67	90	GF	771.99	1242.40	49.01667	-97.55556
Steelman Bakken Pump Station	Ln 26	2605	QS	85.07	136.90	49.28444	-102.63722

**T.O – Take off*

1.5.4 Regional Tank Table

Tank No.	Location	Build Date	Total Volume	Total Barrel Capacity
300-TK-64	Stoney Beach TO (SB)	1992	30,000	66,250
300-TK-65		1993	36,250	
301-TK-71	Regina (QU)	1951	56,000	792,050
301-TK-72		1951	56,000	
301-TK-73		1951	140,000	
301-TK-74		1952	80,000	
301-TK-77		1955	56,000	
301-TK-78		1955	56,000	
301-TK-79		1994	150,000	
301-TK-80		2015	198,050	
302-TK-87	Cromer (CM)	2015	199,200	2,487,700
302-TK-88		2015	199,200	
301-TK-89		1986	100,000	
301-TK-90		1986	100,000	
301-TK-91		1986	100,000	
301-TK-92		1986	100,000	
301-TK-93		1986	100,000	
303-TK-94		1974	120,000	
302-TK-95		1963	150,000	
303-TK-96		1956	56,000	
303-TK-97		1956	56,000	
303-TK-98		1956	96,000	
302-TK-99		1956	56,000	
301-TK-100		1988	150,000	
301-TK-101		1992	150,000	
301-TK-102		1994	174,300	
303-TK-103		1996	150,000	
301-TK-104		1996	150,000	
302-TK-107		1956	96,000	
302-TK-109		1956	89,000	
303-TK-110		1957	96,000	
300-TK-111	Gretna (GF)	Arial	56,000	280,000
300-TK-112		Arial	56,000	
300-TK-113		Arial	Out of Service	
300-TK-114		Arial	56,000	
300-TK-115		Arial	56,000	
300-TK-116		Arial	56,000	
REGION TOTAL				3,626,000

1.5.5 County and Municipal Boundaries

The table below lists the provinces and municipal boundaries (counties, townships, etc,) and the beginning and ending Mile/Kilometer Posts by line in which the Central Region pipelines traverse.

Central Region					
Saskatchewan					
County	**Line**	**MP Beginning**	**KP Beginning**	**MP Ending**	**KP Ending**
Loreburn No. 254	1,2,3,4, 13	334	538	343	552
Willner No. 253		343	552	347	559
Huron No. 223		347	559	365	587
Craik No. 222		365	587	386	622
Dufferin No. 190		386	622	412	663
Pense No. 160		412	663	424	682
Sherwood No. 159		424	682	432	695
Regina		432	695	441	709
Sherwood No. 159		441	709	443	713
Edenwold No. 158		443	713	455	733
South Qu'Appelle No. 157		455	733	457	735
Lajord No. 128		457	735	462	744
Francis No. 127		462	744	482	776
Montmartre No. 126		482	776	501	807
Chester No. 125		501	807	520	837
Kingsley No. 124		520	837	539	868
Silverwood No. 123		539	868	544	876
Wawken No. 93		544	876	557	899
Walpole No. 92		559	899	572	921
Maryfield No. 91		572	921	574	923
Walpole No. 92		574	923	574	924
Maryfield No. 91		574	924	587	945
Loreburn No. 254	67	227	365	235	378
Willner No. 253		235	378	240	386
Huron No. 223		240	386	257	414
Craik No. 222		257	414	279	449
Dufferin No. 190		279	449	304	490
Pense No. 160		304	490	318	511
Sherwood No. 159		318	511	338	544
Edenwold No. 158		338	544	350	564
Lajord No. 128		350	564	357	574
Browning No. 34	26		0		3
Coalfields No. 4			3		34
Canada/US Border		85.07			
Enniskllen No. 3					
Moos Creek No. 33					
Reciprocity No. 32					
Storthoaks No. 31	26				
Antler No. 61					

Central Region					
Saskatchewan					
County	**Line**	**MP Beginning**	**KP Beginning**	**MP Ending**	**KP Ending**
Francis No. 127	67	357	574	377	607
Montmartre No. 126		377	607	396	638
Chester No. 125		396	638	415	668
Kingsley No. 124		415	668	434	699
Silverwood No. 123		434	699	440	708
Wawken No. 93		440	708	454	731
Walpole No. 92		454	731	469	756
Maryfield No. 91		470	756	482	777
Manitoba					
Wallace	1,2,3,4, 13	587	945	590	949
Pipestone		590	949	613	986
Sifton		613	986	632	1017
Glenwood		632	1017	651	1047
Oakland		651	1047	669	1077
South Cypress		669	1077	687	1106
Argyle		687	1106	695	1119
Lorne		695	1119	717	1154
Pembina		717	1154	729	1174
Thompson		729	1174	730	1175
Pembina		730	1175	736	1185
Stanley		736	1185	757	1218
Rhineland		757	1218	774	1245
Pipestone	65	0	0	17	27
Sifton		17	27	35	57
Glenwood		35	57	55	88
Oakland		55	88	74	119
South Cypress		74	119	92	148
Argyle		92	148	100	161
Lorne		100	161	121	195
Pembina		121	195	134	216
Thompson		134	216	135	217
Pembina		135	217	141	227
Stanley		141	227	162	260
Rhineland		162	260	179	288
Pipestone No. 163	26	162.31			
Cromer Terminal					

Central Region					
Manitoba					
County	**Line**	**MP Beginning**	**KP Beginning**	**MP Ending**	**KP Ending**
Wallace	67	483	777	486	782
Pipestone		486	782	510	820
Sifton		510	820	528	850
Glenwood	67	528	850	547	880
Oakland		547	880	567	912
South Cypress		567	912	585	941
Argyle		585	941	593	954
Lorne		593	954	614	988
Pembina		614	988	627	1009
Thompson		627	1009	628	1010
Pembina		628	1010	634	1020
Stanley		634	1020	654	1053
Rhineland		654	1053	672	1081

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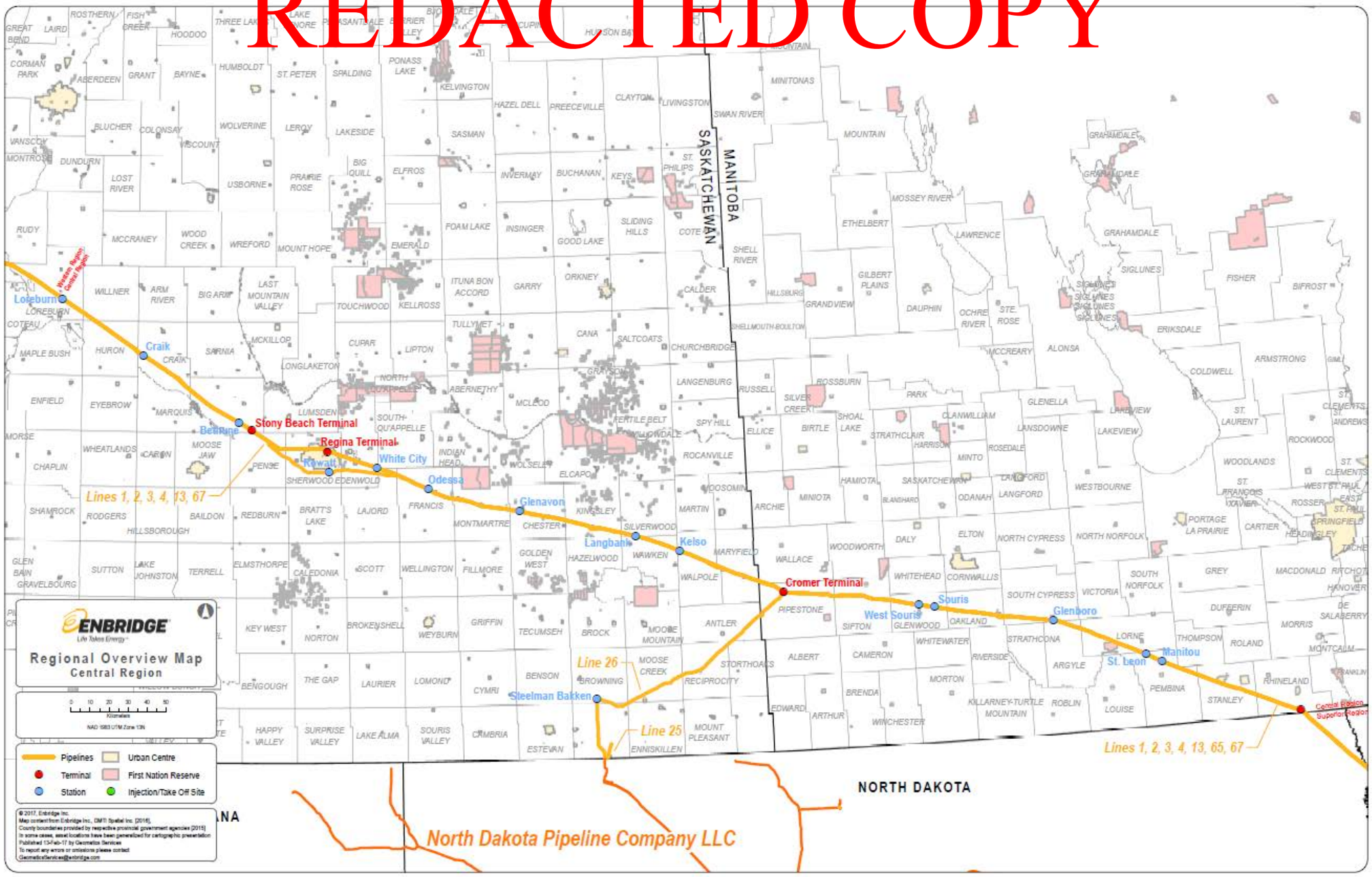

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1.6 Local Spill Response Equipment

It is the responsibility of each Area Manager/PLM Supervisor to ensure that the spill response equipment is inventoried annually and restocked as resources are expended.

The following table lists the Enbridge-owned primary spill recovery equipment and its capabilities. Emergency response trailers contain hard boom, sorbent boom, skimmers, and porta-tanks as well as various tools for initial emergency response to both land and water releases.

Enbridge Pipelines Inc, is a member of Western Canadian Spill Services LTD. (WCSS); the NISKU Unit, Saskatoon Unit. WCSS provides spill preparedness and response support services. For full current inventory lists refer to http://www.wcss.ab.ca/equipment/spill-response.asp. They are also affiliated with Saskatchewan Oil Spill Cooperative in Estevan, SK, (http://saskoilspill.com/) and Manitoba Producers Oil Spill Cooperative in Virden, MB (http://www.gov.mb.ca/iem/petroleum/pdirectory/service.html).

The WCSS and Cooperative equipment location maps are included below. The locations of these individual facilities are noted on emergency response maps within this Annex under *Section 1.8*.

In the event of an incident, the Control Center would contact the Regional-On-Call Manager, who has the ability to mobilize personnel and equipment on a 24-hour basis.

1.6.1 Enbridge Equipment

Central Region		
Cromer		
CM-630-OUT-0823 - Cromer yard		
Resource Name	SPECIALIZED EQUIPMENT	Total
Trailer,Command/40021417		1 Each
Cromer		
CM-630-STRM-0817 - Cromer Cold Storage building		
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, CENTRIFUGAL, 6IN, GORMAN-RUPP, CUMMINS DIESEL/40021063		1 Each
PUMP, CENTRIFUGAL, 4IN, GORMAN-RUPP, CUMMINS DIESEL/40021066		1 Each
PUMP, TRASH, 2IN/40013876		1 Each
Resource Name	SPECIALIZED EQUIPMENT	Total
GENERATOR, HONDA, EM6500SX/40020367		2 Each
GENERATOR, HONDA, ES6500/40020839		1 Each
GENERATOR, PORTABLE, 7.5KW, ONAN, DIESEL/40021065		1 Each
GENERATOR, HONDA, EM 2500 (gas Powered)/40020356		2 Each
GENERATOR, HONDA, 2000 WATT/40021062		2 Each
GENERATOR, HONDA 3500 WATTS/40020791		1 Each
GENERATOR, 15KW, ISUZU/40021064		1 Each
Vehicle, All Terrain, Amphibious, Hydra-Trek, Diesel , D2488, V3600T 85 H.P. Turbo Diesel, 5,700.0 LBS/40013640		1 Each
Cromer		
CM-862-TRLR-0822 - Cromer Summer Response Trailer		
Resource Name	BOOM	Total
BOOM,OSCAR RIVER, 12FT/40021067		30 Each
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, YANMAR, 2IN, DIESEL,/40020928		1 Each
Resource Name	SPECIALIZED EQUIPMENT	Total
GENERATOR, HONDA, ES6500/40020839		1 Each

Cromer		
CM-862-TRLR-0826 - Cromer ER Response Trailer		
Resource Name	SKIMMER	Total
SKIMMER, MECHANICAL, DRUM, GROOVED , OSYSTSK340, 70 G.P.M., TDS118G, ELASTEC/AMERICAN MARINE, HYDRAULIC Drive, SHALLOW WATER/40013608		1 Each
Gretna		
GF-630-STRM-0825 - Gretna PLM Shop		
Resource Name	BOAT & RESPONSE VEHICLE	Total
BOAT, WORK, OUTLAW EAGLE, HULL 18FT, Aluminum, MERCURY ENGINE, Inboard, 200 HP, Jet, C/W TRAILER/40020941		1 Each
BOAT,WORK BOAT, 20 FT, 175 HP, ENGINE Inboard/40021056		1 Each
BOAT,WORK BOAT, LANDING CRAFT, 20FT, INBOARD, 5.7L, 350HP, Jet, OUTLAW EAGLE MANUFACTURING, 350 HP 5.7L. JET/40021057		1 Each
Resource Name	SPECIALIZED EQUIPMENT	Total
VEHICLE, OFF HIGHWAY, Gasoline, SIDE BY SIDE, 4WHL DRIVE/40015239		1 Each
Gretna		
GF-845-CCN-0810 - Gretna PLM Oil Spill containment CCAN #1		
Resource Name	SORBENTS	Total
POM POMS, OIL POMS POMS/40015603		1500 Each
Gretna		
GF-845-CCN-0811 - Gretna PLM Oil Spill containment CCAN #2		
Resource Name	SORBENTS	Total
POM POMS, OIL POMS POMS/40015603		1500 Each
Gretna		
GF-845-CCN-0813 - Gretna PLM Oil Spill containment CCAN #4		
Resource Name	SORBENTS	Total
POM POMS, OIL POMS POMS/40015603		1000 Each

Gretna		
GF-862-CCN-0814 - Gretna PLM Oil Spill Containment CCAN #3/ Water Recovery equipment		
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, HYDRAULIC, ELASTEC/AMERICANMARINE, 3IN/40020395		1 Each
Resource Name	SKIMMER	Total
SKIMMER, MECHANICAL, C/W HEATER, PUMP AND HOSES, OSKIMUN350G, ELASTEC/AMERICAN MARINE, HYDRAULIC/40013722		1 Each
Resource Name	SPECIALIZED EQUIPMENT	Total
Tank, Pillow, 5000 U.S. Gallons, Elastec, with 3IN Flange, Valve/Camlock, Close nipple, Brass gate valve, Alum. Camlock./40013597		1 Each
Gretna		
GF-862-TRLR-0815 - Gretna PLM Emergency Response Trailer #1		
Resource Name	BOOM	Total
BOOM,OSCAR RIVER, 8IN X 50FT/40021060		650 Each
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, YANMAR, 2IN, DIESEL,/40020928		1 Each
Resource Name	SKIMMER	Total
SKIMMER, MECHANICAL DISC, AQUAGUARD, RBS-10D/40021058		1 Each
Resource Name	SPECIALIZED EQUIPMENT	Total
Tank, Fast, 2000 (Full Kit),Includes Roof Cover, Ground Mat, Tank Liner, Valve Outlet, Pipe Saddle, Tapst and & Handpump/40013599		2 Each
REGINA		
QU-630-STRM-0801 - Regina Cold Storage Building		
Resource Name	BOAT & RESPONSE VEHICLE	Total
BOAT, WORK BOAT, LANDING CRAFT, 22 FT, OUTLAW EAGLE , INBOARD TWIN 330 HP 5.7L. JET/40020924		1 Each
BOAT,LANDING CRAFT, EAGLE/OUTLAW MARINE, 18FT, 200 HP MERCURY, Jet/40015621		1 Each
BOAT,WORK BOAT, LANDING CRAFT, 20FT, INBOARD, 5.7L 330HP, JET, OUTLAW EAGLE MANUFACTURING/40021027		1 Each

REGINA		
QU-630-STRM-0804 - Regina PLM Shop		
Resource Name	SPECIALIZED EQUIPMENT	Total
GENERATOR, HONDA, EU6500/40020857		1 Each
ARGO, Diesel, AMPHIBIOUS, PERSONNEL, ALLWHL DRIVE, 950DT/40013663		1 Each
VEHICLE, OFF HIGHWAY, Gasoline, SIDE BY SIDE, 4WHL DRIVE/40015239		1 Each

REGINA		
QU-862-TRLR-0805 - Regina Summer Response Trailer		
Resource Name	BOOM	Total
BOOM,OSCAR RIVER, 16IN X 50FT/40020354		10 Each
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, TRASH, 2IN/40013876		1 Each
Resource Name	SKIMMER	Total
SKIMMER, MECHANICAL, MORRIS, MI-11/24, 24 DISCS, 11IN, C/W DIESEL HYDRAULIC POWER PACK/40020822		1 Each
SKIMMER, WEIR, PEDCO , 2FT WIDE/40020397		1 Each
Resource Name	SPECIALIZED EQUIPMENT	Total
TANK, PORT-A-TANK, C/W BLADDERS, 1500 GAL/40020355		2 Each

REGINA		
QU-862-TRLR-0806 - Regina Winter Response Trailer		
Resource Name	SPECIALIZED EQUIPMENT	Total
GENERATOR, HONDA 3500 WATTS/40020791		1 Each

REGINA		
QU-862-TRLR-0809 - Regina Summer Response Semi		
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, ELASTEC/AMERICANMARINE, 4IN/40021054		1 Each
PUMP, TRASH, 2IN/40013876		1 Each
Resource Name	SKIMMER	Total
SKIMMER, MECHANICAL, GROOVED DRUM, TDS136, ELASTEC/AMERICAN MARINE/40021053		1 Each
SKIMMER, VACUUM, Shovel Head, Vacuum system w/Hydraulic Motor, ELASTEC/AMERICAN MARINE,/40013600		1 Each
SKIMMER, WEIR, ES400 helical screw pump, OSYSTSK440S, 520.0 GPM, Sea Skater Weir, ELASTEC/AMERICAN MARINE, Self-Adjusting/40013609		1 Each

1.6.2 Spill Response Organizations – Internal & External Locations

Equipment Locations	Emergency Phone Number	Address	Coordinates	
Central Region Response Units				
Cromer Terminal	[redacted]	[redacted]	[redacted]	[redacted]
Gretna Terminal	[redacted]	[redacted]	[redacted]	[redacted]
Regina Terminal	[redacted]	[redacted]	[redacted]	[redacted]
External Response Agencies				
Husky Pipeline Yard	[redacted]	[redacted]	[redacted]	[redacted]
Dick's Welding & Contracting	[redacted]	[redacted]	[redacted]	[redacted]
Encana Corporation Coop	[redacted]	[redacted]	[redacted]	[redacted]
Bromby Welding Ltd.	[redacted]	[redacted]	[redacted]	[redacted]
Saskatchewan Oil Spill Cooperative	[redacted]	[redacted]	[redacted]	[redacted]
Manitoba Oil Spill Cooperative	[redacted]	[redacted]	[redacted]	[redacted]
Cenovus Parking Lot	[redacted]	[redacted]	[redacted]	[redacted]
CEPA Mutual Emergency Assistance Agreement**	Primary: [redacted] Dir. Central Region Ops Emergency Phone Number: [redacted] Secondary: [redacted], Manager, PLM Emergency Phone Number [redacted] Chose the "Mutual Aid" tab on the following SharePoint site that displays the external contact information for the CEPA Mutual Emergency Assistance Agreement: http://myteamsites.cnpl.enbridge.com/sites/EmergencySM			

** As a member company of the Canadian Energy Pipeline Association ("CEPA"), Enbridge Pipelines Inc. and affiliate companies can activate the Mutual Emergency Assistance Agreement ("MEAA") to access additional human resources and equipment, to increase response capabilities. See *Annex 2* for information on how to activate the MEAA agreement.

Western Canadian Spill Services LTD- Equipment by Area
REDACTED COPY
Area VR-1
Regional Custodian
Pipeline Control Room
Husky Pipeline Yard Phone: [redacted] Phone: [redacted]
Equipment Location
Husky Pipeline Yard [redacted]
Equipment Summary
OSCAR Trailer (Tractor Truck) (2) (These units vary in size but typically contain at least 122 meters of boom along with rope, skimmers, pumps and sorbents. These units are trailers that require a 1 ton truck c/w 2-5/16 ball or skid units that require a flat deck or lowboy to haul.) Workboats (3) ($_{1/2}$ Ton Truck with 2" Ball Hitch) Winter OSCAR ($_{3/4}$ Ton Truck with 2 $_{5/16}$" Ball Hitch)) (Winter OSCAR trailers contain ice assessment and cutting equipment, safety equipment, hardware and other specialized equipment for recovery of oil from under an icesheet. They are typically 16 ft long and require at least a 3/4 ton truck with 1-5/16 ball.) Hydraulic Drum Skimmer with Power Pak and Pump
Regional Custodian
Co-op Equipment
Phone: [redacted]
Equipment Location
[redacted]
Equipment Summary
Mini-OSCAR Trailer (Semi-Truck) (These units vary in size but typically contain at least 122 meters of boom along with rope, skimmers, pumps and sorbents. These units are trailers that require a 1 ton truck c/w 2-5/16 ball or skid units that require a flat deck or lowboy to haul.)
Area N
Equipment Locations (South)
Encana Corporation Coop [redacted]
Equipment Summary
24 ft. Trailer (Towing requirements 3/4 ton Truck with 2 5/16” hitch and electric brake controller)

Area I/J
Regional Custodian
Bromby Welding Phone: [redacted] Cell: [redacted]
Equipment Location
[redacted]
Equipment Summary
OSCAR Trailer (Semi-truck) (These units vary in size but typically contain at least 122 meters of boom along with rope, skimmers, pumps and sorbents. These units are trailers that require a 1 ton truck c/w 2-5/16" ball or skid units that require a flat deck or lowboy to haul.)
Area I/J
Regional Custodian
Dick's Welding & Contracting [redacted]
Equipment Location
[redacted]
Equipment Summary
OSCAR (Semi-Truck) (2) (45 to 54 ft. trailers strategically placed within WCSS. These are the largest equipped units in the fleet and contain at least 300 metres of boom along with pumps, skimmers and hardware designed to contain and recover a hydrocarbon spill in surface water. These units require a semi-trailer truck to haul.) Work Boats (2) (½ Ton Truck with Ball Hitch) Barge with Bow Collector (1 Ton Truck with 2 5/16" Ball Hitch and Electric Brakes) Winter OSCAR (3/4 Ton Truck with Ball Hitch) (Winter OSCAR trailers contain ice assessment and cutting equipment, safety equipment, hardware and other specialized equipment for recovery of oil from under an icesheet. They are typically 16 ft long and require at least a 3/4 ton truck with 1-5/16 ball.) Boom Vane (Shallow Draft) Hydraulic Drum Skimmer (4) (with Pump and Hydraulic Power Pack) Incinerator (Semi-Truck) Inflatable Lake Boom Trailer (3/4 Ton Truck with 2 5/16" Ball Hitch and Electric Brakes) Inflatable River Boom Trailer (3/4 Ton Truck with 2 5/16" Ball Hitch and Electric Brakes)

Equipment Summary cont
(A lake boom trailer is available which stores specialized boom designed for rougher, wavier water. This boom is bigger than conventional river boom. It has 30 cm of skirt and 30 cm of sail or freeboard. There is presently 300 meters of boom in this trailer.)
Bow Collector
Airboats (3)
Boom Deflectors (10)
Wildlife Response Unit ($_{1/2}$ Ton Truck with 2" Ball Hitch)
Directions
Transport Contact - Dick's Welding

Oil Spill Cooperatives
Manitoba Producers Oil Spill Cooperative (“MPOSC”)
[redacted]
Sask Oil Spill Contingency Group (“SOSC”)
[redacted]

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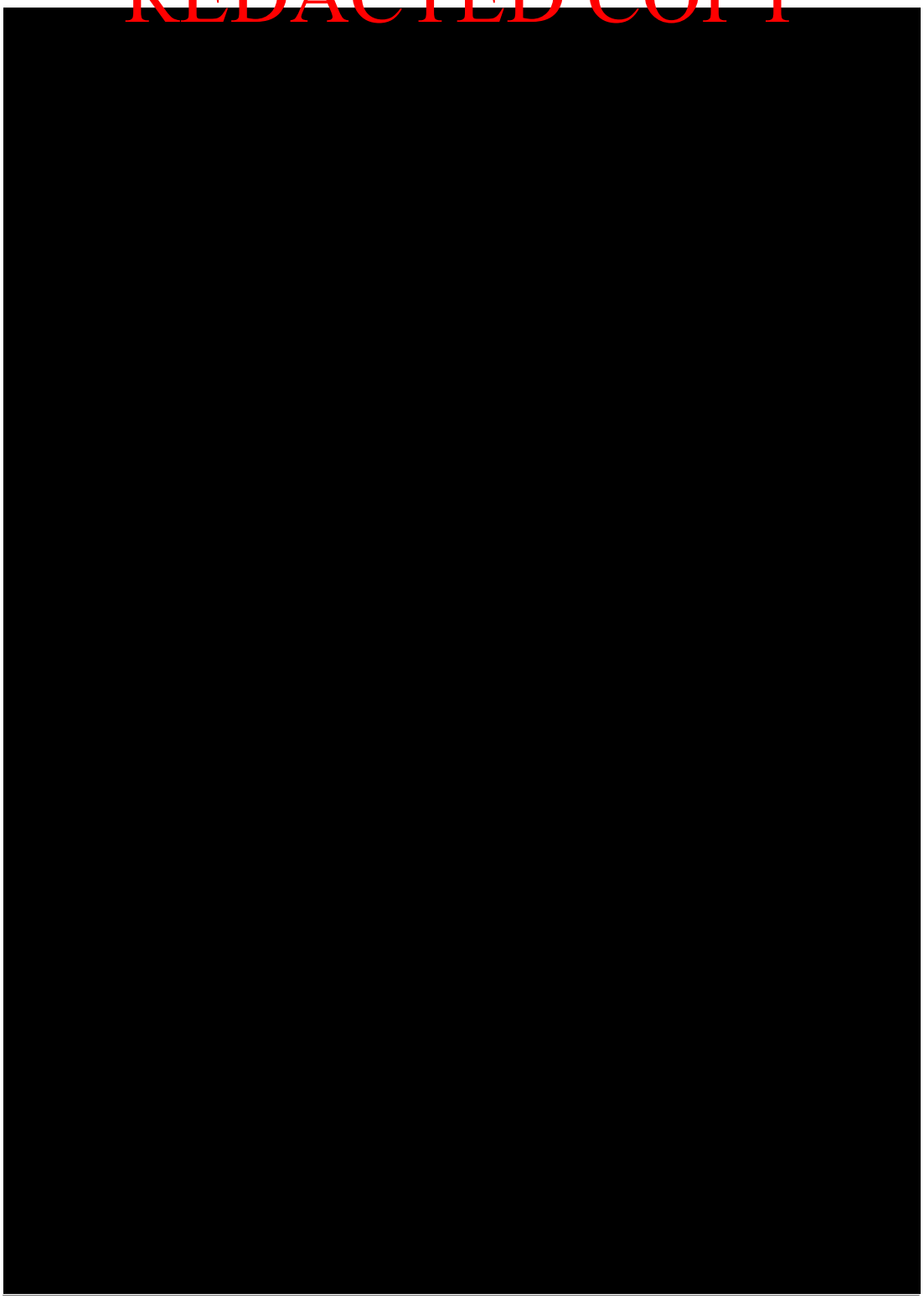

1.7 Evacuation

It is important to remember that evacuations beyond Company property will have to be initiated and coordinated with local emergency response/management organizations which have the legislative authority to order the movement of persons. Provincial, Indigenous and local authorities have primary responsibility and authority for evacuation planning and for the transportation, sheltering, public safety, and security of persons and non-Federal property within their respective jurisdictions. The unique challenges that might confront Provincial, Indigenous and local governments during a mass evacuation could require them to request additional assistance, of either a logistical or operational nature, from within their province, from other provinces pursuant to mutual aid and assistance compacts, or from the Federal government.

If the public is at risk, Regional Management will contact the Lands Services Department for a list of landowners in the emergency planning zone to initiate notifications.

Company Responsibilities:

- The Company should ensure that local emergency response/management organizations are provided with a clear recommendation to evacuate the public should the Company become aware of an immediate threat to life or safety that may not be under action by first responders.
- The Company will serve only in an advisory capacity during an evacuation order and may assist with the logistics of an evacuation.
- The Company must provide as much product information as possible to any emergency management organization coordinating an evacuation. The latest version of the Emergency Response Guidebook (“ERG”) should be consulted in order to determine safe evacuation distances. See *Core II- Section 2.3.2 Isolation Distance*

1.8 Emergency Response Time Maps

1.8.1 Central Region Response Zone

Regional Emergency Response Time Maps were created utilizing ESRI® (Environmental Systems Research Institute) ArcMap. Times were calculated utilizing actual street speed limits based on a network dataset built from ESRI's StreetMap Premium for ArcGIS, which contains street information from 2016. Optimal driving conditions were used in this response time analysis, actual time is subject to change based on local road, traffic and weather conditions.

These response time maps are considered a conservative time frame for travel to site and do not include additional time for deployment. In the event of an incident, reference to individual maps will be necessary.

Manned Station travel times are calculated in hours up to 6 hours. The colored zone changes every 2 hours on the maps. This will show **only** the travel time required from the manned stations to the company trailers or to areas along the pipeline.

Enbridge Emergency Response Trailer location travel times are calculated every 2 hours up to 6 hours depicting travel time **only** for the trailer to locations along the pipelines. Each trailer location has its own map with color changes representing one-two hour time changes.

Mutual Aid Trailer location travel times are represented by calculating every 2 hours up to 6 hours. The color changes represent two-hour travel time changes. Response times may vary with the locations of mutual aid personnel at the time of an event. This is representative of travel time for the trailers **only**.

1.8.2 Company Response Times

Response times may be variable due to remote access, extreme road and weather conditions. The safety of responders is of the utmost importance, good decisions and safe behavior are more important than speed. The response times in the Emergency Response Time Maps are strictly guidelines intended to be used during incident pre-planning to pre-identify and appropriately pre-position the resources (people and equipment) before an incident occurs

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Emergency Response Maps
Central Region

1.8.3 Manned Facilities with an Emergency Response Trailer

Manned/Trailer Facility

This map will show the travel time required from the manned facility with an Emergency Response Trailer, after notification, to access areas along the pipeline.

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Emergency Response Maps
Central Region

1.8.4 Western Canadian Spill Services LTD (WCSS) & Mutual Aid Coop Trailers

Mutual Aid

These maps show the travel time **only,** after notification, from the WCSS & Mutual Aid facilities with an Emergency Response trailer to areas along the pipeline

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1.9 SAFETY DATA SHEETS (SDS)

Table of Contents

- AHS Albian Heavy Synthetic
- AMH Albian Muskeg River Heavy
- ARB Albian Residual Blend
- AVB Albian Vacuum Blend
- AWB Access Western Blend
- BHB Borealis Heavy Blend
- BHB Suncor
- BR CL CLB CDB CSB WH WCS Bow River (Cold Lake (CL) Western Canada Blend (WCB) Western Canadian Select (WCS_ CSB- Bow River (BR) CDB-Christina Lake Dilbit Blend
- BSO Sour Crude Canada
- Canadian Heavy Sweet
- CNC Synthetic Custom Blend
- CRW Condensate Blend
- Distillate
- DRA EP 2000 Flow Improver
- FLOFUS3000
- Gasoline
- HSC Hardisty Synthetic Crude
- KDB Kearl Lake Dilbit
- LSB Light Sour Blend
- MID Midale Blend
- MJT Moose Jaw Tops
- MKH Suncor
- MSB LSB ENB Crude Oil Sour
- MSW Mixed Sweet Blend
- NGL Natural Gas Liquids
- NSA Newgrade Synthetic Blend
- NSW North Dakota Sweet
- OCC Suncor
- OSA Suncor
- OSC Suncor C
- OSH Suncor H
- OSJ Suncor
- OSN Suncor
- OSP Suncor
- OSQ Suncor
- OSU Suncor
- PBS Pine Bend Special
- PCH CHV ENB Crude Oil Heavy
- PSC Nexen
- PSR Plains Sweet Regina
- PSW Long Lake Sweet Blend
- PSX Nexen
- PSY Premium Synthetic
- SCB Statoil Cheecham Blend
- SCM Statoil Cheecham Mix
- SH Crude Oil Sour
- SPX Shell Upgrade Crude
- SSX Shell Synthetic Light
- SVXTurboflo
- SYB Synbit Sweet Blend
- SYN Synthetic Sweet Blend
- UHC Sweet Clearbrook

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SAFETY DATA SHEET
According to the Hazardous Products Regulations
Albian Heavy Synthetic

Version	Revision Date:	SDS Number:	Print Date: 2017-02-03
7.0	2017-02-02	800001027449	Date of last issue: 19.10.2016
			Date of first issue: 02.02.2017

SECTION 1. IDENTIFICATION

Product name : Albian Heavy Synthetic

Product code : 001B3607

Manufacturer or supplier's details

Manufacturer/Supplier : **Shell Trading Canada**
400 - 4th Avenue S.W.
Calgary-Alberta T2P 0J4
Canada

Telephone : (+1) 800-661-1600
Telefax :

Emergency telephone number : CHEMTREC (24 hr) (+1) 703-527-3887 or (+1) 800-424-9300 (US)
; CANUTEC (24 hr): (+1) 613-996-6666; Toll Free: 1-888-CANUTEC (226-8832)

Recommended use of the chemical and restrictions on use

Recommended use : Refinery Feedstock.

Restrictions on use :
This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Flammable liquids : Category 1

Aspiration hazard : Category 1

Skin irritation : Category 2

Acute toxicity (Inhalation) : Category 4

Specific target organ toxicity - single exposure (Inhalation) : Category 3 (Central nervous system)

Germ cell mutagenicity	:	Category 1B
Carcinogenicity	:	Category 1B
Reproductive toxicity	:	Category 2
Specific target organ toxicity - repeated exposure	:	Category 2 (Blood, Liver, thymus, spleen)
Chronic aquatic toxicity	:	Category 2

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements :
PHYSICAL HAZARDS:
H224 Extremely flammable liquid and vapour.
HEALTH HAZARDS:
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H332 Harmful if inhaled.
H336 May cause drowsiness or dizziness.
H340 May cause genetic defects.
H350 May cause cancer.
H361 Suspected of damaging fertility or the unborn child.
H373 May cause damage to organs through prolonged or repeated exposure.
ENVIRONMENTAL HAZARDS:
H411 Toxic to aquatic life with long lasting effects.

Precautionary statements :
Prevention:
P201 Obtain special instructions before use.
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P331 Do NOT induce vomiting.
Disposal:
P501 Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations.

Other hazards which do not result in classification

Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers.
May ignite on surfaces at temperatures above auto-ignition temperature.
Flammable vapours may be present even at temperatures below the flash point.
This material is a static accumulator.
Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.
If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.

The following percentage of the mixture consists of ingredient(s) with unknown acute oral toxicity: < 5 %

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

Substance name : Albian Heavy Synthetic

Chemical nature : Crude oil produced by an upgrading process and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

Hazardous components

Chemical name	CAS-No.	Concentration (% w/w)
Crude, Synthetic Petroleum (other e.g. oil sand)	Not Assigned	0 - 100

Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil and the contributing process plants at that time., Refer to Chapter 8 for Occupational Exposure Guidelines.

Further information

Contains:

Chemical name	Identification number	Concentration [%]
n-Hexane	110-54-3, 203-777-6	0 - < 2
toluene	108-88-3, 203-625-9	0 - 1
Ethylbenzene	100-41-4, 202-849-4	0 - < 0.5
benzene	71-43-2, 200-753-7	0 - < 0.5
cumene	98-82-8, 202-704-5	0 - < 0.5
Naphthalene	91-20-3, 202-049-5	0 - < 0.5
Hydrogen sulfide	7783-06-4, 231-977-3	0 - < 0.01

SECTION 4. FIRST-AID MEASURES

General advice : Vapourisation of H2S that has been trapped in clothing can be dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.

If inhaled	:	Call emergency number for your location / facility. Remove to fresh air. Do not attempt to rescue the victim unless proper respiratory protection is worn. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting, or unresponsive, give 100% oxygen with rescue breathing or Cardio-Pulmonary Resuscitation as required and transport to the nearest medical facility.
In case of skin contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
In case of eye contact	:	Flush eye with copious quantities of water. Remove contact lenses, if present and easy to do. Continue rinsing. If persistent irritation occurs, obtain medical attention.
If swallowed	:	Call emergency number for your location / facility. If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Most important symptoms and effects, both acute and delayed	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, lightheadedness, headache and nausea. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in

the body tissue after repeated exposure.

Protection of first-aiders	:	When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.
Notes to physician	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Specific hazards during fire-fighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Oxides of sulphur. Unidentified organic and inorganic compounds. Oxides of nitrogen The vapour is heavier than air, spreads along the ground and distant ignition is possible. Will float and can be reignited on surface water. Flammable vapours may be present even at temperatures below the flash point. Hydrogen sulphide (H2S) and other toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Further information	:	If the fire cannot be extinguished the only course of action is to evacuate immediately. Keep adjacent containers cool by spraying with water.

If possible remove containers from the danger zone.
Contain residual material at affected sites to prevent material from entering drains (sewers), ditches, and waterways.

Special protective equipment for firefighters : Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : May ignite on surfaces at temperatures above auto-ignition temperature.
Do not breathe fumes, vapour.
Do not operate electrical equipment.

Environmental precautions : Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.

Methods and materials for containment and cleaning up : For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely
For small liquid spills (< 1 drum), transfer by mechanical means to a labeled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely Remove contaminated soil and dispose of safely.

Observe all relevant local and international regulations.
Remove contaminated clothing.
Evacuate the area of all non-essential personnel.
Avoid contact with skin, eyes and clothing.
Ventilate contaminated area thoroughly.

Additional advice : For guidance on selection of personal protective equipment see Chapter 8 of this Safety Data Sheet.
Notify authorities if any exposure to the general public or the environment occurs or is likely to occur.
For guidance on disposal of spilled material see Chapter 13 of

this Safety Data Sheet.
Local authorities should be advised if significant spillages cannot be contained.
Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26.

SECTION 7. HANDLING AND STORAGE

General Precautions : Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Prevent spillages.
For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier.

Advice on safe handling : Ensure that all local regulations regarding handling and storage facilities are followed.
When using do not eat or drink.
Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks.
Never siphon by mouth.
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Avoid exposure.
Use only non-sparking tools.
Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.
Bulk storage tanks should be diked (bunded).

Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.
If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.
Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges.
These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements.
These activities may lead to static discharge e.g. spark formation.
Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (≤ 1 m/s until fill pipe submerged to twice its diameter, then ≤ 7 m/s). Avoid splash filling.
Do NOT use compressed air for filling, discharging, or han-

dling operations.

Hydrogen sulphide (H2S) and other toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Hydrogen sulphide (H2S or Sour Gas) may be present when loading and unloading transport vessels. Stay upwind and away from newly opened hatches and allow to vent thoroughly before handling material. Steam may be used to vent hatches. Keep all sources of ignition away from loading area. See National Fire Protection Association (NFPA) Code 655 for specific information on the crushing, grinding, pulverizing or handling of sulphur.

Avoidance of contact : Strong oxidising agents.

Product Transfer : Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes.

Avoid splash filling Keep containers closed when not in use. Do not use compressed air for filling discharge or handling. Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.

Storage

Other data : Drum and small container storage:
Keep containers closed when not in use.
Drums should be stacked to a maximum of 3 high.
Use properly labeled and closable containers.
Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat.
Take suitable precautions when opening sealed containers, as pressure can build up during storage.
Tank storage:
Tanks must be specifically designed for use with this product.
Bulk storage tanks should be diked (bunded).
Locate tanks away from heat and other sources of ignition.
Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.
Electrostatic charges will be generated during pumping.
Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk.

The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.
Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Packaging material : Suitable material: For containers, or container linings use mild steel, stainless steel., Aluminium may also be used for applications where it does not present an unnecessary fire hazard., Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product., For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy., For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F , or Neoprene (CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).
Unsuitable material: Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), nitrile rubber (NBR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyvinyl chloride (PVC), polyisobutylene., However, some may be suitable for glove materials.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.

Specific use(s) : Not applicable.

See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity).
IEC/TS 60079-32-1: Electrostatic hazards, guidance

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
n-Hexane	110-54-3	TWA	500 ppm 1,800 mg/m3	OSHA Z-1

		TWA	50 ppm	ACGIH
toluene	108-88-3	TWA	20 ppm	ACGIH
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm (10 minutes)	OSHA Z-2
cumene	98-82-8	TWA	50 ppm 245 mg/m3	OSHA Z-1
		TWA	50 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	Shell Internal Standard (SIS) for 8-12 hour TWA.
		STEL	2.5 ppm 8 mg/m3	Shell Internal Standard (SIS) for 15 min (STEL)
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm (10 minutes)	OSHA Z-2
Ethylbenzene	100-41-4	TWA	20 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	OSHA Z-1
Naphthalene	91-20-3	TWA	10 ppm 50 mg/m3	OSHA Z-1
		TWA	10 ppm	ACGIH
Hydrogen sulfide	7783-06-4	TWA	5 ppm 7 mg/m3	2009/161/EU
	Further information: This value is for information where there is no national limit value available.			
		STEL	10 ppm 14 mg/m3	2009/161/EU
	Further information: This value is for information where there is no national limit value available.			
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm (10 minutes once only if no other measured expo-sure occurs)	OSHA Z-2
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
n-Hexane	110-54-3	2,5-Hexanedione	Urine	End of shift at end of workweek	0.4 mg/l	ACGIH BEI
toluene	108-88-3	Toluene	In blood	Prior to last shift of workweek	0.02 mg/l	ACGIH BEI
		Toluene	Urine	End of shift (As soon as possible after exposure ceases)	0.03 mg/l	ACGIH BEI
		o-Cresol	Urine	End of shift (As soon as possible after exposure ceases)	0.3 mg/g Creatinine	ACGIH BEI
benzene	71-43-2	S-Phenylmercapturic acid	Urine	End of shift (As soon as possible after exposure ceases)	25 µg/g creatinine	ACGIH BEI
		t,t-Muconic acid	Urine	End of shift (As soon as possible after exposure ceases)	500 µg/g creatinine	ACGIH BEI
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	Urine	End of shift (As soon as possible after exposure ceases)	0.15 g/g creatinine	ACGIH BEI

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general

workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.
National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/
Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/
Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hse.gov.uk/
Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany http://www.dguv.de/inhalt/index.jsp
L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

Engineering measures : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances.
Appropriate measures include:
Use sealed systems as far as possible.
Firewater monitors and deluge systems are recommended.
Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.
Local exhaust ventilation is recommended.
Eye washes and showers for emergency use.

General Information:

Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or for subsequent recycle.

Personal protective equipment

Hand protection
Remarks : Where hand contact with the product may occur the use of

gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC. Longer term protection: Nitrile rubber. Incidental contact/Splash protection: Neoprene rubber. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.

Eye protection : Wear goggles for use against liquids and gas.

Skin and body protection : Wear chemical resistant gloves/gauntlets, boots, and apron.

Protective measures : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Environmental exposure controls

General advice : Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.
Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid

Colour : Brown to black

Odour : Potential smell of rotten eggs and sulphur.

Odour Threshold : Data not available

pH : Not applicable

Not applicable

Melting point/freezing point : Data not available

Boiling point/boiling range	:	>= 10 °C / >= 50 °F Method: Unspecified
Flash point	:	<= 23 °C / <= 73 °F Method: Unspecified
Evaporation rate	:	Data not available
Flammability (solid, gas)	:	Not applicable
Upper explosion limit	:	no data available
Lower explosion limit	:	no data available
Vapour pressure	:	Data not available
Relative vapour density	:	Data not available
Relative density	:	Data not available
Density	:	940.2 kg/m3 (15.0 °C / 59.0 °F)Method: Unspecified
Solubility(ies) Water solubility	:	negligible
Solubility in other solvents	:	Data not available
Partition coefficient: n-octanol/water	:	Data not available
Auto-ignition temperature	:	Data not available > 220 °C / 428 °F
Decomposition temperature	:	Data not available
Viscosity Viscosity, kinematic	:	3 - 1000 mm2/s (40 °C / 104 °F) Method: Unspecified
Explosive properties	:	Classification Code: NOT CLASS: Not classified
Oxidizing properties	:	Not applicable
Conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semiconductive,

the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Oxidises on contact with air.
Chemical stability	:	Stable under normal conditions of use.
Possibility of hazardous reactions	:	No hazardous reaction is expected when handled and stored according to provisions
Conditions to avoid	:	Avoid heat, sparks, open flames and other ignition sources. In certain circumstances product can ignite due to static electricity.
Incompatible materials	:	Strong oxidising agents.
Hazardous decomposition products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

SECTION 11. TOXICOLOGICAL INFORMATION

Basis for assessment : Information given is based on data from components.

Information on likely routes of exposure
Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.

Acute toxicity

Product:

Acute oral toxicity	:	(Rat): Remarks: Low toxicity: LD50 >5000 mg/kg
Acute inhalation toxicity	:	Remarks: Harmful if inhaled. LC50 > 1.0 - <= 5.0 mg/l
Acute dermal toxicity	:	(Rabbit): Remarks: Low toxicity: LD50 >2000 mg/kg

Acute toxicity (other routes of administration) : Remarks: Inhalation of vapours or mists may cause irritation to the respiratory system.

Skin corrosion/irritation

Product:
Remarks: Irritating to skin.

Serious eye damage/eye irritation

Product:
Remarks: Expected to be moderately irritating to eyes (but insufficient to classify).

Respiratory or skin sensitisation

Product:
Remarks: Not expected to be a sensitiser.

Germ cell mutagenicity

Product:
Genotoxicity in vivo : Remarks: May cause heritable genetic damage
Contains Benzene, CAS # 71-43-2.
Mutagenicity studies on gasoline and gasoline blending streams have shown predominantly negative results.

Carcinogenicity

Product:
Remarks: Known human carcinogen.
Contains Benzene, CAS # 71-43-2.
May cause leukaemia (AML - acute myelogenous leukaemia).
Inhalation exposure to mice causes liver tumours, which are not considered relevant to humans.

IARC	Group 2B: Possibly carcinogenic to humans	
	Ethylbenzene	100-41-4
	Naphthalene	91-20-3
	Group 1: Carcinogenic to humans	
	benzene	71-43-2
	Group 3: Not classifiable as to its carcinogenicity to humans	
	crude oil	8002-05-9

	Group 1: Carcinogenic to humans	
	benzene	71-43-2
	Group 2B: Possibly carcinogenic to humans	
	Naphthalene	91-20-3
	cumene	98-82-8
OSHA	OSHA specifically regulated carcinogen	
	benzene	71-43-2
NTP	Reasonably anticipated to be a human carcinogen	
	Naphthalene	91-20-3
	Known to be human carcinogen	
	benzene	71-43-2
	Reasonably anticipated to be a human carcinogen	
	benzene	71-43-2
	Naphthalene	91-20-3

Reproductive toxicity

Product:

Effects on fertility : Remarks: Many case studies involving abuse during pregnancy indicate that toluene can cause birth defects, growth retardation and learning difficulties.
Causes foetotoxicity at doses which are maternally toxic.
Contains Toluene, CAS # 108-88-3.
May impair fertility at doses which produce other toxic effects.
Contains n-Hexane, CAS # 110-54-3.

STOT - single exposure

Product:

Remarks: High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.

STOT - repeated exposure

Product:

Remarks: May cause damage to organs or organ systems through prolonged or repeated expo-

sure.
Blood
Liver
thymus
spleen
Kidney: caused kidney effects in male rats which are not considered relevant to humans
Peripheral nervous system: repeated exposure causes peripheral neuropathy in animals.
Contains n-Hexane, CAS # 110-54-3.

Aspiration toxicity

Product:

Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

Further information

Product:

Remarks: Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest.
Prolonged and repeated exposures to high concentrations have resulted in hearing loss in rats.
Solvent abuse and noise interaction in the work environment may cause hearing loss.
Abuse of vapours has been associated with organ damage and death.
Contains Toluene, CAS # 108-88-3.
Myelodysplastic syndrome (MDS) was observed in individuals exposed to very high levels (50 ppm to 300 ppm range) of benzene over a long period of time in the workplace. The relevance of these results to lower levels of exposure is not known.
H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

SECTION 12. ECOLOGICAL INFORMATION

Basis for assessment	:	Incomplete ecotoxicological data are available for this product. The information given below is based partly on a knowledge of the components and the ecotoxicology of similar products. Remarks

Ecotoxicity

Product:

Toxicity to fish (Acute toxicity)	:	Remarks: Expected to be toxic:

LL/EL/IL50 1-10 mg/l

Toxicity to crustacean (Acute toxicity) : Remarks: Expected to be toxic:
LL/EL/IL50 1-10 mg/l

Toxicity to algae/aquatic plants (Acute toxicity) : Remarks: Expected to be toxic:
LL/EL/IL50 1-10 mg/l

Toxicity to fish (Chronic toxicity) : Remarks: Data not available

Toxicity to crustacean (Chronic toxicity) : Remarks: Data not available

Toxicity to microorganisms (Acute toxicity) : Remarks: Expected to be harmful:
LL/EL/IL50 10-100 mg/l

Persistence and degradability

Product:

Biodegradability : Remarks: Oxidises rapidly by photo-chemical reactions in air.
Expected to be inherently biodegradable.

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: Contains components with the potential to bioaccumulate.

Partition coefficient: n-octanol/water : Remarks: Data not available

Mobility in soil

Product:

Mobility : Remarks: Floats on water.
If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater.

Other adverse effects

Product:

Additional ecological information : Films formed on water may affect oxygen transfer and damage organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses
Do not dispose of tank water bottoms by allowing them to drain into the ground.
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Contaminated packaging : Send to drum recoverer or metal reclaimer.
Drain container thoroughly.
After draining, vent in a safe place away from sparks and fire.
Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums.
Do not pollute the soil, water or environment with the waste container.
Comply with any local recovery or waste disposal regulations.

SECTION 14. TRANSPORT INFORMATION

TDG

UN number	:	3494
Proper shipping name	:	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class	:	3
Subsidiary risk	:	6.1
Packing group	:	I
Labels	:	3 (6.1)
Marine pollutant	:	no

International Regulations

IATA-DGR

UN/ID No.	:	UN 3494
Proper shipping name	:	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class	:	3
Subsidiary risk	:	6.1
Packing group	:	I
Labels	:	3 (6.1)

IMDG-Code

UN number : UN 3494

Proper shipping name	:	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class	:	3
Subsidiary risk	:	6.1
Packing group	:	I
Labels	:	3 (6.1)
Marine pollutant	:	yes

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Pollution category	:	Not applicable
Ship type	:	Not applicable
Product name	:	Not applicable

Special precautions for user

Not applicable

Additional Information : MARPOL Annex 1 rules apply for bulk shipments by sea.

SECTION 15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

The components of this product are reported in the following inventories:

DSL : All components listed or polymer exempt.

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

AICS - Australian Inventory of Chemical Substances; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; CPR - Controlled Products Regulations; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC -

No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

This product is intended for use in closed systems only.

Due to a change of detail in Section 1, this document has been released as a significant change.

Revision Date : 2017-02-02

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

CA / EN

Shell Canada Limited
Material Safety Data Sheet
Effective Date: 2011-02-16
Supersedes: None

Class B2 Flammable Liquid

Class D2A Embryo/Fetotoxicity
Class D2A Carcinogenicity

Class D2A Mutagenicity
Class D2B Skin Irritation

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN MUSKEG RIVER HEAVY (AMH)**
SYNONYMS:	AMH Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**9700-140**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS	
Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Brown Hydrocarbon Odour

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.

Hazards:
Flammable Liquid.
Irritating to skin.
A component in this product has been classified by IARC as carcinogenic to humans (Group 1).
May affect fetal development.
This product contains a component that has produced mutagenic effects.
May be irritating to eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling:
Eliminate all ignition sources.
Avoid inhalation of vapours.

Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Residues (Petroleum), Vacuum	64741-56-6	35 - 50	Yes
Distillates (petroleum), petroleum residues vacuum	68955-27-1	10 - 30	Yes
Natural Gas Condensates (C2 to C20)	64741-47-5	0 - 30	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	0 - 30	Yes
Distillates (Petroleum), Straight-run Middle	64741-44-2	7 - 15	Yes
Naphtha (petroleum), heavy straight-run	64741-41-9	0 - 5	Yes
Naphtha, heavy hydrocracked	64741-78-2	0 - 5	Yes
Toluene	108-88-3	0 - 3	Yes
n-Hexane	110-54-3	< 1	Yes
Benzene	71-43-2	0.1 - 1	Yes
Xylene (Mixed Isomers)	1330-20-7	0.1 - 0.5 % (wt)	Yes
Ethylbenzene	100-41-4	0.05 - 0.5	Yes

Note: N-hexane, toluene, xylene, ethylbenzene and benzene are not introduced into the product as intentional additives. These chemicals may be contained in one or more of the blending components that make up the product.

See Section 8 for Occupational Exposure Guidelines.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately. Guard against aspiration into lungs by having the individual turn on to their left side. If vomiting occurs spontaneously, keep head below hips to prevent aspiration of liquid into the lungs. Do not give anything by mouth to an unconscious person.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: The main hazard following accidental ingestion is aspiration of the liquid into the lungs producing chemical pneumonitis.

5. FIRE FIGHTING MEASURES

Extinguishing Media:	Dry Chemical Carbon Dioxide Foam Water Fog
Firefighting Instructions:	Flammable. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Do not use a direct stream of water as it may spread fire. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Fight fire from maximum distance.
Hazardous Combustion Products:	A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Adsorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling:	Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.
Storage:	Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following information, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
The exposure limits listed here are provided for guidance only. Consult local, provincial and territorial authorities for specific values.

Xylene: 100 ppm (STEL: 150 ppm)
Gasoline: 300 ppm (STEL: 500 ppm)
Diesel fuel, as total hydrocarbons (skin): 100 mg/m3
Benzene (skin) : 0.5 ppm (STEL: 2.5 ppm)
Benzene: Shell internal standard is 0.5 ppm or 1.6 mg/m3 (8-12 hour time-weighted average limit), 2.5 ppm or 8 mg/m3 (15-minute short term limit)
Ethyl benzene: 100 ppm (STEL: 125 ppm)
Skin Notation: Absorption through skin, eyes and mucous membranes may contribute significantly to the total exposure.

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves (viton, nitrile) should be worn at all times when handling this material. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Protection: Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark Brown
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	35 - 930 °C
Density:	910 - 930 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.91 - 0.93
pH:	Not available
Flash Point:	PMCC 26 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Autoignition Temperature:	Not available
Viscosity:	350 mm2/s @ pipeline reference temperature
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available

Water Solubility: Insoluble

10. STABILITY AND REACTIVITY

Chemically Stable: Yes
Hazardous Polymerization: No
Sensitive to Mechanical Impact: No
Sensitive to Static Discharge: Yes
Hazardous Decomposition Products: When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials: Avoid strong oxidizing agents.
Conditions of Reactivity: Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Residues (Petroleum), Vacuum	
Distillates (petroleum), petroleum residues vacuum	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Natural Gas Condensates (C2 to C20)	LC50 Inhalation Rat > 5200 mg/m3 for 4hours LD50 Oral Rat = 14000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Distillates (Petroleum), Straight-run Middle	LC50 Inhalation Rat 1700 mg/m3 for 4hours
Naphtha (petroleum), heavy straight-run	LC50 Inhalation Rat > 5000 mg/m3 for 4hours
Naphtha, heavy hydrocracked	LC50 Inhalation Rat > 5240 mg/m3 for 4hours LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Toluene	LD50 Oral Rat 5580 mg/kg LC50 Inhalation Rat 26700 ppm for 1 hour LD50 Dermal Rabbit 12400 mg/kg
n-Hexane	LD50 Oral Rat > 8 mL/kg LD50 Dermal Rat > 4 mL/kg LC50 Inhalation Rat = 54090 - 57000 ppm for 4 hours
Benzene	LD50 Oral Rat 690 - 3400 mg/kg LC50 Inhalation Rat 13700 ppm for 4 hours LD50 Dermal Rabbit > 8260 mg/kg
Xylene (Mixed Isomers)	LD50 Oral Rat = 4300 mg/kg LC50 Inhalation Rat = 6700 ppm for 4 hours LD50 Dermal Rabbit > 2000 mg/kg
Ethylbenzene	LD50 Oral Rat = 3500 mg/kg LC50 Inhalation Rat = 4000 ppm for 4 hours LD50 Dermal Rabbit = 17.8 mL/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne.

Feto/Teratogenicity: High exposures to xylene in some animal studies, often at levels toxic to the mother, have affected embryo/fetal development. Other animal and human studies have not shown this effect.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects. This product contains benzene. Repeated exposure to benzene concentrations greater than the recommended TLV/TWA may reduce the cellular components of peripheral blood and bone marrow. Epidemiological studies indicate that long term inhalation of benzene vapour can cause leukaemia in man. Benzene has also produced chromosomal aberrations in peripheral blood lymphocytes. IARC has listed Ethylbenzene among those materials for which there is limited evidence for carcinogenicity in animals and inadequate evidence in humans. As a result, Ethylbenzene is classified by IARC as a possible human carcinogen (i.e. IARC 2b)

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. In the event of a release, the light fraction will vaporize and cause exposure via breathing and body contact. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG II
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG II

15. REGULATORY INFORMATION

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

WHMIS Class:	Class B2 Flammable Liquid Class D2A Embryo/Fetotoxicity Class D2A Carcinogenicity Class D2A Mutagenicity Class D2B Skin Irritation
DSL/NDSL Status:	This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.
Other Regulatory Status:	The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement :	Flammable Liquid. Irritating to skin. A component in this product has been classified by IARC as carcinogenic to humans (Group 1). May affect fetal development. This product contains a component that has produced mutagenic effects.
Handling Statement:	Eliminate all ignition sources. Avoid inhalation of vapours. Wear suitable gloves and eye protection. Bond and ground transfer containers and equipment to avoid static accumulation. Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.
First Aid Statement :	Wash contaminated skin with soap and water. Flush eyes with water. If overcome by vapours remove to fresh air. Do not induce vomiting. Obtain medical attention.
Revisions:	This is a new MSDS.

Material Safety Data Sheet

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name	:	**Albian Residual Blend**
Product Code	:	001D1781
Uses	:	Refinery Feedstock.
Manufacturer/Supplier	:	**Motiva Enterprises LLC** PO BOX 4540 Houston TX 77210-4540 USA
SDS Request	:	(+1) 8772767285

Emergency Telephone Number

Spill Information	:	+1- 877-242-7400
Health Information	:	+1- 877-504-9351

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical Identity	CAS No.	Concentration
Petroleum, Crude Oil	8002-05-9	100.00 %

Contains Benzene, CAS # 71-43-2.
Contains Ethylbenzene, CAS # 100-41-4.
Contains n-Hexane, CAS # 110-54-3.
Contains Naphthalene, CAS # 91-20-3.
Contains hydrogen sulphide, CAS # 7783-06-4.
Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil.
Raw petroleum extracted in its natural state from the ground (excluding hydrocarbons from shale) and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

3. HAZARDS IDENTIFICATION

Emergency Overview

Appearance and Odour	:	Brown to black. Viscous liquid. Potential smell of rotten eggs and sulphur..
Health Hazards	:	Harmful: may cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome). Hydrogen sulphide is highly toxic and may be fatal if inhaled. Repeated exposure may cause skin dryness or cracking.
Safety Hazards	:	Flammable liquid. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Electrostatic

charges may be generated during handling. Electrostatic discharge may cause fire. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and potentially toxic sulphur oxides may be present.

Environmental Hazards : Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Health Hazards

Inhalation : Vapours may cause drowsiness and dizziness. Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers.

Eye Contact : Moderately irritating to eyes.

Ingestion : Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.Harmful: may cause lung damage if swallowed.

Other Information : A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).

Signs and Symptoms : Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

Environmental Hazards : Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Additional Information : This product is intended for use in closed systems only.

4. FIRST-AID MEASURES

General Information	:	Vaporisation of H2S that has been trapped in clothing can be dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.
Inhalation	:	Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
Skin Contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
Eye Contact	:	Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.
Ingestion	:	If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Advice to Physician	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

5. FIRE-FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point	:	< 23 °C / 73 °F
Upper / lower Flammability or Explosion limits	:	0.6 - 8 %(V)
Auto ignition temperature	:	> 220 °C / 428 °F
Specific Hazards	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Oxides of nitrogen. Oxides of sulphur. Unidentified organic and inorganic compounds. Flammable vapours may be present even at temperatures below the flash point. The

vapour is heavier than air, spreads along the ground and distant ignition is possible. Carbon monoxide may be evolved if incomplete combustion occurs. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.

Suitable Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Protective Equipment for Firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
Additional Advice	:	Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. If the fire cannot be extinguished the only course of action is to evacuate immediately.

6. ACCIDENTAL RELEASE MEASURES

Observe the relevant local and international regulations. Remove contaminated clothing. Evacuate the area of all non-essential personnel. Avoid contact with skin, eyes and clothing. Ventilate contaminated area thoroughly. Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. See Chapter 13 for information on disposal.

Protective measures	:	May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Clean Up Methods	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an

appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.

Additional Advice : Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26. U.S. regulations may require reporting releases of this material to the environment which exceed the reportable quantity (refer to Chapter 15) to the National Response Center at (800) 424-8802. Under Section 311 of the Clean Water Act (CWA) this material is considered an oil. As such, spills into surface waters must be reported to the National Response Center at (800) 424-8802. This material is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Petroleum Exclusion. Therefore, releases to the environment may not be reportable under CERCLA. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet.

7. HANDLING AND STORAGE

General Precautions : Avoid breathing vapours or contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.

Handling : When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Never siphon by mouth. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Avoid exposure. Use only non-sparking tools. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Bulk storage tanks should be diked (bunded). Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck

operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/s until fill pipe submerged to twice its diameter, then <= 7 m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

Storage : Drum and small container storage: Keep containers closed when not in use. Drums should be stacked to a maximum of 3 high. Use properly labelled and closeable containers. Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat. Take suitable precautions when opening sealed containers, as pressure can build up during storage. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition. Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions. Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Product Transfer : Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes.
Avoid splash filling. Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling. Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.
Refer to guidance under Handling section.

Recommended Materials : For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product. For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy. For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F, or Neoprene

(CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).

Unsuitable Materials : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyisobutylene. However, some may be suitable for glove materials.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.

Additional Information : Ensure that all local regulations regarding handling and storage facilities are followed. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning. Hydrogen sulphide (H2S or Sour Gas) may be present when loading and unloading transport vessels. Stay upwind and away from newly opened hatches and allow to vent thoroughly before handling material. Steam may be used to vent hatches. Keep all sources of ignition away from loading area.
Use hydrogen sulphide monitors for detection.
See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). CENELEC CLC/TR 50404 (Electrostatics – Code of practice for the avoidance of hazards due to static electricity).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
n-hexane	ACGIH	TWA	50 ppm		
n-hexane	ACGIH	SKIN_DES			Can be absorbed through the skin.
n-hexane	OSHA Z1	PEL	500 ppm	1,800 mg/m3	
Benzene	ACGIH	TWA	0.5 ppm		
Benzene	ACGIH	STEL	2.5 ppm		
Benzene	ACGIH	SKIN_DES			Can be absorbed through the skin.

Benzene	OSHA	TWA	1 ppm		
Benzene	OSHA	STEL	5 ppm		
Benzene	OSHA	OSHA_ACT	0.5 ppm		
Benzene	SHELL IS	TWA	0.5 ppm	1.6 mg/m3	
Benzene	SHELL IS	STEL	2.5 ppm	8 mg/m3	
Benzene	OSHA Z2	TWA	10 ppm		
Benzene	OSHA Z2	Ceiling	25 ppm		
Benzene	OSHA Z2	MAX. CONC	50 ppm		
Naphthalene	ACGIH	TWA	10 ppm		
Naphthalene	ACGIH	STEL	15 ppm		
Naphthalene	ACGIH	SKIN_DES			Can be absorbed through the skin.
Naphthalene	OSHA Z1	PEL	10 ppm	50 mg/m3	
Ethylbenzene	ACGIH	TWA	20 ppm		
Ethylbenzene	OSHA Z1	PEL	100 ppm	435 mg/m3	
Ethylbenzene	OSHA Z1				Listed.
Hydrogen Sulphide	ACGIH	TWA	1 ppm		
Hydrogen Sulphide	ACGIH	STEL	5 ppm		
Hydrogen Sulphide	OSHA Z2	Ceiling	20 ppm		
Hydrogen Sulphide	OSHA Z2	MAX. CONC	50 ppm		

Additional Information : Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes.
SHELL IS is the Shell Internal Standard. Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes.

Biological Exposure Index (BEI)

Material	Determinant	Sampling Time	BEI	Reference
Benzene	t,t-Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
Benzene	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in Creatinine in urine	Sampling time: End of shift at end of work week.	0.7 g/g	ACGIH BEL (2011)
Ethylbenzene	Ethyl benzene in End-exhaled air	Sampling time: Not critical.		ACGIH BEL (2011)
n-hexane	2,5-Hexanedion, without hydrolysis in Urine	Sampling time: End of shift at end of work week.	0.4 mg/l	ACGIH BEL (2011)

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Eye washes and showers for emergency use. Firewater monitors and deluge systems are recommended. Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping. Define procedures for safe handling and maintenance of controls. Educate and train workers in the hazards and control measures relevant to normal activities associated with this product. Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g.

		personal protective equipment, local exhaust ventilation. Drain down system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle.
Personal Protective Equipment	:	Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.
Respiratory Protection	:	Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134.
Hand Protection	:	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC. Longer term protection: Nitrile rubber. Incidental contact/Splash protection: Neoprene rubber. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognise that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time may be acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.
Eye Protection	:	Chemical splash goggles (chemical monogoggles).
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron.
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory. Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/ Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. Take appropriate measures to fulfil the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Chapter 6. If necessary, prevent undissolved material from

being discharged to waste water. Waste water should be treated in a municipal or industrial waste water treatment plant before discharge to surface water.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Brown to black. Viscous liquid.
Odour	:	Potential smell of rotten eggs and sulphur..
pH	:	Not applicable
Initial Boiling Point and Boiling Range	:	10 - 400 °C / 50 - 752 °F
Freezing Point	:	Data not available
Flash point	:	< 23 °C / 73 °F
Upper / lower Flammability or Explosion limits	:	0.6 - 8 %(V)
Auto-ignition temperature	:	> 220 °C / 428 °F
Vapour pressure	:	Typical 10 - 70 kPa
Specific gravity	:	Data not available
Water solubility	:	Insoluble.
Solubility in other solvents	:	Data not available
Kinematic viscosity	:	3 - 1,000 mm2/s at 40 °C / 104 °F
Vapour density (air=1)	:	Data not available
Electrical conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.
Other Information	:	Not applicable.
Molecular weight	:	Data not available

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions of use.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on data on the components and the toxicology of similar products.

Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Acute Oral Toxicity : Low toxicity: LD50 > 5000 mg/kg , Rat

Acute Dermal Toxicity : Low toxicity: LD50 >2000 mg/kg , Rabbit

Acute Inhalation Toxicity : Extremely toxic: LC100 = 600ppm(v) / 30 min, Man (Hydrogen Sulphide)
Low toxicity by inhalation. (Petroleum, Crude Oil)

Skin Irritation : Not irritating to skin. Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.

Eye Irritation : Expected to be moderately irritating to eyes (but insufficient to classify).

Respiratory Irritation : Not expected to be a respiratory irritant.

Sensitisation : Not expected to be a sensitiser.

Repeated Dose Toxicity : Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.

Mutagenicity : Not expected to be mutagenic.

Carcinogenicity : Causes cancer in laboratory animals.
Known human carcinogen. May cause leukaemia (AML - acute myelogenous leukemia).

Material	:	**Carcinogenicity Classification**
Crude Oil	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Crude Oil	:	GHS / CLP: No carcinogenicity classification
Hydrogen Sulphide	:	GHS / CLP: No carcinogenicity classification
n-hexane	:	GHS / CLP: No carcinogenicity classification
Benzene	:	ACGIH Group A1: Confirmed human carcinogen.
Benzene	:	NTP: Known To Be Human Carcinogen.
Benzene	:	IARC 1: Carcinogenic to humans.
Benzene	:	GHS / CLP: Carcinogenicity Category 1A
Naphthalene	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Naphthalene	:	NTP: Reasonably Anticipated to be a Human Carcinogen.
Naphthalene	:	IARC 2B: Possibly carcinogenic to humans.
Naphthalene	:	GHS / CLP: Carcinogenicity Category 2
Ethylbenzene	:	ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Ethylbenzene	:	IARC 2B: Possibly carcinogenic to humans.
Ethylbenzene	:	GHS / CLP: No carcinogenicity classification

Reproductive and Developmental Toxicity : Not expected to impair fertility. Not expected to be a developmental toxicant.

Additional Information : Classifications by other authorities under varying regulatory frameworks may exist.
Can cause liver damage. (Hydrogen Sulphide)
H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after ~20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
May cause MDS (Myelodysplastic Syndrome). (Benzene)

12. ECOLOGICAL INFORMATION

Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Acute Toxicity	:	Expected to be harmful: LL/EL/IL50 1-10 mg/l (to aquatic organisms) LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.
Chronic Toxicity		
Fish	:	Data not available
Aquatic crustacea	:	Data not available
Mobility	:	If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater. Contains volatile constituents. Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day. Floats on water and forms a slick.
Persistence/degradability	:	Major constituents are inherently biodegradable, but contains components that may persist in the environment.
Bioaccumulation	:	Contains constituents with the potential to bioaccumulate.
Other Adverse Effects	:	Films formed on water may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Material Disposal	:	Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
Container Disposal	:	Send to drum recoverer or metal reclaimer. Drain container

thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or waste disposal regulations.

Local Legislation : 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 and must be in compliance.

14. TRANSPORT INFORMATION

US Department of Transportation Classification (49CFR)

Identification number	UN 1267
Proper shipping name	Petroleum crude oil
Class / Division	3
Packing group	I
Emergency Response Guide No .	128

IMDG

Identification number	UN 3494
Proper shipping name	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class / Division	3
Subsidiary class/Division	6.1
Packing group	I
Marine Pollutant:	Yes

IATA (Country variations may apply)

Identification number	UN 3494
Proper shipping name	Petroleum sour crude oil, flammable, toxic
Class / Division	3
Subsidiary class/Division	6.1
Packing group	I

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

Federal Regulatory Status

Notification Status

EINECS	All components listed or polymer exempt.
DSL	All components listed.
TSCA	All components listed.

Comprehensive Environmental Release, Compensation & Liability Act (CERCLA)

Albian Residual Blend (8002-05-9)	Reportable quantity: 1 lbs
Crude Oil (8002-05-9)	Reportable quantity: 100 lbs
Hydrogen Sulphide (7783-06-4)	Reportable quantity: 100 lbs
n-hexane (110-54-3)	Reportable quantity: 5000 lbs
Benzene (71-43-2)	Reportable quantity: 10 lbs
Naphthalene (91-20-3)	Reportable quantity: 100 lbs
Ethylbenzene (100-41-4)	Reportable quantity: 1000 lbs

Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.
The components with RQs are given for information.

Clean Water Act (CWA) Section 311

Hydrogen Sulphide (7783-06-4)	Reportable quantity: 100 lbs
Benzene (71-43-2)	Reportable quantity: 10 lbs
Naphthalene (91-20-3)	Reportable quantity: 100 lbs
Ethylbenzene (100-41-4)	Reportable quantity: 1000 lbs

SARA Toxic Release Inventory (TRI) (313)

Crude Oil (8002-05-9)	100.00%
Hydrogen Sulphide (7783-06-4)	10.00%
n-hexane (110-54-3)	9.99%
Benzene (71-43-2)	8.99%
Naphthalene (91-20-3)	0.99%

Ethylbenzene (100-41-4) 0.99%

SARA Extremely Hazardous Substances (302/304)

Hydrogen Sulphide (7783-06-4) Reportable quantity: 100 lbs
Hydrogen Sulphide (7783-06-4) Threshold Planning Quantity: 500 lbs

State Regulatory Status

California Safe Drinking Water and Toxic Enforcement Act (Proposition 65)

This product contains a chemical known to the State of California to cause cancer.
Known to the State of California to cause birth defects or other reproductive harm.

New Jersey Right-To-Know Chemical List

Crude Oil (8002-05-9) 100.00%
Listed.
Hydrogen Sulphide (7783-06-4) 10.00%
Listed.
n-hexane (110-54-3) 9.99%
Listed.
Benzene (71-43-2) 8.99%
Listed.
Naphthalene (91-20-3) 0.99%
Listed.
Ethylbenzene (100-41-4) 0.99%
Listed.

Pennsylvania Right-To-Know Chemical List

Crude Oil (8002-05-9) 100.00%
Listed.
Environmental hazard.
Hydrogen Sulphide (7783-06-4) 10.00%
Environmental hazard.
Listed.
n-hexane (110-54-3) 9.99%
Listed.
Benzene (71-43-2) 8.99%
Environmental hazard.
Listed.
Special hazard.
Naphthalene (91-20-3) 0.99%
Environmental hazard.
Listed.
Ethylbenzene (100-41-4) 0.99%
Environmental hazard.
Listed.

16. OTHER INFORMATION

NFPA Rating (Health, Fire, Reactivity) : 1, 3, 0

Material Safety Data Sheet

SDS Version Number	:	1.1
SDS Effective Date	:	02/13/2014
SDS Revisions	:	A vertical bar (|) in the left margin indicates an amendment from the previous version.
SDS Regulation	:	The content and format of this MSDS is in accordance with the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
SDS Distribution	:	The information in this document should be made available to all who may handle the product.
Disclaimer	:	The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Albian Heavy Synthetic

Product code : 001B3607
Chemical nature : Crude oil produced by an upgrading process and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

Manufacturer or supplier's details

Manufacturer/Supplier : **Motiva Enterprises LLC**
PO BOX 4540
Houston TX 77210-4540
USA
SDS Request : (+1) 8772767285
Customer Service :

Emergency telephone number

Spill Information : +1-877-504-9351
Health Information : +1-877-242-7400

Recommended use of the chemical and restrictions on use

Recommended use : Refinery Feedstock.

Restrictions on use : This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	Brown to black
Odour	Potential smell of rotten eggs and sulphur.
Health Hazards	Harmful: May cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). Highly toxic and may be fatal if inhaled. (Hydrogen Sulfide) Repeated exposure may cause skin dryness or cracking May cause MDS (Myelodysplastic Syndrome).
Safety Hazards	Flammable liquid. The vapour is heavier than air, spreads along the ground and distant ignition is possible.Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire.Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and potentially toxic sulphur oxides may be present.

Environmental Hazards	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Other Hazards
Flammable liquid
Carcinogen

Other hazards which do not result in classification
None known.

Additional Information
The vapour is heavier than air, spreads along the ground and distant ignition is possible. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and potentially toxic sulphur oxides may be present.

The following percentage of the mixture consists of ingredient(s) with unknown acute oral toxicity:
< 5 %

Potential Health Effects

Inhalation	:	Highly toxic and may be fatal if inhaled. (Hydrogen Sulfide) Vapours may cause drowsiness and dizziness.
Skin	:	Repeated exposure may cause skin dryness or cracking
Eyes	:	Moderately irritating to eyes.
Ingestion	:	Harmful: May cause lung damage if swallowed.
Chronic Exposure	:	A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia).
Symptoms of Overexposure	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache and nausea. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of

consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

Environmental Effects

Environmental Effects : Toxic to aquatic organisms; may cause long-term adverse effects in the aquatic environment.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical nature : Crude oil produced by an upgrading process and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

Hazardous components

Chemical Name	CAS-No.	Concentration [%]
crude oil	8002-05-9	0 - 100
	Not Assigned	0 - 100

Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil and the contributing process plants at that time., Refer to Chapter 8 for Occupational Exposure Guidelines.

Further information

Contains:

Chemical Name	Identification number	Classification	Concentration [%]
n-Hexane	110-54-3, 203-777-6	Flammable liquids: Category 2, H225 Skin corrosion/irritation: Category 2, H315 Aspiration hazard: Category 1, H304 Specific target organ toxicity - repeated exposure: Category 1 Specific target organ toxicity - single exposure: Category 3, H336 Reproductive toxicity: Category 2, H361 Hazardous to the aquatic environment: Category 2, H411	0 < 2

Ethylbenzene	100-41-4, 202-849-4	Flammable liquids: Category 2, H225 Acute toxicity: Category 4, H332 Skin corrosion/irritation: Category 2, H315 Serious eye damage/eye irritation: Category 2, H319 Aspiration hazard: Category 1, H304 Specific target organ toxicity - single exposure: Category 3, H335 Specific target organ toxicity - repeated exposure: Category 2, H373	0 < 0.5
benzene	71-43-2, 200-753-7	Flammable liquids: Category 2, H225 Skin corrosion/irritation: Category 2, H315 Serious eye damage/eye irritation: Category 2, H319 Germ cell mutagenicity: Category 1B, H340 Specific target organ toxicity - repeated exposure: Category 1, H372 Aspiration hazard: Category 1, H304	0 < 0.5
Cumene	98-82-8, 202-704-5		0 < 0.5
Naphthalene	91-20-3, 202-049-5		0 < 0.5
Hydrogen Sulphide	7783-06-4, 231-977-3	Flammable gas.: Category 1, H220 Acute toxicity: Category 1, H330 Chronic aquatic toxicity: Category 1, H400	0 < 0.01

Further information

NFPA Rating (Health, Fire, Reactivity) 1, 3, 0

SECTION 4. FIRST AID MEASURES

General advice : Vaporisation of H2S that has been trapped in clothing can be

dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.

If inhaled	:	Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
In case of skin contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
In case of eye contact	:	Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.
If swallowed	:	If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do NOT induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Most important symptoms and effects, both acute and delayed	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache and nausea. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
Protection of first-aiders	:	When administering first aid, ensure that you are wearing the

appropriate personal protective equipment according to the incident, injury and surroundings.

Immediate medical attention, special treatment	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended oc cupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Specific hazards during firefighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Oxides of nitrogen Oxides of sulphur. Unidentified organic and inorganic compounds. Flammable vapours may be present even at temperatures below the flash point. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Carbon monoxide may be evolved if incomplete combustion occurs. Hydrogen sulphide (H2S) and other toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Further information	:	Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. If the fire cannot be extinguished the only course of action is to evacuate immediately.
Special protective equipment	:	Proper protective equipment including chemical resistant

for firefighters

gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures : Notify authorities if any exposure to the general public or the environment occurs or is likely to occur.
Local authorities should be advised if significant spillages cannot be contained.

Environmental precautions : Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapor or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.

Methods and materials for containment and cleaning up : For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely
For small liquid spills (< 1 drum), transfer by mechanical means to a labeled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely Remove contaminated soil and dispose of safely.

Observe all relevant local and international regulations.

Additional advice : For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet.
Notify authorities if any exposure to the general public or the environment occurs or is likely to occur.
For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet.
Local authorities should be advised if significant spillages cannot be contained.
Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26.

U.S. regulations may require reporting releases of this material to the environment which exceed the reportable quantity (refer to Chapter 15) to the National Response Center at (800) 424-8802.
Under Section 311 of the Clean Water Act (CWA) this material

is considered an oil. As such, spills into surface waters must be reported to the National Response Center at (800) 424-8802.
This material is covered by EPA's Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) Petroleum Exclusion. Therefore, releases to the environment may not be reportable under CERCLA.

SECTION 7. HANDLING AND STORAGE

General Precautions	:	Avoid breathing of or direct contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.
Precautions for safe handling	:	When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Never siphon by mouth. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Avoid exposure. Use only non-sparking tools. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Bulk storage tanks should be diked (bunded).
Avoidance of contact	:	Strong oxidising agents.
Product Transfer	:	Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes. Avoid splash filling Keep containers closed when not in use. Do not use compressed air for filling discharge or handling. Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.

Storage

Other data	:	Drum and small container storage:

Keep containers closed when not in use.
Drums should be stacked to a maximum of 3 high.
Use properly labelled and closable containers.
Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat.
Take suitable precautions when opening sealed containers, as pressure can build up during storage.
Tank storage:
Tanks must be specifically designed for use with this product.
Bulk storage tanks should be diked (bunded).
Locate tanks away from heat and other sources of ignition.
Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.
Electrostatic charges will be generated during pumping.
Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk.
The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.
Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Packaging material : Suitable material: For containers, or container linings use mild steel, stainless steel.
Unsuitable material: Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), nitrile rubber (NBR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyvinyl chloride (PVC), polyisobutylene.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
n-Hexane	110-54-3	TWA	50 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC

Biological occupational exposure limits

Component	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
n-Hexane	110-54-3	2,5-Hexanedione	Urine	End of shift at end of workweek	0.4 mg/l	ACGIH BEI
benzene	71-43-2	S-Phenylmercapturic acid	Urine	End of shift (As soon as possible after exposure ceases)	0.025 mg/g	ACGIH BEI
Remarks: Creatinine						
benzene		t,t-Muconic acid	Urine	End of shift (As soon as possible after exposure ceases)	0.5 mg/g	ACGIH BEI
Remarks: Creatinine						
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl glyoxylic acid	Urine	End of shift at end of workweek	700 mg/g	ACGIH BEI
Remarks: Creatinine						
Ethylbenzene		Ethylbenzene	In end-exhaled air	Not critical		ACGIH BEI

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods
http://www.cdc.gov/niosh/
Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods
http://www.osha.gov/

Appropriate engineering controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:

Use sealed systems as far as possible.
Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.
Local exhaust ventilation is recommended.
Eye washes and showers for emergency use.
Firewater monitors and deluge systems are recommended.
Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or for subsequent recycle.

Personal protective equipment

Protective measures

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory protection	:	Respirator selection, use and maintenance should be in accordance with the requirements of the OSHA Respiratory Protection Standard, 29 CFR 1910.134.
Hand protection Remarks	:	Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC. Longer term protection: Nitrile rubber. Incidental contact/Splash protection: Neoprene rubber. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.

Eye protection	:	Wear goggles for use against liquids and gas.
Skin and body protection	:	Wear chemical resistant gloves/gauntlets, boots, and apron.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	Brown to black
Odour	:	Potential smell of rotten eggs and sulphur.
Flash point	:	<= 23 °C / <= 73 °F Method: Unspecified
Flammability (solid, gas)	:	Not applicable
Vapour pressure	:	Data not available
Density	:	888.9 kg/m3 (15.0 °C / 59.0 °F) Method: Unspecified
Auto-ignition temperature	:	> 220 °C / 428 °F
Viscosity		
Viscosity, kinematic	:	3 - 1,000 mm2/s (40 °C / 104 °F) Method: Unspecified
Explosive properties	:	Classification Code: NOT CLASS: Not classified
Oxidizing properties	:	Not applicable
Conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semiconductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Oxidises on contact with air.
Chemical stability	:	Stable under normal conditions of use.

Conditions to avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Incompatible materials	:	Strong oxidising agents.
Hazardous decomposition products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

SECTION 11. TOXICOLOGICAL INFORMATION

Basis for assessment	:	Information given is based on data on the components and the toxicology of similar products.Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Acute toxicity

Product:

Acute oral toxicity	:	LD 50 rat: > 5,000 mg/kg Remarks: Low toxicity:
Acute inhalation toxicity	:	Remarks: Expected to be of low toxicity if inhaled. Man: Exposure time: 30 min Remarks: Contains hydrogen sulphide. Extremely toxic: LC100 = 600ppm(v)
Acute dermal toxicity	:	LD 50 Rabbit: > 2,000 mg/kg Remarks: Low toxicity:
Acute toxicity (other routes of administration)	:	Remarks: Not expected to be a respiratory irritant.

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitisation

Product:

Test Method: Skin sensitisation

Remarks: Not expected to be a sensitiser.

Test Method: Respiratory sensitisation
Remarks: Not expected to be a sensitiser.

Germ cell mutagenicity

Product:

Remarks: Not expected to be mutagenic.

Carcinogenicity

Product:

Remarks: Causes cancer in laboratory animals.

Remarks: Known human carcinogen., May cause leukaemia (AML - acute myelogenous leukaemia).

Other Carcinogenicity Classification:

IARC	Group 2B: Possibly carcinogenic to humans	
	Ethylbenzene	100-41-4
	Naphthalene	91-20-3
	Group 1: Carcinogenic to humans	
	benzene	71-43-2
	Group 3: Not classifiable as to its carcinogenicity to humans	
	crude oil	8002-05-9
ACGIH	Confirmed human carcinogen	
	benzene	71-43-2
	Confirmed animal carcinogen with unknown relevance to humans.	
	Ethylbenzene	100-41-4
	Not classifiable as a human carcinogen.	
	Naphthalene	91-20-3
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.	
NTP	Reasonably anticipated to be a human carcinogen	
	Naphthalene	91-20-3

Reproductive toxicity

Product:

Remarks: Not expected to impair fertility., Not expected to be a developmental toxicant.

STOT - single exposure

Product:

Remarks: High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.

STOT - repeated exposure

no data available

Aspiration toxicity

no data available

Further information

Product:

Remarks: Classifications by other authorities under varying regulatory frameworks may exist.

Remarks: H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

Remarks: Contains Benzene, CAS # 71-43-2., May cause MDS (Myelodysplastic Syndrome).

SECTION 12. ECOLOGICAL INFORMATION

Basis for assessment	:	Ecotoxicological data have not been determined specifically for this product. Information given is based on a knowledge of the components and the ecotoxicology of similar products. Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Ecotoxicity

Product:

Toxicity to fish (Chronic toxicity)	:	Remarks: NOEC/NOEL expected to be > 0.1 - <= 1.0 mg/l (based on modeled data)
Toxicity to crustacean (Chronic toxicity)	:	Remarks: NOEC/NOEL expected to be > 0.1 - <= 1.0 mg/l (based on modeled data)

Persistence and degradability

Product:

Biodegradability	:	Remarks: Major constituents are inherently biodegradable, but

contains components that may persist in the environment., The volatile constituents will oxidize rapidly by photochemical reactions in air.

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: Contains constituents with the potential to bioaccumulate.

Mobility in soil

Product:

Mobility : Remarks: If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater., Contains volatile components., Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day., Floats on water and forms a slick.

Other adverse effects

no data available

Product:

Additional ecological information : Films formed on water may affect oxygen transfer and damage organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses
Do not dispose of tank water bottoms by allowing them to drain into the ground.
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Contaminated packaging : Send to drum recoverer or metal reclaimer.
Drain container thoroughly.
After draining, vent in a safe place away from sparks and fire.
Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums.
Do not pollute the soil, water or environment with the waste container.
Comply with any local recovery or waste disposal regulations.

Local legislation
Remarks : 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 and must be complied with.

SECTION 14. TRANSPORT INFORMATION

National Regulations

49 CFR

UN/ID/NA number	:	UN 1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3
Marine pollutant	:	no
Remarks	:	This material is an 'OIL' under 49 CFR Part 130 when transported in a container of 3500 gallon capacity or greater.

International regulation

IATA-DGR

UN/ID No.	:	UN 3494
Proper shipping name	:	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class	:	3
Subsidiary risk	:	6.1
Packing group	:	I
Labels	:	3 (6.1)

IMDG-Code

UN number	:	UN 3494
Proper shipping name	:	PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Class	:	3
Subsidiary risk	:	6.1
Packing group	:	I
Labels	:	3 (6.1)
Marine pollutant	:	yes

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

Special precautions for user

Remarks : Special Precautions: Refer to Chapter 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

Additional Information : MARPOL Annex 1 rules apply for bulk shipments by sea.

SECTION 15. REGULATORY INFORMATION

OSHA Hazards : Flammable liquid, Carcinogen

EPCRA - Emergency Planning and Community Right-to-Know Act

CERCLA Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Benzene	71-43-2	10	*
Hydrogen Sulfide	7783-06-4	100	*
Naphthalene	91-20-3	100	*
Ethylbenzene	100-41-4	1000	*
n-Hexane	110-54-3	5000	*

*: Calculated RQ exceeds reasonably attainable upper limit.

CERCLA Reportable Quantity

Calculated RQ exceeds reasonably attainable upper limit.

CERCLA Reportable Quantity

Shell classifies this material as an "oil" under the CERCLA Petroleum Exclusion, therefore releases to the environment are not reportable under CERCLA.

CERCLA Reportable Quantity

The components with RQs are given for information.

SARA 304 Extremely Hazardous Substances Reportable Quantity

Components	CAS-No.	Component RQ (lbs)	Calculated product RQ (lbs)
Hydrogen Sulphide	7783-06-4	100	*

*: Calculated RQ exceeds reasonably attainable upper limit.

SARA 311/312 Hazards : Fire Hazard

SARA 302 : SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

Hydrogen Sulphide	7783-06-4	0.01 %

SARA 313 : The following components are subject to reporting levels established by SARA Title III, Section 313:

n-Hexane	110-54-3	2 %
benzene	71-43-2	0.5 %
Naphthalene	91-20-3	0.5 %
crude oil	8002-05-9	100 %
Hydrogen Sulphide	7783-06-4	0.01 %

Clean Water Act

The following Hazardous Substances are listed under the U.S. CleanWater Act, Section 311, Table 116.4A:

Hydrogen Sulphide	7783-06-4	0.01 %

benzene	71-43-2	0.5 %
Toluene	108-88-3	1 %

The following Hazardous Chemicals are listed under the U.S. CleanWater Act, Section 311, Table 117.3:

Toluene	108-88-3	1 %
benzene	71-43-2	0.5 %
Hydrogen Sulphide	7783-06-4	0.01 %

This product does not contain any toxic pollutants listed under the U.S. Clean Water Act Section 307

US State Regulations

Pennsylvania Right To Know

crude oil	8002-05-9	90 - 100 %
	Not Assigned	90 - 100 %
n-Hexane	110-54-3	1 - 5 %
benzene	71-43-2	0.1 - 1 %
Hydrogen Sulphide	7783-06-4	0 - 0.1 %

New Jersey Right To Know

crude oil	8002-05-9	90 - 100 %
	Not Assigned	90 - 100 %
n-Hexane	110-54-3	1 - 5 %
benzene	71-43-2	0.1 - 1 %
Hydrogen Sulphide	7783-06-4	0 - 0.1 %

California Prop 65 WARNING! This product contains a chemical known to the State of California to cause cancer.

benzene 71-43-2

WARNING: This product contains a chemical known to the State of California to cause birth defects or other reproductive harm.

benzene 71-43-2

The components of this product are reported in the following inventories:

TSCA All components are listed on the TSCA Inventory.

SECTION 16. OTHER INFORMATION

Abbreviations and Acronyms : The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID date base, EC 1272 regulation, etc).

Further information

NFPA Rating (Health, Fire, Reactivity) 1, 3, 0

This product is intended for use in closed systems only.

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

Shell Canada Limited
Material Safety Data Sheet

Effective Date: 2010-02-15
Supersedes: 2007-02-23

Class B2 Flammable Liquid

Class D2B Skin Irritation

Class D2A Carcinogenicity

1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT:	**ALBIAN VACUUM GASOIL BLEND**
SYNONYMS:	AVB Synthetic crude oil is a mixture of paraffins, naphthenes, aromatics and sulphur compounds
PRODUCT USE:	Base product for Petroleum Refining.
PRODUCT CODE:	**873-331**

SUPPLIER
Shell Canada Limited (SCL)
P.O. Box 100, Station M
400-4th Ave. S.W.
Calgary, AB Canada
T2P 2H5

TELEPHONE NUMBERS	
Shell Emergency Number	1-800-661-7378
CANUTEC 24 HOUR EMERGENCY NUMBER	1-613-996-6666
For general information:	1-800-661-1600
	www.shell.ca

This MSDS was prepared by the Toxicology and Product Stewardship Section of Shell Canada Limited.
*An asterisk in the product name designates a trade-mark of Shell Brands International AG. Used under license.

2. COMPOSITION/INFORMATION ON INGREDIENTS

Component Name	CAS Number	% Range	WHMIS Controlled
Distillates (petroleum), petroleum residues vacuum	68955-27-1	80 - 90	Yes
Naphtha (Petroleum), Hydrotreated Light	64742-49-0	10 - 20	Yes

See Section 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

Physical Description: Viscous Liquid Dark Hydrocarbon Odour
Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Hazards:

Flammable Liquid.
Irritating to skin.
May cause cancer.

Exposure to vapours may cause irritation of the eyes.
Inhalation of oil mist or vapours from hot oil may cause irritation of the upper respiratory tract.

Handling: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

For further information on health effects, see Section 11.

4. FIRST AID MEASURES

Eyes: Flush eyes with water for at least 15 minutes while holding eyelids open. If irritation occurs and persists, obtain medical attention.

Skin: Wash contaminated skin with mild soap and water for at least 15 minutes. If irritation occurs and persists, obtain medical attention.

Ingestion: Do not induce vomiting; get medical help immediately.

Inhalation: Remove victim from further exposure and restore breathing, if required. Obtain medical attention.

Notes to Physician: Treatment of exposure should be directed at the control of symptoms and the clinical condition.

5. FIRE FIGHTING MEASURES

Extinguishing Media: Dry Chemical
Carbon Dioxide
Foam
Water Fog

Firefighting Instructions: Flammable. Do not use a direct stream of water as it may spread fire. Clear area of unprotected personnel. Vapours may travel along ground and flashback along vapour trail may occur. Containers exposed to intense heat from fires should be cooled with water to prevent vapour pressure buildup, which could result in container rupture. Delayed lung damage can be experienced after exposure to combustion products, sometimes hours after the exposure. Do not enter confined fire space without adequate protective clothing and an approved positive pressure self-contained breathing apparatus. Fight fire from maximum distance.

Hazardous Combustion Products: A complex mixture of airborne solid, liquid, particulates and gases will evolve when this material undergoes pyrolysis or combustion. Carbon monoxide, carbon dioxide, oxides of nitrogen and oxides of sulphur may be formed on combustion.

6. ACCIDENTAL RELEASE MEASURES

Issue warning "Flammable". See Section 8 for advice on personal protective equipment. Eliminate all ignition sources. Isolate hazard area and restrict access. Stop leak only if safe to do so. Notify appropriate environmental agency(ies). Work upwind of spill if it is safe to do so. Dike and contain land spills; contain

spills to water by booming. Do not wash spills into sewers or other public water systems. For large spills remove by mechanical means and place in containers. Absorb residue or small spills with adsorbent material and remove to non-leaking containers for disposal. After area has been cleaned up to the satisfaction of regulatory authorities, flush area with water to remove trace residue. Dispose of recovered material as noted under Disposal Considerations.

7. HANDLING AND STORAGE

Handling: Flammable. Fixed equipment as well as transfer containers and equipment should be grounded to prevent accumulation of static charge. Avoid breathing vapours and prolonged or repeated contact with skin. Do not cut, drill, grind, weld or perform similar operations on or near containers. Empty containers are hazardous, may contain flammable/explosive dusts, residues or vapours. Launder contaminated clothing prior to reuse. Wash with soap and water prior to eating, drinking, smoking, applying cosmetics or using toilet facilities. Use good personal hygiene.

Storage: Tank storage should be done according to NFPA Code 30 for crude oils.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

The following, while appropriate for this product, is general in nature. The selection of personal protective equipment will vary depending on the conditions of use.

OCCUPATIONAL EXPOSURE LIMITS (Current ACGIH TLV/TWA unless otherwise noted):
North American exposure limits have not been established for the product. Consult local and provincial authorities for acceptable values.
Polycyclic Aromatic Hydrocarbons (PAH): Shell Canada's internal guideline is 0.02 mg/m3 as an OEL (8-hour TWA).
Petroleum Distillates (Carbon range C9 to C20): Shell Canada's internal guideline is 100 mg/m3 total hydrocarbon as an OEL (8-hour TWA).
Naphtha (Carbon range C3 to C11): Shell Canada's internal guideline is 900 mg/m3 total hydrocarbon as an OEL (8-hour TWA).

Mechanical Ventilation: Use explosion-proof ventilation as required to control vapour concentrations. Concentrations in air should be maintained below the occupational exposure limit if unprotected personnel are involved. Make up air should always be supplied to balance air exhausted (either generally or locally). Local ventilation recommended where general ventilation is ineffective in controlling airborne concentrations below the recommended occupational exposure limit. For personnel entry into confined spaces (i.e. bulk storage tanks) a proper confined space entry procedure must be followed including ventilation and testing of tank atmosphere.

PERSONAL PROTECTIVE EQUIPMENT:

Eye Protection: Chemical safety goggles and/or full face shield to protect eyes and face, if product is handled such that it could be splashed into eyes.

Skin Protection: Avoid contact with skin. Impervious gloves should be worn at all times when handling this product. In confined spaces or where the risk of skin exposure is much higher, impervious clothing should be worn. Use protective clothing and gloves manufactured from nitrile.

Respiratory Avoid breathing vapour or mists. If exposure exceeds occupational exposure limits, use

Protection: an appropriate NIOSH-approved respirator. Depending on airborne concentration, use either a NIOSH-approved chemical cartridge respirator with organic vapour cartridges in combination with a P95 particulate filter or use a NIOSH-approved supplied-air respirator, either self-contained or airline, operated in positive pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State:	Viscous Liquid
Appearance:	Dark
Odour:	Hydrocarbon Odour
Odour Threshold:	Not available
Boiling Point:	-25 - 600 °C
Density:	940 kg/m3 @ 15 °C
Specific Gravity (Water = 1):	0.94
pH:	Not available
Flash Point:	< 0 °C
Lower Flammable Limit:	Not available
Upper Flammable Limit:	Not available
Auto-ignition Temperature:	Not available
Viscosity:	350 cSt @ 6 °C
Evaporation Rate (n-BuAc = 1):	Not available
Partition Coefficient (log K_{OW}):	Not available
Water Solubility:	Insoluble
Other Solvents:	Hydrocarbon Solvents

10. STABILITY AND REACTIVITY

Chemically Stable:	Yes
Hazardous Polymerization:	No
Sensitive to Mechanical Impact:	No
Sensitive to Static Discharge:	Yes
Hazardous Decomposition Products:	When heated to decomposition, may emit toxic and corrosive fumes of sulphur oxides, as well as CO, CO2, uncombusted hydrocarbons and soot.
Incompatible Materials:	Avoid strong oxidizing agents.
Conditions of Reactivity:	Avoid excessive heat, formation of vapours or mists.

11. TOXICOLOGICAL INFORMATION

Ingredient (or Product if not specified)	Toxicological Data
Distillates (petroleum), petroleum residues vacuum	LD50 Oral Rat = 4320 mg/kg LD50 Dermal Rat > 2000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg
Naphtha (Petroleum), Hydrotreated Light	LD50 Oral Rat > 5000 mg/kg LD50 Dermal Rabbit > 2000 mg/kg

Routes of Exposure: Exposure will most likely occur through skin contact or inhalation.
Irritancy: Based on the ingredients, this product is expected to be irritating to skin.

Chronic Effects: Prolonged or repeated contact may cause various forms of dermatitis including folliculitis and oil acne. Prolonged exposure to high vapour concentration can cause headache, dizziness, nausea, blurred vision and central nervous system depression. Long term intensive exposure to oil mist may cause benign lung fibrosis.

Pre-existing Conditions: Pre-existing skin disorders may be aggravated by exposure to components of this product.

Carcinogenicity and Mutagenicity: Carcinogenic hazard. According to the International Agency for Research on Cancer (IARC) this product is considered to be possibly carcinogenic to humans. This product may contain a variety of polycyclic aromatic hydrocarbons (PAH), some of which are associated with the potential of inducing skin cancer. Increasing amounts of PAH may be released if this product is heated above 200 C. A component of this product has produced mutagenic effects.

12. ECOLOGICAL INFORMATION

Environmental Effects: The immediate effect of a release is the physical impairment of the environment from the coating of surfaces, resulting in the disruption of oxygen, water and light to flora and fauna. May cause physical fouling of aquatic and avian organisms. Prolonged exposure may result in the partitioning of light-end hydrocarbon fractions into the water and gas phases of the subsurface soil environment with potential to adversely affect soil and groundwater quality.

Biodegradability: Not readily biodegradable.

13. DISPOSAL CONSIDERATIONS

Waste management priorities (depending on volumes and concentration of waste) are: 1. recycle (reprocess), 2. energy recovery 3. incineration, 4. disposal at a licenced waste disposal facility. Do not attempt to combust waste on-site. Incinerate at a licenced waste disposal site with approval of environmental authority. Landfill adsorbed material in a government approved site.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification:

UN Number	UN1268
Proper Shipping Name	PETROLEUM DISTILLATES, N.O.S.
Hazard Class	Class 3 Flammable Liquids
Packing Group	PG I
Shipping Description	PETROLEUM DISTILLATES, N.O.S. Class 3 UN1268 PG I

15. REGULATORY INFORMATION

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

WHMIS Class: Class B2 Flammable Liquid
Class D2B Skin Irritation

Class D2A Carcinogenicity

DSL/NDSL Status: This product, or all components, are listed on the Domestic Substances List, as required under the Canadian Environmental Protection Act.

Other Regulatory Status: The regulatory information is not intended to be comprehensive. Other regulations may apply to this material. For purposes of TSCA, the product is a mixture of certain blending components, all of which are on the TSCA Inventory. Individual shipments of this product will not necessarily contain all of the blending components listed in Section 2 above.

16. OTHER INFORMATION

LABEL STATEMENTS

Hazard Statement : Flammable Liquid.
Irritating to skin.
May cause cancer.

Handling Statement: Eliminate all ignition sources.
Avoid inhalation of vapours.
Wear suitable gloves and eye protection.
Bond and ground transfer containers and equipment to avoid static accumulation.
Empty containers are hazardous, may contain flammable / explosive dusts, liquid residue or vapours. Keep away from sparks and open flames.

First Aid Statement : Wash contaminated skin with soap and water.
Flush eyes with water.
If overcome by vapours remove to fresh air.
Do not induce vomiting.
Obtain medical attention.

Revisions: This MSDS has been reviewed and updated. Changes have been made to: Section 11 Section 15

Section 1: IDENTIFICATION

Product Name: Access Western Blend

Synonyms: AWB.

Product Use: Refinery feedstock.

Restrictions on Use: Not available.

Manufacturer/Supplier: Access Pipeline Inc.
Suite 1510, 540 – 5th Avenue S.W.
Calgary, AB T2P 0M2

Emergency Phone: 1-866-987-3899; Canutec: (613) 996-6666 or Cellular *666

Date of Preparation of SDS: February 24, 2014

Section 2: HAZARD(S) IDENTIFICATION

GHS INFORMATION

Classification:
Flammable Liquids, Category 2
Skin Irritation, Category 2
Germ Cell Mutagenicity, Category 1B
Carcinogenicity, Category 1A
Toxic to Reproduction, Category 2
Specific Target Organ Toxicity (Single Exposure), Category 3 - Narcotic Effects
Specific Target Organ Toxicity (Repeated Exposure), Category 1

LABEL ELEMENTS

Hazard Pictogram(s):

Signal Word: Danger

Hazard Statements:
Highly flammable liquid and vapor.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May cause drowsiness or dizziness.
Causes damage to organs through prolonged or repeated exposure.

Precautionary Statements

Prevention:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, and hot surfaces. – No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical, ventilating, and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe mist, vapors, or spray.

Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves, protective clothing and eye protection.

Response: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
Call a poison center or doctor if you feel unwell.
If skin irritation occurs: Get medical advice/attention.
Wash contaminated clothing before reuse.
In case of fire: Use dry chemical, CO2, water spray or regular foam to extinguish.

Storage: Store in a well-ventilated place. Keep container tightly closed.
Keep cool.
Store locked up.

Disposal: Dispose of contents/container in accordance with applicable regional, national and local laws and regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients with Unknown Toxicity: None.

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

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% wt./wt.
Petroleum	Not available.	8002-05-9	100
Sulfur	Not available.	7704-34-9	1 - 5

Section 4: FIRST-AID MEASURES

Inhalation: If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor if you feel unwell. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

Acute and delayed symptoms and effects: May cause drowsiness or dizziness. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20

minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

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 (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Call a poison center or doctor if you feel unwell. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

Acute and delayed symptoms and effects: Causes 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. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

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

Highly flammable liquid and vapor. Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Fire involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge.

MEANS OF EXTINCTION

Suitable Extinguishing Media: Small Fire: Dry chemical, CO_2, 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.

Unsuitable Extinguishing Media: Do not use straight streams. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

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

Protection of Firefighters: Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. 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: As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. 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). All equipment used when handling the product must be grounded.

Personal Precautions: Do not touch or walk through spilled material. Use personal protection recommended in Section 8. Don full-face, positive pressure, self-contained breathing apparatus.

Environmental Precautions: Prevent entry into waterways, sewers, basements or confined areas.

Methods for Containment: Stop leak if you can do it without risk. A vapor suppressing foam may be used to reduce vapors.

Methods for Clean-Up: Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.

Other Information: See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not breathe mist, vapors, or spray. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, and hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Harmful concentrations of hydrogen sulfide (H2S) gas can accumulate in excavations and low-lying areas as well as the vapour space of storage and bulk transport compartments. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in a well-ventilated place. Keep container tightly closed. Store locked up. 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

Petroleum [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];

Sulfur [CAS No. 7704-34-9]
- **ACGIH:** 10 mg/m³ (TWA); Inhalable. 3 mg/m³ (Respirable.); For Particles (Insoluble or Poorly Soluble) Not Otherwise Specified
- **OSHA:** 15 mg/m³ (Total dust) (TWA), 5 mg/m³ (Respirable fraction) (TWA); For Particulates Not Otherwise Regulated (PNOR).

Hexane [CAS No. 110-54-3]
- **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)
- **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin. 50 ppm (TWA) [Vacated];

Benzene [CAS No. 71-43-2]
- **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)
- **OSHA:** 1 ppm (TWA); 5 ppm (STEL);

Toluene [CAS No. 108-88-3]
- **ACGIH:** 20 ppm (TWA); A4; BEI (2006)
- **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.) 100 ppm (TWA); 150 ppm (STEL) [Vacated];

Ethylbenzene [CAS No. 100-41-4]
ACGIH: 20 ppm (TWA); A3; BEI (2010)
OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
125 ppm (STEL) [Vacated];

Xylene [CAS No. 1330-20-7]
ACGIH: 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)
OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
150 ppm (STEL) [Vacated]; For Xylenes.

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];

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

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof electrical, ventilating, and lighting equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection: Wear safety glasses. Use equipment for eye protection that meets the standards referenced by CSA Standard CAN/CSA-Z94.3-92 and 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. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.

Respiratory Protection: If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator that meets the requirements of CSA Standard CAN/CSA-Z94.4-11, with organic vapor cartridge, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are

low or if airborne concentrations exceed the limits of the air-purifying respirators.

General Hygiene Considerations: Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Brown liquid.
Colour:	Brown.
Odour:	Petroleum.
Odour Threshold:	0.0047 ppm, (Hydrogen sulphide)
Physical State:	Liquid.
pH:	Not available.
Melting Point / Freezing Point:	Not available.
Initial Boiling Point:	36.4 °C (97.5 °F)
Boiling Range:	36.4 to 288.4 °C (97.5 to 551.1 °F)
Flash Point:	< -15 °C (5 °F) (PMCC)
Evaporation Rate:	Not available.
Flammability (solid, gas):	Not applicable.
Lower Flammability Limit:	1.1 % (Hexane)
Upper Flammability Limit:	7.5 % (Hexane)
Vapor Pressure:	61.5 kPa at 37.8 °C (100 °F) (Reid Vapour Pressure)
Vapor Density:	Not available.
Relative Density:	0.9 to 1 (Water = 1) at 15 °C (59 °F)
Solubilities:	Insoluble in water.
Partition Coefficient: n-Octanol/Water:	Not available.
Auto-ignition Temperature:	Not available.
Decomposition Temperature:	Not available.
Viscosity:	90 to 100 cSt at 30 °C (86 °F)
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.
Density:	900 to 1000 kg/m³
Coefficient of Water/Oil Distribution:	Not available.

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 acids. Strong oxidizers. Halogens.

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

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Petroleum	8002-05-9	4300 mg/kg (rat)	Not available.	Not available.
Sulfur	7704-34-9	> 8437 mg/kg (rat)	Not available.	Not available.
Hexane	110-54-3	25000 mg/kg (rat)	Not available.	48000 ppm (rat); 4H
Benzene	71-43-2	930 mg/kg (rat)	> 9400 µl/kg (rabbit)	10000 ppm (rat); 7H
Toluene	108-88-3	600 mg/kg (rat)	14.1 mL/kg (rabbit)	49000 mg/m³ (rat); 4H
Ethylbenzene	100-41-4	3500 mg/kg (rat)	17800 µl/kg (rabbit)	Not available.
Xylene	1330-20-7	4300 mg/kg (rat)	> 1700 mg/kg (rabbit)	5000 ppm (rat); 4H
Hydrogen sulphide	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H

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

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

Symptoms (including delayed and immediate effects)

Inhalation: May cause drowsiness or dizziness. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product

contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

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

Skin: Causes 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)

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

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. High vapour concentrations, generally greater than 10% by volume, may sensitize the heart and lead to lethal cardiac arrhythmias. Repeated dermal application of crude oils in rats produced systemic toxicity in blood, liver, thymus and bone marrow. Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effectsReports of chronic poisoning with Benzene, Toluene, Ethylbenzene or Xylene describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated exposure of the eyes to high concentrations of Xylenes vapour may cause reversible eye damage. Chronic inhalation exposure to xylene causes mid-frequency hearing loss in laboratory animals. Xylene reacts synergistically with n-hexane to enhance hearing loss. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system.

Carcinogenicity: May cause cancer. Lifetime skin painting studies in animals with whole crude oils and crude oil fractions have produced tumours in animals following prolonged and repeated skin contact. Chronic exposure to

benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Petroleum	A2	Group 3	List 1	OSHA Carcinogen.	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen.	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Ethylbenzene	A3	Group 2B	Not listed.	OSHA Carcinogen.	Listed.
Xylene	A4	Group 3	Not listed.	Not listed.	Not listed.

Mutagenicity: May cause genetic defects.

Reproductive Effects: Suspected of damaging fertility or the unborn child. Studies exist which report a link to crude oil and reproductive effects including menstrual disorders.

Developmental Effects

Teratogenicity: Not available.

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

Toxicologically Synergistic Materials: Xylene reacts synergistically with n-hexane to enhance hearing loss.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Petroleum: 21 and 41 mg/l, 96 hr., Rainbow trout;

Petroleum: 2.7 and 4.1 mg/l, 96 hr., Mysid;

Petroleum: 122 and 528 ml/kg, 96 hr., Algae.

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: UN1267, PETROLEUM CRUDE OIL, 3, PG I

Class: 3

UN Number: UN1267

Packing Group: I

Label Code:

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

Class: 3

UN Number: UN1267

Packing Group: I

Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

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

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

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

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

Hazard Symbols:

United States

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

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Hexane	Not listed.	Not listed.	5000	313	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Ethylbenzene	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Xylene	Not listed.	Not listed.	100	313	U239	Not listed.
Hydrogen sulphide	500	100	100	313s	U135	10000

State Regulations

Massachusetts

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

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Sulfur	7704-34-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	E
Toluene	108-88-3	Listed.
Ethylbenzene	100-41-4	Listed.
Xylene	1330-20-7	Listed.
Hydrogen sulphide	7783-06-4	E

Note: E = Extraordinarily Hazardous Substance

New Jersey

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

Component	CAS No.	RTK List
Petroleum	8002-05-9	SHHS
Sulfur	7704-34-9	Listed.
Hexane	110-54-3	SHHS
Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Ethylbenzene	100-41-4	SHHS
Xylene	1330-20-7	SHHS
Hydrogen sulphide	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

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

Component	CAS No.	RTK List
Petroleum	8002-05-9	Listed.
Sulfur	7704-34-9	Listed.
Hexane	110-54-3	Listed.

Benzene	71-43-2	ES
Toluene	108-88-3	E
Ethylbenzene	100-41-4	E
Xylene	1330-20-7	E
Hydrogen sulphide	7783-06-4	E

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

California

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

Component	Type of Toxicity
Petroleum	cancer
Benzene	cancer; developmental, male
Toluene	developmental; female
Ethylbenzene	cancer

Section 16: OTHER INFORMATION

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

Date of Preparation of SDS: February 24, 2014

SDS Expiry Date (Canada): February 23, 2017

Version: 1.0

GHS SDS Prepared by: **Deerfoot Consulting Inc.**
Phone: (403) 720-3700

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR BHB

Manufacturer or supplier's details

SUNCOR ENERGY INC.
P.O. Box 2844, 150 - 6th Avenue South-West
Calgary Alberta T2P 3E3
Canada

Emergency telephone number

Suncor Energy: +1 403-296-3000;
Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use : Refinery Feedstock

Prepared by : Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	liquid
Colour	black
Odour	hydrocarbon-like
Hazard Summary	Flammable liquid Irritating to eyes and skin. May cause sensitisation by skin contact. Contains material that may adversely affect the developing foetus. Contains material that may cause adverse reproductive effects. Contains material which may cause cancer based on animal data.

Potential Health Effects

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Target Organs : Respiratory system
Central nervous system
Eyes
Skin

Inhalation : Inhalation of high vapour concentrations may cause

symptoms like headache, dizziness, tiredness, nausea and vomiting.
Inhalation may cause central nervous system effects.

Skin : May cause allergic skin reaction.
May cause skin irritation.

Eyes : May cause eye irritation.

Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Aspiration hazard if swallowed - can enter lungs and cause damage.

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC
Group 1: Carcinogenic to humans

Benzene	71-43-2
1,3-BUTADIENE	106-99-0

Group 2B: Possibly carcinogenic to humans

Ethylbenzene	100-41-4

OSHA
OSHA specifically regulated carcinogen

Benzene	71-43-2
1,3-BUTADIENE	106-99-0

NTP
Known to be human carcinogen

Benzene	71-43-2
1,3-BUTADIENE	106-99-0

ACGIH
Confirmed human carcinogen

Benzene	71-43-2

Suspected human carcinogen

1,3-BUTADIENE	106-99-0

Confirmed animal carcinogen with unknown relevance to humans

Ethylbenzene	100-41-4

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
Bitumens	128683-24-9	60 - 80 %
Natural gas condensates	68919-39-1	0 - 40 %
Naphtha (oil sand), hydrotreated	128683-33-0	0 - 40 %
pentane	109-66-0	10 - 15 %
2-methylbutane	78-78-4	10 - 15 %
n-hexane	110-54-3	5 - 10 %

n-heptane	142-82-5	5 - 10 %
n-octane	111-65-9	5 - 10 %
butane	106-97-8	3 - 7 %
isobutane	75-28-5	1 - 5 %
sulfur	7704-34-9	<= 3.5 %
xylene	1330-20-7	0.5 - 1.5 %
benzene	71-43-2	0.5 - 1.5 %
1,3-butadiene	106-99-0	0.1 - 1 %
methylcyclohexane	108-87-2	1 - 5 %
cyclohexane	110-82-7	1 - 5 %
cyclopentane	287-92-3	1 - 5 %
methylcyclopentane	96-37-7	1 - 5 %
trimethylbenzene	25551-13-7	1 - 5 %
toluene	108-88-3	1 - 5 %
ethylbenzene	100-41-4	0.1 - 1 %

Contains trace amounts of Polycyclic aromatic hydrocarbons, some of which are suspected carcinogens., Product may contain trace amounts of hydrogen sulphide

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.
Seek medical advice.

In case of skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Wash skin thoroughly with soap and water or use recognized skin cleanser.
Wash contaminated clothing before reuse.
Seek medical advice.

In case of eye contact : Remove contact lenses.
Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.

If swallowed : Rinse mouth with water.
Never give anything by mouth to an unconscious person.
DO NOT induce vomiting unless directed to do so by a physician or poison control center.
Seek medical advice.

Most important symptoms and effects, both acute and delayed : First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media : Carbon dioxide (CO2)
Foam
Dry chemical

Unsuitable extinguishing media	:	No information available.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), sulphur oxides (SOx), sulphur compounds (H2S), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Specific extinguishing methods	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Persons with a history of skin sensitisation problems or asthma, allergies, chronic or recurrent respiratory disease should not be employed in any process in which this mixture is being used. Smoking, eating and drinking should be prohibited in the application area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct

sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	CA AB OEL
		STEL	2.5 ppm 8 mg/m3	CA AB OEL
		TWA	0.5 ppm	CA BC OEL
		STEL	2.5 ppm	CA BC OEL
		TWA	0.5 ppm	CA ON OEL
		STEL	2.5 ppm	CA ON OEL
		TWAEV	1 ppm 3 mg/m3	CA QC OEL
		STEV	5 ppm 15.5 mg/m3	CA QC OEL
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0

		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0
Bitumens	128683-24-9	TWA	5 mg/m3	
pentane	109-66-0	TWAEV	120 ppm 350 mg/m3	CA QC OEL
		TWA	120 ppm 350 mg/m3	NIOSH REL
		C	610 ppm 1,800 mg/m3	NIOSH REL
		TWA	1,000 ppm 2,950 mg/m3	OSHA Z-1
		TWA	600 ppm 1,800 mg/m3	OSHA P0
		STEL	750 ppm 2,250 mg/m3	OSHA P0
		TWA	120 ppm 350 mg/m3	NIOSH REL
		C	610 ppm 1,800 mg/m3	NIOSH REL
		TWA	1,000 ppm 2,950 mg/m3	OSHA Z-1
		TWA	600 ppm 1,800 mg/m3	OSHA P0
		STEL	750 ppm 2,250 mg/m3	OSHA P0
isobutane	75-28-5	TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
2-methylbutane	78-78-4	TWA	600 ppm 1,770 mg/m3	CA AB OEL
n-hexane	110-54-3	TWA	50 ppm 176 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 176 mg/m3	CA QC OEL
		TWA	50 ppm	ACGIH
		TWA	50 ppm 180 mg/m3	NIOSH REL
		TWA	500 ppm 1,800 mg/m3	OSHA Z-1
		TWA	50 ppm 180 mg/m3	OSHA P0
		TWA	50 ppm	ACGIH
		TWA	50 ppm 180 mg/m3	NIOSH REL
		TWA	500 ppm 1,800 mg/m3	OSHA Z-1
		TWA	50 ppm 180 mg/m3	OSHA P0
1,3-butadiene	106-99-0	TWA	2 ppm 4.4 mg/m3	CA AB OEL
		TWA	2 ppm	CA BC OEL

		TWAEV	2 ppm 4.4 mg/m3	CA QC OEL
		TWA	2 ppm	ACGIH
		TWA	1 ppm	OSHA Z-1
		STEL	5 ppm	OSHA Z-1
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	2 ppm	ACGIH
		TWA	1 ppm	OSHA Z-1
		STEL	5 ppm	OSHA Z-1
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
n-heptane	142-82-5	TWA	400 ppm	CA BC OEL
		STEL	500 ppm	CA BC OEL
		TWAEV	400 ppm 1,640 mg/m3	CA QC OEL
		STEV	500 ppm 2,050 mg/m3	CA QC OEL
		TWA	85 ppm 350 mg/m3	NIOSH REL
		C	440 ppm 1,800 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	400 ppm 1,600 mg/m3	OSHA P0
		STEL	500 ppm 2,000 mg/m3	OSHA P0
		TWA	85 ppm 350 mg/m3	NIOSH REL
		C	440 ppm 1,800 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	400 ppm 1,600 mg/m3	OSHA P0
		STEL	500 ppm 2,000 mg/m3	OSHA P0
n-octane	111-65-9	TWA	300 ppm 1,400 mg/m3	CA AB OEL
		TWAEV	300 ppm 1,400 mg/m3	CA QC OEL
		STEV	375 ppm 1,750 mg/m3	CA QC OEL
		TWA	300 ppm	ACGIH
		TWA	75 ppm 350 mg/m3	NIOSH REL
		C	385 ppm 1,800 mg/m3	NIOSH REL
		TWA	500 ppm 2,350 mg/m3	OSHA Z-1
		TWA	300 ppm 1,450 mg/m3	OSHA P0
		STEL	375 ppm 1,800 mg/m3	OSHA P0

		TWA	300 ppm	ACGIH
		TWA	75 ppm 350 mg/m3	NIOSH REL
		C	385 ppm 1,800 mg/m3	NIOSH REL
		TWA	500 ppm 2,350 mg/m3	OSHA Z-1
		TWA	300 ppm 1,450 mg/m3	OSHA P0
		STEL	375 ppm 1,800 mg/m3	OSHA P0
methylcyclohexane	108-87-2	TWA	400 ppm 1,610 mg/m3	CA AB OEL
		TWA	400 ppm	CA BC OEL
		TWAEV	400 ppm 1,610 mg/m3	CA QC OEL
		TWA	400 ppm	ACGIH
		TWA	400 ppm 1,600 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	400 ppm 1,600 mg/m3	OSHA P0
		TWA	400 ppm	ACGIH
		TWA	400 ppm 1,600 mg/m3	NIOSH REL
		TWA	500 ppm 2,000 mg/m3	OSHA Z-1
		TWA	400 ppm 1,600 mg/m3	OSHA P0
cyclohexane	110-82-7	TWA	100 ppm 344 mg/m3	CA AB OEL
		TWA	100 ppm	CA BC OEL
		TWAEV	300 ppm 1,030 mg/m3	CA QC OEL
		TWA	100 ppm	ACGIH
		TWA	300 ppm 1,050 mg/m3	NIOSH REL
		TWA	300 ppm 1,050 mg/m3	OSHA Z-1
		TWA	300 ppm 1,050 mg/m3	OSHA P0
		TWA	100 ppm	ACGIH
		TWA	300 ppm 1,050 mg/m3	NIOSH REL
		TWA	300 ppm 1,050 mg/m3	OSHA Z-1
		TWA	300 ppm 1,050 mg/m3	OSHA P0
cyclopentane	287-92-3	TWA	600 ppm 1,720 mg/m3	CA AB OEL
		TWA	600 ppm	CA BC OEL
		TWAEV	600 ppm 1,720 mg/m3	CA QC OEL
		TWA	600 ppm	ACGIH

		TWA	600 ppm 1,720 mg/m3	NIOSH REL
		TWA	600 ppm 1,720 mg/m3	OSHA P0
		TWA	600 ppm	ACGIH
		TWA	600 ppm 1,720 mg/m3	NIOSH REL
		TWA	600 ppm 1,720 mg/m3	OSHA P0
trimethylbenzene	25551-13-7	TWA	25 ppm 123 mg/m3	CA AB OEL
		TWAEV	25 ppm 123 mg/m3	CA QC OEL
		TWA	25 ppm	ACGIH
		TWA	25 ppm 125 mg/m3	OSHA P0
		TWA	25 ppm	ACGIH
		TWA	25 ppm 125 mg/m3	OSHA P0
toluene	108-88-3	TWA	50 ppm 188 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 188 mg/m3	CA QC OEL
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
ethylbenzene	100-41-4	TWA	100 ppm 434 mg/m3	CA AB OEL
		STEL	125 ppm 543 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		STEV	125 ppm 543 mg/m3	CA QC OEL

		TWAEV	100 ppm 434 mg/m3	CA QC OEL
		TWA	100 ppm	ACGIH
		STEL	125 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	NIOSH REL
		ST	125 ppm 545 mg/m3	NIOSH REL
		TWA	100 ppm 435 mg/m3	OSHA Z-1
		TWA	100 ppm 435 mg/m3	OSHA P0
		STEL	125 ppm 545 mg/m3	OSHA P0
		TWA	100 ppm	ACGIH
		STEL	125 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	NIOSH REL
		ST	125 ppm 545 mg/m3	NIOSH REL
		TWA	100 ppm 435 mg/m3	OSHA Z-1
		TWA	100 ppm 435 mg/m3	OSHA P0
		STEL	125 ppm 545 mg/m3	OSHA P0
hydrogen sulphide	7783-06-4	TWA	10 ppm 14 mg/m3	CA AB OEL
		(c)	15 ppm 21 mg/m3	CA AB OEL
		C	10 ppm	CA BC OEL
		TWA	10 ppm	CA ON OEL
		STEL	15 ppm	CA ON OEL
		TWAEV	10 ppm 14 mg/m3	CA QC OEL
		STEV	15 ppm 21 mg/m3	CA QC OEL
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH
		C	10 ppm 15 mg/m3	NIOSH REL
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	10 ppm 14 mg/m3	OSHA P0
		STEL	15 ppm 21 mg/m3	OSHA P0
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH
		C	10 ppm 15 mg/m3	NIOSH REL
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	10 ppm 14 mg/m3	OSHA P0

	STEL	15 ppm 21 mg/m3	OSHA P0

Biological occupational exposure limits

Component	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
Toluene	108-88-3	Toluene	In blood	Prior to last shift of workweek	0.02 mg/l	ACGIH BEI
Toluene		Toluene	Urine	End of shift (As soon as possible after exposure ceases)	0.03 mg/l	ACGIH BEI
Toluene	108-88-3	Toluene	In blood	Prior to last shift of workweek	0.02 mg/l	ACGIH BEI
		Toluene	Urine	End of shift (As soon as possible after exposure ceases)	0.03 mg/l	ACGIH BEI

Engineering measures : Ensure adequate ventilation, especially in confined areas.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.

Hand protection
Material : neoprene, nitrile.
Remarks : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Wear face-shield and protective suit for abnormal processing problems.
Ensure that eyewash stations and safety showers are close to

the workstation location.

Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use. No special protective equipment required.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	black
Odour	:	hydrocarbon-like
Odour Threshold	:	No data available
pH	:	No data available
Melting point/range	:	No data available
Initial boiling point and boiling range	:	> 31 °C (88 °F) Method: ASTM D-86
Flash point	:	< -35 °C (-31 °F) Method: ASTM D 93, closed cup
Fire Point	:	No data available
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	40 - 50 kPa (37.8 °C / 100.0 °F) Method: ASTM D6377
Relative vapour density	:	No data available
Density	:	915 - 940 kg/m3 (15.56 °C / 60.01 °F)
Solubility(ies)		

Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: estimated < 1

Viscosity

Viscosity, kinematic	:	estimated 63.5 mm2/s (40 °C / 104 °F) estimated 268.5 mm2/s (15.5 °C / 59.9 °F) Method: ASTM D 445
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, SOx, H2S, hydrocarbons, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: No data available
Acute inhalation toxicity	:	Remarks: No data available
Acute dermal toxicity	:	Remarks: No data available

Components:

Natural gas condensates:

Acute oral toxicity	:	LD50 Rat: 14,000 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: > 5.2 mg/l Exposure time: 4 h

pentane:
Acute oral toxicity : LD50 Rat: > 2,000 mg/kg,

Acute inhalation toxicity : LC50 Rat: 364 mg/l
Exposure time: 4 h

2-methylbutane:
Acute inhalation toxicity : LC50 Rat: 280 mg/l
Exposure time: 4 h

n-hexane:
Acute oral toxicity : LD50 Rat: 15,840 mg/kg,

Acute inhalation toxicity : LC50 Rat: 48000 ppm
Exposure time: 4 h

Acute dermal toxicity : LD50 Rabbit: > 3,295 mg/kg,

butane:
Acute inhalation toxicity : LC50 Rat: 658 mg/l
Exposure time: 4 h
Test atmosphere: gas

isobutane:
Acute inhalation toxicity : LC50 Rat: 658,000 mg/m3
Exposure time: 4 h
Test atmosphere: gas

xylene:
Acute oral toxicity : LD50 Rat: 4,300 mg/kg,

Acute inhalation toxicity : LC50 Rat: 5000 ppm
Exposure time: 4 h
Test atmosphere: vapour

Acute dermal toxicity : LD50 Rabbit: > 1,700 mg/kg,

benzene:
Acute oral toxicity : LD50 Rat: 930 mg/kg,

Acute inhalation toxicity : LC50 Rat: 13700 ppm
Exposure time: 4 h
Test atmosphere: vapour

Acute dermal toxicity : LD50 Rabbit: > 8,240 mg/kg,

toluene:
Acute oral toxicity : LD50 Rat: 636 mg/kg,

Acute inhalation toxicity	:	LC50 Rat: 7585 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: 12,125 mg/kg,

ethylbenzene:

Acute oral toxicity	:	LD50 Rat: 3,500 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 4000 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: 15,380 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

2-methylbutane:
Result: Mild skin irritation

sulfur:
Result: Moderate skin irritant

xylene:
Result: Skin irritation

benzene:
Result: Moderate skin irritant

toluene:
Result: Moderate skin irritant

ethylbenzene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

2-methylbutane:
Result: Mild eye irritation

sulfur:
Result: Moderate eye irritation

benzene:
Result: Moderate eye irritation

toluene:
Result: Mild eye irritation

ethylbenzene:
Result: Mild eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

Bitumens:
Natural gas condensates:
Naphtha (oil sand), hydrotreated:
pentane:
2-methylbutane:
n-hexane:
n-heptane:
n-octane:
butane:
isobutane:
sulfur:
xylene:
benzene:
1,3-butadiene:
methylcyclohexane:
cyclohexane:
cyclopentane:
methylcyclopentane:
trimethylbenzene:
toluene:
ethylbenzene:

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Components:

n-hexane :

Toxicity to fish	:	LC50 (Fish): 4.12 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia (water flea)): 3.87 mg/l Exposure time: 48 h

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Pow: estimated < 1

Components:

pentane :

Partition coefficient: n-octanol/water	:	log Pow: 3.39

butane :

Partition coefficient: n-octanol/water	:	log Pow: 2.89

isobutane :

Partition coefficient: n-octanol/water	:	log Pow: 2.76

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : The product should not be allowed to enter drains, water courses or the soil.
Offer surplus and non-recyclable solutions to a licensed disposal company.
Waste must be classified and labelled prior to recycling or disposal.
Send to a licensed waste management company.
Dispose of as hazardous waste in compliance with local and national regulations.
Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1993
Proper shipping name	:	Flammable liquid, n.o.s. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
Packing instruction (cargo aircraft)	:	361

IMDG-Code

UN number	:	1993
Proper shipping name	:	FLAMMABLE LIQUID, N.O.S. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

49 CFR

UN/ID/NA number	:	1993
Proper shipping name	:	Flammable liquids, n.o.s. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

TDG

UN number	:	1993

Proper shipping name		FLAMMABLE LIQUID, N.O.S. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

OSHA Hazards	:	Flammable liquid, Skin sensitiser, Moderate eye irritant, Carcinogen, Moderate skin irritant
WHMIS Classification	:	B2: Flammable liquid D2A: Very Toxic Material Causing Other Toxic Effects D2B: Toxic Material Causing Other Toxic Effects Flammable liquid Teratogen Carcinogen Moderate eye irritant Skin sensitiser Mutagen Moderate skin irritant

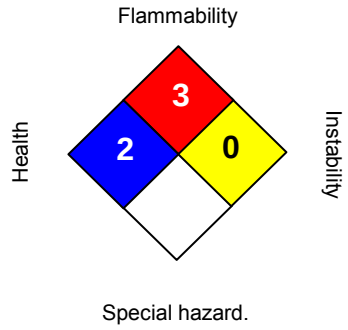
The components of this product are reported in the following inventories:

DSL	All components of this product are on the Canadian DSL.

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2*
FLAMMABILITY	3
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

Suncor BHB

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D1A - Materials causing immediate and serious toxic effects, Very Toxic Material D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Dust and Vapor Respirator

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Suncor BHB

Product type : Suncor Product
MSDS Number : OS0000000006
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
BITUMEN	128683-24-9	60 - 80 %
Naphtha (oil sand), hydrotreated	128683-33-0	20 - 40 %
HYDROGEN SULPHIDE	7783-06-4	0 - 40 PPM
Sulphur based on mass/mass	7704-34-9	>= 3.0 %
BENZENE	71-43-2	0.04 - 0.12 %
XYLENE	1330-20-7	0.40 - 0.80 %

Comment on components : Contains trace amounts of Polycyclic aromatic hydrocarbons, some of which are suspected carcinogens.

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary	:	Highly flammable.Product may contain Hydrogen Sulfide.

Potential Health Effects

Eyes	:	May cause eye irritation. Liquid may cause severe irritation, reddening and swelling.
Skin	:	Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance. May cause irritation, drying and blistering.
Inhalation	:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. High concentration of vapours may induce unconsciousness. May cause respiratory tract irritation. Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath. In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis. Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.
Ingestion	:	May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness. Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.
Chronic Exposure	:	Chronic exposure causes drying effect on the skin and eczema. May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory. May cause kidney damage and enlargement of the liver. Chronic exposure to benzene may result in increased risk of leukemia and other blood disorders.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Carcinogenic Effects	:	Benzene is an animal carcinogen and is known to produce

acute myelogenous leukemia in humans.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	Estimated-30 - -20 °C (-22 - -4 °F) Test type: closed cup Method: ASTM D 93
Lower explosion limit	:	Note: no data available
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product. Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear a positive-pressure supplied-air respirator with full facepiece. Wear structural fire fighters protective clothing.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Ensure adequate ventilation. Wear proper protective equipment as specified in the protective equipment section. Remove all sources of ignition. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.

Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.
Hand protection	:	Wear suitable gloves. The following materials are acceptable: Nitrile rubber Neoprene
Skin and body protection	:	Wear as appropriate: Long sleeved clothing A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	Concentration in air determines protection needed. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor cartridges is acceptable to 50 times the exposure limit. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
Sulphur based on mass/mass	7704-34-9	CAD AB OEL	TWA	10 mg/m3	
BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3
		CAD ON OEL	TWA	0.5 ppm	
		CAD ON OEL	STEL	2.5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
		OEL (QUE)	TWA	1 ppm	3 mg/m3

		Remarks		Exposure must be minimized.	
		OEL (QUE)	STEL	5 ppm	15.5 mg/m3
		Remarks		Exposure must be minimized.	
XYLENE	1330-20-7	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	150 ppm	651 mg/m3
		CAD ON OEL	TWA	100 ppm	435 mg/m3
		CAD ON OEL	STEL	150 ppm	650 mg/m3
		ACGIH	TWA	100 ppm	
		ACGIH	STEL	150 ppm	
		OSHA Z1	PEL	100 ppm	435 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	black
Odour	:	hydrocarbon-like
Physical state	:	liquid
Vapour pressure	:	Estimated 11.8 kPa Method: ASTM D 323A
Density	:	0.915 - 0.925 g/cm3
Specific gravity	:	0.915 - 0.925
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	POW: Estimated< 1
Viscosity, kinematic	:	Estimated 63.5 mm2/s at 40 °C (104 °F) Estimated 268.5 mm2/s at 15.5 °C (59.9 °F) Method: ASTM D 445

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.

Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide sulfur dioxide
Hazardous reactions	:	Hazardous polymerization does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD 50 Rat(Female) Dose: > 2,000 mg/kg Method: OECD Test Guideline 425 Test substance: naphtha
Acute dermal toxicity	:	LD 50 Rabbit (Female, Male) Dose: > 2,000 mg/kg Method: OECD Test Guideline 402 Test substance: naphtha
Acute inhalation toxicity	:	LC 50 Rat (Female, Male) Exposure time: 4 h Dose: Approximate 5.1 mg/l Method: OECD Test Guideline 403 Test substance: naphtha
Skin irritation	:	rabbit Result: Mild skin irritation Method: OECD Test Guideline 404 Exposure time: 4 h Test substance: Bitumen
Eye irritation	:	rabbit Result: slight irritation Method: OECD Test Guideline 405 Test substance: Bitumen

SECTION 12. ECOLOGICAL INFORMATION

Acute and prolonged toxicity to fish	:	No Observed Effect Concentration NOEC Species: Oncorhynchus mykiss (rainbow trout) Dose: 1.24 mg/l Test substance: naphtha Method: OECD Test Guideline 203 Remarks: Not toxic to rainbow trout LC 50 Species: Oncorhynchus mykiss (rainbow trout)

Dose: 1.24 mg/l
Exposure time: 96 h
Test substance: naphtha
Method: OECD Test Guideline 203
Remarks: Not toxic to rainbow trout

Acute toxicity to aquatic invertebrates : Immobilization EC 50
Species: Water flea (Daphnia magna)
Dose: Estimated 2.89 mg/l
Exposure time: 48 h
Test substance: naphtha
Method: OECD Test Guideline 202
Remarks:
Based on mean measured concentration

Lowest Observed Effect Concentration LOEC
Species: Water flea (Daphnia magna)
Dose: Estimated 7.95 mg/l
Test substance: naphtha
Method: OECD Test Guideline 202
Remarks:
Based on mean measured concentration

No Observed Effect Concentration NOEC
Species: Water flea (Daphnia magna)
Dose: Estimated 0.69 mg/l
Test substance: naphtha
Method: OECD Test Guideline 202
Remarks:
Based on mean measured concentration

Additional ecological information : no data available

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal : Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

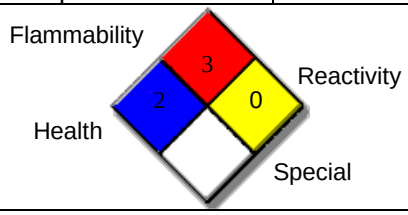
DOT	Proper shipping name	: **Flammable liquid, n.o.s.**
	UN-Number	: 1993
	Class	: 3
	Packing group	: II
TDG	Proper shipping name	: Flammable liquid, n.o.s.
	UN-Number	: 1993
	Class	: 3
	Packing group	: II

IATA	UN Number		: 1993
	Description of the goods		: Flammable liquid, n.o.s.
	Class	:	3
	Packaging group	:	II
	ADR/RID-Labels	:	3
	Packing instruction (cargo aircraft)	:	307
	Packing instruction (passenger aircraft)	:	305
	Packing instruction (passenger aircraft)	:	Y305

IMDG	Substance No.	:	UN 1993
	Description of the goods	:	Flammable liquid, n.o.s.
	Class	:	3
	Packaging group	:	II
	ADR/RID-Labels	:	3
	EmS Number	:	F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Dust and Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D1A - Materials causing immediate and serious toxic effects, Very Toxic Material, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

TSCA Status : Listed on TSCA

HYDROGEN SULPHIDE	7783-06-4
sec-Butyl Mercaptan	513-53-1
1-Propanethiol	107-03-9

ETHANETHIOL	75-08-1
Isopropyl Mercaptan	75-33-2
Butyl Mercaptan	109-79-5
METHANETHIOL	74-93-1
Sulphur based on mass/mass	7704-34-9

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 05/27/2010

References : Maxxam Analytics Inc. analysis, 2002
Hazelton Wisconsin, Primary Dermal Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Eye Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991

SECTION 1 – MATERIAL IDENTIFICATION

Material Name: HEAVY CRUDE OIL DILUENT MIX
Synonyms: Bow River (BR); Cold Lake Blend (CLB); Christina Lake Dil-bit Blend (CDB), Christina Lake Blend (CSB); Western Canadian Blend (WCB); Western Canadian Select (WCS); Wabasca Heavy (WH)
Use: Process stream, fuels and lubricants production
WHMIS Classification: Class B, Div. 2, Class D, Div. 2, Sub-Div. A and B
NFPA: **Fire**: 2 **Reactivity**: 0 **Health**: 3
TDG Shipping Name: Petroleum Crude Oil
TDG Class: 3 **UN**: 1267
TDG Packing Group: II (boiling point 35 deg. C or above, and flash point less than 23 deg. C)
Manufacturer/Supplier: CENOVUS ENERGY INC.
500 Centre Street SE, PO Box 766
Calgary, AB T2P 0M5
Emergency Telephone: 1-877-458-8080, CANUTEC 1-613-996-6666 (Canada)
Chemical Description: A naturally occurring mixture of paraffins, naphthalenes, aromatic hydrocarbons and small amounts of sulphur and nitrogen compounds mixed with condensate

SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	Approximate Concentrations (%)	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Bitumen	50 – 90	8052-42-4		5 mg/m^3 (OEL, PEL oil mist)
Hydrocarbon Diluent	10 – 50	N.Av.	N.Av.	900 mg/m^3 (OEL)*
Benzene	0.03 - 0.3	71-43-2	LD50, rat, oral, 930 mg/kg LC50, rat, 4 hr, 13200 ppm	0.5 ppm (OEL, TLV) 10 ppm (PEL)
Hydrogen Sulphide§	<0.1	7783-06-04	LC50, rat, 4 hrs, 444 ppm	10 ppm (OEL), 1 ppm (TLV), 20 ppm (PEL-C)

OEL = AB Occupational Exposure Limit; TLV = ACGIH Threshold Limit Value; PEL = OSHA Permissible Exposure Limit; C = Ceiling; *OEL for gasoline; §Hydrogen Sulfide in liquid, vapour phase may contain higher concentrations

SECTION 3 – PHYSICAL DATA FOR MATERIAL

Physical State: Liquid
Specific Gravity: 0.91 – 0.94
Vapour Density (air=1): 2.5 -5.0 (estimated)
Percent Volatiles, (v/v): 15 - 30 (estimated)
pH: N.Av.
Vapour Pressure, Reid (kPa): 76 @ 38ºC
Odour Threshold (ppm): N.Av.
Evaporation Rate: N.Av.
Boiling Pt. (deg.C): 35 – 180ºC
Freezing Pt. (deg.C): <20
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: Brown/black liquid, hydrocarbon odour
(N.Av. = not available N.App. = not applicable)

SECTION 4 – FIRE AND EXPLOSION

Flammability: Yes **Conditions**: Material will ignite at normal temperatures.
Means of Extinction: Foam, 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.
Flash Point (deg.C) & Method: <-35 (PMCC)
Upper Explosive Limit (% by vol.): 8 (estimated)
Lower Explosive Limit (% by vol.): 0.8 (estimated)
Auto-Ignition Temp. (deg.C): 250 (estimated)
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes, at normal temperatures
TDG Flammability Classification: 3
Hazardous Combustion Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 5 – REACTIVITY DATA

Chemical Stability: Stable **Conditions**: Heat
Incompatibility: Yes **Substances**: Oxidizing agents (e.g. chlorine)
Reactivity: Yes **Conditions**: Heat, strong sunlight
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

Routes of Entry:
Skin Absorption : Yes **Skin Contact**: Yes **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes
Effects of 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/burns.
Effects of 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.
Sensitization to Product: No.
Exposure Limits of Product: 0.5 ppm (OEL for benzene)
Irritancy: Yes
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

SECTION 7 – PREVENTIVE MEASURES

Personal Protective Equipment: Use positive pressure self-contained breathing apparatus, supplied air breathing apparatus or cartridge air purifying respirator approved for organic vapours where concentrations may exceed exposure limits (note: cartridge respirator not suitable for hydrogen sulfide, oxygen deficiency or IDLH situations) – see also Storage below).
Gloves: Viton (nitrile adequate for short exposure to liquid)
Eye: Chemical splash goggles. **Footwear**: As per safety policy **Clothing**: As per fire protection policy
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: Stop leak if safe to do so. Use personal protective equipment. Use water spray to cool containers. Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined spaces. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.
Waste Disposal: Contact appropriate regulatory authorities for disposal requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight, and ignition sources.
Special Shipping Provisions: N.App.

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

SECTION 8 – FIRST AID MEASURES

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

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

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. DO NOT INDUCE VOMITING. Keep warm and at rest. Get immediate medical attention.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: Cenovus Energy Inc. Health and Safety
Phone Number: 1-403-766-2000
Preparation Date: April 10, 2013

Material Safety Data Sheet

1 . Product and company identification

Product name : FLO FUSION3000 PIPELINE BOOSTER

Supplier : Baker Hughes Canada Company
5050 47th Street S.E.
Calgary, Alberta, T2B 3S1, Canada
For Product Information: 403-537-3850 or 281-276-5400
(8:00 a.m. - 5:00 p.m. cst, Monday - Friday)

Material Uses : Special: Pipeline Booster.

Code : FLOFUS3000

Validation date : 1/18/2016.

Print date : 1/18/2016.

Version : 1

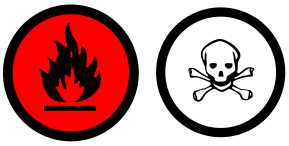
Responsible name : Global Regulatory Affairs - Telephone 281-276-5400 or 800-231-3606

In case of emergency : CANUTEC 613-996-6666 (Canada 24 hours)
Baker Petrolite 800-231-3606 (North America 24 hour)
(001)281-276-5400
CHEMTREC 800-424-9300 (U.S. 24 hour)
CHEMTREC Int'l 01-703-527-3887 (International 24 hours)

Canada

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

WHMIS (Pictograms) :



2 . Hazards identification

Physical state : Liquid. [Opaque. Dispersion.]

Odor : Mild. Sweet.

Color : White.

Emergency overview : WARNING!

COMBUSTIBLE LIQUID AND VAPOR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Static discharges can cause ignition or explosion when container is not bonded. Keep away from heat, sparks and flame. Do not get in eyes. Avoid breathing vapor or mist. Avoid contact with skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Routes of entry : Eye contact.

Potential acute health effects

2 . Hazards identification

Inhalation : Irritating to respiratory system.

Ingestion : Ingestion may cause gastrointestinal irritation and diarrhea.

Skin : Harmful in contact with skin. Irritating to skin.

Eyes : Severely irritating to eyes. Risk of serious damage to eyes.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Target organs : Contains material which may cause damage to the following organs: blood, kidneys, liver, mucous membranes, lymphatic system, upper respiratory tract, skin, central nervous system (CNS), eye, lens or cornea.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : None known.

Skin : irritation, redness, dryness, cracking

Eyes : pain or irritation, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	Wt. %
Olefin copolymer	86797-81-1	10 - 30
Alkyl alcohol	111-87-5	10 - 30
Hexylene glycol	107-41-5	10 - 30
Alpha olefin	112-41-4	5 - 10
Alkyl alcohol	111-27-3	5 - 10
Ethene homopolymer	9002-88-4	1 - 5
Alpha olefin	592-41-6	1 - 5
2-Butoxyethanol	111-76-2	1 - 5
Medium aliphatic naphtha	64742-88-7	1 - 5

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

4 . First aid measures

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	**List name**	**ppm**	**mg/m³**	**Other**	**ppm**	**mg/m³**	**Other**	**ppm**	**mg/m³**	**Other**	**Notations**
Hexylene glycol	US ACGIH	-	-	-	-	-	-	25	121	-	
	OSHA PEL 1989	-	-	-	-	-	-	25	125	-	
Alpha olefin	US ACGIH	50	-	-	-	-	-	-	-	-	
2-Butoxyethanol	US ACGIH	20	-	-	-	-	-	-	-	-	
	OSHA PEL	50	240	-	-	-	-	-	-	-	[1]
	OSHA PEL 1989	25	120	-	-	-	-	-	-	-	[1]
Medium aliphatic naphtha	OSHA PEL	100	400	-	-	-	-	-	-	-	
	OSHA PEL 1989	100	400	-	-	-	-	-	-	-	
Ethene homopolymer	US ACGIH	-	10	-	-	-	-	-	-	-	[a]
	US ACGIH	-	3	-	-	-	-	-	-	-	[b]
	OSHA PEL	-	5	-	-	-	-	-	-	-	[c]
	OSHA PEL	-	15	-	-	-	-	-	-	-	[d]

[1]Absorbed through skin.
Form: [a]Inhalable fraction. [b]Respirable fraction [c]Respirable dust [d]Total dust

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

8 . Exposure controls/personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid. [Opaque. Dispersion.]

Flash point : Closed cup: 62.778°C (145°F) [SFCC]

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : White.

Odor : Mild. Sweet.

pH : Not available.

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : 0.853 (20°C)

Density : 7.1287 (lbs/gal)

Vapor density : >1 [Air = 1]

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Not available.

Solubility (Water) : Insoluble

Vapor pressure : Not available.

Pour Point : Not available.

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Materials to avoid : Reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Conditions of reactivity : Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Hexylene glycol	LD50 Dermal	Rabbit	7290 mg/kg	-
	LD50 Oral	Rat	3700 mg/kg	-
Alkyl alcohol	LC50 Inhalation Vapor	Rat	>21 mg/l	1 hours
	LD50 Dermal	Rabbit	2330 mg/kg	-
	LD50 Dermal	Rabbit	2542 mg/kg	-
	LD50 Dermal	Rabbit	1500 to 2000 mg/kg	-
	LD50 Dermal	Rat	3210 mg/kg	-
	LD50 Oral	Rat	710 mg/kg	-
Alkyl alcohol	LD50 Dermal	Rabbit	2000 mg/kg	-
	LD50 Oral	Rat	5000 mg/kg	-
Alpha olefin	LC50 Inhalation Gas.	Rat	32000 ppm	4 hours
	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5600 mg/kg	-
Alpha olefin	LD50 Dermal	Rabbit	10000 mg/kg	-
	LD50 Oral	Rat	10000 mg/kg	-
2-Butoxyethanol	LC50 Inhalation Gas.	Rat	450 ppm	4 hours
	LD50 Dermal	Guinea pig	>2000 mg/kg	-
	LD50 Dermal	Rabbit	200 mg/kg	-
	LD50 Dermal	Rabbit	99 mg/kg	-
	LD50 Oral	Guinea pig	500 to 2000 mg/kg	-
	LD50 Oral	Rabbit	320 mg/kg	-
Medium aliphatic naphtha	LD50 Dermal	Rabbit	3900 mg/kg	-
	LD50 Oral	Rat	>19500 mg/kg	-
Ethene homopolymer	LD50 Oral	Rat	>3000 mg/kg	-

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Ethene homopolymer	-	3	-	-	-	-
2-Butoxyethanol	A3	3	-	-	-	-

Chronic toxicity Remarks

1) Olefin copolymer

Not available.

2) Alkyl alcohol

Not available.

3) Hexylene glycol

Hexylene glycol is a component of this product. Hexylene glycol did affect male fertility in rats when given orally at a dose of 148 to 190 mg/kg/day for 130 days (Clayton & Clayton, 1982).

4) Alpha olefin

Not available.

5) Alkyl alcohol

The alkyl alcohol produced questionable signs of neurotoxicity in rats exposed for 30 weeks (Perbellini et al, 1978). In

11 . Toxicological information

rabbits, inhalation of the alkyl alcohol for 6 months caused ultrastructural changes in the eyes, with the possibility of decreased color vision (Gendlo et al, 1971). At the time of this review, no chronic effects were found for the alkyl alcohol in humans.

6) Ethene homopolymer

An ethene homopolymer (polyethylene) is a component of this product. Polyethylene in its solid form is not expected to have any significant toxicological effect, except intestinal blockage if swallowed. The only chronic effects seen in humans has been with exposure to polyethylene pyrolysis products. Workers exposed to these pyrolysis products had symptoms of eye, mucous membrane, and skin inrritation, headaches, nausea, coughing, shortness of breath, and flu-like complaints (Robinson et al, 1982), indicative of poymer fume fever. Rats after inhaling polyethylene dust developed mild inflammatory changes in the lungs (Kochetkova et al, 1971). Prolonged inhalation of thermal degradation products from polyethylene caused neurological effects in rats (Zitting & Savolainen, 1979).

7) Alpha olefin

Not available.

8) 2-Butoxyethanol

2-Butoxyethanol [synonym: ethylene glycol monobutyl ether (EGBE)] is a component of this product. EGBE has no tendency to accumulate in humans or animals (Clayton & Clayton, 1994). Little is known about the potential long-term or delayed effects of low-level chronic EGBE exposure.

In mice, treatment with doses of 500 or 1,000 mg/kg/day for 4 days induced atrophy of the thymus and lymphocytopenia, indicative of potential depression of the immune system. Hemolytic anemia was also produced (Grant et al, 1985). Anemia was also produced in rats.

Reproductive studies in laboratory animals have produced mixed results.

Chronic inhalation has produced tumors in laboratory animals [National Toxicology Program (2000) Report NTP TR 484 and NIH Publication No. 00-3974].

In vitro mutagenicity has been demonstrated in human lymphocytes [Vallalobos-Pietnini, R. et al (1989) Revista Internacionial de Contaminaci on Ambiental 5: 41-48]. 2-Butoxyethanol expressed positive in vitro mutagenic results in Salmonella typhimurium TA 97a, with and without metabolic activation [Hoflack, J.C. et al (1995) Mutation Research 341: 281-287].

Chronic ingestion and inhalation has produced fetotoxicity and postnatal developmental toxicity in laboratory animals [Heindel, J.J. et al (1990) Fundmental Applied Toxicology 15: No. 4 683-696 and Tyl, R. et al (1984) Environmental Health Persp. 57: 47-68].

ACGIH has classified 2-butoxyethanol as an animal carcinogen with unknown relevance to humans.

9) Medium aliphatic naphtha

Chronic exposure to some naphthas has been associated with liver, kidney, and brain damage. Naphtha, in general, has been linked with birth defects and menstrual disorders in humans.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Hexylene glycol	Acute EC50 28000000 to 3200000 µg/l Fresh water	Crustaceans - Water flea - Ceriodaphnia reticulata - Larvae	48 hours
	Acute EC50 3200000 to 3700000 µg/l Fresh water	Daphnia - Water flea - Daphnia magna - Larvae	48 hours
	Acute LC50 10000000 µg/l Marine water	Fish - Inland silverside - Menidia beryllina	96 hours
Alkyl alcohol	Acute LC50 120000 µg/l Marine water	Fish - Bleak - Alburnus alburnus	96 hours
Alkyl alcohol	Acute LC50 13100 µg/l Fresh water	Fish - Fathead minnow - Pimephales promelas	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Daphnia - Water flea - Daphnia magna	21 days
Alpha olefin	Acute EC50 30 mg/l Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	Acute LC50 25 mg/l Fresh water	Fish - Zebra danio - Danio rerio - Young	96 hours
2-Butoxyethanol	Acute EC50 >1000 mg/l Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	Acute LC50 1000 mg/l Marine water	Crustaceans - Amphipod - Chaetogammarus marinus - Young	48 hours
	Acute LC50 1250000 µg/l Marine water	Fish - Inland silverside - Menidia beryllina	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	NA1993	COMBUSTIBLE LIQUID, N.O.S. (Contains: Alkyl alcohol)	Combustible liquid.	III		**Remarks** This material is not regulated by DOT if transported in a packaging </= 119 gallons.
TDG Classification	Not regulated.	-	-	-		-

14 . Transport information

IMDG Class	Not regulated.	-	-	-		-
IATA-DGR Class	Not regulated.	-	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : 128

15 . Regulatory information

Canada

WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : All components are listed or exempted.

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.

Canadian NPRI : The following components are listed: Hexene (all isomers); 2-Butoxyethanol; Solvent naphtha (petroleum), medium aliph.

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304 : No products were found.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

SARA 313

Supplier notification :

Product name	CAS number	Concentration
2-Butoxyethanol	111-76-2	1 - 5

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

National Fire Protection Association (U.S.A.) :

Date of printing : **1/18/2016.**

16 . Other information

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this SDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This SDS was prepared and is to be used for this product. If the product is used as a component in another product, this SDS information may not be applicable.

ENBRIDGE

Safety Data Sheet

REDACTED COPY

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Canadian Heavy Sweet (CHS)	
OTHER MEANS OF IDENTIFICATION	UN-Number	UN1267
	Synonyms	CHS, Mix of Heavy and Sweet Blend
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	CHEMTREC	1-800-424-9300 for US 703-527-3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Irritation	Category 3
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Natural Gas Condensates (petroleum)	64741-47-5	45-100	
Petroleum Distallates (naptha)	8002-05-9	45-100	
Asphalt	8052-42-4	70-80	
Natural Gas Condensate	68919-39-1	0-25	
Ethane	74-84-0	0-15	
Propane	74-98-6	0-15	
Pentane	109-66-0	0-15	
2-Methylbutane	78-78-4	0-10	
Butane	106-97-8	0-10	
Heptane	142-82-5	0-10	
Hexane	110-54-3	0-10	
Octane	111-65-9	0-10	
Nonane	111-84-2	0-5	
Isobutane	75-28-5	0-5	
Decane	124-18-5	0-5	
Benzene	71-43-2	0-2	
Xylene	1330-20-7	0-2	
Toluene	108-88-3	0-2	
Ethylbenzene	100-41-4	0-2	
Methylcyclohexane	108-87-2	0-2	
Methylcyclopentane	96-37-7	0-2	
Cyclohexane	110-82-7	0-1	
Cyclopentane	287-92-3	0-1	
1,2,4-Trimethylbenzene	95-63-6	0-1	
Hydrogen Sulfide	7783-06-4	0-1	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/ attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	Refer to Section 11 - Toxicological Information	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	Note to the Physician	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	Suitable Extinguishing Media	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk. • LARGE FIRES: Use water spray or fog; do not use straight streams. • LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn. • LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (C_2O). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen.
- Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.
Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS	• Avoid runoff to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	
Methods for Containment	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	
Handling	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

	Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
Petroleum distillate (naphtha)	–	–	TWA 350 mg/m^3 IDLH 1100 ppm Ceiling 1800 mg/m^3
Asphalt	TLV 0.5 mg/m^3		Ceiling 5 mg/m^3
Ethane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-C4	–	

Propane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-C4	TWA 1000 ppm TWA 1800 mg/m^3	TWA 1000ppm TWA 1800 mg/m^3
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m3 IDLH 1500 ppm
2-Methylbutane	TWA 600 ppm	–	–
Butane	STEL 1000 ppm		TWA 800 PPM TWA 1900 mg/m^3
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m^3	–	TWA 200 ppm TWA 1050 mg/m^3
Isobutane	TWA 1000 ppm	–	–
Decane	–	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

Toluene	TLV 20 ppm TLV 75 mg/m³	PEL 200 ppm STEL 300 mg/m³	TWA 100 ppm TWA 375 mg/m³ STEL 150 ppm STEL 560 mg/m³ IDLH 500 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m³	PEL 100 ppm PEL 435 mg/m³	TWA 100 ppm TWA 435 mg/m³ STEL 125 ppm STEL 545 mg/m³ IDLH 800 ppm
MethylCyclohexane	TLV 400 ppm TLV 1610 mg/m³	PEL 500 ppm PEL 2000 mg/m³	TWA 400 ppm TWA 1600 mg/m³ IDLH 1200 ppm
Cyclohexane	TLV 100 ppm TLV 334 mg/m³	PEL 300 ppm PEL 1050 mg/m³	TWA 300 ppm TWA 1050 mg/m³ IDLH 1300 ppm
Cyclopentane	TLV 600 ppm	–	TWA 600 ppm TWA 1720 mg/m³
1,2,4-Trimethylbenzene	TWA 25 ppm	-	TWA 25 ppm TWA 125 mg/m³
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m³ STEL 5 ppm STEL 7 mg/m³	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m³ IDLH 100 ppm

APPROPRIATE ENGINEERING CONTROLS	• Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.
INDIVIDUAL PROTECTION MEASURES	
Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN149. Use a NIOSH/MSHA or European Standard EN149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION	Physical State	Liquid	Odor	Petroleum like odor
	Substance Type	Mixture	Odor Threshold	No data available
	Appearance	Brown/black Liquid		
PROPERTIES	pH	No data available	Vapor pressure	95kPa@37.8°C
	Melting Point/ Freezing Point	No data available	Vapor density	>1 Air=1
	Boiling Point/ Boiling Range	-20 to 722°C -4 to 1331°F	Relative density	No data available
	Flash Point	-40 to 260 °C -40 to 500 °F	Water Solubility	Negligible
	Evaporation Rate	No data available	Partition coefficient: n-octanol/water	No data available
	Flammability (solid, gas)	No data available	Autoignition temperature	No data available
	Upper Flammability Limit	No data available	Decomposition temperature	No data available

Lower Flammability Limit	No data available	Specific Gravity	0.90-0.925
Viscosity	< 145 cSt @ 10°C		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE	Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
	Eye Contact	• Causes serious eye irritation.
	Skin Contact	• Causes skin irritation.
	Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Natural gas condensates (petroleum)	-	–	>600 mg/m³ (Rat)
Asphalt	>5000 mg/kg (Rat)	–	>94.4 mg/m³ (Rat)
Propane	–	–	>800000 ppm (Rat) 15 min
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
2-Methylbutane	–	–	= 150,000 mg/m³ (Rat) 2 h
Butane	–	–	658 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m³ (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h

Octane	–	–	=118g/m³(Rat)4h =25260ppm(Rat)4h
Nonane	–	–	= 3200 ppm (Rat) 4 h
Decane	>5000mg/kg	>2000mg/kg (Rat	–
Benzene	1800mg/kg (Rat)	–	13050-14380ppm(Rat)4h
Xylenes	=3500mg/kg (Rat)	>4350mg/kg(Rabbit) >1700mg/kg(Rabbit)	=29.08mg/L(Rat)4h =5000ppm (Rat)4h
Toluene	2.6to7.5g/kg(Rat)	14.1ml/kg(Rabbit)	–
Ethylbenzene	=3500mg/kg(Rat)	=15400mg/kg(Rabbit)	=17.2mg/L(Rat)4h
MethylCyclohexane	>3200mg/kg(Rat)	–	–
Cyclohexane	>5000mg/kg(Rat)	>2000mg/kg(Rabbit)	=13.9mg/L(Rat)4h
Cyclopentane	11400 mg/kg(Rat)	–	72g/m³(Mouse)
1,2,4-Trimethylbenzene	5g/kg(Rat)	–	18000mg/m³(Rat)4h
Hydrogen sulfide	–	–	=444ppm(Rat)

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/ week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver,

kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

Toluene	Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. 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. Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	Carcinogenicity: Rats and mice exposed to 0, 75, 250, or 750 ppm ethylbenzene in a two year inhalation study demonstrated limited evidence of kidney, liver, and lung cancer. Ethylbenzene has been listed as a possible human carcinogen by IARC. Target Organs: In rats and mice exposed to 0, 75, 250, or 750 ppm ethylbenzene in a two year inhalation study there was mild damage to the kidney (tubular hyperplasia), liver (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT-AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Petroleum distillate (naphtha)	A2	–	Group 3		–
Asphalt	A4	–	Group 2B	Reasonably Anticipated	–
Hexane	–	X	–	–	–
Benzene	A1	X	Group 1	Known	X
Xylenes	A4	–	Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Ethylbenzene	A3	–	Group 2B	Evidence	X

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY	• Suspected of damaging fertility or the unborn child.
STOT—SINGLE EXPOSURE	• May cause drowsiness and dizziness.
STOT—REPEATED EXPOSURE	• Causes damage to organs through prolonged or repeated exposure.
ASPIRATION HAZARD	May be fatal if swallowed and enters airways. Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Petroleum distillate (naphtha)	–	LC50: 258 mg/L Salmo gairdneri 96 h static	EC50 48h: <0.26 mg/L Static (Daphnia magna) EC50 24h: =36 mg/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96h: =119 mg/L static (Alburnus alburnus) LC50 96h: =82 mg/L static (Cyprinodon variegatus)	EC50 24h: =170 mg/L (Daphnia magna)	–
Butane	–	–	–	–
Pentane	–	LC50 96h: =11.59 mg/L (Pimephales promelas) LC50 96h: =9.87 mg/L (Oncorhynchus mykiss) LC50 96h: =9.99 mg/L (Lepomis macrochirus)	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Octane	–	–	EC50 48h: =0.38 mg/L (water flea) EC50 48h: =0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Heptane	–	LC50 96h: =375.0 mg/L (Cichlid fish)	EC50 24h: >10 mg/L (Daphnia magna)	–
2-Methylbutane			EC50 48h: =2.3 mg/L (Daphnia magna)	
Hexane	–	LC50 96h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24h: >1000 mg/L (Daphnia magna)	–
Decane	EC50 24h: =0.043 mg/L (Chlorella vulgaris)	–	EC50 48h: =0.029 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72h: =29mg/L (Pseudokirchneriella subcapitata)	LC50 96h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96h: =5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96h: =22.49 mg/L static (Lepomis macrochirus) LC50 96h: =28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48h: =10 mg/L (Daphnia magna)	–
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Cyclopentane			EC50 48 h: 150 nmol/cu m (Daphnia magna)	LC50 24h: 280 mmol/cu m Artemia salina (Brine Shrimp)
MethylCyclohexane		LC50 96hr: 72.0 mg/l (Golden Shiner)		
Xylenes	EC50 72h: =11 mg/L (Pseudokirchneriella subcapitata)	LC50 96h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48h: =3.82 mg/L (water flea) LC50 48h: =0.6 mg/L (Gammarus lacustris)	-
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0 - 15.0 mg/L Lepomis macrochirus 96 h static	EC50 48h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48h: =11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
		LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static		

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Ethylbenzene	EC50 72h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96h: >438 mg/L (Pseudokirchneriella subcapitata) EC50 72h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96h: = 32 mg/L static (Lepomis macrochirus) LC50 96h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h (Microorganisms)
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–

ECOTOXICITY

- No information available

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY

PERSISTENCE AND DEGRADABILITY

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Asphalt	6.006
Butane	2.89
Benzene	1.83
YCyclohexane	3.44
Cyclopentane	3.00
Decane	5.1
Ethane	1.81
Ethylbenzene	3.118
Pentane	3.39
Octane	5.18
Heptane	4.66
2-Methylbutane	2.72
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Nonane	5.65
Propane	2.36
Toluene	2.65
Xylene	2.77-3.15
Isobutane	2.76
Hexane	3.90

1,2,4-Trimethylbenzene	3.78
Hydrogen Sulfide	0.45

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
Petroleum distillate (naphtha)	High
Butane	Low
Cyclohexane	Moderate
Cyclopentane	Moderate
Ethane	Very High
Methylcyclopentane	Low
Propane	Moderate
Pentane	High
Octane	Immobile
Nonane	Immobile
Heptane	Moderate
2-Methylbutane	Low
Isobutane	Very High
Hexane	High
Decane	Immobile
Benzene	High
Xylene	Very High to Moderate
Toluene	High to Moderate
Ethylbenzene	Low
1,2,4-Trimethylbenzene	Low

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.

• This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
• This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
• It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging	Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

CHART NAME

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pollutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pollutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Cyclopentane	287-92-3	Not Listed
Ethane	74-84-0	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Propane	74-98-6	Not Listed

Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed

Isobutane	75-28-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Decane	124-18-5	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Cyclopentane	287-92-3	Not Listed
Ethane	74-84-0	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Propane	74-98-6	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	10 lb RQ

Xylene	1330-20-7	100lbRQ
Toluene	108-88-3	1000lbRQ
Ethylbenzene	100-41-4	1000lbRQ
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	100lbRQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Ethane	74-84-0	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Pentane	109-66-0	Not Listed
Propane	74-98-6	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	X
Toluene	108-88-3	X

Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Cyclopentane	287-92-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Propane	74-98-6	Not Listed
Ethane	74-84-0	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	Not Listed
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
2-Methylbutane (In Liquid form)	78-78-4	B2
Asphalt	8052-42-4	Not Listed
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Cyclopentane	287-92-3	B2
Decane	124-18-5	B3, D2B
Ethane	74-84-0	A, B1
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	B2, D2B
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2
Propane	74-98-6	A, B1

Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Pentane	109-66-0	X
Ethane	74-84-0	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed

Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	X
Isobutane	75-28-5	X
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	X
Propane	74-98-6	X
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	X

X= The component is listed

Section16: Other Information

NFPA

Health Hazard: 2	Flammability: 4	Instability: 0	Physical and Chemical Hazards: X

HMIS	Health Hazard: 2	Flammability: 4	Instability: 0	Personal Protection: X
ISSUING DATE	09/19/16			
REVISION DATE	09/19/16			

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

Material Safety Data Sheet
May be used to comply with
OSHA's Hazard Communication Standard
29 CFR 1910.1200. Standard must be
consulted for specific requirements.

U.S. Department of Labor
Occupation Safety and Health Administration
(Non-Mandatory Form)
Form Approved
OMB No. 1218-0072

IDENTITY
CNC PLUS (120485)

Note: Blank spaces are not permitted. If any item is not applicable, or no information is available, the space must be marked to indicate that.

Section I

Manufactured For: Beaver Research Company	Emergency Telephone Number 1-800-255-3924 (Chem-Tel)
Address (Number, Street, City, State, and ZIP Code) 3700 E. Kilgore Road, Portage, MI 49002	Telephone Number For Information 1-800-544-0133
HMIS Rating: Health-2; Flammability-2; Reactivity-0; Personal Protection-B DOT Hazard Classification: ORM-D	Date Prepared 10/12/09 Signature of Preparer (optional)

Section II - Hazardous Ingredients/Identity Information

Hazardous Components (Specific Chemical Identity; Common Name(s))	CAS No.	OSHA PEL (ppm)	ACGIH TLV (ppm)	Carcinogen Ref. Source**	SARA III LIST
Petroleum Oil/Hydrotreated Petroleum Distillate	64742-54-7	5mg/M3 TWA for oil mist	5mg/M3 TWA for oil mist	d	No
Petroleum Distillate	8052-41-3	100	100	d	No
Isobutane/Propane Blend	75-28-5	800	800	d	No
	74-98-6	1000	1000	d	No

**Chemical listed as carcinogen or potential carcinogen. [a] NTP [b] IARC [c] OSHA [d] Not Listed [e] Animal Data Only

Section III - Physical/Chemical Characteristics

Boiling Point	N/A	Specific Gravity (H2O = 1) Concentrate only	0.90
Vapor Pressure (PSIG @ 70°F) Aerosols	Max 60	Vapor Pressure: (Non-Aerosols)	N/A
Vapor Density (AIR = 1)	N/E	Evaporation Rate	N/E

Solubility in Water Insoluble	Water Reactive No

Appearance and Odor
Silver color with aliphatic solvent odor.

Section IV - Fire and Explosion Hazard Data

Flash Point (Method Used)	Flammability as per USA FLAME PROJECTION TEST	LEL	UEL
N/A	Flammable	N/E	N/E

Extinguishing Media
Foam, dry chemical, carbon dioxide.

Special Fire Fighting Procedures
Self-contained breathing apparatus.

Unusual Fire and Explosion Hazards
Do not expose aerosols to temperatures above 120°F or the container may rupture.

Section V - Reactivity Data

Stability	Unstable		Conditions to Avoid	N/A
	Stable	X		

Incompatibility (Materials to Avoid)
Strong oxidizing agents.

Hazardous Decomposition or Byproducts
CO, CO_2, and various hydrocarbons.

Hazardous Polymerization	May Occur		Conditions to Avoid	Open flame, welding arcs, heat, sparks.
	Will Not Occur	X		

Section VI - Health Hazard Data

Route(s) of Entry:	Inhalation?	Skin?	Ingestion?
	Yes	Yes	Yes

Health Hazards (Acute and Chronic)

Acute Effects

Inhalation: Excessive inhalation of vapors can be harmful and may cause headache, dizziness, asphyxia, anesthetic effects and possible unconsciousness. **Eye Contact**: Mild irritation. **Skin Contact**: Mild irritation due to defatting of skin. **Ingestion**: Possible chemical pneumonitis if aspirated into lungs. Nausea.

Chronic Effects*(Effects due to excessive exposure to the raw materials of this mixture)**:*

May cause elevated carboxyhemoglobin levels, eye damage, lung damage.

Carcinogenicity:	NTP?	IARC Monographs?	OSHA Regulated?
N/A	N/A	N/A	N/A

Signs and Symptoms of Exposure

May cause elevated carboxyhemoglobin levels, eye damage, lung damage.

Medical Conditions Generally Aggravated by Exposure

May aggravate existing eye, skin, or upper respiratory conditions.

Emergency and First Aid Procedure

Eye Contact: Flush with water for 15 minutes. If irritated, seek medical attention. **Skin Contact**: Wash with soap and water. If irritated, seek medical attention. **Inhalation**: Remove to fresh air. Resuscitate if necessary. Get medical attention. **Ingestion**: DO NOT INDUCE VOMITING. Drink two large glasses of water. Get immediate medical attention.

Section VII - Precautions for Safe Handling and Use

Steps to be Taken in Case Material is Released or Spilled

Absorb with suitable medium. Incinerate or landfill according to local, state or federal regulations. DO NOT FLUSH TO SEWER.

Waste Disposal Method

Aerosol cans when vented to atmospheric pressure through normal use, pose no disposal hazard.

Precautions to be Taken in Handling and Storage

Do not puncture or incinerate containers. Do not store at temperatures above 120°F.

Other Precautions

KEEP OUT OF REACH OF CHILDREN. Avoid food contamination. Remove ignition sources.

Section VIII - Control Measures

Respiratory Protection (Specify Type)

If vapor concentration exceeds TLV, use respirator approved by NIOSH or U.S. Bureau of Mines for organic vapor.

Ventilation				
	Local Exhaust	N/A	Special	N/A
	Mechanical(General)	Adequate	Other	N/A

Protective Gloves	Eye Protection
Neoprene, if skin easily irritated.	Safety glasses recommended.

Other Protective Clothing or Equipment

None

Work/Hygienic Practices

Wash with soap and water before handling food. Remove contaminated clothing.

ENBRIDGE

Safety Data Sheet

REDACTED COPY

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil - Condensate	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1268
	Synonyms	Condensate Blend (CRW), Pembina Condensate (CPM), Southern Lights Diluent (SLD), Fort Saskatchewan Condensate (CFT), Gibson Condensate (CGB), Condensate Gibsons Light Density (CGL), Plains Marketing Condensate (CLN), Pembina Nexus Condensate (CPN), Rangeland Condensate (CRL), Rimbey Condensate (CRM), Petrocanada Condensate (CPC), Suncor N (OSN), Federated Condensate (CFD), Gibson Condensate Hardisty (CGY)
	Chemical Category	Crude oils—extremely flammable Petroleum Distillate
RECOMMENDED USE	Refinery feedstock	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-5	
2-Methylbutane (In Liquid form)	78-78-4	0-10	
Benzene	71-43-2	0-10	
Benzene, trimethyl-	25551-13-7	0-1	
Butane	106-97-8	0-7	
Cyclohexane	110-82-7	0-5	
Cyclopentane	287-92-3	0-5	
Decane	124-18-5	0-7	
Ethane	74-84-0	0-60	
Ethylbenzene	100-41-4	0-5	
Heptane	142-82-5	0-20	
Hexane	110-54-3	0-30	
Hydrogen Sulfide	7783-06-4	0-1	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-10	
Methylcyclopentane	96-37-7	0-6	
Naphtha (oil sand), Hydrotreated	128683-33-0	0-100	
Natural gas condensate	68919-39-1	0-100	
Natural gas condensates (petroleum)	64741-47-5	0-100	
Nonane	111-84-2	0-10	
Octane	111-65-9	0-15	
Pentane	109-66-0	0-70	
Propane	74-98-6	0-60	
Toluene	108-88-3	0-10	
Xylene	1330-20-7	0-10	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	–	–	TWA 25 ppm TWA 125 mg/m^3
2-Methylbutane (In Liquid form)	TLV 1000 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Benzene, trimethyl-	TLV 25 ppm	–	–

Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Cyclopentane	TLV 600 ppm	–	TWA 600 ppm TWA 1720 mg/m^3
Ethane	TLV 1000 ppm	–	–
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm		
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m^3	–	TWA 200 ppm TWA 1050 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm

Propane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	TWA 1000 ppm TWA 1800 mg/m^3	TWA 1000 ppm TWA 1800 mg/m^3
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor Pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor Density**	>1 Air=1
Boiling Point/ Boiling Range	-30 to 538°C -22 to 1000.4°F	**Relative Density**	No data available

Flash Point	>-40 °C >-40 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**PartitionCoefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition Temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition Temperature**	No data available
Lower Flammability Limit	No data available	**Specific Gravity**	No data available
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m³ (Rat) 4h
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m³ (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Benzene, trimethyl-	8970 mg/kg (Rat)	–	–
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Cyclopentane	11400 mg/kg (Rat)	–	72 g/m³ (Mouse)
Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	–
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m³ (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m³ (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m³ (Rat)
Nonane	–	–	= 3200 ppm (Rat) 4 h
Octane	–	–	= 118 g/m³ (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Propane	–	–	>800000 ppm (Rat) 15 min
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Ethylbenzene	**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. **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 (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia), and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **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. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE	**Sensitization**	• No information available
	Mutagenic Effects	• May cause genetic defects
	Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY	• Suspected of damaging fertility or the unborn child.
STOT—SINGLE EXPOSURE	• May cause drowsiness and dizziness.
STOT—REPEATED EXPOSURE	• Causes damage to organs through prolonged or repeated exposure.
ASPIRATION HAZARD	May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Benzene, trimethyl-	–	–	–	LC50 24h: 7000 ug/L Palaemonetes pugio (Daggerblade grass shrimp)
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Cyclopentane			EC50 48 h: 150 nmol/cu m (Daphnia magna)	LC50 24h: 280 mmol/cu m Artemia salina (Brine Shrimp)
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: = 0.029 mg/L (Daphnia magna)	–
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
MethylCyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
1,2,4-Trimethylbenzene	3.78
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89
YCyclohexane	3.44
Cyclopentane	3.00
Decane	5.1
Ethane	1.81
Ethylbenzene	3.118
Heptane	4.66
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Nonane	5.65
Octane	5.18
Pentane	3.39
Propane	2.36
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
2-Methylbutane (In Liquid form)	Low
Benzene	High
Benzene, trimethyl-	Moderate to High
Butane	Low
Cyclohexane	Moderate
Cyclopentane	Moderate
Decane	Immobile
Ethane	Very High
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Nonane	Immobile
Octane	Immobile
Pentane	High
Propane	Moderate
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste

- Container contents should be completely used and containers should be emptied prior to discard.
- Container 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 drum re-conditioner.
- To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1268	Petroleum Distillate, N.O.S.	3	I	Emergency response guide number: 128
TDG	UN1268	Petroleum Distillate, N.O.S.	3	I	–
IMO/IMDG	UN1268	Petroleum Distillate, N.O.S.	3	I	–
IATA/ICAO	UN1268	Petroleum Distillate, N.O.S.	3	I	–

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)— HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed

Propane	74-98-6	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Benzene, trimethyl-	25551-13-7	B3
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Cyclopentane	287-92-3	B2
Decane	124-18-5	B3, D2B
Ethane	74-84-0	A, B1
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	B2, D2B
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Propane	74-98-6	A, B1
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Benzene, trimethyl-	25551-13-7	Not Listed
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural gas condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed

Pentane	109-66-0	X
Propane	74-98-6	X
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 3	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 3	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

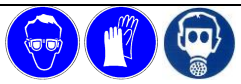
ISSUING DATE 5/8/15

REVISION DATE 5/8/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

DISTILLATE NAPHTHA

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	4	Flashpoint below 73 F	Flammability	4
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : DISTILLATE NAPHTHA

Product type : Intermediate stream
MSDS Number : V00000000436
Synonyms : Coker Naphtha, Untreated Naphtha, Raw Naphtha, SUNCOR OSR

Intended Use : Process Stream
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Naphtha (oil sand)	128683-32-9	98 - 100 %
Xylene, All Isomers	1330-20-7	1 - 3 %
TOLUENE	108-88-3	1 - 2 %
BENZENE	71-43-2	0.5 - 1 %
SULPHUR	7704-34-9	1 - 3.5 %
HYDROGEN SULPHIDE	7783-06-4	<= 200 PPM
sec-Butyl Mercaptan	513-53-1	500 - 1,500 PPM
1-Propanethiol	107-03-9	300 - 600 PPM

ETHANETHIOL	75-08-1	500 - 1,000 PPM
Isopropyl Mercaptan	75-33-2	200 - 600 PPM
Butyl Mercaptan	109-79-5	150 - 300 PPM
METHANETHIOL	74-93-1	500 - 1,000 PPM
ETHYLBENZENE	100-41-4	0.3 - 0.7 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Extremely flammable.May liberate highly toxic and flammable hydrogen sulfide gas.Hydrogen sulphide may be released and collect in the vapor space of process vessels and storage tanks.

Potential Health Effects

Eyes : Vapor may irritate eyes.
Liquid may cause severe irritation, reddening and swelling.

Skin : Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
Toluene and benzene are readily absorbed through the skin.

Inhalation : High concentration of vapours may induce unconsciousness.
Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.
May cause kidney damage and enlargement of the liver.
Benzene can impair the formation of red and white blood cells and platelets.
Benzene can cause cancer of the white blood cells.

Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system Blood
Carcinogenic Effects	:	Component in the product is a human carcinogen IARC Group 1 - Known Human Carcinogen ACGIH A1 - Confirmed Human Carcinogen

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIREFIGHTING MEASURES

Flash point	:	< -35 °C (< -31 °F) Method: ASTM D 93
Auto-ignition temperature	:	254 - 258 °C (489 - 496 °F) Method: ASTM E659
Lower explosion limit	:	0.55 - 0.6 %(V) Method: ASTM E681
Flammability in Presence of	:	Vapors can accumulate and travel to distant ignition sources and flash back.

		Extremely flammable, will ignite at room temperature. Hydrogen sulphide may be released and collect in the vapor space of process vessels and storage tanks.
Explosibility in Presence of	:	Explosive reaction may occur on heating or burning.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), nitrogen oxides, sulfur dioxide

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for firefighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials.

Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn.
Hand protection	:	Wear suitable gloves. The following materials are acceptable: Nitrile rubber Viton (R)
Skin and body protection	:	Long sleeved clothing A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

Xylene, All Isomers	1330-20-7	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	150 ppm	651 mg/m3
		CAD ON OEL	TWA	100 ppm	435 mg/m3
		CAD ON OEL	STEL	150 ppm	650 mg/m3
		ACGIH	TWA	100 ppm	
		ACGIH	STEL	150 ppm	
		OSHA Z1	PEL	100 ppm	435 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3

		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
TOLUENE	108-88-3	CAD AB OEL	TWA	50 ppm	188 mg/m3
		ACGIH	TWA	20 ppm	
		NIOSH	REL	100 ppm	375 mg/m3
		NIOSH	STEL	150 ppm	560 mg/m3
		OSHA Z2	TWA	200 ppm	
		OSHA Z2	Ceiling	300 ppm	
		OSHA Z2	MAX. CONC	500 ppm	
		OEL (QUE)	TWA	50 ppm	188 mg/m3
		CAD BC OEL	TWA	20 ppm	
		CAD ON OEL	TWA	20 ppm	
BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3
		CAD ON OEL	TWA	0.5 ppm	
		CAD ON OEL	STEL	2.5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
		OEL (QUE)	TWA	1 ppm	3 mg/m3
		OEL (QUE)	STEL	5 ppm	15.5 mg/m3
SULPHUR	7704-34-9	CAD AB OEL	TWA	10 mg/m3	
HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	
		CAD ON OEL	STEL	15 ppm	
		ACGIH	TWA	1 ppm	
		ACGIH	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OEL (QUE)	TWA	10 ppm	14 mg/m3
		OEL (QUE)	STEL	15 ppm	21 mg/m3
		CAD BC OEL	Ceiling	10 ppm	
		CAD SK OEL		10 ppm	
		CAD SK OEL		15 ppm	
1-Propanethiol	107-03-9	NIOSH	Ceil_Time	0.5 ppm	1.6 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3
ETHYLBENZENE	100-41-4	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	125 ppm	543 mg/m3

CAD ON OEL	TWA	100 ppm	435 mg/m3
CAD ON OEL	STEL	125 ppm	540 mg/m3
ACGIH	TWA	100 ppm	
ACGIH	STEL	125 ppm	
NIOSH	REL	100 ppm	435 mg/m3
NIOSH	STEL	125 ppm	545 mg/m3
OSHA Z1	PEL	100 ppm	435 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	Amber
Odour	:	hydrocarbon-like
Physical state	:	liquid
pH	:	6.3
Boiling point/boiling range	:	35 - 285 °C (95 - 545 °F) Method: ASTM D-2887
Evaporation rate	:	1.7 compared to Butyl Acetate
Vapour pressure	:	35 - 80 kPa Method: ASTM D 323A
Density	:	0.72 - 0.77 g/cm3
Specific gravity	:	0.73 - 0.77
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	POW: < 1

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Oxidizing agents
Hazardous decomposition products	:	Carbon oxides (CO, CO2) and other toxic vapors.
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD50 rat Dose: > 5,000 mg/kg
Acute dermal toxicity	:	LD50 rabbit Dose: > 3,000 mg/kg
Acute inhalation toxicity	:	LC50 rat Exposure time: 4 h Dose: > 5 mg/l
Skin irritation	:	rabbit Result: Moderate skin irritation Method: OECD Test Guideline 404 Exposure time: 4 h
Eye irritation	:	rabbit Result: slight irritation Method: OECD Test Guideline 405
Sensitisation	:	Remarks: Did not cause sensitisation on laboratory animals.
Further information	:	Weak response in Syncrude skin assay and two Suncor short-term tests could indicate a low carcinogenic potential. Weak response on modified Ames test and UDS assay. Information given is based on data obtained from similar substances.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	:	**PETROLEUM DISTILLATES, N.O.S.**
	UN number	:	1268
	Class	:	3
	Packing group	:	I
TDG	Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.
	UN number	:	1268
	Class	:	3

Packing group : I

IATA

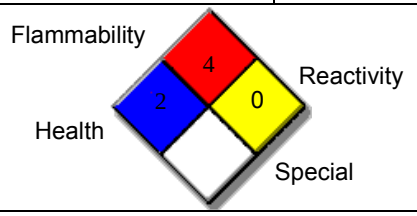
UN Number	: 1268
Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
Class	: 3
Packaging group	: I
ADR/RID-Labels	: 3
Packing instruction (cargo aircraft)	: 303
Packing instruction (passenger aircraft)	: 302

IMDG

Substance No.	: UN 1268
Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
Class	: 3
Packaging group	: I
ADR/RID-Labels	: 3
EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	4
Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

SECTION 16. OTHER INFORMATION

Date Validated : 02/07/2014

References : Hazelton Wisconsin, Primary Dermal Irritation/Corrosion Study of Naphtha in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Eye Irritation/Corrosion Study of Naphtha in Rabbits (OECD Guidelines), January 22, 1991
The American Petroleum Institute Petroleum HPV Testing Group, Gasoline Blending Streams Test Plan, September 5, 2003
Chemex Labs Alberta Inc., Characterization of Suncor Inc. process streams, 1989.
Core laboratory and Maxxam laboratory analysis, 1999.
Maxxam Analytics Inc. Laboratory Analysis 2006
Kidde Fenwal Combustion Research Center Laboratory Analysis 2006
Kidde Fenwal Combustion Research Centre Laboratory Analysis 2007
Journal of Applied Toxicology 9(1), 59-65 (1989), An Evaluation of the Acute Toxic Properties of Liquids Derived from Oil Sands.
Fundamental and Applied Toxicology 7, 228-235 (1986), Evaluation of the Dermal Carcinogenic Potential of Tar Sands Bitumen-Derived Liquids.

Validation date of previous version : 04/16/2009

General contact information : [redacted]

Safety Data Sheet

According to OSHA HCS 2012 (29 CFR 1910.1200)

SECTION 1: Identification

Product Identifier: **EP™ 2000 Flow Improver**
SDS Number: **828649**
Relevant identified uses: Flow Improver
Uses Advised Against: All others
24 Hour Emergency Phone Number: +1 800-424-9300 (USA, 24 hours)
+1 703-527-3887 (USA, 24 hours)

Manufacturer/Supplier:
Lubrizol Specialty Products, Inc.
One Briar Lake Plaza
2000 W Sam Houston Pkwy S
Third Floor, Suite 320
Houston, TX 77042

SDS Information:
URL:
www.LubrizolSpecialtyProducts.com
Email: LSPI.SDS@Lubrizol.com

Customer Service:
+1 713-339-8703 or +1 800-897-2774 (USA Toll Free)

SECTION 2: Hazard identification

Classified Hazards
H315 -- Skin corrosion/irritation -- Category 2
H336 -- Specific target organ toxicity (single exposure) -- Category 3
H373 -- Specific target organ toxicity (repeated exposure) -- Category 2
H412 -- Hazardous to the aquatic environment, chronic toxicity -- Category 3

Other Hazards
None Known

Label Elements

WARNING

Causes skin irritation
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure
Harmful to aquatic life with long lasting effects

Wash skin thoroughly after handling; Use only outdoors or in a well-ventilated area; Avoid release to the environment; Wear protective gloves/protective clothing and eye/face protection; IF ON SKIN: Wash with plenty of soap and water; If skin irritation or rash occurs: Get medical advice/attention; IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing; Call a POISON CENTER or doctor/physician if you feel unwell; Take off contaminated clothing and wash before reuse; Store in a well-ventilated place. Keep container tightly closed; Dispose of contents/container to an approved waste disposal plant

SECTION 3: Composition/information on ingredients

Chemical Name	CASRN	Concentration[1]
Non-Hazardous Materials	VARIOUS	60 - 80
Ethylene glycol	107-21-1	10 - 40
C11-C15 hydrocarbon solvent	PROPRIETARY	2 - 10

One of the following substances may also be present:

Chemical Name	CASRN	Concentration[1]
Alcohols, C12-14-secondary, ethoxylated	84133-50-6	0 - 6
Alcohol Ethoxylate 1	PROPRIETARY	0 - 6
Alcohol Ethoxylate 2	PROPRIETARY	0 - 6

[1] All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 4: First aid measures

Eye Contact: If irritation or redness develops from exposure, flush eyes with clean water. If symptoms persist, seek medical attention.

Skin Contact: Remove contaminated shoes and clothing, and flush affected area(s) with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. If skin surface is not damaged, cleanse affected area(s) thoroughly by washing with mild soap and water or a waterless hand cleaner. If irritation or redness develops, seek medical attention. Wash contaminated clothing before reuse.

Inhalation (Breathing): First aid is not normally required. If breathing difficulties develop, move victim away from source of exposure and into fresh air in a position comfortable for breathing. Seek immediate medical attention.

Ingestion (Swallowing): First aid is not normally required; however, if swallowed and symptoms develop, seek medical attention.

Most important symptoms and effects, both acute and delayed: While significant vapor concentrations are not likely, high concentrations can cause minor respiratory irritation, headache, drowsiness, dizziness, loss of coordination, disorientation and fatigue. Ingestion can cause irritation of the digestive tract, nausea, diarrhea, and vomiting. Effects of overexposure may include coughing, abdominal pain, pulmonary edema (accumulation of fluids in the lungs), irregular heartbeats (arrhythmias), visual disturbances, convulsions and coma. Dry skin and possible irritation with repeated or prolonged exposure.

SECTION 5: Firefighting measures

NFPA 704 Hazard Class

Health: 1 **Flammability:** 1 **Instability:** 0

0 (Minimal)
1 (Slight)
2 (Moderate)
3 (Serious)
4 (Severe)

Extinguishing Media: Dry chemical, carbon dioxide, foam, or water spray is recommended. Water or foam may cause frothing of materials heated above 212°F / 100°C. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.

Specific hazards arising from the chemical

Unusual Fire & Explosion Hazards: This material may burn, but will not ignite readily. If container is not properly cooled, it can rupture in the heat of a fire.

Hazardous Combustion Products: Combustion may yield carbon monoxide and aldehydes.

Special protective actions for firefighters: For fires beyond the initial stage, emergency responders in the immediate hazard area should wear protective clothing. When the potential chemical hazard is unknown, in enclosed or confined spaces, a self contained breathing apparatus should be worn. In addition, wear other appropriate protective equipment as conditions warrant (see Section 8).

Isolate immediate hazard area and keep unauthorized personnel out. Stop spill/release if it can be done safely. Move undamaged containers from immediate hazard area if it can be done safely. Water spray may be useful in minimizing or dispersing vapors and to protect personnel. Cool equipment exposed to fire with water, if it can be done safely. Avoid spreading burning liquid with water used for cooling purposes.

See Section 9 for Flammable Properties including Flash Point and Flammable (Explosive) Limits

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures: This material may burn, but will not ignite readily. Keep all sources of ignition away from spill/release. Stay upwind and away from spill/release. Avoid direct contact with material. For large spillages, notify persons down wind of the spill/release, isolate immediate hazard area and keep unauthorized personnel out. Wear appropriate protective equipment, including respiratory protection, as conditions warrant (see Section 8). See Sections 2 and 7 for additional information on hazards and precautionary measures.

Environmental Precautions: If spill/release in excess of EPA reportable quantity (see Section 15) is made into the environment, immediately notify the National Response Center (phone number 800-424-8802). Stop and contain spill/release if it can be done safely. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Use water sparingly to minimize environmental contamination and reduce disposal requirements. If spill occurs on water notify appropriate authorities and advise shipping of any hazard.

Methods and material for containment and cleaning up: Notify relevant authorities in accordance with all applicable regulations. Immediate cleanup of any spill is recommended. Dike far ahead of spill for later recovery or disposal. Absorb spill with inert material such as sand or vermiculite and place in suitable container for disposal. If spilled on water remove with appropriate methods (e.g. skimming, booms or absorbents). In case of soil contamination, remove contaminated soil for remediation or disposal, in accordance with local regulations.

Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken. See Section 13 for information on appropriate disposal.

SECTION 7: Handling and storage

Precautions for safe handling: Keep away from flames and hot surfaces. Wear eye/face protection. Wash thoroughly after handling. Do not breathe vapors or mists. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8). Spills will produce very slippery surfaces. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. Do not wear contaminated clothing or shoes.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well-ventilated area away from heat and all sources of ignition. Store only in approved containers. Keep away from any incompatible material (see Section 10). Protect container(s) against physical damage.

"Empty" containers retain residue and may be dangerous. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, or other sources of ignition. They may explode and cause injury or death. "Empty" drums should be completely drained, properly bunged, and promptly shipped to the supplier or a drum reconditioner. All containers should be disposed of in an environmentally safe manner and in accordance with governmental regulations. Before working on or in tanks which contain or have contained this material, refer to OSHA regulations, ANSI Z49.1, and other references pertaining to cleaning, repairing, welding, or other contemplated operations.

SECTION 8: Exposure controls/personal protection

Chemical Name	ACGIH	OSHA	Other
Ethylene glycol	Ceiling: 100 mg/m³	---	---
C11-C15 hydrocarbon solvent	TWA: 200 mg/m³ Skin	---	

Note: State, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local agencies, for further information.

Engineering controls: If current ventilation practices are not adequate to maintain airborne concentrations below the established exposure limits, additional engineering controls may be required.

Eye/Face Protection: The use of eye protection that meets or exceeds ANSI Z.87.1 is recommended to protect against potential eye contact, irritation, or injury. Depending on conditions of use, a face shield may be necessary.

Skin/Hand Protection: The use of gloves impervious to the specific material handled is advised to prevent skin contact. Users should check with manufacturers to confirm the breakthrough performance of their products. Suggested protective materials: Nitrile. Depending on exposure and use conditions, additional protection may be necessary to prevent skin contact including use of items such as chemical resistant boots, aprons, arm covers, hoods, coveralls, or encapsulated suits.

Respiratory Protection: Respiratory protection is not normally required under intended conditions of use. Emergencies or conditions that could result in significant airborne exposures may require the use of NIOSH approved respiratory protection. An industrial hygienist or other appropriate health and safety professional should be consulted for specific guidance under these situations.

Other Protective Equipment: Eye wash and quick-drench shower facilities should be available in the work area. Thoroughly clean shoes and wash contaminated clothing before reuse.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION 9: Physical and chemical properties

Note: Unless otherwise stated, values are determined at 20°C (68°F) and 760 mm Hg (1 atm). Data represent typical values and are not intended to be specifications.

Appearance: White
Physical Form: Liquid
Odor: Mild
Odor Threshold: No data
pH: 6-8
Vapor Density (air=1): <1
Upper Explosive Limits (vol % in air): No data
Lower Explosive Limits (vol % in air): No data
Evaporation Rate (nBuAc=1): Same as water
Particle Size: Not applicable
Percent Volatile: No data
Flammability (solid, gas): Not applicable

Flash Point: > 200 °F / > 93 °C
Test Method: Pensky-Martens Closed Cup (PMCC), ASTM D93, EPA 1010
Initial Boiling Point/Range: 222 °F / 106 °C
Vapor Pressure: 24 mm Hg @ 100°F / 37.8°C (estimate)
Partition Coefficient (n-octanol/water) (Kow): No data
Melting/Freezing Point: -9 °F / -23 °C
Auto-ignition Temperature: No data
Decomposition Temperature: No data
Specific Gravity (water=1): 1.00 - 1.02 @ 68ºF (20ºC)
Bulk Density: N/D
Viscosity: 85 cP @ 511s-1 @ 77°F (Non-Newtonian)
Solubility in Water: Disperses completely

SECTION 10: Stability and reactivity

Reactivity: Not chemically reactive.

Chemical stability: Stable under normal ambient and anticipated conditions of use.

Possibility of hazardous reactions: Hazardous reactions not anticipated.

Conditions to avoid: Avoid all possible sources of ignition.

Incompatible materials: Avoid contact with strong oxidizing agents

Hazardous decomposition products: Not anticipated under normal conditions of use.

SECTION 11: Toxicological information

Information on Toxicological Effects of Substance/Mixture

Substance / Mixture

Acute Toxicity	Hazard	Additional Information	LC50/LD50 Data
Inhalation	Unlikely to be harmful		>5 mg/L (mist, estimated)
Dermal	Unlikely to be harmful		> 2 g/kg (estimated)
Oral	Unlikely to be harmful		> 5 g/kg (estimated)

Aspiration Hazard: Not expected to be an aspiration hazard.

Skin Corrosion/Irritation: Causes skin irritation. Repeated exposure may cause skin dryness or cracking.

Serious Eye Damage/Irritation: Causes mild eye irritation.

Skin Sensitization: No information available on the mixture, however none of the components have been classified for skin sensitization (or are below the concentration threshold for classification).

Respiratory Sensitization: No information available.

Specific Target Organ Toxicity (Single Exposure): May cause drowsiness and dizziness. Based on component information

Specific Target Organ Toxicity (Repeated Exposure): May cause damage to organs through prolonged or repeated exposure. Based on component information.

Carcinogenicity: No information available on the mixture, however none of the components have been classified for carcinogenicity (or are below the concentration threshold for classification).

Germ Cell Mutagenicity: No information available on the mixture, however none of the components have been classified for germ cell mutagenicity (or are below the concentration threshold for classification).

Reproductive Toxicity: No information available on the mixture, however none of the components have been classified for reproductive toxicity (or are below the concentration threshold for classification).

Information on Toxicological Effects of Components

Ethylene glycol

Reproductive Toxicity: Ethylene glycol can cause adverse developmental effects such as skeletal and soft tissue malformations in rodents when administered during gestation at high doses. However, given the absence of reported developmental effects in humans, the relevance of defects in rodents remains largely unknown. It was concluded by the National Toxicology Program Center for the Evaluation of Risks to Human Reproduction that there is negligible concern for reproductive or developmental toxicity in humans at typical exposure levels.

Target Organ(s): Ingestion of ethylene glycol by humans results in kidney damage (renal epithelial damage and oxalate crystals in the tubules). Administration of ethylene glycol resulted in hepatocellular hyaline degeneration in male mice fed diets containing 12,500 or 25,000 ppm ethylene glycol and female mice fed diets containing 50,000 ppm ethylene glycol.

C11-C15 hydrocarbon solvent

Reproductive Toxicity: C11-C15 hydrocarbon solvent applied to the skin of female rats at 494, 330, or 165 mg/kg daily for 7 consecutive weeks (premating, mating, and gestation), or for 8 consecutive weeks in males did not result in systemic, reproductive, or developmental toxicity.

SECTION 12: Ecological information

GHS Classification:
H412 -- Hazardous to the aquatic environment, chronic toxicity -- Category 3
Harmful to aquatic life with long lasting effects.

Toxicity: Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Persistence and Degradability: Not expected to persist in the environment if spilled or released.

Bioaccumulative Potential: Not expected to bioaccumulate in the environment based on its physical properties.

Mobility in Soil: Expected to have low mobility in soil and sediments with adsorption being the predominant physical process.

Other adverse effects: None anticipated.

SECTION 13: Disposal considerations

The generator of a waste is always responsible for making proper hazardous waste determinations and needs to consider state and local requirements in addition to federal regulations. This material, if discarded as produced, would not be a federally regulated RCRA "listed" hazardous waste and is not believed to exhibit characteristics of hazardous waste. See Sections 7 and 8 for information on handling, storage and personal protection and Section 9 for physical/chemical properties. It is possible that the material as produced contains constituents which are not required to be listed in the SDS but could affect the hazardous waste determination. Additionally, use which results in chemical or physical change of this material could subject it to regulation as a hazardous waste. Container contents should be completely used and containers should be emptied prior to discard.

SECTION 14: Transport information

U.S. Department of Transportation (DOT)

Shipping Description:	***Shipping description is only for shipments that contain a CERCLA Reportable Quantity in a single container, other shipments are NOT REGULATED. See Section 15 for RQ amount.*** NA3082, Other Regulated Substances, Liquid, n.o.s (Ethylene glycol), 9, III, RQ
Non-Bulk Package Marking:	none
Non-Bulk Package Labeling:	none
Bulk Package/Placard Marking:	None / 3082 ***or*** Class 9 / 3082
Packaging - References:	None; None; 49 CFR 173.241 ***(Exceptions; Non-bulk; Bulk)***

Hazardous Substances: See Section 15 for RQ`s Yes. See Section 15 for RQ's.
Emergency Response Guide: 171

International Maritime Dangerous Goods (IMDG)
Shipping Description: *Not regulated*
Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 25.*

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:
Not applicable

International Civil Aviation Org. / International Air Transport Assoc. (ICAO/IATA)
UN/ID #: *Not regulated*
Note: *U.S. DOT compliance requirements may apply. See 49 CFR 171.22, 23 & 24.*

	LTD. QTY	Passenger Aircraft	Cargo Aircraft Only
Packaging Instruction #:	---	---	---
Max. Net Qty. Per Package:	---	---	---

SECTION 15: Regulatory information

CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

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

Acute Health Hazard:	Yes
Chronic Health Hazard:	Yes
Fire Hazard:	No
Pressure Hazard:	No
Reactive Hazard:	No

CERCLA/SARA - Section 313 and 40 CFR 372:
This material contains the following chemicals subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR 372:

Chemical Name	Concentration[1]	de minimis
Ethylene glycol	10 - 40	1.0%

EPA (CERCLA) Reportable Quantity (in pounds):
This material contains the following chemicals subject to the reporting requirements of 40 CFR 302.4:

Chemical Name	RQ
Ethylene glycol	5000 lb

California Proposition 65:
This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.

International Hazard Classification

Canada:
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.

WHMIS Hazard Class:
D1B - Toxic materials
D2A - Very toxic materials

National Chemical Inventories
All components are either listed on the US TSCA Inventory, or are not regulated under TSCA.

All components are either on the DSL, or are exempt from DSL listing requirements.

U.S. Export Control Classification Number: EAR99

SECTION 16: Other Information

Date of Issue:	Previous Issue Date:	SDS Number:	Status:
22-May-2014	18-Dec-2014	828649	FINAL

Revised Sections or Basis for Revision:
General edits

Precautionary Statement(s):

P264 - Wash skin thoroughly 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
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water
P332 + P313 - If skin irritation occurs: Get medical advice/attention
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 if you feel unwell
P362 - Take off contaminated clothing and wash before reuse
P403 + P233 - Store in a well-ventilated place. Keep container tightly closed
P501 - Dispose of contents/ container to an approved waste disposal plant

Guide to Abbreviations:
ACGIH = American Conference of Governmental Industrial Hygienists; CASRN = Chemical Abstracts Service Registry Number; CEILING = Ceiling Limit (15 minutes); CERCLA = The Comprehensive Environmental Response, Compensation, and Liability Act; EPA = Environmental Protection Agency; GHS = Globally Harmonized System; IARC = International Agency for Research on Cancer; INSHT = National Institute for Health and Safety at Work; IOPC = International Oil Pollution Compensation; LEL = Lower Explosive Limit; NE = Not Established; NFPA = National Fire Protection Association; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; PEL = Permissible Exposure Limit (OSHA); SARA = Superfund Amendments and Reauthorization Act; STEL = Short Term Exposure Limit (15 minutes); TLV = Threshold Limit Value (ACGIH); TWA = Time Weighted Average (8 hours); UEL = Upper Explosive Limit; WHMIS = Worker Hazardous Materials Information System (Canada)

Disclaimer of Expressed and implied Warranties:
The information presented in this Safety Data Sheet is based on data believed to be accurate as of the date this 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.

SAFETY DATA SHEET

1. Identification

Product identifier	**LP™ 100 Flow Improver**
Other means of identification	None.
Recommended use	Flow Improver.
Recommended restrictions	Other uses are not recommended unless an assessment demonstrates potential exposures will be controlled.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer	LiquidPower Specialty Products Inc.
Address	One BriarLake Plaza 2000 W Sam Houston Pkwy S Suite 400 Houston, TX 77042
Telephone	1.713.339.8703 or 1.800.897.2774
e-mail	SDS@LiquidPower.com
Website	www.LiquidPower.com
Emergency telephone	+1 703.527.3887 +1 800.424.9300

2. Hazard(s) identification

Physical hazards	Not classified.
Health hazards	Not classified.
Environmental hazards	Not classified.

Label elements

Hazard symbol	None.
Signal word	None.
Hazard statement	The mixture does not meet the criteria for classification.
Precautionary statements	
Prevention	Observe good industrial hygiene practices.
Response	Wash hands after handling.
Storage	Store away from incompatible materials.
Disposal	Dispose of waste and residues in accordance with local authority requirements.
Other hazards	None known.
Supplemental information	None.

3. Composition/information on ingredients

Mixtures

The components are not hazardous or are below required disclosure limits.

4. First-aid measures

Inhalation	Move to fresh air. Call a physician if symptoms develop or persist.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops and persists.
Eye contact	Rinse with water. Get medical attention if irritation develops and persists.
Ingestion	Rinse mouth. Get medical attention if symptoms occur.
Most important symptoms/effects, acute and delayed	Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed	Treat symptomatically.
General information	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire-fighting measures

Suitable extinguishing media	Water fog. Foam. Dry chemical powder. Carbon dioxide (CO_2).
Unsuitable extinguishing media	Do not use water jet as an extinguisher, as this will spread the fire.
Specific hazards arising from the chemical	During fire, gases hazardous to health may be formed.
Special protective equipment and precautions for firefighters	Self-contained breathing apparatus and full protective clothing must be worn in case of fire.
Fire fighting equipment/instructions	Move containers from fire area if you can do so without risk.
Specific methods	Use standard firefighting procedures and consider the hazards of other involved materials.
General fire hazards	No unusual fire or explosion hazards noted.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary personnel away. For personal protection, see section 8 of the SDS.
Methods and materials for containment and cleaning up	Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Absorb in vermiculite, dry sand or earth and place into containers. Following product recovery, flush area with water. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination. Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.
Environmental precautions	Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Ensure adequate ventilation. Observe good industrial hygiene practices.
Conditions for safe storage, including any incompatibilities	Store in original tightly closed container. Store away from incompatible materials (see section 10 of the SDS).

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Exposure guidelines	Follow standard monitoring procedures. No exposure standards allocated.
Appropriate engineering controls	Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Individual protection measures, such as personal protective equipment

Eye/face protection	Risk of contact: Wear approved safety goggles.
Skin protection	
Hand protection	Use suitable protective gloves if risk of skin contact. Suitable gloves can be recommended by the glove supplier.
Other	If prolonged or repeated contact is likely, chemical resistant clothing is recommended.
Respiratory protection	In case of inadequate ventilation, use respiratory protection.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.

9. Physical and chemical properties

Appearance	
Physical state	Liquid.

Form	Liquid.
Colour	White.
Odour	Mild.
Odour threshold	Not available.
pH	10 - 12.3
Melting point/freezing point	0 °C (32 °F)
Initial boiling point and boiling range	100 °C (212 °F)
Flash point	Not applicable.
Evaporation rate	Same as water.
Flammability (solid, gas)	Not applicable.
Upper/lower flammability or explosive limits	
Flammability limit - lower (%)	Not applicable.
Flammability limit - upper (%)	Not applicable.
Vapour pressure	23.8 mmHg (25°C)
Vapour density	< 1 (Air = 1)
Relative density	0.87 - 0.97 (15.6°C)
Solubility(ies)	
Solubility (water)	Disperses completely.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Viscosity	350 cP 511s-1 (Non-Newtonian) (25°C)
Other information	
Explosive properties	Not explosive.
Oxidising properties	Not oxidising.

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
Conditions to avoid	Contact with incompatible materials.
Incompatible materials	Strong oxidising agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	No adverse effects due to inhalation are expected.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	Expected to be a low ingestion hazard.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity	Not expected to be acutely toxic.

Skin corrosion/irritation	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Serious eye damage/eye irritation	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Respiratory or skin sensitisation	
Respiratory sensitisation	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Skin sensitisation	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Germ cell mutagenicity	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Carcinogenicity	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Reproductive toxicity	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Specific target organ toxicity - single exposure	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Specific target organ toxicity - repeated exposure	No information available on the mixture. However, none of the components are classified in respect of this hazard (or are present at a level below the concentration threshold for classification).
Aspiration hazard	Not an aspiration hazard.
Chronic effects	None known.
Further information	None known.

12. Ecological information

Ecotoxicity	The product is not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.
Persistence and degradability	No data available.
Bioaccumulative potential	No data available.
Mobility in soil	No data available.
Other adverse effects	No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions	Waste material from this product should not be exposed to waste streams or sumps containing any concentration of hydrocarbon. This will cause formation of gelled substances that may plug pipes. Collect and reclaim or dispose in sealed containers at licensed waste disposal site.
Local disposal regulations	Dispose in accordance with all applicable regulations.
Hazardous waste code	The waste code should be assigned in discussion between the user, the producer and the waste disposal company.
Waste from residues / unused products	Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).
Contaminated packaging	Since emptied containers may retain product residue, follow label warnings even after container is emptied. Empty containers should be taken to an approved waste handling site for recycling or disposal.

14. Transport information

TDG

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not established.

15. Regulatory information

Canadian regulations This product has been classified in accordance with the hazard criteria of the HPR and the SDS contains all the information required by the HPR.

Controlled Drugs and Substances Act

Not regulated.

Export Control List (CEPA 1999, Schedule 3)

Not listed.

Greenhouse Gases

Not listed.

Precursor Control Regulations

Not regulated.

International regulations

Stockholm Convention

Not applicable.

Rotterdam Convention

Not applicable.

Kyoto protocol

Not applicable.

Montreal Protocol

Not applicable.

Basel Convention

Not applicable.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	Yes
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates this product complies with the inventory requirements administered by the governing country(s).
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information

Issue date 19-April-2017

Revision date -

Version No. 01

List of abbreviations

LD50: Lethal Dose, 50%.
LC50: Lethal Concentration, 50%.
PBT: Persistent, bioaccumulative, toxic.
vPvB: very Persistent, very Bioaccumulative.
TWA : time weighed average.
STEL: Short term exposure limit.
TLV: Threshold Limit Value.

References

HSDB® - Hazardous Substances Data Bank
IARC Monographs. Overall Evaluations of Carcinogenicity

Disclaimer

LiquidPower Specialty Products Inc. cannot anticipate all conditions under which this information and its product, or the products of other manufacturers in combination with its product, may be used. It is the user's responsibility to ensure safe conditions for handling, storage and disposal of the product, and to assume liability for loss, injury, damage or expense due to improper use. The information in the sheet was written based on the best knowledge and experience currently available.

SAFETY DATA SHEET

Section 1. Identification

Product name : FLO FUSION3000 PIPELINE BOOSTER

Product code : FLOFUS3000

Relevant identified uses of the substance or mixture and uses advised against

Identified uses : Pipeline Booster.

Print date : 12/22/2015.

Validation date : 12/22/2015.

Version : 1

Supplier's details : Baker Petrolite LLC
12645 W. Airport Blvd.
Sugar Land, TX 77478
For Product Information/SDSs Call: 800-231-3606
(8:00 a.m. - 5:00 p.m. CST, Monday - Friday) 281-276-5400

Emergency telephone number (with hours of operation) : CHEMTREC: 800-424-9300 (U.S. 24 hour)
Baker Petrolite: 800-231-3606 (North America 24 hour)
CANUTEC: 613-996-6666 (Canada 24 hours)
CHEMTREC Int'l 01-703-527-3887 (International 24 hour)

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 4
ACUTE TOXICITY: ORAL - Category 4
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2
AQUATIC HAZARD (ACUTE) - Category 3

GHS label elements

Hazard pictograms :

Signal word : Warning

Hazard statements : Combustible liquid.
Harmful if swallowed.
Causes serious eye irritation.
Causes skin irritation.
Harmful to aquatic life.

Precautionary statements

Prevention : Wear protective gloves. Wear eye or face protection. Keep away from flames and hot surfaces. - No smoking. Avoid release to the environment. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Section 2. Hazards identification

Response : IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. Wash contaminated clothing before reuse. If skin irritation occurs: Get medical attention. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.

Storage : Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Supplemental label elements : Avoid contact with skin and clothing. Wash thoroughly after handling.

Hazards not otherwise classified : Prolonged or repeated contact may dry skin and cause irritation.

Section 3. Composition/information on ingredients

Substance/mixture : Mixture

Ingredient name	%	CAS number
Alkyl alcohol	15 - 35	Trade secret.
Hexylene glycol	20 - 30	107-41-5
Alpha olefin	5 - 10	Trade secret.
Alkyl alcohol	0 - 20	Trade secret.
Alpha olefin	1 - 5	Trade secret.
2-Butoxyethanol	1 - 5	111-76-2
Medium aliphatic naphtha	1 - 5	64742-88-7

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Continue to rinse for at least 10 minutes. Check for and remove any contact lenses. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention if adverse health effects persist or are severe. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Skin contact : Wash skin thoroughly with soap and water or use recognized skin cleanser. Remove contaminated clothing and shoes. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Section 4. First aid measures

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation. Defatting to the skin.

Ingestion : Harmful if swallowed. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : pain or irritation,watering,redness

Inhalation : No specific data.

Skin contact : irritation,redness,dryness,cracking

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard. This material is harmful to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities.

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Section 7. Handling and storage

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	**List name**	**ppm**	**mg/m³**	**Other**	**ppm**	**mg/m³**	**Other**	**ppm**	**mg/m³**	**Other**	**Notations**
Hexylene glycol	US ACGIH	-	-	-	-	-	-	25	121	-	
	OSHA PEL 1989	-	-	-	-	-	-	25	125	-	
Alpha olefin	US ACGIH	50	-	-	-	-	-	-	-	-	
2-Butoxyethanol	US ACGIH	20	-	-	-	-	-	-	-	-	
	OSHA PEL	50	240	-	-	-	-	-	-	-	[1]
	OSHA PEL 1989	25	120	-	-	-	-	-	-	-	[1]
Medium aliphatic naphtha	OSHA PEL	100	400	-	-	-	-	-	-	-	
	OSHA PEL 1989	100	400	-	-	-	-	-	-	-	

[1]Absorbed through skin.

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Hand protection : Chemical-resistant gloves.

Skin protection : Wear long sleeves to prevent repeated or prolonged skin contact.

Respiratory protection : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Opaque, Dispersion.]

Color : White

Odor : Mild. Sweet.

Odor threshold : Not available.

pH : Not available.

Melting/freezing point : Not available.

Boiling point : Not available.

Initial Boiling Point : Not available.

Flash point : Closed cup: 62.778°C (145°F) [SFCC]

Burning time : Not applicable.

Burning rate : Not applicable.

Evaporation rate : Not available.

Flammability (solid, gas) : Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

Lower and upper explosive (flammable) limits : Not available.

Vapor pressure : Not available.

Vapor density : >1 [Air = 1]

Relative density : 0.853 (20°C)

Density : 7.1287 (lbs/gal)

Solubility in water : Insoluble

Partition coefficient: n-octanol/water : Not available.

Auto-ignition temperature : Not available.

Decomposition temperature : Not available.

Viscosity : Not available.

VOC : Not available.

Pour Point : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Alkyl alcohol	LD50 Dermal	Rabbit	2000 mg/kg	-
	LD50 Oral	Rat	5000 mg/kg	-
Hexylene glycol	LD50 Dermal	Rabbit	7890 mg/kg	-
	LD50 Oral	Rat	3700 mg/kg	-
Alpha olefin	LD50 Dermal	Rabbit	10000 mg/kg	-
	LD50 Oral	Rat	10000 mg/kg	-
Alkyl alcohol	LC50 Inhalation Vapor	Rat	>21 mg/l	1 hours
	LD50 Dermal	Rabbit	2330 mg/kg	-
	LD50 Dermal	Rabbit	2542 mg/kg	-
	LD50 Dermal	Rabbit	1500 to 2000 mg/kg	-
	LD50 Dermal	Rat	3210 mg/kg	-
	LD50 Oral	Rat	710 mg/kg	-
Alpha olefin	LC50 Inhalation Gas.	Rat	32000 ppm	4 hours
	LD50 Dermal	Rabbit	>2000 mg/kg	-
	LD50 Oral	Rat	>5600 mg/kg	-
2-Butoxyethanol	LC50 Inhalation Gas.	Rat	450 ppm	4 hours
	LD50 Dermal	Guinea pig	>2000 mg/kg	-
	LD50 Dermal	Rabbit	200 mg/kg	-
	LD50 Dermal	Rabbit	99 mg/kg	-
	LD50 Oral	Guinea pig	500 to 2000 mg/kg	-
	LD50 Oral	Rabbit	320 mg/kg	-
Medium aliphatic naphtha	LD50 Dermal	Rabbit	3900 mg/kg	-
	LD50 Oral	Rat	>19500 mg/kg	-

Irritation/Corrosion

No applicable toxicity data

Sensitization

No applicable toxicity data

Mutagenicity

No applicable toxicity data

Carcinogenicity

Product/ingredient name	OSHA	IARC	NTP
2-Butoxyethanol	-	3	-

Reproductive toxicity

No applicable toxicity data

Teratogenicity

No applicable toxicity data

Specific target organ toxicity (single exposure)

Name	Category	Route of exposure	Target organs
Medium aliphatic naphtha	Category 3	Not applicable.	Narcotic effects

Specific target organ toxicity (repeated exposure)

Not applicable.

Section 11. Toxicological information

Aspiration hazard

Name	Result
Alpha olefin	ASPIRATION HAZARD - Category 1
Alpha olefin	ASPIRATION HAZARD - Category 1
Medium aliphatic naphtha	ASPIRATION HAZARD - Category 1

Information on the likely routes of exposure : Not available.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

General : Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Route	ATE value
Oral	1382.4 mg/kg
Dermal	4382.5 mg/kg
Inhalation (vapors)	382 mg/l

Section 12. Ecological information

Toxicity

Product/ingredient name	Result	Species	Exposure
Alkyl alcohol	Acute LC50 13100 µg/l Fresh water	Fish - Pimephales promelas	96 hours
	Chronic NOEC 1000 µg/l Fresh water	Daphnia - Daphnia magna	21 days
Hexylene glycol	Acute EC50 2800000 to 3200000 µg/l Fresh water	Crustaceans - Ceriodaphnia reticulata - Larvae	48 hours
	Acute EC50 3200000 to 3700000 µg/l Fresh water	Daphnia - Daphnia magna - Larvae	48 hours
	Acute LC50 10000000 µg/l Marine water	Fish - Menidia beryllina	96 hours
Alkyl alcohol	Acute LC50 120000 µg/l Marine water	Fish - Alburnus alburnus	96 hours
Alpha olefin	Acute EC50 30 mg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 25 mg/l Fresh water	Fish - Danio rerio - Young	96 hours
2-Butoxyethanol	Acute EC50 >1000 mg/l Fresh water	Daphnia - Daphnia magna	48 hours
	Acute LC50 1000 mg/l Marine water	Crustaceans - Chaetogammarus marinus - Young	48 hours
	Acute LC50 1250000 µg/l Marine water	Fish - Menidia beryllina	96 hours

Section 12. Ecological information

Persistence and degradability

Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	DOT Classification	TDG Classification	IMDG	IATA
UN number	NA1993	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	COMBUSTIBLE LIQUID, N.O.S. (Contains: Alkyl alcohol)	-	-	-
Transport hazard class(es)	Combustible liquid.	-	-	-
Packing group	III	-	-	-
Environmental hazards	No.	No.	No.	No.
Additional information	**Remarks** This material is not regulated by DOT if transported in a packaging </= 119 gallons.	-	-	-

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Section 14. Transport information

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

DOT Reportable Quantity Not applicable.

Marine pollutant Not available.

North-America NAERG : 128

Section 15. Regulatory information

U.S. Federal regulations :
TSCA 12(b) one-time export: No products were found.
TSCA 12(b) annual export notification: No products were found.
United States inventory (TSCA 8b): All components are listed or exempted.
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Not listed

SARA 302/304 : No products were found.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard

SARA 313

	Product name	CAS number	%
Supplier notification	2-Butoxyethanol	111-76-2	1 - 5

Canada

Canada (CEPA DSL): : All components are listed or exempted.

Section 16. Other information

National Fire Protection Association (U.S.A.)

History

Date of printing : 12/22/2015.

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this SDS is based on data which is considered to be accurate. Baker Hughes, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

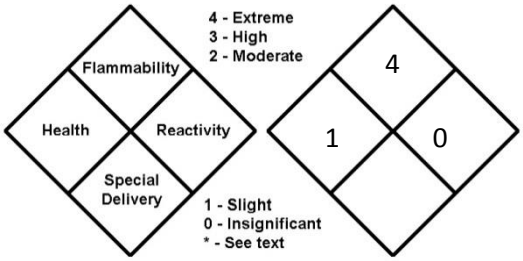
Section 16. Other information

This SDS was prepared and is to be used for this product. If the product is used as a component in another product, this SDS information may not be applicable.

REDACTED COPY

Safety Data Sheet

1. PRODUCT IDENTIFICATION

24-HOUR EMERGENCY ASSISTANCE	**GENERAL ASSISTANCE**	NFPA DIAMOND *
Gas Control **(888) 650-8099** CHEMTREC Assistance **(800) 424-9300**	Phone **(713) 650-8900** Fax **(713) 821-2080**	
SDS NUMBER **1000**		

MANUFACTURER/SUPPLIER: **Enbridge, (U.S.), Inc.**
1100 Louisiana Street, Suite 3300
Houston, Texas 77002

Name:
NATURAL GASOLINE, SWEET

CAS NUMBER:	68425-31-0
Synonym/Product Name:	Casinghead Gasoline, 14# Gasoline, M-Grade, Hydrocarbon Mixture
Chemical Family:	Aliphatic Hydrocarbon
Molecular Formula:	NA
Molecular Weight:	ND
Intended use:	Feed stock

2. HAZARD IDENTIFICATION

GHS Classification

Flammable Liquids - Category 2
Acute Toxicity Inhalation - Category 3
Germ Cell Mutagenicity - Category 1B
Carcinogenicity - Category 1A
Specific Target Organ Toxicity Single Exposure - Category 3
Specific Target Organ Toxicity Repeat Exposure - Category 1
Aspiration Toxicity - Category 1
Toxic to the Aquatic Environment Acute - Category 3

GHS LABEL ELEMENTS
Symbol(s)

Signal Word

Danger

Hazard Statements
Highly flammable liquid and vapor.
Toxic if inhaled.
May cause genetic defects.
May cause cancer.
May cause respiratory irritation.
May cause drowsiness or dizziness.
May cause damage to organs (liver, kidneys, blood, nervous system, and skin) through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.
Harmful to aquatic life.

Precautionary Statements
Material Name: Natural Gas Condensate Sweet
Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilating/lighting/equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Wear protective gloves/protective clothing/eye protection/face protection.
Do not breathe fume/gas/mist/vapors/spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in well-ventilated area.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Avoid release to the environment.
Response
IF ON SKIN (or hair): Wash with plenty of soap and water. Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep comfortable for breathing. Call a poison center/doctor.
IF SWALLOWED: Immediately call a POISON CNETER or doctor/physician. Do not induce vomiting.
IF exposed or concerned: Get medical advice/attention.
In case of fire: Use water spray, fog or firefighting foam.
Storage

3. COMPOSITION INFORMATION ON INGREDIENTS

Component	CAS NO.	Typical %*	EXPOSURE GUIDLINE	
			PPM	TYPE (AGENCY)
A Complex Combination of Hydrocarbons consisting predominately of saturated Aliphatic Hydrocarbons in the range of C5-C8	68425 – 31 – 0	86 – 100		Oil Mist, Mineral: 5 MG/M3 8-Hour TWA (OSHA) 5 MG/M3 8-Hour TWA (ACGIH) 10 MG/M3 15-Min STEL (ACGIH)
n-Hexane	110 – 54 – 3	0 – 10	500 50	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH)
Cyclohexane	110 – 82 – 7	0 – 3.5	300 300	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH)
Toluene	108 – 88 – 3	0 – 0.75	200 50	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH)
Benzene	71 – 43 – 2	0 – 0.5	 1 5 0.5	** 8-Hour TWA (OSHA) 15-Min STEL (OSHA) 8-Hour TWA (ACGIH)
Xylene	1330 – 20 – 7	Trace	100 100 150	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH) 15-Min STEL (ACGIH)
Ethylbenzene	100 – 41 – 4	Trace	100 100 125	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH) 15-Min STEL (ACGIH)

4. FIRST AID MEASURES

First Aid: Eyes
In case of contact with eyes, immediately flush with clean, low-pressure water for at least 15 min. Hold eyelids open to ensure adequate flushing. Seek medical attention.

First Aid: Skin
Remove contaminated clothing. Wash contaminated areas thoroughly with soap and water or waterless hand cleanser. Obtain medical attention if irritation or redness develops.

First Aid: Ingestion
DO NOT INDUCE VOMITING. Do not give liquids. Obtain immediate medical attention. If spontaneous vomiting occurs, lean victim forward to reduce the risk of aspiration. Monitor for breathing difficulties. Small amounts of material which enter the mouth should be rinsed out until the taste is dissipated.

First Aid: Inhalation
Remove person to fresh air. If person is not breathing, ensure an open airway and provide artificial respiration. If breathing and heart beat have stopped, administer CPR. If necessary, provide additional oxygen once breathing is restored if trained to do so. Seek medical attention immediately.

NOTES TO PHYSICIAN:

Aspiration of low viscosity petroleum hydrocarbons may cause severe pneumonitis (oil pneumonia). Vomiting should not be induced. If spontaneous vomiting has occurred after ingestion, the patient should be monitored for difficult breathing, as adverse effects of aspiration into the lungs may be delayed up to 48 hours.

In cases of acute poisoning, artificial respiration with administration of oxygen may be useful for support. Do not give Epinephrine, Ephedrine or similar adrenergic drugs. They may induce fatal ventricular fibrillation. Electrocardiographic monitoring should be carried out with severely ill patients to anticipate possible cardiac arrest.

Anemia may require the usual supportive measures. Medical evaluation of acute overexposure should include hematological determinations until stable.

In severe, acute and chronic poisoning, both renal and hepatic damage may occur and should be anticipated in such cases. Respiratory and pulmonary problems may require special attention. After severe acute symptoms have been alleviated, it may be advisable to consider periodic monitoring of the patient until such time as the likelihood of other adverse effects can be discounted.

5. FIRE FIGHTING MEASURES

General Fire Hazards
See Section 9 for Flammability Properties.
Vapors may be ignited rapidly when exposed to heat, spark, open flame or other source of ignition. Flowing product may be ignited by self-generated static electricity. When mixed with air and exposed to an ignition source, flammable vapors can burn in the open or explode in confined spaces. Being heavier than air, vapors may travel long distances to an ignition source and flash back. Runoff to sewer may cause fire or explosion hazard.

Hazardous Combustion Products
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

Extinguishing Media
SMALL FIRES: Any extinguisher suitable for Class B fires, dry chemical, CO2, water spray, firefighting foam, or gaseous extinguishing agent.
LARGE FIRES: Water spray, fog or firefighting foam. Water may be ineffective for fighting the fire, but may be used to cool fire-exposed containers

Unsuitable Extinguishing Media
None

Fire Fighting Equipment/Instructions
Small fires in the incipient (beginning) stage may typically be extinguished using handheld portable fire extinguishers and other firefighting equipment. Firefighting activities that may result in potential exposure to high heat, smoke or toxic by-products of combustion should require NIOSH/MSHA- approved pressure-demand self-contained breathing apparatus with full face piece and full protective clothing. Isolate area around container involved in fire. Cool tanks, shells, and containers exposed to fire and excessive heat with water. For massive fires the use of unmanned hose holders or monitor nozzles may be advantageous to further minimize personnel exposure. Major fires may require withdrawal, allowing the tank to burn. Large storage tank fires typically require specially trained personnel and equipment to extinguish the fire, often including the need for properly applied firefighting foam.

6. ACCIDNETAL RELEASE MEASURES

Recovery and Neutralization
Carefully contain and stop the source of the spill, if safe to do so.

Materials and Methods for Clean-Up
Take up with sand or other oil absorbing materials. Carefully shovel, scoop or sweep up into a waste container for reclamation or disposal.

Emergency Measures
Evacuate nonessential personnel and remove or secure all ignition sources. Consider wind direction; stay upwind and uphill, if possible. Evaluate the direction of product travel, diking, sewers, etc. to confirm spill areas. Product may release substantial amounts of flammable vapors and gases (e.g., methane, ethane, and propane), at or below ambient temperature depending on source and process conditions and pressure.

Personal Precautions and Protective Equipment
Response and clean-up crews must be properly trained and must utilize proper protective equipment (see Section 8).

Environmental Precautions
Protect bodies of water by diking, absorbents, or absorbent boom, if possible. Do not flush down sewer or drainage systems, unless system is designed and permitted to handle such material. The use of firefighting foam may be useful in certain situations to reduce vapors. The proper use of water spray may effectively disperse product vapors or the liquid itself, preventing contact with ignition sources or areas/equipment that require protection - do not discharge solid water stream patterns into the liquid resulting in splashing.

7. HANDLING AND STORAGE

Handling Procedures
Handle as a flammable liquid. Keep away from heat, sparks, and open flame! Electrical equipment should be approved for classified area. Bond and ground containers during product transfer to reduce the possibility of static-initiated fire or explosion.

Storage Procedures
Keep away from flame, sparks, excessive temperatures and open flame. Use approved vented containers. Keep containers closed and clearly labeled. Empty product containers or vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose such containers to sources of ignition.

Store in a well-ventilated area. This storage area should comply with NFPA 30 "Flammable and Combustible Liquid Code". Avoid storage near incompatible materials. The cleaning of tanks previously containing this product should follow API Recommended Practice (RP) 2013 "Cleaning Mobile Tanks in Flammable and Combustible Liquid Service" and API RP 2015 "Cleaning Petroleum Storage Tanks."

Naturally Occurring Radioactive Materials (NORM):
Industry experience indicates that natural gas contains small amounts of radon, a naturally-occurring radioactive gas. The solid decay products of radon, called radon daughters, can accumulate inside production and process equipment handling natural gas liquids. Scales, deposits, and sludges from this equipment may have a significant accumulation of this NORM.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Component	EXPOSURE GUIDLINE	
	PPM	**TYPE (AGENCY)**
A Complex Combination of Hydrocarbons consisting predominately of saturated Aliphatic Hydrocarbons in the range of C5-C8		Oil Mist, Mineral: 5 MG/M3 8-Hour TWA (OSHA) 5 MG/M3 8-Hour TWA (ACGIH) 10 MG/M3 15-Min STEL (ACGIH)
n-Hexane	500 50	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH)
Cyclohexane	300 300	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH)
Toluene	200 50	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH)
Benzene	 1 5 0.5	** 8-Hour TWA (OSHA) 15-Min STEL (OSHA) 8-Hour TWA (ACGIH)
Xylene	100 100 150	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH) 15-Min STEL (ACGIH)
Ethylbenzene	100 100 125	8-Hour TWA (OSHA) 8-Hour TWA (ACGIH) 15-Min STEL (ACGIH)

Engineering Measures
Use adequate ventilation to keep vapor concentrations of this product below occupational exposure and flammability limits, particularly in confined spaces.

Personal Protective Equipment: Respiratory
Use a positive pressure, air-supplied respirator if there is a potential for uncontrolled release, exposure levels are not known, in oxygen-deficient atmospheres, or any other circumstance where an air-purifying respirator may not provide adequate protection.

Personal Protective Equipment: Hands
Gloves constructed of nitrile or neoprene are recommended.

Personal Protective Equipment: Eyes
Safety glasses or goggles are recommended where there is a possibility of splashing or spraying.

Personal Protective Equipment: Skin and Body
Chemical protective clothing such as of E.I. DuPont TyChem®, Saranex® or equivalent recommended based on degree of exposure. Note: The resistance of specific material may vary from product to product as well as with degree of exposure. Consult manufacturer specifications for further information.

Hygiene Measures
Emergency eye wash capability should be available in the near proximity to operations presenting a potential splash exposure. Use good personal hygiene practices. Avoid repeated and/or prolonged skin exposure. Wash hands before eating, drinking, smoking, or using toilet facilities. Do not use as a cleaning solvent on the skin. Do not use gasoline or solvents (naphtha, kerosene, etc.) for washing this product from exposed skin areas. Waterless hand cleaners are effective. Promptly remove contaminated clothing and launder before reuse. Use care when laundering to prevent the formation of flammable vapors which could ignite via washer or dryer. Consider the need to discard contaminated leather shoes and gloves.

9. PHYSICAL AND CHEMICAL HAZARDS

Boiling Point:	58°F (14°C)
Specific Gravity:	0.65 – 0.67
Melting Point:	ND
% Volatile:	ND
Vapor Pressure:	14 – 31 PSI @ 100°F (38°C)
Evaporation Rate (Water = 1):	Moderately Fast
Vapor Density (Air = 1):	3 – 4
Viscosity:	ND
% Solubility in Water:	Slight
Octanol/Water Partition Coefficient:	ND
Pour Point:	ND
pH:	ND
Freezing Point:	ND
Appearance/Odor:	Clear, colorless liquid with a distant
Burning Rate :	hydrocarbon odor
VOC:	ND
	ND

10. STABILITY AND REACTIVITY

Chemical Stability
This is a stable material.

Hazardous Reaction Potential
Will not occur.

Conditions to Avoid
Avoid high temperatures, open flames, sparks, welding, smoking and other ignition sources.

Incompatible Products
Keep away from strong oxidizers.

Hazardous Decomposition Products
Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke).

11. TOXICOLOGICAL INFORMATION

A: General Product Information

May cause cancer

Exposure to light hydrocarbons in the same boiling range as this product have been associated in animal studies with effects to the central nervous system, peripheral nervous system, liver, and kidneys. The significance of these animal models to predict similar human response is uncertain. Observing good work practices and personal hygiene procedures (Sections 7 and 8) can minimize potential risks to humans.

This product contains benzene. Human health studies indicate that prolonged and/or repeated overexposure to benzene may cause damage to the blood-forming system (particularly bone marrow), and serious blood disorders such as aplastic anemia and leukemia. Benzene is listed as a human carcinogen by the NTP, IARC, OSHA and ACGIH.

B: Component Carcinogenicity

Benzene (71-43-2) ACGIH:	A1 - Confirmed Human Carcinogen
OSHA:	5 ppm STEL (Cancer hazard, Flammable, See 29 CFR 1910.1028, 15 min); 0.5 ppm Action Level; 1 ppm TWA
NIOSH:	potential occupational carcinogen
NTP:	Known Human Carcinogen (Select Carcinogen)
IARC:	Monograph 100F [in preparation]; Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans)

Reproductive Toxicity

This product is not reported to have any reproductive toxicity effects.

Specified Target Organ General Toxicity: Single Exposure

This product is not reported to have any specific target organ general toxicity single exposure effects.

Specified Target Organ General Toxicity: Repeated Exposure

Causes damage to organs (liver, kidneys, blood, nervous system and skin) through prolonged or repeated exposure.

Aspiration Respiratory Organs Hazard

The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

12. ECOLOGICAL INFORMATION

Ecotoxicity

A: General Product Information

Keep out of sewers, drainage areas and waterways. Report spills and releases, as applicable, under Federal and State regulations.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Natural gas condensates (68919-39-1) Test & Species	Conditions
96 Hr LC50 Alburnus alburnus	119 mg/L [static]
96 Hr LC50 Cyprinodon variegatus	82 mg/L [static]
72 Hr EC50 Pseudokirchneriella subcapitata	56 mg/L
24 Hr EC50 Daphnia magna	170 mg/L

Persistence/Degradability

No information available.

Bioaccumulation

No information available.

Mobility in Soil

No information available.

13. DISPOSAL CONCIDERATIONS

Waste Disposal Instructions

See Section 7 for Handling Procedures. See Section 8 for Personal Protective Equipment recommendations.

Disposal of Contaminated Containers or Packaging

Dispose of contents/container in accordance with local/regional/national/international regulations.

Waste Disposal

This product, as supplied, when discarded or disposed of, may be hazardous waste according to Federal Regulations (40 CFR 261) due to its ignitability and benzene content. Under RCRA, it is the responsibility of the user of the product to determine, at the time of disposal, whether the product meets RCRA criteria for hazardous waste.

The transportation, storage, treatment and disposal of this waste material must be conducted in compliance with 40 CFR 262, 263, 264, 268 and 270. Disposal can occur only in properly permitted facilities. Check state and local regulations for any additional requirements, as these may be more restrictive than federal laws and regulations. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Disposal of this material must be conducted in compliance with all federal, state and local regulations.

14. TRANSPORTATION INFORMATION

General Transportation Information:

DOT Proper Shipping Name (49 CFR 172.101):	Gasoline
DOT Hazard Classes (49 CFR 172.101):	3
UN/NA Code (49 CFR 172.101):	UN1203
Packing Group (49 CFR 172.101):	PGII
Bill of Lading Description (49 CFR 172.202):	Gasoline, 3, UN1203, PGII
DOT Labels Required (49 CFR 172.101):	Flammable Liquid
DOT Placards Required (49 CFR 172.504):	Flammable Liquid, UN1203

15. REGULATORY INFORMATION

All major components of this product are listed on the TSCA Inventory.

Sara Title III Information: Listed below are the hazard categories for the Superfund Amendments and Reauthorization Act (SARA) Section 311/312 (40 CRF 370):

Immediate Hazard: x Delayed Hazard: x Fire Hazard: x

Pressure Hazard: x Reactivity Hazard:_

This product contains the following toxic chemicals subject to the annual toxic chemical release reporting requirements of the Superfund Amendments and Reauthorization Act (SARA) Section 313 (40 CFR 372):

Components:	**CAS Number:**	**Maximum %**
n-Hexane	110-54-3	10
Cyclohexane	110-82-7	3.5
Benzene	71-43-2	0.5

This information is provided for SARA 313 information purposes only – not for health and safety determination.

Additional Environmental Regulatory Information: This product contains one or more components designated as hazardous substances or toxic pollutants pursuant to the Federal Clean Water Act (40 CFR 116.4 Table A; 40 CFR 401.15). Any un-permitted introduction of this product into a facility stormwater or wastewater discharge may constitute a violation of the Clean Water Act. Facilities must notify the appropriate permitting agency prior to introducing this product into the aforementioned discharges.

This product contains one or more substances listed as hazardous, toxic of flammable air pollutants under Section 112 of the Clean Air Act.

There may be specific regulations at the local, regional or state level that pertain to this product.

16. OTHER INFORMATION

REVISION DATE: **10/1/2015**

REPLACES SHEET DATED: **NA**

COMPLETED BY: **Enbridge (U.S.) Inc. EHS Department**

NOTE: The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

ENBRIDGE

Safety Data Sheet

REDACTED COPY

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Light Synthetic	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1268
	Synonyms	Premium Synthetic (PSY), Hardisty Synthetic Crude (HSC), Synthetic Sweet Blend (SYN).
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703-527-3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	
Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-5	
Benzene	71-43-2	0-5	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Decane	124-18-5	0-10	
Distillates (petroleum), hydrotreated middle	64742-46-7	0-60	
Ethylbenzene	100-41-4	0-5	
Fuels, diesel, No. 2	68476-34-6	0-30	
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	0-100	
Heptane	142-82-5	0-7	
Hexane	110-54-3	0-7	
Methylcyclohexane	108-87-2	0-7	
Naphtha (petroleum), hydrotreated light	64742-49-0	0-7	
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	0-60	
Octane	111-65-9	0-7	
o-Xylene	95-47-6	0-5	
Petroleum distillate (naphtha)	8002-05-9	0-100	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-5	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen.
- Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges. • Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

Handling	• Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	–	–	TWA 25 ppm TWA 125 mg/m^3
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm

Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Fuels, diesel, No. 2	TLV 100 mg/m^3	–	–
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
o-Xylene	TLV 100 ppm STEL 150 ppm	–	TLV 100 ppm STEL 150 ppm
Petroleum distillate (naptha)	–	–	TWA 350 mg/m^3 Ceiling 1800 mg/m^3
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES	**Eye and Face**	• Wear face shield and eye protection.
	Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
	Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
	General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION	**Physical State**	Liquid	**Odor**	Petroleum like odor
	Substance Type	Mixture	**Odor Threshold**	No data available
	Appearance	Yellow/green to Brown/black liquid		
PROPERTIES	**pH**	No data available	**Vapor pressure**	No data available
	Melting Point/ Freezing Point	No data available	**Vapor density**	No data available
	Boiling Point/ Boiling Range	-18 to 560°C -0.4 to 1040°F	**Relative density**	No data available
	Flash Point	>-35 °C >-31 °F	**Water Solubility**	Negligible
	Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
	Flammability (solid, gas)	No data available	**Decomposition temperature**	No data available
	Upper Flammability Limit	No data available	**Specific Gravity**	No data available
	Lower Flammability Limit	No data available		
	Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure

POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
Benzene	=1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Decane	–	–	>1369 ppm (Rat) h h 72300 mg/m^3 (Rat) 2 h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphtha, (petroleum), heavy, hydrotreated	= >6 g/kg (Rat)	–	= 8500 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
o-Xylene	= 3910 mg/kg (Rat)	–	–
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–

Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hexane

- This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes

- Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

Toluene

Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

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.

Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic.

Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Ethylbenzene

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.

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 (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Fuels, diesel, No. 2	A3	X	–	–	–
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Petroleum distillate (naphtha)	–	–	Group 3	–	–
Toluene	A4	–	Group 3	Evidence	–
o-Xylene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

• May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: >90-280 mg/L (Daphnia magna)	–
Distillates (petroleum), hydrotreated middle	–	LC50 96h : 35 mg/L (Pimephales promelas) LC50 96h: >10000 mg/L (Pimephales promelas)	–	–
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Fuels, diesel, No. 2	–	LC50 96 h: = 35 mg/L (Pimephales promelas)	–	–
Gas Oils, Petroleum, Hydrodesulfurized	LC50 96 h: = 35 mg/L (Pimephales promelas)	–	LC50 96 h: < 1.00 ppm (Diatomus forbesi)	–
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphtha (petroleum), hydrotreated light	–	–	LC50 96 h: = 2.6 mg/L (Chaetogammarus marinus)	–
Naphtha, (petroleum), heavy, hydrotreated	–	LC50 96 h: = 2200 mg/L (Pimephales promelas)	LC50 96 h: = 2.6 mg/L (Chaetogammarus marinus)	–
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
o-Xylene	EC50 24 h: = 55000 ug/L (Chlorella vulgaris)	–	–	LC50 96h: 1.3 ppm Crangon franciscorum (Shrimp)
Petroleum distillate (naphtha)	–	LC50: 258 mg/L Salmo gairdneri 96 h static	EC50 48 h: < 0.26 mg/L Static (Daphnia magna) EC50 24 h: = 36 mg/L (Daphnia magna)	–
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	–

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
1,2,4-Trimethylbenzene	3.78
Benzene	1.83
Butane	2.89
Cyclohexane	3.44
Decane	5.1
Ethylbenzene	3.118
Heptane	4.66
Hexane	3.90
Methylcyclohexane	3.61
Octane	5.18
o-Xylene	3.12
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Decane	Immobile
Ethylbenzene	Low
Heptane	Moderate
Hexane	High

Octane	Immobile
o-Xylene	Very High to Moderate
Petroleum distillate (naptha)	High
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1268	Petroleum Distillate, N.O.S.	3	I	Emergency response guide number: 128
TDG	UN1268	Petroleum Distillate, N.O.S.	3	I	–
IMO/IMDG	UN1268	Petroleum Distillate, N.O.S.	3	I	EmS No. F-E, S-E
IATA/ICAO	UN1268	Petroleum Distillate, N.O.S.	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	1000 lb final RQ; 454 kg final RQ
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	1000 lb RQ
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed

Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	X
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed

Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Decane	124-18-5	B3, D2B
Distillates (petroleum), hydrotreated middle	64742-46-7	Uncontrolled product according to WHMIS classification criteria
Ethylbenzene	100-41-4	B2, D2A, D2B
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Methylcyclohexane	108-87-2	B2
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	B3
Octane	111-65-9	B2, D2B
o-Xylene	95-47-6	B2, D2B

Petroleum distillate (naphtha)	8002-05-9	B2
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed

Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/13/15

REVISION DATE 5/13/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

ENBRIDGE

Safety Data Sheet

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Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Dilbit	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1993
	Synonyms	Dilbit Kearl, Diluted Kearl Bitumen, Kearl Blend, Kearl Dilbit, Kearl Lake Dilbit (KDB)
	Chemical Category	Crude oils—extremely flammable Bitumen Products
RECOMMENDED USE	Feedstock	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Benzene	71-43-2	0-1.2	
Bitumen	8052-42-4	0-85	
Hexane	110-54-3	0-3.5	
Natural Gas Condensate	68919-39-1	15-40	
Sulfur	7704-34-9	0-3.5	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time. All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA

Suitable Extinguishing Media

- SMALL FIRES: Dry chemical, CO_2, water spray or regular foam.
- LARGE FIRE: Water spray, fog or regular foam.

Unsuitable Extinguishing Media

- CAUTION: Use of water spray when fighting fire may be inefficient.
- Do not use straight streams.

FIREFIGHTING PROCEDURES

- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.
- Stay upwind.
- Ventilate closed spaces before entering.
- Fire fighters should wear complete protective clothing including self-contained breathing apparatus.
- FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products

- Carbon monoxide, Carbon dioxide (CO2), Nitrogen oxides (NOx), Oxides of sulfur, Hydrogen Sulfide.
- Aldehydes, aromatic and other hydrocarbons.

Sensitivity to Mechanical Impact

- None.

Sensitivity to Static Discharge

- Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen.
- Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions

- Evacuate personnel to safe areas.
- Remove all sources of ignition.
- Deny entry to unauthorized and unprotected personnel.
- Use personal protective equipment.
- Avoid contact with skin, eyes and clothing.
- Stop leak if you can do it without risk.
- Keep people away from and upwind of spill/leak.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- Ventilate enclosed areas.
- Do not walk through spilled material.

Protective Equipment

- Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.
- Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up

- Clean up spill immediately.
- LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.
- SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.
- Use appropriate Personal Protective Equipment (PPE).
- Use clean non-sparking tools to collect absorbed material.
- Vacuum spilled material.
- Try to work upwind of spill.
- All equipment used when handling the product must be grounded.
- Recover and return free product to proper containers
- Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.
- Do not place spilled materials back in the original container.
- Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling

- This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.
- Hydrogen sulfide (H_2S) may be given off when this material is heated.
- All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces.
- The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).
- The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
- Take precautionary measures against static discharges.

Handling

- Do not cut drill, grind or weld on empty containers since they may contain explosive residues.
- Stay upwind and vent open hatches before uploading.
- Avoid contact with skin, eyes and clothing.
- Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.
- Wear personal protective equipment.
- Remove and wash contaminated clothing before re-use.
- Do not eat, drink or smoke when using this product.
- Do not take internally.
- Wash thoroughly after handling.
- Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Bitumen	TLV 0.5 mg/m^3	–	Ceiling 5 mg/m^3
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm

APPROPRIATE ENGINEERING CONTROLS	• Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.	
INDIVIDUAL PROTECTION MEASURES	**Eye and Face**	• Wear face shield and eye protection.
	Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.

Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid
Substance Type	Mixture
Appearance	Black
Odor	Petroleum/solvent like odor
Odor Threshold	No data available

PROPERTIES

pH	No data available
Melting Point/ Freezing Point	No data available
Boiling Point/ Boiling Range	68 to 1049 °F 20 to 565°C
Flash Point	<-0.4 to 60.8 °F <-18 to 16 °C (Closed Cup)
Evaporation Rate	No data available
Flammability (solid, gas)	No data available
Upper Flammability Limit	No data available
Lower Flammability Limit	No data available
Viscosity	52 to 96 Centistoke (cSt, cS) or mm^2/sec @ 38 °C (100.4 °F)
Vapor pressure	12 to 21 kPa @ 24 °C (75.2 °F)
Vapor density	No data available
Density	900 to 1200 kg/m^3 @ 15.5 °C (59.9°F
Water Solubility	No data available
Partition coefficient: n-octanol/water	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Specific Gravity	0.94

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, hydrogen sulfide, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Bitumen	>5000 mg/kg (Rat)	–	>94.4 mg/m^3 (Rat)
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Sulfur	–	–	1660 mg/m^3 (Mammal)

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentrations (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Bitumen	A4	–	–	–	–
Hexane	–	X	–	–	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

• May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Sulfur	–	LC50 96h: <14000 ug/l (Lepomis macrochirus)	EC50 48 h: = >5000000 ug/L (Daphnia magna)	–

PERSISTENCE AND DEGRADABILITY

- Low molecular wt. component—Expected to be inherently biodegradable
- High molecular wt. component—Expected to be persistent.

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Benzene	1.83
Hexane	3.90

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
Benzene	High
Hexane	High

OTHER ADVERSE EFFECTS

- VOC (EPA Method 24): 2.353 lbs/gal

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste

- Container contents should be completely used and containers should be emptied prior to discard.
- Container 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 drum re-conditioner.
- To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1993	FLAMMABLE LIQUIDS, N.O.S.	3	I	Emergency response guide number: 128
TDG	UN1993	FLAMMABLE LIQUIDS, N.O.S.	3	I	Special Provision: 16
IMO/IMDG	UN1993	FLAMMABLE LIQUIDS, N.O.S.	3	I	EMS No. F-E, S-E
IATA/ICAO	UN1993	FORBIDDEN	–	–	–

SPECIAL RECAUTIONS FOR USER

- None specified

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	10 lb RQ

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed
Hexane	110-54-3	Not Listed
Natural gas condensates (petroleum)	68919-39-1	Not Listed
Sulfur	7704-34-9	Not Listed

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed
Hexane	110-54-3	Not Listed
Natural gas condensates (petroleum)	68919-39-1	Not Listed
Sulfur	7704-34-9	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
Benzene	71-43-2	B2, D2A, D2B
Bitumen	8052-42-4	Not Listed
Hexane	110-54-3	B2, D2A, D2B
Natural gas condensates (petroleum)	68919-39-1	Not Listed
Sulfur	7704-34-9	B4

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Benzene	71-43-2	X
Bitumen	8052-42-4	Not Listed
Hexane	110-54-3	Not Listed
Natural gas condensates (petroleum)	68919-39-1	Not Listed
Sulfur	7704-34-9	Not Listed

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 3	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 3	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 4/19/15

REVISION DATE 4/19/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: (see Section 16 for Synonyms) **CRUDE OIL, SOUR**
Product Description: Petroleum Crude Oil (>0.005% H2S)
MSDS Number: 3277

Intended Use: Feedstock

COMPANY IDENTIFICATION

Supplier: **Imperial Oil - Crude Oil Supply & Marketing**
Products & Chemicals Division
P.O. Box 2480, Station M
Calgary, ALBERTA. T2P 3M9 Canada

24 Hour Environmental / Health Emergency Telephone 1-866-232-9563
Transportation Emergency Phone Number 1-866-232-9563
Supplier General Contact 1-800-567-3776

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*	Acute Toxicity
HYDROGEN SULPHIDE	7783-06-4	0.1 - 1%	Inhalation Lethality: LC50 444 ppm (Rat)
PETROLEUM CRUDE OIL	8002-05-9	100%	Dermal Lethality: LD50 > 2.0 g/kg (Rat); Oral Lethality: LD50 > 4.3 g/kg (Rat)

Hazardous Constituent(s) Contained in Complex Substance(s)

Name	CAS#	Concentration*	Acute Toxicity
BENZENE	71-43-2	1 - 5%	None
CYCLOHEXANE	110-82-7	1 - 5%	Dermal Lethality: LD50 > 2000 mg/kg (Rabbit); Inhalation Lethality: LC50 > 19.1 mg/l (Rat)
ETHYL BENZENE	100-41-4	0.1 - 1%	Inhalation Lethality: LC50 17.8 mg/l (Rat); Oral Lethality: LD50 3.5 g/kg (Rat)
n-Hexane	110-54-3	1 - 5%	None
NAPHTHALENE	91-20-3	0.1 - 1%	Dermal Lethality: LD50 > 2500 mg/kg (Rat); Inhalation Lethality: LC50 > 0.4 mg/l (Rat); Oral Lethality: LD50 622 mg/kg (Mouse)
POLYNUCLEAR AROMATIC HYDROCARBONS		0.1 - 1%	None
TOLUENE	108-88-3	1 - 5%	None
XYLENES	1330-20-7	0.1 - 1%	Oral Lethality: LD50 > 5000 mg/kg (Rat)

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

SECTION 3 HAZARDS IDENTIFICATION

This material is considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

PHYSICAL/CHEMICAL EFFECTS

FLAMMABLE. Material can release vapours that readily form flammable mixtures. Vapour accumulation could flash and/or explode if ignited. Material can accumulate static charges which may cause an ignition.

HEALTH EFFECTS

Very toxic by inhalation. Irritating to skin. Danger of serious irreversible effects by a single exposure. If swallowed, may be aspirated and cause lung damage. Under conditions of poor personal hygiene and prolonged repeated contact, some polycyclic aromatic compounds (PACs) have been suspected as a cause of skin cancer in humans. Hydrogen sulphide, a highly toxic gas, is expected to be present. Signs and symptoms of overexposure to hydrogen sulphide include respiratory and eye irritation, dizziness, nausea, coughing, a sensation of dryness and pain in the nose, and loss of consciousness. Odour does not provide a reliable indicator of the presence of hazardous levels in the atmosphere. May be irritating to the eyes, nose, throat, and lungs. May cause cancer. Aliphatic hydrocarbon gases may build up in confined spaces and may cause dizziness, light-headedness, headache, nausea and loss of co-ordination. Continued inhalation may result in narcosis, unconsciousness, and possibly lead to death. May cause central nervous system depression. High-pressure injection under skin may cause serious damage. Exposure to benzene is associated with cancer (acute myeloid leukaemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders (see Section 11).

NFPA Hazard ID:	Health:	2	Flammability:	3	Reactivity:	0
HMIS Hazard ID:	Health:	2*	Flammability:	3	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

SKIN CONTACT

Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. If product is injected into or under the skin, or into any part of the body, regardless of the appearance of the wound or its size, the individual should be evaluated immediately by a physician as a surgical emergency. Even though initial symptoms from high pressure injection may be minimal or absent, early surgical treatment within the first few hours may significantly reduce the ultimate extent of injury. For hot product: Immediately immerse in or flush affected area with large amounts of cold water to dissipate heat. Cover with clean cotton sheeting or gauze and get prompt medical attention.

EYE CONTACT

Flush thoroughly with water for at least 15 minutes. Get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This light hydrocarbon material, or a component, may be associated with cardiac sensitisation following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

Inappropriate Extinguishing Media: Straight streams of water

FIRE FIGHTING

Fire Fighting Instructions: Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapours and to protect personnel attempting to stop a leak. Prevent run-off from fire control or dilution from entering streams, sewers or drinking water supply. Fire-fighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Highly flammable. Vapour is flammable and heavier than air. Vapour may travel across the ground and reach remote ignition sources, causing a flashback fire danger. Exposure to fire can generate toxic fumes. Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Hydrogen sulphide, Smoke, Fume, Sulphur oxides, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: -20°C (-4°F) - 35°C (95°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 15
Autoignition Temperature: >400°C (752°F)

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required, due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be

necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

For emergency responders: Respiratory protection: half-face or full-face respirator with filter(s) for organic vapor and, when applicable, H2S, or Self Contained Breathing Apparatus (SCBA) can be used depending on the size of spill and potential level of exposure. If the exposure cannot be completely characterized or an oxygen deficient atmosphere is possible or anticipated, SCBA is recommended. Chemical goggles are recommended if splashes or contact with eyes is possible. Work gloves that are resistant to aromatic hydrocarbons are recommended. If contact with hot product is possible or anticipated, gloves should be heat-resistant and thermally insulated. Note: gloves made of PVA are not water-resistant, and are not suitable for emergency use. Small spills: normal antistatic work clothes are usually adequate. Large spills: full body suit of chemical resistant, antistatic and, if necessary, heat resistant and thermal insulated material is recommended.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Large Spills: Water spray may reduce vapour, but may not prevent ignition in enclosed spaces.

Water Spill: Stop leak if you can do so without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 deg C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Use booms as a barrier to protect shorelines. Use containment booms when the ambient temperature is below the flash point of the material. Large Spills: Dyke far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

H2S is present. Avoid all personal contact. Avoid contact with skin. Crude oils can contain trace levels of natural impurities including heavy metals, such as mercury, nickel or lead, as well as naturally occurring radioactive material. As the impurity content may concentrate during refining/processing, process operations, including equipment, materials and products should be evaluated to identify and manage any potential risks to health, safety or the environment or regulatory concerns.
Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapour may be evolved from heated or agitated material. Use only with adequate ventilation. Do not enter storage areas or confined spaces unless adequately ventilated. The toxic and olfactory (sense of smell) fatigue properties of hydrogen sulfide require that air monitoring alarms and respiratory protection be used where the concentration might be expected to reach a harmful level, such as in an enclosed space, heated transport vessel, or in a spill or leak situation.
Material may contain trace amounts of naturally occurring radioactive material (NORM), which will accumulate in process equipment and storage vessels. Prevent small spills and leakage to avoid slip hazard. Material can

accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The container choice, for example storage vessel, may effect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be earthed and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Substance Name	Form	Limit/Standard			Note	Source
BENZENE		STEL	1 ppm			Supplier
BENZENE		TWA	0.5 ppm			Supplier
BENZENE		STEL	2.5 ppm		Skin	ACGIH
BENZENE		TWA	0.5 ppm		Skin	ACGIH
CYCLOHEXANE		TWA	100 ppm			ACGIH
ETHYL BENZENE		TWA	20 ppm			ACGIH
HYDROGEN SULPHIDE		STEL	14 mg/m3	10 ppm		Supplier
HYDROGEN SULPHIDE		TWA	7 mg/m3	5 ppm		Supplier
HYDROGEN SULPHIDE		STEL	5 ppm			ACGIH
HYDROGEN SULPHIDE		TWA	1 ppm			ACGIH
n-Hexane		TWA	50 ppm		Skin	ACGIH
NAPHTHALENE		STEL	15 ppm		Skin	ACGIH
NAPHTHALENE		TWA	10 ppm		Skin	ACGIH
TOLUENE		TWA	20 ppm			ACGIH
XYLENES		STEL	150 ppm			ACGIH
XYLENES		TWA	100 ppm			ACGIH

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Use explosion-proof ventilation equipment to stay below exposure limits.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Positive-pressure, air-supplied respirator in areas where H2S vapours may accumulate.

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapour warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended. If contact with forearms is likely wear gauntlet style gloves.

Eye Protection: Chemical goggles are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practise good housekeeping.

ENVIRONMENTAL CONTROLS

Comply with applicable environmental regulations limiting discharge to air, water and soil. Protect the environment by applying appropriate control measures to prevent or limit emissions.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Colour: Dark Brown
Odour: Rotten Egg
Odour Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 °C): 0.7 - 0.95

Flash Point [Method]: -20°C (-4°F) - 35°C (95°F) [ASTM D-92]
Flammable Limits (Approximate volume % in air): LEL: 0.6 UEL: 15
Autoignition Temperature: >400°C (752°F)
Boiling Point / Range: > 20°C (68°F)
Vapour Density (Air = 1): N/D
Vapour Pressure: > 0.36 kPa (2.7 mm Hg) at 20ºC
Evaporation Rate (n-butyl acetate = 1): N/D
pH: N/A
Log Pow (n-Octanol/Water Partition Coefficient): N/D
Solubility in Water: Negligible
Viscosity: [N/D at 40 °C] | <15 cSt (15 mm2/sec) at 20°C
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: N/D
Melting Point: N/A
Pour Point: -60°C (-76°F) - 20°C (68°F)
Decomposition Temperature: N/D

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity: No end point data for material.	Highly toxic.
Irritation: No end point data for material.	Elevated temperatures or mechanical action may form vapours, mist, or fumes which may be irritating to the eyes, nose, throat, or lungs.
Ingestion	
Toxicity (Rat): LD50 > 5000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Skin	
Toxicity (Rabbit): LD50 > 2000 mg/kg	Minimally Toxic. Based on test data for structurally similar materials.
Irritation: Data available.	May dry the skin leading to discomfort and dermatitis. Based on test data for structurally similar materials.
Eye	
Irritation: Data available.	Irritating and will injure eye tissue. Based on test data for

structurally similar materials

CHRONIC/OTHER EFFECTS

For the product itself:

Vapour/aerosol concentrations above recommended exposure levels are irritating to the eyes and respiratory tract, may cause headaches, dizziness, anaesthesia, drowsiness, unconsciousness and other central nervous system effects including death. May cause central nervous system disorder (e.g., narcosis involving a loss of coordination, weakness, fatigue, mental confusion and blurred vision) and/or damage. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Very high exposure (confined spaces / abuse) to light hydrocarbons may result in abnormal heart rhythm (arrhythmias). Concurrent high stress levels and/or co-exposure to high levels of hydrocarbons (above occupational exposure limits), and to heart-stimulating substances like epinephrine, nasal decongestants, asthma drugs, or cardiovascular drugs may initiate arrhythmias.
Crude oil: Contains polycyclic aromatic compounds (PACs). Prolonged and / or repeated exposure by skin or inhalation of certain PACs may cause cancer of the skin, lung, and of other sites of the body. In animal studies, some crudes produced skin tumors in mice, while other crudes produced no tumors. Developmental studies of crude oil in lab animals showed reduced fetal weight and increased fetal resorptions at maternally toxic levels. Repeated dermal exposure to crude oils in rats resulted in toxicity to the blood, liver, thymus, and bone morrow.

Contains:

BENZENE: Caused cancer (acute myeloid leukemia and myelodysplastic syndrome), damage to the blood-producing system, and serious blood disorders in human studies. Caused genetic effects and effects on the immune system in laboratory animal and some human studies. Caused toxicity to the fetus and cancer in laboratory animal studies. HYDROGEN SULPHIDE: Chronic health effects due to repeated exposures to low levels of H2S have not been established. High level (700 ppm) acute exposure can result in sudden death. High concentrations will lead to cardiopulmonary arrest due to nervous system toxicity and pulmonary edema. Lower levels (150 ppm) may overwhelm sense of smell, eliminating warning of exposure. Symptoms of overexposure to H2S include headache, fatigue, insomnia, irritability, and gastrointestinal problems. Repeated exposures to approximately 25 ppm will irritate mucous membranes and the respiratory system and have been implicated in some eye damage. NAPHTHALENE: Exposure to high concentrations of naphthalene may cause destruction of red blood cells, anemia, and cataracts. Naphthalene caused cancer in laboratory animal studies, but the relevance of these findings to humans is uncertain.
N-HEXANE: Prolonged and/or repeated exposures to n-Hexane can cause progressive and potentially irreversible damage to the peripheral nervous system (e.g. fingers, feet, arms, legs, etc.). Simultaneous exposure to Methyl Ethyl Ketone (MEK) or Methyl Isobutyl Ketone (MIBK) and n-Hexane can potentiate the risk of adverse effects from n-Hexane on the peripheral nervous system. n-Hexane has been shown to cause testicular damage at high doses in male rats. The relevance of this effect for humans is unknown. TOLUENE : Concentrated, prolonged or deliberate inhalation may cause brain and nervous system damage. Prolonged and repeated exposure of pregnant animals (> 1500 ppm) have been reported to cause adverse fetal developmental effects. ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.
XYLENES: High exposures to xylenes in some animal studies have been reported to cause health effects on the developing embryo/fetus. These effects were often at levels toxic to the mother. The significance of these findings to humans has not been determined.

CMR Status:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	1, 4, 5
CYCLOHEXANE	110-82-7	4

ETHYL BENZENE	100-41-4	3, 4
HYDROGEN SULPHIDE	7783-06-4	4
n-Hexane	110-54-3	4
NAPHTHALENE	91-20-3	3, 4
TOLUENE	108-88-3	4
XYLENES	1330-20-7	4

--REGULATORY LISTS SEARCHED--

1 = IARC 1
2 = IARC 2A
3 = IARC 2B
4 = ACGIH ALL
5 = ACGIH A1
6 = ACGIH A2

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms. May cause long-term adverse effects in the aquatic environment.

MOBILITY

More volatile component -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

Less volatile component -- Low solubility and floats and is expected to migrate from water to the land. Expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:

Low molecular wt. component -- Expected to be inherently biodegradable

High molecular wt. component -- Expected to biodegrade slowly.

Photolysis:

More water soluble component -- Expected to degrade at a moderate rate in water when exposed to sunlight.

Atmospheric Oxidation:

More volatile component -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL

Components -- Has the potential to bioaccumulate.

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS

Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (TDG)

Proper Shipping Name: PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Hazard Class & Division: 3 (6.1)
UN Number: 3494
Packing Group: I

Footnote: If shipped over water, product TDG classification as shown below for SEA (IMDG).

LAND (DOT)

Proper Shipping Name: PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Hazard Class & Division: 3
ID Number: 3494
Packing Group: I
ERG Number: 131
Label(s): 3 (6.1)
Transport Document Name: UN3494, PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC, 3 (6.1), PG I

SEA (IMDG)

Proper Shipping Name: PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC
Hazard Class & Division: 3
EMS Number: F-E, S-E
UN Number: 3494
Packing Group: I
Label(s): 3 (6.1)
Transport Document Name: UN3494, PETROLEUM SOUR CRUDE OIL, FLAMMABLE, TOXIC, 3 (6.1), PG I, (-20°C c.c.)

AIR (IATA)

Proper Shipping Name: FORBIDDEN

SECTION 15 REGULATORY INFORMATION

WHMIS Classification: Class B, Division 2: Flammable Liquids Class D, Division 1, Subdivision A: Very Toxic Material Class D, Division 2, Subdivision B: Toxic Material

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

CEPA: All components of this material are either on the Canadian Domestic Substances List (DSL), exempt, or have been notified under CEPA.

Complies with the following national/regional chemical inventory requirements AICS, DSL, ENCS, IECSC, KECI, PICCS, TSCA

The Following Ingredients are Cited on the Lists Below:

Chemical Name	CAS Number	List Citations
BENZENE	71-43-2	6
CYCLOHEXANE	110-82-7	6
n-Hexane	110-54-3	6
TOLUENE	108-88-3	6

--REGULATORY LISTS SEARCHED--

1 = TSCA 4
2 = TSCA 5a2
3 = TSCA 5e
4 = TSCA 6
5 = TSCA 12b
6 = NPRI

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 09: Boiling Point C(F) information was modified.
Section 11: Inhalation Lethality Test Data information was modified.
Section 11: Dermal Irritation Test Data information was modified.
Section 11: Eye Irritation Test Data information was modified.
Section 11: Inhalation Lethality Test Comment information was modified.
Section 09: Flash Point C(F) information was modified.
Section 09 Viscosity information was modified.
Section 14: Packing Group information was modified.
Section 14: Transport Document Name information was modified.
Section 14: Proper Shipping Name information was modified.
Section 14: Packing Group information was modified.
Section 14: Packing Group information was modified.
Section 14: Transport Document Name information was modified.
Section 16: First Aid Skin information was modified.
Section 14: Hazard Class & Division - Header information was deleted.
Section 14: Hazard Class information was deleted.
Section 14: UN Number - Header information was deleted.
Section 14: UN Number information was deleted.
Section 14: Packing Group - Header information was deleted.
Section 14: Packing Group information was deleted.

Section 14: Label(s) - Header information was deleted.
Section 14: Label(s) information was deleted.
Section 14: Transport Document Name - Header information was deleted.
Section 14: Transport Document Name information was deleted.
SYNONYMS: DRAYTON VALLEY SOUR CRUDE (PREVIOUSLY CALLED PEMBINA SOUR), EDMONTON HIGH SOUR CRUDE (SHE), EDMONTON LOW SOUR CRUDE (ELE), LIGHT SOUR BLEND CRUDE, MIXED BLEND SOUR CRUDE, SOUR CRUDE OIL, CRUDE OIL, HIGH H2S, CRUDE OIL (>0.005% H2S)

PRECAUTIONARY LABEL TEXT:
WHMIS Classification: Class B, Division 2: Flammable Liquids Class D, Division 1, Subdivision A: Very Toxic Material Class D, Division 2, Subdivision B: Toxic Material

HEALTH HAZARDS
Very toxic by inhalation. Irritating to skin. Danger of serious irreversible effects by a single exposure. If swallowed, may be aspirated and cause lung damage.

PHYSICAL HAZARDS
FLAMMABLE. In use, may form flammable/explosive vapour-air mixture. Material can accumulate static charges which may cause an ignition.

PRECAUTIONS
H2S is present. Avoid contact with skin. Avoid contact with eyes. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Potentially toxic/irritating fumes/vapour may be evolved from heated or agitated material. Use only with adequate ventilation. Do not enter storage areas or confined spaces unless adequately ventilated. Use proper bonding and/or earthing procedures.However, bonding and earthing may not eliminate the hazard from static accumulation. The toxic and olfactory (sense of smell) fatigue properties of hydrogen sulfide require that air monitoring alarms and respiratory protection be used where the concentration might be expected to reach a harmful level, such as in an enclosed space, heated transport vessel, or in a spill or leak situation.

FIRST AID
Inhalation: Immediately remove from further exposure. Get immediate medical assistance. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. Give supplemental oxygen, if available. If breathing has stopped, assist ventilation with a mechanical device.

Eye: Flush thoroughly with water for at least 15 minutes. Get medical assistance.

Oral: Seek immediate medical attention. Do not induce vomiting.

Skin: Remove contaminated clothing. Dry wipe exposed skin and cleanse with waterless hand cleaner and follow by washing thoroughly with soap and water. For those providing assistance, avoid further skin contact to yourself or others. Wear impervious gloves. Launder contaminated clothing separately before reuse. Discard contaminated articles that cannot be laundered. For hot product: Immediately immerse in or flush affected area with large amounts of cold water to dissipate heat. Cover with clean cotton sheeting or gauze and get prompt medical attention.

FIRE FIGHTING MEDIA
Use water fog, foam, dry chemical or carbon dioxide (CO2) to extinguish flames.

SPILL/LEAK
Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do so without risk. Prevent entry into waterways, sewer, basements or confined areas. A vapour-suppressing foam may be used to reduce vapour. Fully encapsulating, vapour-protective clothing should be worn for spills and leaks with no fire.

Water Spill: Stop leak if you can do so without risk. Eliminate sources of ignition. Warn other shipping. Report spills as required to appropriate authorities. If the Flash Point exceeds the Ambient Temperature by 10 deg C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Use

Not intended or suitable for use in or around a household or dwelling.

DGN: 5003405 (1014936)

Prepared by: Imperial Oil Limited, IH and Product Safety

SECTION 1 – MATERIAL IDENTIFICATION AND USE

Material Name: CRUDE OIL (SOUR)
Synonyms: Midale Blend (M or MID), Central Alberta Crude (CAL)
Use: Process stream, fuel and lubricants production
WHMIS Classification: Class B, Div. 2; Class D, Div. 1, Sub-Div. A; Div. 2, Sub-Div. A and B
NFPA: **Fire**: 4 **Reactivity**: 0 **Health**: 4
TDG Shipping Name: Petroleum Crude Oil (contains Hydrogen Sulfide)
TDG Class: 3 **UN:** 1267
TDG Packing Group: II (boiling point 35 deg. C or above, and flash point less than 23 deg. C)
Manufacturer/Supplier: CENOVUS ENERGY INC.
500 Centre Street SE, PO Box 766
Calgary, AB T2P 0M5
Emergency Telephone: 1-877-458-8080, CANUTEC 1-613-996-6666 (Canada)
Chemical Family: Complex mixture of aliphatic and aromatic hydrocarbons, with dissolved hydrogen sulfide

SECTION 2 – HAZARDOUS INGREDIENTS OF MATERIAL

Hazardous Ingredients	Approximate Concentrations (%)	C.A.S. Nos.	LD50/LC50 (Incl. Species & Route)	Exposure Limits
Crude oil	100	8002-05-9	LD50,rat, skin,>2 g/kg	5 mg/m3 (OEL,TLV)
Benzene	0.1	71-43-2	LD50,rat,oral,930 mg/kg LC50,rat,4 hr,13200 ppm	0.5 ppm (OEL, TLV)
Hydrogen sulfide§	>20 ppm	7783-06-04	LC50, rat, 4 hrs, 444 ppm	10 ppm (OEL) 1 ppm (TLV)

OEL = 8 hr. Alberta Occupational Exposure Limit; TLV = ACGIH Threshold Limit Value (8 hrs)
§Hydrogen Sulfide in liquid, vapour phase may contain higher concentrations

SECTION 3 – PHYSICAL DATA FOR MATERIAL

Physical State: Liquid
Specific Gravity: 0.7- 0.95
Vapour Density (air=1): 2.5 - 5.0
Percent Volatiles: N.Av.
pH: N.Av.
Vapour Pressure (mmHg): 0.5-14000 @ 20 deg. C.
Odour Threshold (ppm): 0.13
Evaporation Rate: N.Av.
Boiling Pt. (deg.C): 38-500+
Freezing Pt. (deg.C): <-40
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: brown/black/green viscous liquid, rotten eggs odour
(N.AV. = not available)

SECTION 4 – FIRE AND EXPLOSION

Flammability: Yes **Conditions**: Material will ignite at normal temperatures.
Means of Extinction: Foam, CO2, dry chemical. Explosive and toxic vapours can build up in poorly ventilated areas.
Special Procedures: Use water spray to cool fire-exposed containers, and to disperse vapors if spill has not ignited. If safe to do so, cut off fuel and allow flame to burn out.
Flash Point (deg.C) & Method: <-40 (TCC)
Upper Explosive Limit (% by vol.): 44
Lower Explosive Limit (% by vol.): 0.8
Auto-Ignition Temp. (deg.C): 260
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes, may ignite
TDG Flammability Classification: 3
Hazardous Combustion Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 5 – REACTIVITY DATA

Chemical Stability: Yes **Conditions**: Heat
Incompatibility: Yes **Substances**: Oxidizing agents (eg chlorine); metals (e.g. iron, copper, lead).
Reactivity: Yes **Conditions**: Heat, strong sunlight
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, sulphur oxides

SECTION 6 – TOXICOLOGICAL PROPERTIES OF PRODUCT

Routes of Entry:
Skin Absorption Yes **Skin Contact**: Yes (liquid) **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes
Effects of Acute Exposure: Initial odour of H2S detected as low as about 0.1 ppm. Gas/vapour may cause irritation of eyes, nose and throat, dizziness and drowsiness. Hydrogen sulfide may cause a loss of sense of smell at 100 ppm. At higher concentrations, severe irritation of eyes, nose, throat and lungs, dizziness, headache, nausea, unconsciousness and respiratory failure may occur. Death may result if not revived promptly. Repeated contact with skin may cause irritation and possibly dermatitis. Absorbed through intact skin. Contact of liquid with eyes may cause severe irritation.
Effects of Chronic Exposure: Due to presence of benzene and n-hexane, long term exposure may increase the risk of anaemia, leukaemia and nervous system damage.
Sensitization to Product: No.
Exposure Limits of Product: 0.5 ppm OEL for benzene; 10 ppm OEL for H_2S
Irritancy: Yes
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

SECTION 7 – PREVENTIVE MEASURES

Personal Protective Equipment: Use positive pressure self-contained breathing apparatus or supplied air breathing apparatus where concentrations may exceed exposure limits.
Gloves: Viton (nitrile adequate for short exposure to liquid) **Respiratory**: SCBA or SABA
Eye: SCBA with full facepiece
Footwear: As per safety policy **Clothing**: As per fire protection policy
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: Stop leak if safe to do so. Use appropriate personal protective equipment. Use water spray to cool containers. Remove all ignition sources. Provide explosion-proof clearing ventilation, if possible. Prevent from entering confined spaces. Dyke and pump into containers for recycling or disposal. Notify appropriate regulatory authorities.
Waste Disposal: Contact regulatory authorities for disposal requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight and ignition sources.
Special Shipping Information: N.Av.

SECTION 8 – FIRST AID MEASURES

Skin: Flush skin with water, removing contaminated clothing. Get medical attention if irritation persists, or large area of contact. Decontaminate clothing before re-use.
Eye: Immediately flush with large amounts of lukewarm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.
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. DO NOT INDUCE VOMITING. Keep warm and at rest. Get immediate medical attention.

SECTION 9 – PREPARATION DATE OF MSDS

Prepared By: Cenovus Energy Inc. Health and Safety
Phone Number: 1-403-766-2000
Preparation Date: October 11, 2013

ENBRIDGE

Safety Data Sheet

REDACTED COPY

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Sour	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Medium Sour Blend (MSB), Central Alberta Pipeline (CAL 1), Pembina Light Sour (PLS 1), Gibsons Light Sour (GLS 1), Pembina Low Sour (PLO 1), Gibson Sour (MGS 2), Kinder Morgan High Sour (KHE 2), Pembina High Sour (PHO 2), Peace Pipe Sour (SPR 2), Rangeland Sour (RSO 2), Gibsons High Sour (GHE 2), Hardisty Light (MBL 3), Manitoba Medium (MM 4), Wespur Midale (MSM 4), Tundra Light Sour (MLS), Moose Jaw Tops (MJT), Midale (M), Light Sour Blend (LSB)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
2-Methylbutane (In Liquid form)	78-78-4	0-4	
Benzene	71-43-2	0-5	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Ethylbenzene	100-41-4	0-2	
Heptane	142-82-5	0-10	
Hexane	110-54-3	0-8	
Hydrogen Sulfide	7783-06-4	0-5	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-3	
Methylcyclopentane	96-37-7	0-3	
Naphthalene	91-20-3	0-1	
Natural gas condensates (petroleum)	64741-47-5	0-25	
Octane	111-65-9	0-10	
Pentane	109-66-0	0-3	
Petroleum	8002-05-9	0-100	
Sulfur	7704-34-9	0.5-2	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-3	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.

MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED

Refer to Section 11 - Toxicological Information

INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY

Note to the Physician

- Aspiration hazard. Symptoms may be delayed.
- Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias.
- Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA

Suitable Extinguishing Media	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.

FIREFIGHTING PROCEDURES

- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.
- Stay upwind.
- Ventilate closed spaces before entering.
- Fire fighters should wear complete protective clothing including self-contained breathing apparatus.
- FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.
- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

	Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylbutane (In Liquid form)	TWA 600 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3

Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm	–	–
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Naphthalene	TLV 10 ppm STEL 15 ppm	PEL 10 ppm PEL 50 mg/m^3	TWA 10 ppm TWA 50 mg/m^3 STEL 15 ppm STEL 75 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm

Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor Pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor Density**	>1 Air=1
Boiling Point/ Boiling Range	-20 to 550°C -4 to 1022°F	**Relative Density**	No data available
Flash Point	-40 to 100 °C -40 to 212 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition Coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition Temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition Temperature**	No data available

Lower Flammability Limit	No data available	**Specific Gravity**	0.84 to 0.88
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m^3 (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h

Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphthalene	490 mg/kg (Rat)	0.05 ml (Rabbit) 24 h	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Petroleum	>4300 mg/kg (Rat)	500 mg (Rabbit) 24 h	–
Sulfur	–	–	1660 mg/m^3 (Mammal)
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen Sulfide Gas (H_2S)

- Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.

Hexane

- This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fototoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **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. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**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. **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 (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Naphthalene	Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US 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.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Naphthalene	A4	X	2B	Evidence	
Petroleum	–		Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

- Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

- May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

- Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna)	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphthalene	EC50 24 h: = 33000 ug/L (Chlorella vulgaris)	LC50 96 h: = 1.4 mg/L (Oncorhynchus gorbuscha)	EC50 48 h: 1600 ug/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Sulfur	–	LC50 96h: <14000 ug/l (Lepomis macrochirus)	EC50 48 h: = >5000000 ug/L (Daphnia magna)	–
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89
Cyclohexane	3.44
Ethylbenzene	3.118
Heptane	3.90
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Naphthalene	3.30
Octane	5.18
Pentane	3.39
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylbutane (In Liquid form)	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Naphthalene	High to None
Octane	Immobile
Pentane	High

Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128

TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb final RQ; 45.4 kg final RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed

Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	B4, D2A
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2
Sulfur	7704-34-9	B4

Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L
Naphthalene	91-20-3	1.1 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L
Naphthalene	91-20-3	1.4 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	X
Petroleum	8002-05-9	Not Listed

Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 3	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 3	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/7/15

REVISION DATE 9/4/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

Material Safety Data Sheet

SUNCOR MKH

OS0000000003

Version 1.0 Revision Date 2014/08/07 Print Date 2014/08/12

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	SUNCOR MKH
Product code	:	100219
Manufacturer or supplier's details		SUNCOR ENERGY INC. P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Refinery Feedstock
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	liquid
Colour	black
Odour	hydrocarbon-like
Hazard Summary	Flammable liquid Irritating to eyes and skin. May cause sensitisation by skin contact. May cause cancer. May cause heritable genetic damage. May cause harm to the unborn child.

Potential Health Effects

Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system Skin Eyes
Inhalation	:	May cause respiratory tract irritation.

High concentration of vapours may induce unconsciousness.
Inhalation of high vapour concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.
Hydrogen sulphide may be released and collect in the vapor space of process vessels and storage tanks.

Skin : May cause skin irritation and/or dermatitis.
May cause allergic skin reaction.

Eyes : May cause eye irritation.

Ingestion : Aspiration hazard if swallowed - can enter lungs and cause damage.
Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC	Group 1: Carcinogenic to humans	
	Benzene	71-43-2
	1,3-BUTADIENE	106-99-0
OSHA	OSHA specifically regulated carcinogen	
	Benzene	71-43-2
	1,3-BUTADIENE	106-99-0
NTP	Known to be human carcinogen	
	Benzene	71-43-2
	1,3-BUTADIENE	106-99-0
ACGIH	Confirmed human carcinogen	
	Benzene	71-43-2
	Suspected human carcinogen	
	1,3-BUTADIENE	106-99-0

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
Bitumens	128683-24-9	50 - 80 %
Gas oils (oil sand), hydrotreated	128683-29-4	10 - 30 %
fuel, diesel no. 2	68476-34-6	4 - 15 %
Naphtha (oil sand), hydrotreated	128683-33-0	4 - 15 %
sulfur	7704-34-9	<= 3.5 %
butane	106-97-8	0 - 1.2 %
xylene	1330-20-7	0.4 - 0.8 %
benzene	71-43-2	0.04 - 0.12 %

1,3-butadiene	106-99-0	0 -	0.13 %

Product may contain trace amounts of hydrogen sulphide

SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Foam Dry chemical
Unsuitable extinguishing media	:	No information available.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray. Carbon oxides (CO, CO2), sulphur oxides (SOx), nitrogen oxides (NOx), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Hazardous combustion products	:	Carbon oxides (CO, CO2), sulphur oxides (SOx), nitrogen oxides (NOx), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Specific extinguishing methods	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Evacuate personnel to safe areas. Material can create slippery conditions. Ensure adequate ventilation.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL

		TWA	800 ppm 1,900 mg/m3	OSHA P0
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	CA AB OEL
		STEL	2.5 ppm 8 mg/m3	CA AB OEL
		TWA	0.5 ppm	CA BC OEL
		STEL	2.5 ppm	CA BC OEL
		TWA	0.5 ppm	CA ON OEL
		STEL	2.5 ppm	CA ON OEL
		TWAEV	1 ppm 3 mg/m3	CA QC OEL
		STEV	5 ppm 15.5 mg/m3	CA QC OEL
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
Bitumens	128683-24-9	TWA	5 mg/m3	
1,3-butadiene	106-99-0	TWA	2 ppm 4.4 mg/m3	CA AB OEL
		TWA	2 ppm	CA BC OEL
		TWAEV	2 ppm 4.4 mg/m3	CA QC OEL
		TWA	2 ppm	ACGIH
		TWA	1 ppm	OSHA Z-1
		STEL	5 ppm	OSHA Z-1
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	2 ppm	ACGIH
		TWA	1 ppm	OSHA Z-1
		STEL	5 ppm	OSHA Z-1

	PEL	1 ppm	OSHA CARC
	STEL	5 ppm	OSHA CARC

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.

Hand protection
Material : neoprene, nitrile. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Remarks : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Wear face-shield and protective suit for abnormal processing problems.

Skin and body protection : Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Protective measures : Wash contaminated clothing before re-use.
No special protective equipment required.

Hygiene measures : Remove and wash contaminated clothing and gloves, including the inside, before re-use.
Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid

Colour : black

Odour : hydrocarbon-like

Odour Threshold	:	No data available
pH	:	No data available
Melting point/range	:	No data available
Initial boiling point and boiling range	:	> 49 °C (120 °F) Method: ASTM D-86
Flash point	:	< -35 °C (-31 °F)
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	estimated 11.8 kPaMethod: ASTM D 323A
Relative vapour density	:	No data available
Relative density	:	estimated 0.92 - 0.94
Density	:	0.938 kg/l
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: estimated < 1
Viscosity		
Viscosity, kinematic	:	estimated 63.5 mm2/s (40 °C / 104 °F) estimated 268.5 mm2/s (15.5 °C / 59.9 °F) Method: ASTM D 445
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.

Conditions to avoid	:	Heat, flames and sparks. No data available
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: No data available
Acute inhalation toxicity	:	Remarks: No data available
Acute dermal toxicity	:	Remarks: No data available

Components:

butane:

Acute inhalation toxicity	:	LC50 Rat: 658 mg/l Exposure time: 4 h Test atmosphere: gas

xylene:

Acute oral toxicity	:	LD50 Rat: 4,300 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 5000 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: > 1,700 mg/kg,

benzene:

Acute oral toxicity	:	LD50 Rat: 930 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 13700 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: > 8,240 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

sulfur:
Result: Moderate skin irritant

xylene:
Result: Skin irritation

benzene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

sulfur:
Result: Moderate eye irritation

benzene:
Result: Moderate eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

Bitumens:
Gas oils (oil sand), hydrotreated:
fuel, diesel no. 2:
Naphtha (oil sand), hydrotreated:
sulfur:
butane:
xylene:
benzene:
1,3-butadiene:

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

No data available

Persistence and degradability

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Pow: estimated < 1

Components:

butane :

Partition coefficient: n-octanol/water	:	log Pow: 2.89

Mobility in soil

No data available

Other adverse effects

No data available

Product:

Additional ecological information	:	There is no data available for this product. This product has no known ecotoxicological effects.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1993
Proper shipping name	:	Flammable liquid, n.o.s. (Fuels, diesel, no. 2)
Class	:	3
Packing group	:	II
Labels	:	3
Packing instruction (cargo aircraft)	:	364

IMDG-Code

UN number	:	1993
Proper shipping name	:	FLAMMABLE LIQUID, N.O.S. (Fuels, diesel, no. 2)
Class	:	3
Packing group	:	II
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

49 CFR

UN/ID/NA number	:	1993
Proper shipping name	:	Flammable liquids, n.o.s. (Fuels, diesel, no. 2)
Class	:	3
Packing group	:	II
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

TDG

UN number	:	1993
Proper shipping name	:	FLAMMABLE LIQUID, N.O.S. (Fuels, diesel, no. 2)
Class	:	3
Packing group	:	II
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : B2: Flammable liquid

D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects
Flammable liquid
Teratogen
Carcinogen
Mutagen
Moderate skin irritant
Moderate eye irritant
Skin sensitiser

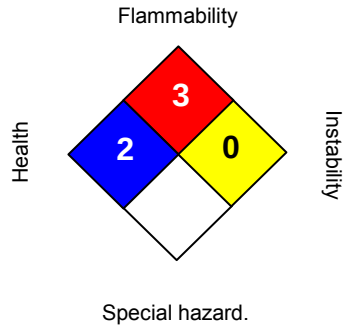
The components of this product are reported in the following inventories:

DSL This product contains one or several components listed in the Canadian NDSL list.

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2*
FLAMMABILITY	3
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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Section 1: IDENTIFICATION

Product Name:	Moose Jaw Tops
Synonyms:	Petroleum Hydrocarbon; Hydrocarbon Mixture.
Product Use:	Tops is a raw material of the petroleum refining industry. Tops contains traces of dissolved hydrogen sulphide.
Restrictions on Use:	Not available.
Manufacturer/Supplier:	Gibson Energy ULC 1700, 440 – 2nd Ave. SW Calgary, Alberta T2P 5E9
Phone Number:	(403) 206-4000
Emergency Phone:	Canutec (613) 993-6666 or Cellular *666
Date of Preparation of SDS:	January 16, 2014

Section 2: HAZARD(S) IDENTIFICATION

GHS INFORMATION

Classification:
Flammable Liquids, Category 1
Skin Irritation, Category 2
Eye Irritation, Category 2B
Germ Cell Mutagenicity, Category 1B
Carcinogenicity, Category 1A
Toxic to Reproduction, Category 2
Specific Target Organ Toxicity (Single Exposure), Category 3 - Narcotic Effects
Specific Target Organ Toxicity (Repeated Exposure), Category 1
Aspiration Hazard, Category 1

LABEL ELEMENTS

Hazard Pictogram(s):

Signal Word: Danger

Hazard Statements:
Extremely flammable liquid and vapor.
Causes skin irritation.
Causes eye irritation.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May cause drowsiness or dizziness.
Causes damage to organs through prolonged or repeated exposure.
May be fatal if swallowed and enters airways.

Precautionary Statements

Prevention:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks, open flames, and hot surfaces. – No smoking.
Keep container tightly closed.
Ground/bond container and receiving equipment.
Use explosion-proof electrical, ventilating, and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Do not breathe mist, vapors, or spray.
Wash thoroughly after handling.
Do not eat, drink or smoke when using this product.
Use only outdoors or in a well-ventilated area.
Wear protective gloves, protective clothing and eye protection.

Response:
If swallowed: Immediately call a poison center or doctor.
If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
If inhaled: Remove person to fresh air and keep comfortable for breathing.
If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Do NOT induce vomiting.
If skin irritation occurs: Get medical advice/attention.
If eye irritation persists: Get medical advice/attention.
Wash contaminated clothing before reuse.
In case of fire: Use dry chemical, CO2, water spray or regular foam to extinguish.

Storage:
Store in a well-ventilated place. Keep container tightly closed.
Keep cool.
Store locked up.

Disposal:
Dispose of contents/container in accordance with applicable regional, national and local laws and regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients with Unknown Toxicity: 45% of this product mixture consists of ingredient(s) of unknown acute toxicity.

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

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% wt./wt.
Gas oils (petroleum), heavy vacuum	Not available.	64741-57-7	30 - 60
Naphtha (petroleum), light straight-run	Not available.	64741-46-4	15 - 40
Distillates (petroleum), straight-run middle	Not available.	64741-44-2	15 - 40
Sulfur	Not available.	7704-34-9	1 - 5
Hydrogen sulfide (H2S)	Not available.	7783-06-4	< 0.01

Section 4: FIRST-AID MEASURES

Inhalation:

If inhaled: Remove person to fresh air and keep comfortable for breathing. Call a poison center or doctor if you feel unwell. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

Acute and delayed symptoms and effects: May cause drowsiness or dizziness. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This material contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

Eye Contact:

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

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

Skin Contact:

If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

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

Ingestion: If swallowed: Do NOT induce vomiting. Immediately call a poison center or doctor/physician. If vomiting occurs naturally, have victim lean forward to reduce the risk of aspiration. Never give anything by mouth to an unconscious person. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

Acute and delayed symptoms and effects: May be fatal if swallowed and enters airways. 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

Extremely flammable liquid and vapor. Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Fire involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

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

Sensitivity to Static Discharge: Take precautionary measures against static discharge. This material is sensitive to static discharge.

MEANS OF EXTINCTION

Suitable Extinguishing Media: Small Fire: Dry chemical, CO_2, 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.

Unsuitable Extinguishing Media:	Do not use straight streams. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.
Products of Combustion:	Oxides of carbon. Oxides of sulphur. Oxides of nitrogen. Aldehydes.
Protection of Firefighters:	Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. 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:	As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. 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). All equipment used when handling the product must be grounded.
Personal Precautions:	Do not touch or walk through spilled material. Use personal protection recommended in Section 8.Don full-face, positive pressure, self-contained breathing apparatus.
Environmental Precautions:	Prevent entry into waterways, sewers, basements or confined areas.
Methods for Containment:	Stop leak if you can do it without risk. A vapor suppressing foam may be used to reduce vapors.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.
Other Information:	See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Do not breathe mist, vapors, or spray. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, and hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in a well-ventilated place. Keep container tightly closed. Store locked up. 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

Gas oils (petroleum), heavy vacuum [CAS No. 64741-57-7]
- **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:** 5 mg/m³ (TWA); For Oil mist, mineral.

Naphtha (petroleum), light straight-run [CAS No. 64741-46-4]
- **ACGIH:** 100 ppm (TWA); (1980); For Stoddard solvent
- **OSHA:** 100 ppm (TWA), 400 mg/m³ (TWA); For Petroleum distillates (Naphtha).

Distillates (petroleum), straight-run middle [CAS No. 64741-44-2]
- **ACGIH:** 200 mg/m³ (TWA); Skin; A3; Application restricted to conditions in which there are negligible aerosol exposures (2003); For Kerosene
- **OSHA:** No PEL established.

Sulphur [CAS No. 7704-34-9]
- **ACGIH:** 10 mg/m³ (TWA) (Inhalable.); 3 mg/m³ (TWA) (Respirable.); For Particles (Insoluble or Poorly Soluble) Not Otherwise Specified
- **OSHA:** 15 mg/m³ (Total dust) (TWA), 5 mg/m³ (Respirable fraction) (TWA); For Particulates Not Otherwise Regulated (PNOR).

Hexane [CAS No. 110-54-3]
- **ACGIH:** 50 ppm (TWA); Skin, BEI (1996)
- **OSHA:** 500 ppm (TWA), 1800 mg/m³ (TWA); Skin.
  50 ppm (TWA) [Vacated];

Benzene [CAS No. 71-43-2]
- **ACGIH:** 0.5 ppm (TWA); 2.5 ppm (STEL); Skin; A1; BEI (1996)
- **OSHA:** 1 ppm (TWA); 5 ppm (STEL);

Toluene [CAS No. 108-88-3]
- **ACGIH:** 20 ppm (TWA); A4; BEI (2006)
- **OSHA:** 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
  100 ppm (TWA); 150 ppm (STEL) [Vacated];

Ethylbenzene [CAS No. 100-41-4]
- **ACGIH:** 20 ppm (TWA); A3; BEI (2010)
- **OSHA:** 100 ppm (TWA), 435 mg/m³ (TWA);
  125 ppm (STEL) [Vacated];

Xylene [CAS No. 1330-20-7]

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

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];

TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof electrical, ventilating, and lighting equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection: Wear safety glasses. Ensure that eyewash stations are close to the workstation location. Use equipment for eye protection that meets the standards referenced by OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.

Hand Protection: Wear protective gloves. Consult manufacturer specifications for further information.

Skin and Body Protection: Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.

Respiratory Protection: If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator with organic vapor cartridge, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.

General Hygiene Considerations: Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Light brown to dark brown liquid.
Colour:	Light brown to dark brown.
Odour:	Mercaptan-like
Odour Threshold:	Not available.
Physical State:	Liquid.
pH:	Not available.
Melting Point / Freezing Point:	Not available.
Initial Boiling Point:	-19 °C (-2.2 °F)
Boiling Range:	-19 to 504 °C (-2.2 to 939.2 °F)
Flash Point:	< -5 °C (23 °F)
Evaporation Rate:	Not available.
Flammability (solid, gas):	Not applicable.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	53 kPa at 37.8 °C (100 °F) (Reid Vapour Pressure)
Vapor Density:	Not available.
Relative Density:	Not available.
Solubilities:	Insoluble in water.
Partition Coefficient: n-Octanol/Water:	Not available.
Auto-ignition Temperature:	Not available.
Decomposition Temperature:	Not available.
Viscosity:	1.711 cSt at 40 °C (104 °F)
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.
Density:	819.9 kg/m³
Coefficient of Water/Oil Distribution:	Not available.

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 acids. Strong oxidizers. Halogens.

Hazardous Decomposition Products: Hydrogen sulphide. 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

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Gas oils (petroleum), heavy vacuum	64741-57-7	Not available.	Not available.	Not available.
Naphtha (petroleum), light straight-run	64741-46-4	Not available.	Not available.	Not available.
Distillates (petroleum), straight-run middle	64741-44-2	> 5000 mg/kg (rat)	> 2000 mg/kg (rabbit)	1700 mg/m³ (rat); 4H
Sulphur	7704-34-9	> 8437 mg/kg (rat)	Not available.	Not available.
Hexane	110-54-3	25000 mg/kg (rat)	Not available.	48000 ppm (rat); 4H
Benzene	71-43-2	930 mg/kg (rat)	> 9400 µl/kg (rabbit)	10000 ppm (rat); 7H
Toluene	108-88-3	600 mg/kg (rat)	14.1 mL/kg (rabbit)	49000 mg/m³ (rat); 4H
Ethylbenzene	100-41-4	3500 mg/kg (rat)	17800 µl/kg (rabbit)	Not available.
Xylene	1330-20-7	4300 mg/kg (rat)	> 1700 mg/kg (rabbit)	5000 ppm (rat); 4H
Hydrogen sulphide	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H

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

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

Symptoms (including delayed and immediate effects)

Inhalation: May cause drowsiness or dizziness. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This material contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

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

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May be fatal if swallowed and enters airways. 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)

Target Organs: Skin. Eyes. Gastrointestinal tract. Respiratory system. Central nervous system. Cardiovascular system. Lungs. Blood. Cardiovascular system. Bone marrow. Spleen. Liver. Kidneys. Nervous system. Thymus.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated contact may dry skin and cause irritation. High vapour concentrations, generally greater than 10% by volume, may sensitize the heart and lead to lethal cardiac arrhythmias. Gas oils may cause damage to the blood, liver or thymus through prolonged or

repeated exposure. Exposure to Naphtha may damage the blood-forming organs resulting in fatigue and anaemia (RBC), decreased resistance to infection, and/or excessive bruising and bleeding (platelet effect). Peripheral nerve damage may be evidenced by impairment of motor function (incoordination, unsteady walk, or muscle weakness in the extremities, and/or loss of sensation in the arms and legs). Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effects. Reports of chronic poisoning with Benzene, Toluene, Ethylbenzene or Xylene describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated exposure of the eyes to high concentrations of Xylenes vapour may cause reversible eye damage. Chronic inhalation exposure to xylene causes mid-frequency hearing loss in laboratory animals. Xylene reacts synergistically with n-hexane to enhance hearing loss. Hydrogen sulphide may reduce lung function; cause neurological effects such as headaches, nausea, depression and personality changes; eye and mucous membrane irritation: damage to cardiovascular system.

Carcinogenicity: May cause cancer. Gas oils cause cancer in laboratory animals. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Gas oils (petroleum), heavy vacuum	A2	Group 1	List 1	OSHA Carcinogen.	Listed.
Distillates (petroleum), straight-run middle	A3	Not listed.	Not listed.	Not listed.	Not listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen.	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Ethylbenzene	A3	Group 2B	Not listed.	OSHA Carcinogen.	Listed.
Xylene	A4	Group 3	Not listed.	Not listed.	Not listed.

Mutagenicity: May cause genetic defects.

Reproductive Effects: Suspected of damaging fertility or the unborn child. This material contains n-Hexane which may impair fertility at doses which produce other toxic effects.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Possible risk of harm to the unborn child. Gas oils cause fetotoxicity at doses which are maternally toxic. Benzene and Xylene have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Xylene reacts synergistically with n-hexane to enhance hearing loss.

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: UN1268, PETROLEUM DISTILLATES, N.O.S., 3, PG I

Class: 3

UN Number: UN1268

Packing Group: I

Label Code:

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN1268, PETROLEUM DISTILLATES, N.O.S., 3, PG I

Class: 3

UN Number: UN1268

Packing Group: I

Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

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

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

Federal Regulations

Canada

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

WHMIS Classification:

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

Hazard Symbols:

United States

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

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Hexane	Not listed.	Not listed.	5000	313	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Ethylbenzene	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Xylene	Not listed.	Not listed.	100	313	U239	Not listed.
Hydrogen sulphide	500	100	100	313s	U135	10000

State Regulations

Massachusetts

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

Component	CAS No.	RTK List
Gas oils (petroleum), heavy vacuum	64741-57-7	Listed.
Naphtha (petroleum), light straight-run	64741-46-4	Listed.
Distillates (petroleum), straight-run middle	64741-44-2	Listed.
Sulphur	7704-34-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	E
Toluene	108-88-3	Listed.
Ethylbenzene	100-41-4	Listed.
Xylene	1330-20-7	Listed.
Hydrogen sulphide	7783-06-4	E

Note: E = Extraordinarily Hazardous Substance

New Jersey

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

Component	CAS No.	RTK List
Gas oils (petroleum), heavy vacuum	64741-57-7	Listed.
Distillates (petroleum), straight-run middle	64741-44-2	Listed.
Sulphur	7704-34-9	Listed.
Hexane	110-54-3	SHHS
Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Ethylbenzene	100-41-4	SHHS
Xylene	1330-20-7	SHHS
Hydrogen sulphide	7783-06-4	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

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

Component	CAS No.	RTK List
Gas oils (petroleum), heavy vacuum	64741-57-7	Listed.
Naphtha (petroleum), light straight-run	64741-46-4	Listed.
Distillates (petroleum), straight-run middle	64741-44-2	Listed.
Sulphur	7704-34-9	Listed.
Hexane	110-54-3	Listed.
Benzene	71-43-2	ES
Toluene	108-88-3	E
Ethylbenzene	100-41-4	E
Xylene	1330-20-7	E
Hydrogen sulphide	7783-06-4	E

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

California

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

Component	Type of Toxicity
Gas oils (petroleum), heavy vacuum	cancer
Benzene	cancer; developmental, male
Toluene	developmental; female
Ethylbenzene	cancer

Section 16: OTHER INFORMATION

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

Date of Preparation of SDS:	January 16, 2014
SDS Expiry Date (Canada):	January 15, 2017
Version:	1.0
GHS SDS Prepared by:	**Deerfoot Consulting Inc.**
	Phone: (403) 720-3700

ENBRIDGE

Safety Data Sheet

REDACTED COPY

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Sour	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Medium Sour Blend (MSB), Central Alberta Pipeline (CAL 1), Pembina Light Sour (PLS 1), Gibsons Light Sour (GLS 1), Pembina Low Sour (PLO 1), Gibson Sour (MGS 2), Kinder Morgan High Sour (KHE 2), Pembina High Sour (PHO 2), Peace Pipe Sour (SPR 2), Rangeland Sour (RSO 2), Gibsons High Sour (GHE 2), Hardisty Light (MBL 3), Manitoba Medium (MM 4), Wespur Midale (MSM 4), Tundra Light Sour (MLS), Moose Jaw Tops (MJT)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	
Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
2-Methylbutane (In Liquid form)	78-78-4	0-4	
Benzene	71-43-2	0-5	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Ethylbenzene	100-41-4	0-2	
Heptane	142-82-5	0-10	
Hexane	110-54-3	0-8	
Hydrogen Sulfide	7783-06-4	0-5	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-3	
Methylcyclopentane	96-37-7	0-3	
Naphthalene	91-20-3	0-1	
Natural gas condensates (petroleum)	64741-47-5	0-25	
Octane	111-65-9	0-10	
Pentane	109-66-0	0-3	
Petroleum	8002-05-9	0-100	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-3	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

	Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES	**Storage**	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
	Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylbutane (In Liquid form)	TWA 600 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3

Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm	–	–
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Naphthalene	TLV 10 ppm STEL 15 ppm	PEL 10 ppm PEL 50 mg/m^3	TWA 10 ppm TWA 50 mg/m^3 STEL 15 ppm STEL 75 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm

Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor Pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor Density**	>1 Air=1
Boiling Point/ Boiling Range	-20 to 550°C -4 to 1022°F	**Relative Density**	No data available
Flash Point	-40 to 100 °C -40 to 212 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition Coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition Temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition Temperature**	No data available

Lower Flammability Limit	No data available	**Specific Gravity**	No data available
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m^3 (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h

Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphthalene	490 mg/kg (Rat)	0.05 ml (Rabbit) 24 h	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Propane	–	–	>800000 ppm (Rat) 15 min
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fototoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **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. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**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. **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 (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Naphthalene	Naphthalene has been evaluated in two year inhalation studies in both rats and mice. The US 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.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Naphthalene	A4	X	2B	Evidence	
Petroleum	–		Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

- Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

- May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

- Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna)	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphthalene	EC50 24 h: = 33000 ug/L (Chlorella vulgaris)	LC50 96 h: = 1.4 mg/L (Oncorhynchus gorbuscha)	EC50 48 h: 1600 ug/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89

Cyclohexane	3.44
Ethylbenzene	3.118
Heptane	3.90
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Naphthalene	3.30
Octane	5.18
Pentane	3.39
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylbutane (In Liquid form)	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Naphthalene	High to None
Octane	Immobile
Pentane	High
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste

- Container contents should be completely used and containers should be emptied prior to discard.
- Container 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 drum re-conditioner.
- To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb final RQ; 45.4 kg final RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	100 lb RQ
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)— HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)— PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed

Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	B4, D2A
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L
Naphthalene	91-20-3	1.1 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L
Naphthalene	91-20-3	1.4 µg/L (listed under Polycyclic aromatic hydrocarbons (PAHs))

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphthalene	91-20-3	X
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	X
Petroleum	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA

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Health Hazard: 3	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 3	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/7/15

REVISION DATE 5/7/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

ENBRIDGE

Safety Data Sheet

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Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Sweet	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Mixed Sweet Blend (MSW) , Pembina (P), Gibson Light (MGL), Joarcam (MLN), Pembina Sweet Blend (PSB), Rangeland Sweet (RSW), Rainbow Light (RA), Federated (FD), Light Smiley (MSY), Manitoba Sweet Tundra (MST)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Irritation	Category 3
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-1	
2-Methylbutane (In Liquid form)	78-78-4	0-30	
Benzene	71-43-2	0-3	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Cyclopentane	287-92-3	0-5	
Decane	124-18-5	0-5	
Ethane	74-84-0	0-60	
Ethylbenzene	100-41-4	0-5	
Heptane	142-82-5	0-20	
Hexane	110-54-3	0-20	
Hydrogen Sulfide	7783-06-4	0-1	
Isobutane	75-28-5	0-5	
Methylcyclohexane	108-87-2	0-6	
Methylcyclopentane	96-37-7	0-6	
Natural Gas Condensate	68919-39-1	0-100	
Natural Gas Condensates (petroleum)	64741-47-5	0-25	
Nonane	111-84-2	0-6	
Octane	111-65-9	0-15	
Pentane	109-66-0	0-30	
Petroleum	8002-05-9	0-100	
Propane	74-98-6	0-60	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-5	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges.

Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	TWA 25 ppm	–	TWA 25 ppm TWA 125 mg/m^3
2-Methylbutane (In Liquid form)	TWA 600 ppm	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Benzene, trimethyl-	TLV 25 ppm	–	–

Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
Cyclopentane	TLV 600 ppm	–	TWA 600 ppm TWA 1720 mg/m^3
Ethane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	–	–
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Isobutane	TWA 1000 ppm		
MethylCyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m^3	–	TWA 200 ppm TWA 1050 mg/m^3
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm

Propane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	TWA 1000 ppm TWA 1800 mg/m^3	TWA 1000 ppm TWA 1800 mg/m^3
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Yellow/green to Brown/black liquid		

PROPERTIES

pH	No data available	**Vapor pressure**	10 to 103 kPa @ 37.9°C
Melting Point/ Freezing Point	No data available	**Vapor density**	>1 Air=1
Boiling Point/ Boiling Range	-20 to 722°C -4 to 1331.6°F	**Relative density**	No data available

Flash Point	-40 to 100 °C -40 to 212 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition temperature**	No data available
Lower Flammability Limit	No data available	**Specific Gravity**	0.65-1.1
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m³ (Rat) 4h
2-Methylbutane (In Liquid form)	–	–	= 150,000 mg/m³ (Rat) 2 h
Benzene	1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Cyclopentane	11400 mg/kg (Rat)	–	72 g/m³ (Mouse)
Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	–
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m³ (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Isobutane	–	–	= 658,000 mg/m³ (Rat) 4 h
MethylCyclohexane	> 3200 mg/kg (Rat)	–	–
Natural gas condensates (petroleum)	–	–	= 600 mg/m³ (Rat)
Nonane	–	–	= 3200 ppm (Rat) 4 h
Octane	–	–	= 118 g/m³ (Rat) 4 h = 25260 ppm (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Petroleum	>4300 mg/kg (Rat)	–	–
Propane	–	–	>800000 ppm (Rat) 15 min
Hydrogen sulfide	–	–	= 444 ppm (Rat)
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.
Ethylbenzene	**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. **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 (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.
Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **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. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Toluene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

• May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
2-Methylbutane (In Liquid form)			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Cyclopentane			EC50 48 h: 150 nmol/cu m (Daphnia magna)	LC50 24h: 280 mmol/cu m Artemia salina (Brine Shrimp)
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: = 0.029 mg/L (Daphnia magna)	–
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–
MethylCyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Pentane	–	–	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
1,2,4-Trimethylbenzene	3.78
2-Methylbutane (In Liquid form)	2.72
Benzene	1.83
Butane	2.89
YCyclohexane	3.44
Cyclopentane	3.00
Decane	5.1
Ethane	1.81
Ethylbenzene	3.118
Heptane	4.66
Hexane	3.90
Hydrogen Sulfide	0.45
Isobutane	2.76
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Nonane	5.65
Octane	5.18
Pentane	3.39
Propane	2.36
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
2-Methylbutane (In Liquid form)	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Cyclopentane	Moderate
Decane	Immobile
Ethane	Very High
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	Very High
Methylcyclopentane	Low
Nonane	Immobile
Octane	Immobile
Pentane	High
Propane	Moderate
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste

- Container contents should be completely used and containers should be emptied prior to discard.
- Container 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 drum re-conditioner.
- To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 129
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	1000 lb RQ
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)— HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed

Propane	74-98-6	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed
Isobutane	75-28-5	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
Propane	74-98-6	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
2-Methylbutane (In Liquid form)	78-78-4	B2
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Cyclopentane	287-92-3	B2
Decane	124-18-5	B3, D2B
Ethane	74-84-0	A, B1
Ethylbenzene	100-41-4	B2, D2A, D2B
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	B2, D2B
Octane	111-65-9	B2, D2B [redacted]
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2
Propane	74-98-6	A, B1
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
2-Methylbutane (In Liquid form)	78-78-4	X
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Cyclopentane	287-92-3	Not Listed
Decane	124-18-5	Not Listed
Ethane	74-84-0	X
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	X
Isobutane	75-28-5	X
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Natural Gas Condensate	68919-39-1	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	X

Petroleum	8002-05-9	Not Listed
Propane	74-98-6	X
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/6/15

REVISION DATE 5/6/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

Material Safety Data Sheet (Canada)
Natural Gas Liquids

Section 1 – Material Identification and Use

Material Name: NATURAL GAS LIQUIDS
Use: Feedstock, fuel
WHMIS Classification: Class A; Class B, Div. 1 and Div. 2; Class D, Div. 2, Sub-Div. A and B
TDG: **UN:** 1075 **Class:** 2.1 **Packing Group:** N.Av.
Shipping Name: LIQUIFIED PETROLEUM GASES
Manufacturer/Supplier: ENCANA COPORATION
500 Centre Street SE
CALGARY, ALBERTA, T2P 2S5
Emergency Telephone: CANUTEC: 1-613-996-6666
Chemical Family: Liquified aliphatic paraffinic and aromatic hydrocarbons

Section 2 – Hazardous Ingredients of Materials

Hazardous Ingredients	Approximate Concentrations %	C.A.S. Nos.	LD50/LC50 Specify Species & Route	Exposure Limits
Natural Gas Condensates	25-85	68919-39-1	LC50, rat, >5610 mg/m3	300 & 500 ppm (STEL) (AB, TLV & BC)
Butane	10-40	106-97-8	LC50, rat, 4 hrs, 658 g/m^3	1000/ 600 (750) ppm (AB & TLV/ BC (STEL))
Propane	5-35	74-9-86	N.Av.	1000 ppm (AB & BC)
Ethane	<10	74-8-40	N.Av.	1000 ppm (AB & BC)
Benzene	0.1-1	71-43-2	LD50, rat, oral, 930 mg/kg LC50, rat, 4 hrs, 13200 ppm	0.5 & 2.5 ppm (STEL) (AB, TLV & BC)

All exposure levels are 8-hour time-weighted exposure limits unless otherwise indicated. STEL is a short-term exposure limit over a 15 minute time-weighted average. Gasoline exposure levels presented for Natural Gas Condensates.

Section 3 – Physical Data for Material

Physical State: Liquids and liquified gas
Specific Gravity: 0.54
Vapour Density (air=1): >2
Percent Volatiles, by volume: 100
Freezing Pt. (deg.C): -164
Vapour Pressure: 15000 @ 20°C
Odour Threshold (ppm): N.Av.
Evaporation Rate: N.Av.
Boiling Pt. (deg.C): -26
Coefficient of Water/Oil Distribution: <0.1
Odour & Appearance: colorless, odourless (or may have a mercaptan odour)
(N.AV. = not available N.App. = not applicable)

Section 4 – Fire and Explosion

Flammability: Yes **Conditions**: Product will ignite at normal temperatures.
Means of Extinction: Foam, 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 gas if leak has not ignited. If safe to do so, cut off fuel and allow flame to burn out.
Flash Point (deg.C): <-50 to -135
Upper Explosive Limit (% by vol.): 13
Lower Explosive Limit (% by vol.): 2
Auto-Ignition Temp. (deg.C): >400
Sensitivity to Impact: No
Sensitivity to Static Discharge: Yes, may ignite
TDG Flammability Classification: 2.1
Hazardous Combustion Products: Carbon monoxide and carbon dioxide

Section 5 – Reactivity Data

Chemical Stability: Yes **Conditions**: N.App.
Incompatibility: Yes **Substances**: Chlorine and other strong oxidizing agents
Reactivity: Yes **Conditions**: Heat, strong sunlight
Hazardous Decomposition Products: Carbon dioxide, carbon monoxide

Section 6 – Toxicological Properties of Product

Routes of Entry:
Skin Absorption: Yes **Skin Contact**: Yes (liquid) **Eye Contact**: Yes
Inhalation: **Acute**: Yes **Chronic**: Yes **Ingestion**: Yes (liquid)
Effects of Acute Exposure: Inhalation can cause headache, disorientation, dizziness, drowsiness and possibly unconsciousness. As concentration increases, oxygen deficiency and asphyxiation may occur. Rapidly expanding gas or vaporized liquid may cause frostbite to skin and eyes. Absorbed through intact skin. Contact of liquid with eyes may cause severe irritation.
Effects of Chronic Exposure: Due to presence of benzene, long term or high dose rate exposures may increase the risk of anemia and leukemia.
Sensitization to Product: No.
Irritancy: N.Av.
Synergistic Materials: None reported
Carcinogenicity: Yes **Reproductive Effects**: Possibly **Teratogenicity**: Possibly **Mutagenicity**: Possibly

Section 7 – Preventative Measures

Personal Protective Equipment: Use a NIOSH approved positive pressure self-contained breathing apparatus or supplied air breathing apparatus when concentrations may exceed exposure limits. Use approved gas detectors; however, note that combustible gas detection will likely not offer warning against overexposure to this product.
Respiratory: SCBA, SABA or cartridge APR
Eye: Full facepiece SCBA or SABA
Footwear: Covered footwear such as steel-toed boots. **Clothing** Fire retardant garments that meet NFPA 2112.
Engineering Controls: Use only in well ventilated areas. Mechanical ventilation required in confined areas. Equipment must be explosion proof.
Leaks & Spills: If safe to do so, stop gas flow. Remove all ignition sources. Provide clearing ventilation if possible. Prevent from entering confined spaces. Use appropriate personal protective equipment. Contact applicable regulatory authorities.
Waste Disposal: Controlled burning or venting in accordance with regulatory requirements.
Handling Procedures & Equipment: Avoid contact with liquid. Avoid inhalation. Bond and ground all transfers. Avoid sparking conditions. Industrial hygiene monitoring such as that detailed in NIOSH Methodology 1501 is required when handling or working near this material.
Storage Requirements: Store in a cool, dry, well ventilated area away from heat, strong sunlight and ignition sources.
Special Shipping Information: N.Av.

Section 8 – First aid Measures

Skin: If freeze burn occurs, gently bathe affected area in warm water (38 – 43 deg. C.) Do not rub. Get medical attention.
Eye: Immediately flush with large amounts of luke warm water for 15 minutes, lifting upper and lower lids at intervals. Seek medical attention if irritation persists.
Inhalation: Ensuring own safety, remove victim to fresh air. Give oxygen, artificial respiration, or CPR if needed. Seek immediate medical attention.
Ingestion: Ingestion of liquid causes freeze burns to mouth, throat, esophagus and lungs. Get immediate medical attention.

Section 9 – Preparation Date of MSDS

Prepared By: Encana Environment, Health and Safety (EH&S)
Phone Number: (403) 645-2000 Preparation Date: July 1, 2014 Expiry Date: July 1, 2017

Section 1: IDENTIFICATION

Product Name:	NGL on Enbridge
Synonyms:	Not available.
Product Use:	Refinery feedstock.
Restrictions on Use:	Not available.
Manufacturer/Supplier:	Plains Midstream Canada ULC, and Affiliates Suite 1400, 607 – 8th Avenue SW Calgary, Alberta T2P 0A7
Phone Number:	1-866-875-2554
Emergency Phone:	USA - CHEMTREC 1-800-424-9300 / CANADA - CANUTEC 1-888-CAN-UTEC (226-8832), 613-996-6666 or *666 on a cellular phone
Date of Preparation of SDS:	April 11, 2016

Section 2: HAZARD(S) IDENTIFICATION

GHS INFORMATION

Classification:
Flammable Gases, Category 1
Gases Under Pressure - Liquefied Gas
Germ Cell Mutagenicity, Category 1B
Carcinogenicity, Category 1A
Toxic to Reproduction, Category 2
Specific Target Organ Toxicity (Repeated Exposure), Category 2
Simple Asphyxiant, Category 1

LABEL ELEMENTS

Hazard Pictogram(s):

Signal Word: Danger

Hazard Statements:
Extremely flammable gas.
Contains gas under pressure; may explode if heated.
May cause genetic defects.
May cause cancer.
Suspected of damaging fertility or the unborn child.
May cause damage to organs through prolonged or repeated exposure.
May displace oxygen and cause rapid suffocation.

Precautionary Statements

Prevention:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
Do not breathe gas.
Wear protective gloves, protective clothing and eye protection.

Response: If exposed or concerned: Get medical advice/attention.
Get medical advice/attention if you feel unwell.
Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
In case of leakage, eliminate all ignition sources.

Storage: Store in a well-ventilated place.
Store locked up.
Protect from sunlight.

Disposal: Dispose of contents/container in accordance with applicable regional, national and local laws and regulations.

Hazards Not Otherwise Classified: Not applicable.

Ingredients with Unknown Toxicity: 6% of this product mixture consists of ingredient(s) of unknown acute toxicity.

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

This material is considered hazardous by the Hazardous Products Regulations, 2015.

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	Common name / Synonyms	CAS No.	% vol./vol.
Natural gas (petroleum), raw liq. mix	Not available.	64741-48-6	100
Propane	Not available.	74-98-6	55 - 80
Butane	Not available.	106-97-8	10 - 25
Propane, 2-methyl-	Isobutane	75-28-5	3 - 16
Pentane	Not available.	109-66-0	0 - 6
Ethane	Not available.	74-84-0	0 - 6
Butane, 2-methyl-	Isopentane	78-78-4	0 - 6
Hexane	Not available.	110-54-3	0 - 5
Methane	Not available.	74-82-8	0 - 3
Heptane	Not available.	142-82-5	0 - 3
Benzene	Not available.	71-43-2	0 - 1
Benzene, methyl-	Toluene	108-88-3	0 - 1

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 displace oxygen and cause rapid suffocation. Central nervous system depression can occur if product is present in concentrations that will reduce the oxygen content of air below 18 % (vol). Symptoms may include headache, lightheadedness, drowsiness, disorientation, vomiting and seizures. Unconsciousness and death may occur with severe oxygen deprivation. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

Eye Contact: If in eyes: Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor.

Acute and delayed symptoms and effects: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result.

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

Acute and delayed symptoms and effects: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

Ingestion: Not a normal route of exposure.

Acute and delayed symptoms and effects: Not a normal route of exposure.

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

Note to Physicians: Symptoms may not appear immediately.

Section 5: FIRE-FIGHTING MEASURES

FLAMMABILITY AND EXPLOSION INFORMATION

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

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

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

Sensitivity to Mechanical Impact: This material is not sensitive to mechanical impact.
Sensitivity to Static Discharge: This material is sensitive to static discharge.

MEANS OF EXTINCTION

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

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

Unsuitable Extinguishing Media: Not available.

Products of Combustion: Oxides of carbon.

Protection of Firefighters: Leaking gas fire: Do not extinguish, unless leak can be stopped safely. In case of leakage, eliminate all ignition sources. Vapors may cause dizziness or asphyxiation without warning. Some may be irritating if inhaled at high concentrations. Contact with gas or liquefied gas may cause burns, severe injury and/or frostbite. Fire may produce irritating and/or toxic gases. Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters' protective clothing will only provide limited protection. Always wear thermal protective clothing when handling refrigerated/cryogenic liquids.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures: As an immediate precautionary measure, isolate spill or leak area for at least 100 meters (330 feet) in all directions. Keep unauthorized personnel away. Stay upwind. Many gases are heavier than air and will spread along ground and collect in low or confined areas (sewers, basements, tanks). Keep out of low areas. ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). All equipment used when handling the product must be grounded.

Personal Precautions: Do not touch or walk through spilled material. Use personal protection recommended in Section 8.

Environmental Precautions: Not normally required.

Methods for Containment: Stop leak if you can do it without risk. If possible, turn leaking containers so that gas escapes rather than liquid. Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. Do not direct water at spill or source of leak.

Methods for Clean-Up: Prevent spreading of vapors through sewers, ventilation systems and confined areas. Isolate area until gas has dispersed. CAUTION: When in contact with refrigerated/cryogenic liquids, many materials become brittle and are likely to break without warning.

Other Information: See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:

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

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

Section 8: EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines
Component

Natural gas (petroleum), raw liq. mix [CAS No. 64741-48-6]
ACGIH: No TLV established.
OSHA: No PEL established.

Propane [CAS No. 74-98-6]
ACGIH: Asphyxia
OSHA: 1000 ppm (TWA), 1800 mg/m³ (TWA);

Butane [CAS No. 106-97-8]
ACGIH: 1000 ppm (STEL); (2012)
OSHA: 800 ppm (TWA) [Vacated];

Isobutane [CAS No. 75-28-5]
ACGIH: 1000 ppm (STEL); (2012)
OSHA: No PEL established.

Pentane [CAS No. 109-66-0]
ACGIH: 1000 ppm (TWA); (2013)
OSHA: 1000 ppm (TWA), 2950 mg/m³ (TWA);
600 ppm (TWA); 750 ppm (STEL) [Vacated];

Ethane [CAS No. 74-84-0]
ACGIH: Asphyxia
OSHA: No PEL established.

Isopentane [CAS No. 78-78-4]
ACGIH: 1000 ppm (TWA); (2013)
OSHA: No PEL established.

Hexane [CAS No. 110-54-3]
ACGIH: 50 ppm (TWA); Skin, BEI (1996)
OSHA: 500 ppm (TWA), 1800 mg/m³ (TWA); Skin.
50 ppm (TWA) [Vacated];

Methane [CAS No. 74-82-8]
ACGIH: Asphyxia
OSHA: No PEL established.

Heptane [CAS No. 142-82-5]
ACGIH: 400 ppm (TWA); 500 ppm (STEL); (1979)
OSHA: 500 ppm (TWA), 2000 mg/m³ (TWA);
400 ppm (TWA); 500 ppm (STEL) [Vacated];

Benzene [CAS No. 71-43-2]

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

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

Toluene [CAS No. 108-88-3]

ACGIH: 20 ppm (TWA); A4; BEI (2006)

OSHA: 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated];

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

Engineering Controls:	Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Wear cold insulating face shield and eye protection. Use equipment for eye protection that meets the standards referenced by CSA Standard CAN/CSA-Z94.3-92 and OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.
Hand Protection:	Wear protective gloves. Wear cold insulating gloves. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear protective clothing.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator that meets the requirements of CSA Standard CAN/CSA-Z94.4-11, 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. Consult a competent industrial hygienist to determine hazard potential and/or the PPE manufacturers to ensure adequate protection.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Liquefied gas.
Colour:	Colourless.
Odour:	Slight hydrocarbon.
Odour Threshold:	Not available.
Physical State:	Gas.
pH:	Not available.
Melting Point / Freezing Point:	Not available.
Initial Boiling Point:	Not available.
Boiling Range:	-42 °C (-43.6 °F) (Propane)
Flash Point:	Not available.
Evaporation Rate:	Not available.
Flammability (solid, gas):	Extremely flammable gas.
Lower Flammability Limit:	2.1 % (Propane)
Upper Flammability Limit:	9.5 % (Propane)
Vapor Pressure:	900 to 1300 kPa gauge at 37.8 °C (100 °F) (ASTM D2598M)
Vapor Density:	Not available.
Relative Density:	0.500 to 0.550 (Air = 1) at 15 °C (59 °F) (calculated)
Solubilities:	Slightly soluble in water.
Partition Coefficient: n-Octanol/Water:	Not available.
Auto-ignition Temperature:	225 °C (437 °F) (Hexane)
Decomposition Temperature:	Not available.
Viscosity:	Not available.
Percent Volatile, wt. %:	100
VOC content, wt. %:	Not available.
Density:	Not available.
Coefficient of Water/Oil Distribution:	Not available.

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: Oxidizers.

Hazardous Decomposition Products: Not available.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Product Toxicity

Oral: Not available.

Dermal: Not available.

Inhalation: Not available.

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Natural gas (petroleum), raw liq. mix	64741-48-6	Not available.	Not available.	Not available.
Propane	74-98-6	Not available.	Not available.	Not available.
Butane	106-97-8	Not available.	Not available.	658000 mg/m³ (rat); 4H
Isobutane	75-28-5	Not available.	Not available.	570000 ppm (rat); 15M
Pentane	109-66-0	400 mg/kg (rat)	Not available.	364000 mg/m³ (rat); 4H
Ethane	74-84-0	Not available.	Not available.	Not available.
Isopentane	78-78-4	Not available.	Not available.	Not available.
Hexane	110-54-3	25000 mg/kg (rat)	Not available.	48000 ppm (rat); 4H
Methane	74-82-8	Not available.	Not available.	Not available.
Heptane	142-82-5	Not available.	Not available.	103000 mg/m³ (rat); 4H
Benzene	71-43-2	930 mg/kg (rat)	> 9400 µL/kg (rabbit)	10000 ppm (rat); 7H
Toluene	108-88-3	2600 mg/kg (rat)	14.1 mL/kg (rabbit)	49000 mg/m³ (rat); 4H

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

Target Organs: Skin. Eyes. Respiratory system. Cardiovascular system. Bone marrow. Liver. Kidneys. Central nervous system. Peripheral nervous system.

Symptoms (including delayed and immediate effects)

Inhalation: May displace oxygen and cause rapid suffocation. Central nervous system depression can occur if product is present in concentrations that will reduce the oxygen content of air below 18 % (vol). Symptoms may include headache, lightheadedness, drowsiness, disorientation, vomiting and seizures. Unconsciousness and death may occur with severe oxygen deprivation. May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

Eye: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. The pain after contact with liquid can quickly subside. Permanent eye damage or blindness could result.

Skin: Contact with rapidly expanding or liquefied gas may cause irritation and/or frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain after contact with liquid can quickly subside.

Ingestion: Not a normal route of exposure.

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)

Target Organs: Skin. Eyes. Respiratory system. Blood. Cardiovascular system. Bone marrow. Liver. Kidneys. Central nervous system. Peripheral nervous system.

Chronic Effects: Hazardous by OSHA/WHMIS criteria. May cause chronic effects. Prolonged or repeated inhalation of Isopentane may cause dizziness, weakness, weight loss, anemia, nervousness, pains in the limbs and peripheral numbness. Chronic inhalation of n-Hexane may cause peripheral nerve disorders and central nervous system effects. Reports of chronic poisoning with Benzene or Toluene describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Immunodepressive effects have also been reported for Benzene.

Carcinogenicity: May cause cancer. Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Benzene	A1	Group 1	List 1	OSHA Carcinogen.	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.

Mutagenicity: May cause genetic defects.

Reproductive Effects: Suspected of damaging fertility or the unborn child.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Possible risk of harm to the unborn child. Benzene has caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Not available.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: 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: UN1075, PETROLEUM GASES, LIQUEFIED, 2.1

Class: 2.1

UN Number: UN1075

Packing Group: Not applicable.

Label Code:

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN1075, PETROLEUM GASES, LIQUEFIED, 2.1

Class: 2.1

UN Number: UN1075

Packing Group: Not applicable.

Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

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

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

Federal Regulations

United States

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

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Propane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Butane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Isobutane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Pentane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Ethane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Isopentane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Hexane	Not listed.	Not listed.	5000	313	Not listed.	Not listed.
Methane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Heptane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.

State Regulations

Massachusetts

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

Component	CAS No.	RTK List
Propane	74-98-6	Listed.
Butane	106-97-8	Listed.
Isobutane	75-28-5	Listed.
Pentane	109-66-0	Listed.
Ethane	74-84-0	Listed.
Isopentane	78-78-4	Listed.
Hexane	110-54-3	Listed.
Methane	74-82-8	Listed.
Heptane	142-82-5	Listed.
Benzene	71-43-2	E
Toluene	108-88-3	Listed.

Note: E = Extraordinarily Hazardous Substance

New Jersey

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

Component	CAS No.	RTK List
Propane	74-98-6	SHHS
Butane	106-97-8	SHHS
Isobutane	75-28-5	SHHS
Pentane	109-66-0	SHHS
Ethane	74-84-0	SHHS
Isopentane	78-78-4	SHHS

Hexane	110-54-3	SHHS
Methane	74-82-8	SHHS
Heptane	142-82-5	SHHS
Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

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

Component	CAS No.	RTK List
Propane	74-98-6	Listed.
Butane	106-97-8	Listed.
Isobutane	75-28-5	Listed.
Pentane	109-66-0	Listed.
Ethane	74-84-0	Listed.
Isopentane	78-78-4	Listed.
Hexane	110-54-3	Listed.
Methane	74-82-8	Listed.
Heptane	142-82-5	Listed.
Benzene	71-43-2	ES
Toluene	108-88-3	E

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

California

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

Component	Type of Toxicity
Benzene	cancer; developmental, male
Toluene	developmental
Ethylbenzene	cancer

Section 16: OTHER INFORMATION

Disclaimer:

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

Date of Preparation of SDS: April 11, 2016

Version: 1.1

GHS SDS Prepared by: **Deerfoot Consulting Inc.**

Phone: (403) 720-3700

Section 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:	Synthetic Crude Oil
Synonyms:	Not available.
Product Use:	Refinery feedstock.
Manufacturer/Supplier:	Husky Oil Operations Ltd. PO Box 6525 Station 'D' Calgary, Alberta T2P 3G7
Phone Number:	403-298-6111
Emergency Phone:	877-262-2111
Date of Preparation:	January 21, 2014

Section 2: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

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

Colour:	Straw coloured.
Physical State:	Liquid.
Odour:	Petroleum.

WHMIS	Personal Protection Equipment	TDG (Ground)
		

Potential Health Effects: See Section 11 for more information.

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

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

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

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May be fatal if swallowed and enters airways. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Medical Conditions Aggravated By Exposure: Not available.

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

Potential Environmental Effects: See Section 12 for more information.

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

Section 3: COMPOSITION / INFORMATION ON INGREDIENTS

Hazardous Ingredient(s)	CAS No.	% wt./wt.
Gas oils (petroleum), hydrodesulfurized	64742-79-6	60 - 100
Naphtha (petroleum), hydrotreated heavy	64742-48-9	10 - 30
Naphtha (petroleum), hydrotreated light	64742-49-0	3 - 7
Butane	106-97-8	1 - 5
Hydrogen sulfide (H2S)	7783-06-4	0.001 - 0.01

Section 4: FIRST AID MEASURES

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

Eye Contact: If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.

Skin Contact: If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. If skin irritation occurs: Get medical advice/attention. Wash contaminated clothing before reuse.

Ingestion: If swallowed: Immediately call a poison center or doctor. 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. If breathing or the heart stops, trained personnel should immediately begin artificial respiration (AR) or cardiopulmonary resuscitation (CPR) respectively. Get medical attention immediately.

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

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

Section 5: FIRE FIGHTING MEASURES

Flammability: Flammable liquid by WHMIS criteria. Class IB flammable liquid by OSHA criteria. Will be easily ignited by heat, sparks or flames. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks). Vapor explosion hazard indoors, outdoors or in sewers. Runoff to sewer may create fire or explosion hazard. Containers may explode when heated. Many liquids are lighter than water. When heated, this material may evolve toxic and flammable Hydrogen sulphide.

If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Fire involving Tanks or Car/Trailer Loads: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Means of Extinction

Suitable Extinguishing Media: Small Fire: Dry chemical, CO_2, 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.

Unsuitable Extinguishing Media: Do not use straight streams. CAUTION: All these products have a very low flash point: Use of water spray when fighting fire may be inefficient.

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

Protection of Firefighters: Inhalation or contact with material may irritate or burn skin and eyes. Fire may produce irritating, corrosive and/or toxic gases. Vapors may cause dizziness or suffocation. 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.

Explosion Data

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

Sensitivity to Static Discharge: This material is sensitive to static discharge.

Section 6: ACCIDENTAL RELEASE MEASURES

Emergency Procedures:	As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. 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). All equipment used when handling the product must be grounded.
Personal Precautions:	Do not touch or walk through spilled material. Use personal protection recommended in Section 8.Don full-face, positive pressure, self-contained breathing apparatus.
Environmental Precautions:	Prevent entry into waterways, sewers, basements or confined areas.
Methods for Containment:	Stop leak if you can do it without risk. A vapor suppressing foam may be used to reduce vapors.
Methods for Clean-Up:	Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to collect absorbed material.
Other Information:	See Section 13 for disposal considerations.

Section 7: HANDLING AND STORAGE

Handling:
Do not swallow. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat, sparks, open flames, and hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Wash thoroughly after handling. See Section 8 for information on Personal Protective Equipment.

Storage:
Store in a well-ventilated place. Store locked up. 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

Gas oils (petroleum), hydrodesulfurized [CAS No. 64742-79-6]

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: 5 mg/m³ (TWA); For Oil mist, mineral.

Naphtha (petroleum), hydrotreated heavy [CAS No. 64742-48-9]

ACGIH: 100 ppm (TWA); (1980); For Stoddard solvent

OSHA: 100 ppm (TWA), 400 mg/m³ (TWA); For Petroleum distillates (Naphtha).

Naphtha (petroleum), hydrotreated light [CAS No. 64742-49-0]

ACGIH: 100 ppm (TWA); (1980); For Stoddard solvent

OSHA: 100 ppm (TWA), 400 mg/m³ (TWA); For Petroleum distillates (Naphtha).

Butane [CAS No. 106-97-8]

ACGIH: 1000 ppm (TWA); (2001)

OSHA: 800 ppm (TWA) [Vacated];

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

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

OSHA: 20 ppm (C); 50 ppm (Peak) (Maximum duration: 10 mins. once only if no other meas. exp. occurs.)
10 ppm (TWA); 15 ppm (STEL) [Vacated];

Benzene [CAS No. 71-43-2]

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

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

Toluene [CAS No. 108-88-3]

ACGIH: 20 ppm (TWA); A4; BEI (2006)

OSHA: 200 ppm (TWA); 300 ppm (C); 500 ppm (Peak) (Maximum duration: 10 minutes.)
100 ppm (TWA); 150 ppm (STEL) [Vacated];

Ethylbenzene [CAS No. 100-41-4]

ACGIH: 20 ppm (TWA); A3; BEI (2010)

OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
125 ppm (STEL) [Vacated];

Xylene [CAS No. 1330-20-7]

ACGIH: 100 ppm (TWA); 150 ppm (STEL); A4; BEI (1992)

OSHA: 100 ppm (TWA), 435 mg/m³ (TWA);
150 ppm (STEL) [Vacated];

TWA: Time-Weighted Average
STEL: Short-Term Exposure Limit
C: Ceiling

Engineering Controls: Use ventilation adequate to keep exposures (airborne levels of dust, fume, vapour, gas, etc.) below recommended exposure limits. Use explosion-proof electrical, ventilating, and lighting equipment.

PERSONAL PROTECTIVE EQUIPMENT (PPE)

Eye/Face Protection:	Wear chemical goggles. Ensure that eyewash stations are close to the workstation location. Use equipment for eye protection that meets the standards referenced by OSHA regulations in 29 CFR 1910.133 for Personal Protective Equipment.
Hand Protection:	Wear protective gloves. Neoprene or nitrile gloves are recommended. Consult manufacturer specifications for further information.
Skin and Body Protection:	Wear protective clothing. Flame resistant clothing that meets the NFPA 2112 and CAN/CGSB 155.20 standards is recommended in areas where material is stored or handled.
Respiratory Protection:	If engineering controls and ventilation are not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator with organic vapor cartridge, or self-contained breathing apparatus must be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.
General Hygiene Considerations:	Handle according to established industrial hygiene and safety practices.

Section 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance:	Clear liquid
Colour:	Straw coloured.
Odour:	Petroleum.
Odour Threshold:	0.0047 ppm, (Hydrogen sulphide)
Physical State:	Liquid.
pH:	Not available.
Viscosity:	Not available.
Melting Point:	Not available.
Boiling Point:	Not available.
Flash Point:	20 °C (68 °F) (PMCC)
Evaporation Rate:	Not available.
Lower Flammability Limit:	Not available.
Upper Flammability Limit:	Not available.
Vapor Pressure:	15 to 35 kPa at 20 °C (68 °F)

Vapor Density:	Not available.
Specific Gravity:	0.86 (Water = 1)
Density:	Not available.
Solubility in Water:	Insoluble in cold water.
Coefficient of Water/Oil Distribution:	Not available.
Auto-ignition Temperature:	Not available.
Percent Volatile, wt. %:	Not available.
VOC content, wt. %:	Not available.

Section 10: STABILITY AND REACTIVITY

Stability:	Stable under normal storage conditions.
Conditions of Reactivity:	Contact with incompatible materials. Exposure to heat.
Incompatible Materials:	Strong acids. Strong oxidizers. Halogens.
Hazardous Decomposition Products:	Oxides of carbon. Oxides of nitrogen. Aldehydes. Hazardous sulphur dioxide, and related oxides of sulphur may be generated upon combustion.
Possibility of Hazardous Reactions:	None known.

Section 11: TOXICOLOGICAL INFORMATION

EFFECTS OF ACUTE EXPOSURE

Component Toxicity

Component	CAS No.	LD_{50} oral	LD_{50} dermal	LC_{50}
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Not available.	Not available.	Not available.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Not available.	Not available.	Not available.
Naphtha (petroleum), hydrotreated light	64742-49-0	Not available.	Not available.	Not available.
Butane	106-97-8	Not available.	Not available.	658000 mg/m³ (rat); 4H
Hydrogen sulfide	7783-06-4	Not available.	Not available.	444 ppm (rat); 4H
Benzene	71-43-2	930 mg/kg (rat)	> 9400 µl/kg (rabbit)	10000 ppm (rat); 7H
Toluene	108-88-3	600 mg/kg (rat)	14.1 mL/kg (rabbit)	49000 mg/m³ (rat); 4H
Ethylbenzene	100-41-4	3500 mg/kg (rat)	17800 µl/kg (rabbit)	Not available.
Xylene	1330-20-7	4300 mg/kg (rat)	> 1700 mg/kg (rabbit)	5000 ppm (rat); 4H

Inhalation: May cause respiratory irritation. Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain. Excessive inhalation may cause headache, dizziness, confusion, loss of appetite and/or loss of consciousness. This product contains small amounts of Hydrogen sulphide which may accumulate in confined spaces. Inhalation of Hydrogen sulphide may cause loss of sense of smell, major irritation of the respiratory tract, headache, nausea, vomiting, dizziness, and fluid buildup in the lungs (pulmonary edema), which can be fatal. At 300 ppm unconsciousness may occur after 20 minutes. From 300 to 500 ppm, death can occur within 1 to 4 hours of continuous exposure. At 500 ppm the respiratory system is paralyzed, the victim collapses almost instantaneously, and death can occur after exposure of only 30 to 60 minutes. Above 500 ppm Hydrogen sulphide may cause immediate loss of consciousness; death is rapid, and possibly immediate.

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

Skin: Causes skin irritation. Signs/symptoms may include localized redness, swelling, and itching.

Ingestion: May be fatal if swallowed and enters airways. May cause gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.

Skin Sensitization: Not available.

Respiratory Sensitization: Not available.

EFFECTS OF CHRONIC EXPOSURE

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

Chronic Effects: Prolonged or repeated contact may dry skin and cause irritation. Exposure to Naphtha may damage the blood-forming organs resulting in fatigue and anaemia (RBC), decreased resistance to infection, and/or excessive bruising and bleeding (platelet effect). Peripheral nerve damage may be evidenced by impairment of motor function (incoordination, unsteady walk, or muscle weakness in the extremities, and/or loss of sensation in the arms and legs). Auditory system effects may include temporary hearing loss and/or ringing in the ears. 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. Reports of chronic poisoning with Benzene, Toluene, Ethylbenzene or Xylene describe anemia, decreased blood cell count and bone marrow hypoplasia. Liver and kidney damage may occur. Repeated exposure of the eyes to high concentrations of

Xylenes vapour may cause reversible eye damage. Chronic inhalation exposure to xylene causes mid-frequency hearing loss in laboratory animals. Xylene reacts synergistically with n-hexane to enhance hearing loss.

Carcinogenicity: May cause cancer. Gas oils cause cancer in laboratory animals. This material contains Benzene which may cause aplastic anemia or acute myelogenous leukemia (AML). Chronic exposure to benzene has been associated with an increased incidence of leukemia and multiple myeloma (tumour composed of cells of the type normally found in the bone marrow).

Component Carcinogenicity

Component	ACGIH	IARC	NTP	OSHA	Prop 65
Gas oils (petroleum), hydrodesulfurized	A2	Group 1	List 1	OSHA Carcinogen.	Listed.
Benzene	A1	Group 1	List 1	OSHA Carcinogen.	Listed.
Toluene	A4	Group 3	Not listed.	Not listed.	Not listed.
Ethylbenzene	A3	Group 2B	Not listed.	OSHA Carcinogen.	Listed.
Xylene	A4	Group 3	Not listed.	Not listed.	Not listed.

Mutagenicity: May cause heritable genetic damage.

Reproductive Effects: Not available.

Developmental Effects

Teratogenicity: Not available.

Embryotoxicity: Possible risk of harm to the unborn child. Benzene and Xylene have caused adverse fetal effects in laboratory animals. Exposure to Toluene may affect the developing fetus.

Toxicologically Synergistic Materials: Xylene reacts synergistically with n-hexane to enhance hearing loss.

Section 12: ECOLOGICAL INFORMATION

Ecotoxicity: Not available.

Persistence / Degradability: Not available.

Bioaccumulation / Accumulation: Not available.

Mobility in Environment: Not available.

Section 13: DISPOSAL CONSIDERATIONS

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

Section 14: TRANSPORT INFORMATION

U.S. Department of Transportation (DOT)

Proper Shipping Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

Class: 3

UN Number: UN1267

Packing Group: I

Label Code:

Canada Transportation of Dangerous Goods (TDG)

Proper Shipping Name: UN1267, PETROLEUM CRUDE OIL, 3, PG I

Class: 3

UN Number: UN1267

Packing Group: I

Label Code:

Section 15: REGULATORY INFORMATION

Chemical Inventories

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

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

Federal Regulations

Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

WHMIS Classification:
Class B2 - Flammable Liquids.
Class D2A - Carcinogenicity.
Class D2A - Embryotoxicity.
Class D2A - Mutagenicity.
Class D2B - Skin irritant.
Class D2B - Eye irritant.

Hazard Symbols:

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

SARA Title III

Component	Section 302 (EHS) TPQ (lbs.)	Section 304 EHS RQ (lbs.)	CERCLA RQ (lbs.)	Section 313	RCRA CODE	CAA 112(r) TQ (lbs.)
Butane	Not listed.	Not listed.	Not listed.	Not listed.	Not listed.	10000
Hydrogen sulfide	500	100	100	313s	U135	10000
Benzene	Not listed.	Not listed.	10	313	U019	Not listed.
Toluene	Not listed.	Not listed.	1000	313	U220	Not listed.
Ethylbenzene	Not listed.	Not listed.	1000	313	Not listed.	Not listed.
Xylene	Not listed.	Not listed.	100	313	U239	Not listed.

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

Component	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Listed.
Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E
Benzene	71-43-2	E
Toluene	108-88-3	Listed.
Ethylbenzene	100-41-4	Listed.
Xylene	1330-20-7	Listed.

Note: E = Extraordinarily Hazardous Substance

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

Component	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Listed.
Butane	106-97-8	SHHS
Hydrogen sulfide (H2S)	7783-06-4	SHHS

Benzene	71-43-2	SHHS
Toluene	108-88-3	SHHS
Ethylbenzene	100-41-4	SHHS
Xylene	1330-20-7	SHHS

Note: SHHS = Special Health Hazard Substance

Pennsylvania

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

Component	CAS No.	RTK List
Gas oils (petroleum), hydrodesulfurized	64742-79-6	Listed.
Naphtha (petroleum), hydrotreated heavy	64742-48-9	Listed.
Naphtha (petroleum), hydrotreated light	64742-49-0	Listed.
Butane	106-97-8	Listed.
Hydrogen sulfide (H2S)	7783-06-4	E
Benzene	71-43-2	ES
Toluene	108-88-3	E
Ethylbenzene	100-41-4	E
Xylene	1330-20-7	E

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

California

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

Component	Type of Toxicity
Gas oils (petroleum), hydrodesulfurized	cancer
Benzene	cancer; developmental, male
Toluene	developmental; female
Ethylbenzene	cancer

Section 16: OTHER INFORMATION

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

MSDS Expiry Date (Canada): January 20, 2017

Version: 2.0

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

Phone: (403) 720-3700

ENBRIDGE

Safety Data Sheet

REDACTED COPY

Section 1: Identification

PRODUCT IDENTIFIER	High Sweet Clearbrook	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Bakken Crude Oil; High Sweet Clearbrook (UHC); Hydrocarbons of Petroleum; North Dakota Sweet (NSW)
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420- 5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Corrosion/Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1
LABEL ELEMENTS	**Signal Word**	Danger
	Hazard Pictograms	

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- No smoking.
- Keep container tightly closed.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF exposed or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- Get medical advice/attention if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- Do NOT induce vomiting.

Storage/Disposal

- Store locked up.
- Store in a well-ventilated place. Keep container tightly closed.
- Keep cool.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Petroleum Hydrocarbons	68919-39-1	100	
Trans-1, 2-dimethylcyclopentane	28729-52-4	1.8	
2-Methylhexane	591-76-4	1.0	
2-Methylpentane	107-83-5	1.8	
3-Methylhexane	589-34-4	1.6	
3-Methylpentane	96-14-0	1.3	
2-Methylheptane	592-27-8	1.4	
Benzene	71-43-2	0.4	
Cyclohexane	110-82-7	1.0	
i-Pentane	109-66-0	1.8	
MethylCyclohexane	108-87-2	2.3	
Methylcyclopentane	96-37-7	2.2	
n-Butane	106-97-8	1.9	
n-Heptane	142-82-5	3.4	
n-Hexane	110-54-3	3.4	
n-Pentane	109-66-0	3.4	
n-Octane	111-65-9	3.0	
n-Nonane	111-84-2	2.2	
n-Decane	124-18-5	2.0	
n-Undecane	1120-21-4	1.7	
n-Dodecane	112-40-3	1.5	
n-Tridecane	629-50-5	1.3	
Toluene	108-88-3	0.9	
Hydrogen sulfide	7783-06-4	<0.00001	
Ethylbenzene	100-41-4	0.6	
Xylenes	1330-20-7	0-5	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed - can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.
- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions

- Evacuate personnel to safe areas.
- Remove all sources of ignition.
- Deny entry to unauthorized and unprotected personnel.
- Use personal protective equipment.
- Avoid contact with skin, eyes and clothing.
- Stop leak if you can do it without risk.
- Keep people away from and upwind of spill/leak.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

- Ventilate enclosed areas.
- Do not walk through spilled material.

Protective Equipment

- Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away Evacuate area Keep out of low areas. Stop leak if you can do it without risk.
- Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up

- Clean up spill immediately.
- LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.
- SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.
- Use appropriate Personal Protective Equipment (PPE).
- Use clean non-sparking tools to collect absorbed material.
- Vacuum spilled material.
- Try to work upwind of spill.
- All equipment used when handling the product must be grounded.
- Recover and return free product to proper containers
- Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.
- Do not place spilled materials back in the original container.
- Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling

- All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces.
- The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).

- The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
- Take precautionary measures against static discharges.

Handling

- Do not cut drill, grind or weld on empty containers since they may contain explosive residues.
- Stay upwind and vent open hatches before unloading.
- Avoid contact with skin, eyes and clothing.
- Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.
- Wear personal protective equipment.
- Remove and wash contaminated clothing before re-use.
- Do not eat, drink or smoke when using this product.
- Do not take internally.
- Wash thoroughly after handling.
- Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage

- Ventilate enclosed areas.
- Store in a well-ventilated place.
- Keep container tightly closed.
- Store locked up.
- Avoid shock, impact, friction, and rough handling. Do not use sparking tools.
- Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources.
- Keep away from sources of ignition.
- No Smoking.
- Do not enter confined spaces such as tanks or pits without following proper entry procedures.
- Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area.
- Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.
- Keep away from open flames, hot surfaces and sources of ignition.
- Keep product and empty container away from heat and sources of ignition.
- Storage containers should be grounded and bonded.
- Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.
- Store away from incompatible materials.

Incompatible Products

- Strong oxidizers such as nitrates, chlorates, peroxides.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylpentane	-	-	TWA 100 ppm TWA 350 mg/m^3 Ceiling 510 ppm Ceiling 1800 mg/m^3

3-Methylpentane	-	-	TWA 100 ppm TWO 350 mg/m^3 Ceiling 510 ppm Ceiling 1800 mg/m^3
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
i-Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
MethylCyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
n-Butane	TLV 1000 ppm	-	TWA 800 ppm TWA 1900 mg/m^3
n-Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
n-Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
n-Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
n-Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
n-Nonane	TLV 200 ppm TLV 1050 mg/m^3	-	TWA 200 ppm TWA 1050 mg/m^3

Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Rotten egg, petroleum-like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Clear to brown liquid		

PROPERTIES				
	pH	No data available	**Vapor pressure**	72.3 to 101.35 kPa @ 37.8°C (100.4°F)
	Melting Point/ Freezing Point	No data available	**Vapor density**	1.0 to 3.9 Air=1
	Boiling Point/ Boiling Range	82.6 to 133.0 °F 28.1 to 72.1 °C	**Relative density**	41.2 to 42.6
	Flash Point	-38 to -36 °F -38.8 to -37.7 °C	**Water Solubility**	Negligible
	Evaporation Rate	(Ethyl Ether =1) >1	**Partition coefficient: n-octanol/water**	No data available
	Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
	Upper Flammability Limit	No data available	**Decomposition temperature**	No data available
	Lower Flammability Limit	No data available	**Specific Gravity**	0.82
	Viscosity	5.43 mm^2/s		

Section 10: Stability and Reactivity

REACTIVITY	No data available
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE		
	Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
	Eye Contact	• Causes serious eye irritation.
	Skin Contact	• Causes skin irritation.

Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Benzene	>300 mg/kg (Rat)	-	13050 - 14380 ppm (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
i-Pentane	>2000 mg/kg (Rat)	-	364 g/cu (Rat) 4 h
MethylCyclohexane	> 3200 mg/kg (Rat)	-	-
n-Butane	-	-	658 mg/L (Rat) 4 h
n-Heptane	-	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
n-Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
n-Pentane	>2000 mg/kg (Rat)	-	364 g/cu (Rat) 4 h
n-Octane	-	-	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
n-Nonane	-	-	= 3200 ppm (Rat) 4 h
n-Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	-
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	-
Hydrogen sulfide	-	-	= 444 ppm (Rat)
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in man. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 50 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	IARC	NTP	OSHA
Benzene	A1	Group 1	Known	X
Toluene	A4	Group 3	Evidence	-
Ethylbenzene	A3	Group 2B	Evidence	X
Xylenes	A4	Group 3	Evidence	-

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT - SINGLE EXPOSURE

• No information available.

STOT - REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	-
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Pentane	-	-	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
MethylCyclohexane	-	LC50 96hr: 72.0 mg/l (Golden Shiner)	-	-
n-Heptane	-	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	-
n-Hexane	-	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	-
n-Octane	-	-	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
n-Undecane	-	-	-	-
n-Dodecane	-	-	-	-
n-Tridecane	-	-	-	-

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 1.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Hydrogen sulfide		LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus) LC50 96 h: = 19 mg/L (Lepomis macrochirus) LC50 96 h: 7.711 - 9.591 mg/L static (Lepomis macrochirus) LC50 96 h: 23.53 - 29.97 mg/L static (Pimephales promelas) LC50 96 h: = 780 mg/L semi-static (Cyprinus carpio) LC50 96 h: > 780 mg/L (Cyprinus carpio) LC50 96 h: 30.26 - 40.75 mg/L static (Poecilia reticulata)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Benzene	1.83
Cyclohexane	3.44
Butane	2.89
Octane	5.18
Heptane	4.66
Decane	5.1
Xylene, mixed isomers	2.77 - 3.15
Toluene	2.65
Ethylbenzene	3.118

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylpentane	Low
3-Methylpentane	Slight
Benzene	High

Cyclohexane	Moderate
Pentane	High
MethylCyclohexane	Low
Butane	Low
Heptane	Moderate
Hexane	High
Octane	Immobile
Nonane	Immobile
Decane	Immobile
Undecane	Immobile
Dodecane	Immobile
Tridecane	Immobile
Toluene	High to Moderate
Ethylbenzene	Low
Xylenes	Very high to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum crude oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum crude oil	3	I	-
IMO/IMDG	UN1267	Petroleum crude oil	3	I	EmS No. F-E, S-E
IATA/ICA	UN1267	Petroleum crude oil	3	I	-

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S. - CERCLA/ SARA - HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ

U.S. - CWA (CLEAN WATER ACT) - REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	100 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ
Benzene	71-43-2	10 lb RQ

U.S. - CWA (CLEAN WATER ACT) - RECOMMENDED WATER QUALITY CRITERIA - CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S. - CWA (CLEAN WATER ACT) - RECOMMENDED WATER QUALITY CRITERIA - CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S. - CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Hydrogen Sulfide	7783-06-4	X
MethylCyclohexane	108-87-2	Not Listed
3- Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	Not Listed
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed
Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X
Benzene	71-43-2	X

Butane	106-97-8	Not Listed
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed
Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed

X= The component is listed

U.S. - CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Hydrogen Sulfide	7783-06-4	Not Listed
MethylCyclohexane	108-87-2	Not Listed
3- Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	Not Listed
Pentane	109-66-0	Not Listed
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed
Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed

Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed

X= The component is listed

US-STATE-RIGHT-TO-KNOW

CHEMICAL	NEW JERSEY	MASSACHUSETTS	PENNSYLVANIA	ILLINOIS	RHODE ISLAND
Nonane	X	X	X	-	X
Decane	X	-	X	-	X
Hexane	X	X	X	X	X
MethylCyclohexane	X	X	X	-	X
Octane	X	X	X	-	X
n-Heptane	X	X	X	-	X
Butane	X	X	X	-	X
Ethylbenzene	X	X	X	X	X
Toluene	X	X	X	X	X
Cyclohexane	X	X	X	-	X
Xylene, mixed isomers	X	X	X	X	X
Benzene	X	X	X	X	X

CANADA-WHMIS-CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylhexane	591-76-4	B2
2-Methylpentane	107-83-5	B2
3-Methylhexane	589-34-4	B2
3-Methylpentane	96-14-0	B2
Benzene	71-43-2	B2, D2A, D2B
MethylCyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	-
n-Butane	106-97-8	A, B1
n-Heptane	142-82-5	B2, D2B
n-Hexane	110-54-3	B2, D2A, D2B

n-Pentane	109-66-0	B2
n-Octane	111-65-9	B2, D2B
n-Decane	124-18-5	B3, D2B
n-Undecane	1120-21-4	B3, D2B
n-Dodecane	112-40-3	B3
n-Tridecane	629-50-5	B3
Toluene	108-88-3	B2, D2A, D2B
Hydrogen sulfide	7783-06-4	A, B1, D1A, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Xylenes	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA - ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Hydrogen sulfide	7783-06-4	X
MethylCyclohexane	108-87-2	Not Listed
3-Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	X
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed

Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X
Benzene	71-43-2	X
Butane	106-97-8	X
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed
Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed
Petroleum Hydrocarbons	68919-39-1	Not Listed

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 3	**Instability:** 1	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 3/2/15

REVISION DATE 3/2/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDS's may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	SUNCOR OCC
Synonyms	:	SUNCOR OSK, Sour Crude Blend
Manufacturer or supplier's details		SUNCOR ENERGY INC. P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Refinery Feedstock
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	brown
Odour	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Hazard Summary	Flammable liquid Toxic by inhalation. Irritating to skin. May cause cancer. May cause heritable genetic damage. Possible risk of harm to the unborn child.

Potential Health Effects

Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system Lungs Skin

Inhalation	:	May cause respiratory tract irritation. Inhalation may cause central nervous system effects. Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness.
Skin	:	May cause skin irritation.
Eyes	:	May cause eye irritation.
Ingestion	:	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Aspiration hazard if swallowed - can enter lungs and cause damage.
Aggravated Medical Condition	:	Asthma Skin disorders

Carcinogenicity:

IARC	Group 1: Carcinogenic to humans	
	Benzene	71-43-2
	Group 2A: Probably carcinogenic to humans	
	Distillates (petroleum), straight-run middle	64741-44-2
	Gas oils, petroleum, light vacuum	64741-58-8
ACGIH	Confirmed human carcinogen	
	Benzene	71-43-2

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
Distillates (petroleum), straight-run middle	64741-44-2	10 - 60 %
Gas oils (petroleum), light vacuum	64741-58-8	10 - 60 %
distillates (petroleum),heavy thermal cracked	64741-81-7	30 - 60 %
Condensates (petroleum), vacuum tower	64741-49-7	10 - 30 %
Naphtha (oil sand)	128683-32-9	0 - 10 %
sulfur	7704-34-9	<= 3.5 %
xylene	1330-20-7	0.1 - 1 %
toluene	108-88-3	0.1 - < 1 %
benzene	71-43-2	0.1 - 1 %

Product may contain 0 - 200 ppm hydrogen sulphide.

SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Foam Dry chemical
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	CA AB OEL
		STEL	2.5 ppm 8 mg/m3	CA AB OEL
		TWA	0.5 ppm	CA BC OEL
		STEL	2.5 ppm	CA BC OEL

		TWA	0.5 ppm	CA ON OEL
		STEL	2.5 ppm	CA ON OEL
		TWAEV	1 ppm 3 mg/m3	CA QC OEL
		STEV	5 ppm 15.5 mg/m3	CA QC OEL
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
hydrogen sulphide	7783-06-4	TWA	10 ppm 14 mg/m3	CA AB OEL
		(c)	15 ppm 21 mg/m3	CA AB OEL
		C	10 ppm	CA BC OEL
		TWA	10 ppm	CA ON OEL
		STEL	15 ppm	CA ON OEL
		TWAEV	10 ppm 14 mg/m3	CA QC OEL
		STEV	15 ppm 21 mg/m3	CA QC OEL
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH

Engineering measures : Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : A NIOSH-approved positive-pressure, air-supplied respirator or self-contained breathing apparatus may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits.

Hand protection

Material : polyvinyl alcohol (PVA), neoprene, nitrile rubber.

Remarks : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Wear face-shield and protective suit for abnormal processing problems.

Skin and body protection : Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Protective measures : Wash contaminated clothing before re-use.

Hygiene measures : Remove and wash contaminated clothing and gloves,

including the inside, before re-use.
Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	brown
Odour	:	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Odour Threshold	:	No data available
pH	:	No data available
Melting point/range	:	No data available
Boiling point/boiling range	:	115 °C (239 °F) Method: ASTM D-2887
Flash point	:	< -35 °C (-31 °F) Method: ASTM D 93
Fire Point	:	No data available
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	15.2 kPaMethod: ASTM D 323A
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	0.93 - 0.94 g/cm3
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	No data available
Viscosity		
Viscosity, kinematic	:	No data available
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may

form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, SOx, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Acute toxicity

Product:

Acute oral toxicity : Remarks: No data available

Acute inhalation toxicity : Remarks: No data available

Acute dermal toxicity : Remarks: No data available

Components:

Distillates (petroleum), straight-run middle:

Acute oral toxicity : LD50 Rat: > 5,000 mg/kg,

Acute inhalation toxicity : LC50 Rat: 1.78 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 2,000 mg/kg,

Gas oils (petroleum), light vacuum:

Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

distillates (petroleum),heavy thermal cracked:

Acute inhalation toxicity : LC50 Rat: 4.1 mg/l

Exposure time: 4 h
Test atmosphere: dust/mist

Condensates (petroleum), vacuum tower:
Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

sulfur:
Acute dermal toxicity : LD50 Rabbit: > 2,000 mg/kg,

xylene:
Acute oral toxicity : LD50 Rat: 4,300 mg/kg,

Acute inhalation toxicity : LC50 Rat: 5000 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 1,700 mg/kg,

toluene:
Acute oral toxicity : LD50 Rat: 5,580 mg/kg,

Acute inhalation toxicity : LC50 Rat: 7585 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: 12,125 mg/kg,

benzene:
Acute oral toxicity : LD50 Rat: 2,990 mg/kg,

Acute inhalation toxicity : LC50 Rat: 13700 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 8,240 mg/kg,

Skin corrosion/irritation

Product:
Remarks: No data available

Components:

Distillates (petroleum), straight-run middle:
Result: Moderate skin irritant

sulfur:
Result: Moderate skin irritant

xylene:
Result: Skin irritation

toluene:
Result: Moderate skin irritant

benzene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

Distillates (petroleum), straight-run middle:
Result: Mild eye irritation

sulfur:
Result: Moderate eye irritation

toluene:
Result: Mild eye irritation

benzene:
Result: Moderate eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

Components:

Distillates (petroleum), straight-run middle :

Partition coefficient: n-octanol/water	:	Remarks: No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1267
Proper shipping name	:	Petroleum crude oil
Class	:	3
Packing group	:	II
Labels	:	3
Packing instruction (cargo aircraft)	:	364

IMDG-Code

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	II
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

TDG

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	II
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : B2: Flammable liquid
D1B: Toxic Material Causing Immediate and Serious Toxic Effects
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

The components of this product are reported in the following inventories:

DSL At least one component is not listed on the DSL but all such components are listed on the NDSL.

SECTION 16. OTHER INFORMATION

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-

1228

For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	SUNCOR OSA
Synonyms	:	Sweet Crude Oil, Blended Synthetic Oil, Petroleum Crude
Manufacturer or supplier's details		SUNCOR ENERGY INC. P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Refinery Feedstock
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	amber
Odour	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Hazard Summary	Flammable liquid Irritating to skin. May cause cancer. May cause heritable genetic damage. Possible risk of harm to the unborn child.

Potential Health Effects

Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Inhalation	:	May cause respiratory tract irritation. Inhalation may cause central nervous system effects. Symptoms and signs include headache, dizziness, fatigue,

muscular weakness, drowsiness and in extreme cases, loss of consciousness.

Skin : May cause skin irritation.
Prolonged skin contact may defat the skin and produce dermatitis.

Eyes : May cause eye irritation.

Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Aspiration hazard if swallowed - can enter lungs and cause damage.

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC	Group 1: Carcinogenic to humans	
	1,3-BUTADIENE	106-99-0
ACGIH	Suspected human carcinogen	
	1,3-BUTADIENE	106-99-0

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
Gas oils (oil sand), hydrotreated	128683-29-4	60 - 70 %
fuel, diesel no. 2	68476-34-6	10 - 25 %
Naphtha (oil sand), hydrotreated	128683-33-0	10 - 25 %
butane	106-97-8	1 - 3 %
pentane	109-66-0	1 - 2 %
isobutane	75-28-5	1 - 2 %
n-hexane	110-54-3	0.1 - < 1 %
xylene	1330-20-7	0.1 - < 1 %
1,3-butadiene	106-99-0	0.1 - < 1 %
toluene	108-88-3	0.1 - < 1 %

Product may contain 0 - 50ppm hydrogen sulphide.

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.

Artificial respiration and/or oxygen may be necessary.
Seek medical advice.

In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Dry chemical Carbon dioxide (CO2) Foam
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.

Environmental precautions : If the product contaminates rivers and lakes or drains inform respective authorities.

Methods and materials for containment and cleaning up : Prevent further leakage or spillage if safe to do so.
Remove all sources of ignition.
Soak up with inert absorbent material.
Non-sparking tools should be used.
Ensure adequate ventilation.
Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling : For personal protection see section 8.
Smoking, eating and drinking should be prohibited in the application area.
Use only with adequate ventilation.
In case of insufficient ventilation, wear suitable respiratory equipment.
Avoid contact with skin, eyes and clothing.
Do not ingest.
Keep away from heat and sources of ignition.
Keep container closed when not in use.

Conditions for safe storage : Store in original container.
Containers which are opened must be carefully resealed and kept upright to prevent leakage.
Keep in a dry, cool and well-ventilated place.
Keep in properly labelled containers.
To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
pentane	109-66-0	TWAEV	120 ppm 350 mg/m3	CA QC OEL
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	OSHA Z-1
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH

1,3-butadiene	106-99-0	TWA	2 ppm 4.4 mg/m3	CA AB OEL
		TWA	2 ppm	CA BC OEL
		TWAEV	2 ppm 4.4 mg/m3	CA QC OEL
		TWA	2 ppm	ACGIH

Engineering measures : Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.

Hand protection

Material : neoprene, polyvinyl alcohol (PVA). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.

Remarks : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Wear face-shield and protective suit for abnormal processing problems.

Skin and body protection : Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Protective measures : Wash contaminated clothing before re-use.

Hygiene measures : Remove and wash contaminated clothing and gloves, including the inside, before re-use.
Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : liquid

Colour	:	amber
Odour	:	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Odour Threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Boiling point/boiling range	:	30 - 550 °C (86 - 1022 °F) Method: ASTM D6352
Flash point	:	< -35 °C (-31 °F) Method: ASTM D 93
Auto-Ignition Temperature	:	247 °C (477 °F) Method: ASTM E659
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	0.41 %(V) Method: ASTM E681
Vapour pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	0.86 - 0.87
Density	:	0.86 - 0.87 g/cm3
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: < 1
Viscosity		
Viscosity, kinematic	:	4.4 mm2/s (30 °C / 86 °F) 3.5 mm2/s (40 °C / 104 °F) 2.9 mm2/s (50 °C / 122 °F) Method: ASTM D 445
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create

fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, hydrocarbons, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Acute toxicity

Product:

Acute oral toxicity : Remarks: No data available

Acute inhalation toxicity : Remarks: No data available

Acute dermal toxicity : Remarks: No data available

Components:

fuel, diesel no. 2:
Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

butane:
Acute inhalation toxicity : LC50 Rat: 658 mg/l
Exposure time: 4 h
Test atmosphere: gas

pentane:
Acute oral toxicity : LD50 Rat: > 2,000 mg/kg,

Acute inhalation toxicity : LC50 Rat: 364 mg/l
Exposure time: 4 h
Test atmosphere: vapour

isobutane:
Acute inhalation toxicity : LC50 Rat: 658,000 mg/m3
Exposure time: 4 h
Test atmosphere: gas

n-hexane:
Acute oral toxicity : LD50 Rat: 15,840 mg/kg,

Acute inhalation toxicity : LC50 Rat: 48000 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 3,295 mg/kg,

xylene:
Acute oral toxicity : LD50 Rat: 4,300 mg/kg,

Acute inhalation toxicity : LC50 Rat: 5000 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 1,700 mg/kg,

toluene:
Acute oral toxicity : LD50 Rat: 5,580 mg/kg,

Acute inhalation toxicity : LC50 Rat: 7585 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: 12,125 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

xylene:
Result: Skin irritation

toluene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

toluene:
Result: Mild eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Components:
n-hexane :

Toxicity to fish	:	LC50 (Fish): 4.12 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia (water flea)): 3.87 mg/l Exposure time: 48 h

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

Components:

butane :

Partition coefficient: n-octanol/water : log Pow: 2.89

pentane :

Partition coefficient: n-octanol/water : log Pow: 3.39

isobutane :

Partition coefficient: n-octanol/water : log Pow: 2.76

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : The product should not be allowed to enter drains, water courses or the soil.
Offer surplus and non-recyclable solutions to a licensed disposal company.
Waste must be classified and labelled prior to recycling or disposal.
Send to a licensed waste management company.
Dispose of as hazardous waste in compliance with local and national regulations.
Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

Contaminated packaging : Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No. : 1267
Proper shipping name : Petroleum crude oil
Class : 3
Packing group : II
Labels : 3
Packing instruction (cargo aircraft) : 364

IMDG-Code

UN number : 1267
Proper shipping name : PETROLEUM CRUDE OIL
Class : 3
Packing group : II

Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

TDG

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	II
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : B2: Flammable liquid
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

The components of this product are reported in the following inventories:
DSL On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	SUNCOR OSC
Synonyms	:	Sweet Crude Oil, Synthetic Crude Oil, Petroleum Crude
Manufacturer or supplier's details		SUNCOR ENERGY INC. P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Refinery Feedstock
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	amber
Odour	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Hazard Summary	Flammable liquid Irritating to skin. May cause cancer. May cause harm to the unborn child. May cause heritable genetic damage. May damage the peripheral nervous system.

Potential Health Effects

Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system Peripheral nervous system
Inhalation	:	May cause respiratory tract irritation.

Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.

Skin	:	May cause skin irritation. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance.
Eyes	:	May cause eye irritation.
Ingestion	:	Aspiration hazard if swallowed - can enter lungs and cause damage. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Chronic Exposure	:	May damage the peripheral nervous system. Symptoms include tingling sensations in fingers and toes and muscle weakness.
Aggravated Medical Condition	:	None known.

Carcinogenicity:

IARC	Group 1: Carcinogenic to humans	
	1,3-BUTADIENE	106-99-0
	Benzene	71-43-2
ACGIH	Confirmed human carcinogen	
	Benzene	71-43-2
	Suspected human carcinogen	
	1,3-BUTADIENE	106-99-0

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
fuel, diesel no. 2	68476-34-6	0 - 100 %
Gas oils (oil sand), hydrotreated	128683-29-4	0 - 100 %
Naphtha (oil sand), hydrotreated	128683-33-0	0 - 100 %
butane	106-97-8	0 - 3 %
pentane	109-66-0	0 - 3 %
isobutane	75-28-5	0 - 3 %

xylene	1330-20-7	1 - 2 %
isopentane	78-78-4	0 - 3 %
n-hexane	110-54-3	1 - 2 %
toluene	108-88-3	0.1 - < 1 %
1,3-butadiene	106-99-0	0.1 - < 1 %
benzene	71-43-2	0.1 - < 1 %

Product may contain 0 - 50ppm hydrogen sulphide.

SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Dry chemical Foam Water fog.
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray. Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.

Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
pentane	109-66-0	TWAEV	120 ppm 350 mg/m3	CA QC OEL
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	OSHA Z-1
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
isopentane	78-78-4	TWA	600 ppm 1,770 mg/m3	CA AB OEL
n-hexane	110-54-3	TWA	50 ppm 176 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 176 mg/m3	CA QC OEL
		TWA	50 ppm	ACGIH
1,3-butadiene	106-99-0	TWA	2 ppm 4.4 mg/m3	CA AB OEL
		TWA	2 ppm	CA BC OEL
		TWAEV	2 ppm 4.4 mg/m3	CA QC OEL
		TWA	2 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	CA AB OEL
		STEL	2.5 ppm 8 mg/m3	CA AB OEL
		TWA	0.5 ppm	CA BC OEL
		STEL	2.5 ppm	CA BC OEL
		TWA	0.5 ppm	CA ON OEL
		STEL	2.5 ppm	CA ON OEL
		TWAEV	1 ppm 3 mg/m3	CA QC OEL
		STEV	5 ppm 15.5 mg/m3	CA QC OEL
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH

Engineering measures : Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe

working limits of the selected respirator.

Filter type	:	Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.
Hand protection		
Material	:	neoprene, nitrile. Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	amber
Odour	:	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Odour Threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Boiling point/boiling range	:	estimated 30 - 550 °C (86 - 1022 °F)
Flash point	:	< -35 °C (-31 °F)
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available

Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	No data available
Relative vapour density	:	No data available
Relative density	:	No data available
Density	:	estimated 0.71 - 0.91 g/cm3
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: < 1
Viscosity		
Viscosity, kinematic	:	No data available
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, hydrocarbons, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion

Acute toxicity

Product:

Acute oral toxicity : Remarks: No data available

Acute inhalation toxicity : Remarks: No data available

Acute dermal toxicity : Remarks: No data available

Components:

fuel, diesel no. 2:
Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

butane:
Acute inhalation toxicity : LC50 Rat: 658 mg/l
Exposure time: 4 h
Test atmosphere: gas

pentane:
Acute oral toxicity : LD50 Rat: > 2,000 mg/kg,

Acute inhalation toxicity : LC50 Rat: 364 mg/l
Exposure time: 4 h
Test atmosphere: vapour

isobutane:
Acute inhalation toxicity : LC50 Rat: 658,000 mg/m3
Exposure time: 4 h
Test atmosphere: gas

xylene:
Acute oral toxicity : LD50 Rat: 4,300 mg/kg,

Acute inhalation toxicity : LC50 Rat: 5000 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 1,700 mg/kg,

isopentane:
Acute inhalation toxicity : LC50 Rat: 280 mg/l
Exposure time: 4 h
Test atmosphere: vapour

n-hexane:
Acute oral toxicity : LD50 Rat: 15,840 mg/kg,

Acute inhalation toxicity : LC50 Rat: 48000 ppm
Exposure time: 4 h

Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 3,295 mg/kg,

toluene:
Acute oral toxicity : LD50 Rat: 5,580 mg/kg,

Acute inhalation toxicity : LC50 Rat: 7585 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: 12,125 mg/kg,

benzene:
Acute oral toxicity : LD50 Rat: 2,990 mg/kg,

Acute inhalation toxicity : LC50 Rat: 13700 ppm
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 8,240 mg/kg,

Skin corrosion/irritation

Product:
Remarks: No data available

Components:

xylene:
Result: Skin irritation

isopentane:
Result: Mild skin irritation

toluene:
Result: Moderate skin irritant

benzene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

isopentane:
Result: Mild eye irritation

toluene:
Result: Mild eye irritation

benzene:
Result: Moderate eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Components:
n-hexane :

Toxicity to fish	:	LC50 (Fish): 4.12 mg/l Exposure time: 96 h
Toxicity to daphnia and other aquatic invertebrates	:	EC50 (Daphnia (water flea)): 3.87 mg/l Exposure time: 48 h

Persistence and degradability

Product:

Biodegradability : Remarks: No data available

Bioaccumulative potential

Components:

butane :

Partition coefficient: n-octanol/water : log Pow: 2.89

pentane :

Partition coefficient: n-octanol/water : log Pow: 3.39

isobutane :

Partition coefficient: n-octanol/water : log Pow: 2.76

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : The product should not be allowed to enter drains, water courses or the soil.
Offer surplus and non-recyclable solutions to a licensed disposal company.
Waste must be classified and labelled prior to recycling or disposal.
Send to a licensed waste management company.
Dispose of as hazardous waste in compliance with local and national regulations.
Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

Contaminated packaging : Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No. : 1267
Proper shipping name : Petroleum crude oil
Class : 3
Packing group : I
Labels : 3
Packing instruction (cargo aircraft) : 361

IMDG-Code

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

TDG

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : B2: Flammable liquid
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

The components of this product are reported in the following inventories:

DSL On the inventory, or in compliance with the inventory

SECTION 16. OTHER INFORMATION

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to

the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	SUNCOR OSH
Synonyms	:	Sour Crude Blend, Sour Crude Oil
Manufacturer or supplier's details		SUNCOR ENERGY INC. P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Refinery Feedstock
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	liquid
Colour	brown
Odour	hydrocarbon-like
Hazard Summary	Flammable liquid Contains material which may cause cancer based on animal data. Contains material that may cause adverse reproductive effects. Irritating to eyes and skin. May cause sensitisation by skin contact.

Potential Health Effects

Primary Routes of Entry	:	Inhalation Eye contact Skin contact Ingestion Skin Absorption
Target Organs	:	Respiratory system Central nervous system Eyes Skin
Inhalation	:	Inhalation of high vapour concentrations may cause

symptoms like headache, dizziness, tiredness, nausea and vomiting.
Inhalation may cause central nervous system effects.

Skin	:	May cause allergic skin reaction. May cause skin irritation.
Eyes	:	May cause eye irritation.
Ingestion	:	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Aspiration hazard if swallowed - can enter lungs and cause damage.
Chronic Exposure	:	This product may cause adverse reproductive effects.
Aggravated Medical Condition	:	None known.

Carcinogenicity:

IARC	Group 2A: Probably carcinogenic to humans Gas oils, petroleum, heavy vacuum 64741-57-7
OSHA	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.
NTP	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
ACGIH	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
gas oils (petroleum), heavy vacuum	64741-57-7	85 - 92 %
Naphtha (oil sand), hydrotreated	128683-33-0	8 - 15 %
sulfur	7704-34-9	<= 3.3 %
butane	106-97-8	0.5 - 1.5 %
xylene	1330-20-7	0.1 - 0.3 %
toluene	108-88-3	0.1 - 0.2 %

Product may contain trace amounts of hydrogen sulphide

SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash contaminated clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Foam Dry chemical
Unsuitable extinguishing media	:	No information available.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), sulphur oxides (SOx), sulphur compounds (H2S), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.
Specific extinguishing methods	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.

Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Persons with a history of skin sensitisation problems or asthma, allergies, chronic or recurrent respiratory disease should not be employed in any process in which this mixture is being used. Smoking, eating and drinking should be prohibited in the application area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Use only with adequate ventilation. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0
		TWA	800 ppm	NIOSH REL

			1,900 mg/m3	
		TWA	800 ppm 1,900 mg/m3	OSHA P0
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
toluene	108-88-3	TWA	50 ppm 188 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 188 mg/m3	CA QC OEL
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
hydrogen sulphide	7783-06-4	TWA	10 ppm 14 mg/m3	CA AB OEL
		(c)	15 ppm 21 mg/m3	CA AB OEL
		C	10 ppm	CA BC OEL
		TWA	10 ppm	CA ON OEL
		STEL	15 ppm	CA ON OEL
		TWAEV	10 ppm 14 mg/m3	CA QC OEL
		STEV	15 ppm 21 mg/m3	CA QC OEL
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH
		C	10 ppm 15 mg/m3	NIOSH REL
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	10 ppm 14 mg/m3	OSHA P0

		STEL	15 ppm 21 mg/m3	OSHA P0
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH
		C	10 ppm 15 mg/m3	NIOSH REL
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		TWA	10 ppm 14 mg/m3	OSHA P0
		STEL	15 ppm 21 mg/m3	OSHA P0

Engineering measures : Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection : Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Filter type : Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.

Hand protection
Material : polyvinyl alcohol (PVA), neoprene, nitrile rubber.
Remarks : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Eye protection : Wear face-shield and protective suit for abnormal processing problems.
Ensure that eyewash stations and safety showers are close to the workstation location.

Skin and body protection : Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Protective measures : Wash contaminated clothing before re-use.
No special protective equipment required.

Hygiene measures : Remove and wash contaminated clothing and gloves, including the inside, before re-use.
Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance		liquid
Colour	:	brown
Odour	:	hydrocarbon-like
Odour Threshold	:	No data available
pH	:	No data available
Melting point/range	:	No data available
Initial boiling point and boiling range	:	> 58 °C (> 136 °F) Method: ASTM D-86
Flash point	:	< -35 °C (-31 °F) Method: ASTM D 93
Fire Point	:	No data available
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	18.4 kPaMethod: ASTM D 323A
Relative vapour density	:	> 1(Air = 1.0)
Relative density	:	0.9 - 0.94
Density	:	0.9 - 0.94 g/cm3 (15.5 °C / 59.9 °F)
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: < 1
Viscosity		
Viscosity, kinematic	:	35.4 mm2/s (30 °C / 86 °F)
		22.5 mm2/s (40 °C / 104 °F)
		14.6 mm2/s (50 °C / 122 °F)
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create

fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, SOx, H2S, hydrocarbons, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: No data available
Acute inhalation toxicity	:	Remarks: No data available
Acute dermal toxicity	:	Remarks: No data available

Components:

butane:

Acute inhalation toxicity	:	LC50 Rat: 658 mg/l Exposure time: 4 h Test atmosphere: gas

xylene:

Acute oral toxicity	:	LD50 Rat: 4,300 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 5000 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: > 1,700 mg/kg,

toluene:

Acute oral toxicity	:	LD50 Rat: 636 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 7585 ppm

Exposure time: 4 h
Test atmosphere: vapour

Acute dermal toxicity : LD50 Rabbit: 12,125 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

sulfur:
Result: Moderate skin irritant

xylene:
Result: Skin irritation

toluene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

sulfur:
Result: Moderate eye irritation

toluene:
Result: Mild eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

gas oils (petroleum), heavy vacuum:
Naphtha (oil sand), hydrotreated:
sulfur:
butane:
xylene:
toluene:

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Pow: < 1

Components:

butane :

Partition coefficient: n-octanol/water	:	log Pow: 2.89

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company.

Dispose of as hazardous waste in compliance with local and national regulations.
Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1267
Proper shipping name	:	Petroleum crude oil
Class	:	3
Packing group	:	II
Labels	:	3
Packing instruction (cargo aircraft)	:	364

IMDG-Code

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	II
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

49 CFR

UN/ID/NA number	:	1267
Proper shipping name	:	Petroleum crude oil
Class	:	3
Packing group	:	II
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

TDG

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	II
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

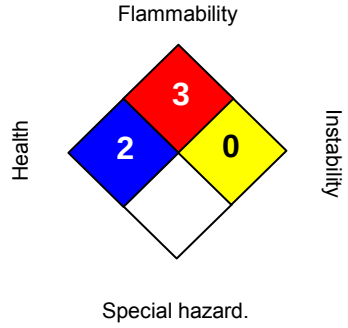
WHMIS Classification : B2: Flammable liquid
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects
Flammable liquid
Carcinogen
Reproductive hazard
Moderate skin irritant
Moderate eye irritant
Skin sensitiser

The components of this product are reported in the following inventories:
DSL All components of this product are on the Canadian DSL.

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2*
FLAMMABILITY	3
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and

is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	SUNCOR OSJ
Synonyms	:	Light Virgin Distillate, LVGO
Manufacturer or supplier's details		SUNCOR ENERGY INC. P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Refinery Feedstock
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Appearance	liquid
Colour	amber
Odour	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Hazard Summary	Combustible liquid. Toxic by inhalation. Irritating to skin. May cause cancer.

Potential Health Effects

Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system
Inhalation	:	Harmful if inhaled. May cause respiratory tract irritation. Inhalation may cause central nervous system effects. Symptoms of overexposure may be headache, dizziness,

tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.

Skin : Causes moderate skin irritation.
Prolonged skin contact may defat the skin and produce dermatitis.

Eyes : May cause eye irritation.

Ingestion : Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.
Aspiration hazard if swallowed - can enter lungs and cause damage.

Aggravated Medical Condition : None known.

Carcinogenicity:

IARC Group 2A: Probably carcinogenic to humans

Gas oils, petroleum, light vacuum	64741-58-8
Distillates (petroleum), straight-run middle	64741-44-2

ACGIH No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
Gas oils (petroleum), light vacuum	64741-58-8	50 - 100 %
Distillates (petroleum), straight-run middle	64741-44-2	0 - 50 %
Condensates (petroleum), vacuum tower	64741-49-7	0 - 50 %
sulfur	7704-34-9	<= 3 %

Product may contain 0 - 200 ppm hydrogen sulphide.

SECTION 4. FIRST AID MEASURES

If inhaled : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.

Seek medical advice.

In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Foam Dry chemical
Unsuitable extinguishing media	:	Do NOT use water jet.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray. Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Further information	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.
Special protective equipment for firefighters	:	Wear self-contained breathing apparatus for firefighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas.

Material can create slippery conditions.

Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. Use only with adequate ventilation. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Contains no substances with occupational exposure limit values.

Engineering measures	:	Use only in well-ventilated areas.

Personal protective equipment

Respiratory protection	:	Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Filter type	:	Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.

Hand protection

Material	:	neoprene, nitrile, polyvinyl alcohol (PVA). Consult your PPE provider for breakthrough times and the specific glove that is best for you based on your use patterns. It should be realized that eventually any material regardless of their imperviousness, will get permeated by chemicals. Therefore, protective gloves should be regularly checked for wear and tear. At the first signs of hardening and cracks, they should be changed.
Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	amber
Odour	:	Hydrocarbon or "rotten egg" if H2S present, but odour is an unreliable warning, since it may deaden the sense of smell.
Odour Threshold	:	No data available
pH	:	No data available
Melting point	:	No data available
Boiling point/boiling range	:	110 - 450 °C (230 - 842 °F) Method: ASTM D-2887
Flash point	:	50 °C (122 °F) Method: ASTM D 93
Auto-Ignition Temperature	:	248 - 267 °C (478 - 513 °F) Method: ASTM E659
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks,

		shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	0.32 - 0.39 %(V) Method: ASTM E681
Vapour pressure	:	< 0.1 kPaMethod: ASTM D 323A
Relative vapour density	:	No data available
Relative density	:	0.89
Density	:	0.89 g/cm3
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: < 1
Viscosity		
Viscosity, kinematic	:	No data available
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, NOx, SOx, H2S, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion

Acute toxicity

Product:

Acute oral toxicity : Remarks: No data available

Acute inhalation toxicity : Remarks: No data available

Acute dermal toxicity : Remarks: No data available

Components:

Gas oils (petroleum), light vacuum:
Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

Distillates (petroleum), straight-run middle:
Acute oral toxicity : LD50 Rat: > 5,000 mg/kg,

Acute inhalation toxicity : LC50 Rat: 1.78 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

Acute dermal toxicity : LD50 Rabbit: > 2,000 mg/kg,

Condensates (petroleum), vacuum tower:
Acute inhalation toxicity : LC50 Rat: 4.1 mg/l
Exposure time: 4 h
Test atmosphere: dust/mist

sulfur:
Acute dermal toxicity : LD50 Rabbit: > 2,000 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

Distillates (petroleum), straight-run middle:
Result: Moderate skin irritant

sulfur:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

Distillates (petroleum), straight-run middle:

Result: Mild eye irritation

sulfur:
Result: Moderate eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

Bioaccumulative potential

Components:
Distillates (petroleum), straight-run middle :

Partition coefficient: n-octanol/water	:	Remarks: No data available

Mobility in soil

No data available

Other adverse effects

No data available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.
Contaminated packaging	:	Do not re-use empty containers.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1268
Proper shipping name	:	Petroleum distillates, n.o.s.
Class	:	3
Packing group	:	III
Labels	:	3
Packing instruction (cargo aircraft)	:	366

IMDG-Code

UN number	:	1268
Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.
Class	:	3
Packing group	:	III
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

TDG

UN number	:	1268
Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.
Class	:	3

Packing group	:	III
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : B3: Combustible Liquid
D1B: Toxic Material Causing Immediate and Serious Toxic Effects
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects

This product has been classified according to the hazard criteria of the CPR and the MSDS contains all of the information required by the CPR.

The components of this product are reported in the following inventories:

DSL	On the inventory, or in compliance with the inventory
TSCA	All components of this product are on the Canadian DSL.

SECTION 16. OTHER INFORMATION

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

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REDACTED COPY

SUNCOR OSP

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D1B - Materials causing immediate and serious toxic effects, Toxic Material D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSP

Product type : Suncor Product
MSDS Number : V00000006059
Synonyms : Sour Crude Oil, Sour Crude Blend

Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
DISTILLATES (PETROLEUM), HEAVY THERMAL CRACKED	64741-81-7	0 - 50 %
Distillates (petroleum) , straight - run middle	64741-44-2	0 - 30 %
Light Vacuum Gas Oil	64741-58-8	0 - 30 %
Vacuum Tower Condensate	64741-49-7	0 - 30 %
Naphtha (oil sand)	128683-32-9	5 - 24 %
HYDROGEN SULPHIDE	7783-06-4	< 150 PPM
METHANETHIOL	74-93-1	5 - 50 PPM

ETHANETHIOL	75-08-1	5 - 100 PPM
sec-Butyl Mercaptan	513-53-1	5 - 75 PPM
GAS OILS (PETROLEUM), HEAVY VACUUM	64741-57-7	0 - 50 %

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Flammable.May liberate highly toxic and flammable hydrogen sulfide gas.Avoid breathing vapors, mist or gas.

Potential Health Effects

Eyes : May cause eye irritation.

Skin : May cause irritation, drying and blistering.
Can be absorbed through the skin in toxic amounts resulting in vomiting, diarrhea, and respiratory disorders.

Inhalation : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : Chronic exposure causes drying effect on the skin and eczema.
May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact
Ingestion

Target Organs : Respiratory system

Central nervous system

Carcinogenic Effects : IARC Group 2A - Probable human carcinogen

SECTION 4. FIRST AID MEASURES

General advice : Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.

Eye contact : Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Seek medical advice.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.
Seek medical advice.
Wash contaminated clothing before reuse.
Thoroughly clean shoes before reuse.

Inhalation : Move to fresh air.
Artificial respiration and/or oxygen may be necessary.
Seek medical advice.

Ingestion : Do NOT induce vomiting.
If vomiting occurs have victim lean forward to reduce the risk of aspiration.
Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point : Estimated2 - 183 °C (36 - 361 °F)
Method: ASTM D 93

Autoignition temperature : Estimated 254 °C (489 °F)
Method: ASTM E659

Lower explosion limit : Estimated 0.36 %(V)
Method: ASTM E681

Flammability in Presence of : Flammable material will readily ignite at normal temperatures.
Risk of fire or explosion exists if static charge accumulates during transfer or flow of product.
Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Vapors can accumulate and travel to distant ignition sources and flash back.

Explosibility in Presence of : Explosive in the form of a vapor when exposed to heat or

flame.

Products of Combustion	:	Hydrogen sulphide, carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, nitrogen oxides, other toxic gases

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Do not extinguish with water unless flow can be stopped The use of water may spread fire. Do NOT use water jet. Do not cut, drill or weld empty containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible

materials.
Storage tank should be vented to atmosphere.
To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded.
A containment dike should be built around tank.
Small quantities should be stored in an approved safety solvent container.
Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.
Hand protection	:	Wear gloves as a standard industrial handling procedure. The following materials are acceptable: polyvinyl alcohol Nitrile rubber Neoprene
Skin and body protection	:	Wear long sleeve clothing or coveralls. Wear as appropriate: A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	Concentration in air determines protection needed. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	
		CAD ON OEL	STEL	15 ppm	
		ACGIH	TWA	1 ppm	
		ACGIH	STEL	5 ppm	

		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OEL (QUE)	TWA	10 ppm	14 mg/m3
		OEL (QUE)	STEL	15 ppm	21 mg/m3
		CAD BC OEL	CEILING	10 ppm	
		CAD SK OEL	8 HR ACL	10 ppm	
		CAD SK OEL	15 MIN ACL	15 ppm	
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.
Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	brown
Odour	:	hydrocarbon-like
Physical state	:	liquid
Boiling point/boiling range	:	5 - 600 °C (41 - 1,112 °F) Method: ASTM D6352
Vapour pressure	:	< 20 kPa Method: ASTM D 323A
Density	:	< 0.940 g/cm3
Specific gravity	:	< 0.940
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	POW: < 1
Relative vapour density	:	> 1

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.

Materials to avoid	:	Strong oxidizing agents
Hazardous decomposition products	:	Carbon monoxide carbon dioxide sulfur dioxide
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD50 Rat Dose: 5,000 mg/kg Test substance: Petroleum distillates
Acute dermal toxicity	:	LD50 Rabbit Dose: > 2,000 mg/kg Test substance: Petroleum distillates
Acute inhalation toxicity	:	LC50 Rat Exposure time: 4 h Dose: 1.7 mg/l Test substance: Petroleum distillates LC50 Rat Exposure time: 4 h Dose: 444 ppm Test substance: Hydrogen sulphide

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	:	**PETROLEUM DISTILLATES, N.O.S.**
	UN-Number	:	1268
	Class	:	3
	Packing group	:	II
TDG	Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.

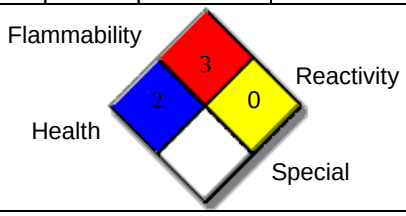
	UN-Number	: 1268
	Class	: 3
	Packing group	: II

IATA	UN Number	: 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3
	Packing instruction (cargo aircraft)	: 307
	Packing instruction (passenger aircraft)	: 305
	Packing instruction (passenger aircraft)	: Y305

IMDG	Substance No.	: UN 1268
	Description of the goods	: PETROLEUM DISTILLATES, N.O.S.
	Class	: 3
	Packaging group	: II
	ADR/RID-Labels	: 3
	EmS Number	: F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D1B - Materials causing immediate and serious toxic effects, Toxic Material, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 05/31/2012

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

Validation date of previous version : 04/16/2009

General contact information : [redacted]

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Material Safety Data Sheet

PRODUCT NAPHTHA

V00000001710

Version 1.0 Revision Date 2014/08/07 Print Date 2014/08/12

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	PRODUCT NAPHTHA
Synonyms	:	SUNCOR OSN, Treated Naphtha, Hydrotreated Naphtha
Manufacturer or supplier's details		SUNCOR ENERGY INC. P.O. Box 2844, 150 - 6th Avenue South-West Calgary Alberta T2P 3E3 Canada
Emergency telephone number		Suncor Energy: +1 403-296-3000; Poison Control Centre: Consult local telephone directory for emergency number(s).

Recommended use of the chemical and restrictions on use

Recommended use	:	Component of synthetic crude
Prepared by	:	Product Safety: +1 905-804-4752

SECTION 2. HAZARDS IDENTIFICATION

Emergency Overview

Form	liquid
Colour	clear
Odour	hydrocarbon-like
Hazard Summary	Flammable liquid Contains material which may cause cancer based on animal data. Contains material that may adversely affect the developing foetus. May cause heritable genetic damage. Irritating to skin.

Potential Health Effects

Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system Blood Skin

Inhalation	:	May cause respiratory tract irritation. Inhalation may cause central nervous system effects. High concentration of vapours may induce unconsciousness. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
Skin	:	May cause skin irritation. Prolonged or repeated skin contact with liquid may cause defatting resulting in drying, redness and possible blistering.
Eyes	:	May cause eye irritation.
Ingestion	:	Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea. Aspiration hazard if swallowed - can enter lungs and cause damage.
Aggravated Medical Condition	:	None known.

Carcinogenicity:

IARC	Group 1: Carcinogenic to humans	
	1,3-BUTADIENE	106-99-0
	Benzene	71-43-2
OSHA	OSHA specifically regulated carcinogen	
	1,3-BUTADIENE	106-99-0
	Benzene	71-43-2
NTP	Known to be human carcinogen	
	1,3-BUTADIENE	106-99-0
	Benzene	71-43-2
ACGIH	Confirmed human carcinogen	
	Benzene	71-43-2
	Suspected human carcinogen	
	1,3-BUTADIENE	106-99-0

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Pure substance/mixture : Mixture

Hazardous components

Chemical Name	CAS-No.	Concentration (%)
Naphtha (oil sand), hydrotreated	128683-33-0	100 %
butane	106-97-8	3 - 7 %
pentane	109-66-0	1 - 5 %
isobutane	75-28-5	1 - 5 %
2-methylbutane	78-78-4	1 - 5 %
xylene	1330-20-7	1 - 2 %
toluene	108-88-3	0.1 - 1 %
1,3-butadiene	106-99-0	0.1 - 1 %

benzene	71-43-2	0.1 - 0.3 %

Product may contain trace amounts of hydrogen sulphide

SECTION 4. FIRST AID MEASURES

If inhaled	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
In case of skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognized skin cleanser. Wash clothing before reuse. Seek medical advice.
In case of eye contact	:	Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
If swallowed	:	Rinse mouth with water. DO NOT induce vomiting unless directed to do so by a physician or poison control center. Never give anything by mouth to an unconscious person. Seek medical advice.
Most important symptoms and effects, both acute and delayed	:	First aider needs to protect himself.

SECTION 5. FIREFIGHTING MEASURES

Suitable extinguishing media	:	Carbon dioxide (CO2) Foam Dry chemical
Unsuitable extinguishing media	:	No information available.
Specific hazards during firefighting	:	Cool closed containers exposed to fire with water spray.
Hazardous combustion products	:	Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), smoke and irritating vapours as products of incomplete combustion.
Specific extinguishing methods	:	Prevent fire extinguishing water from contaminating surface water or the ground water system.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	Use personal protective equipment. Ensure adequate ventilation. Evacuate personnel to safe areas. Material can create slippery conditions.
Environmental precautions	:	If the product contaminates rivers and lakes or drains inform respective authorities.
Methods and materials for containment and cleaning up	:	Prevent further leakage or spillage if safe to do so. Remove all sources of ignition. Soak up with inert absorbent material. Non-sparking tools should be used. Ensure adequate ventilation. Contact the proper local authorities.

SECTION 7. HANDLING AND STORAGE

Advice on safe handling	:	For personal protection see section 8. Smoking, eating and drinking should be prohibited in the application area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid contact with skin, eyes and clothing. Do not ingest. Keep away from heat and sources of ignition. Keep container closed when not in use.
Conditions for safe storage	:	Store in original container. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Keep in a dry, cool and well-ventilated place. Keep in properly labelled containers. To maintain product quality, do not store in heat or direct sunlight.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
xylene	1330-20-7	TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
		TWA	100 ppm	ACGIH
		STEL	150 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	CA AB OEL
		STEL	2.5 ppm 8 mg/m3	CA AB OEL
		TWA	0.5 ppm	CA BC OEL
		STEL	2.5 ppm	CA BC OEL

		TWA	0.5 ppm	CA ON OEL
		STEL	2.5 ppm	CA ON OEL
		TWAEV	1 ppm 3 mg/m3	CA QC OEL
		STEV	5 ppm 15.5 mg/m3	CA QC OEL
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		TWA	0.1 ppm	NIOSH REL
		ST	1 ppm	NIOSH REL
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm	OSHA Z-2
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
butane	106-97-8	TWA	1,000 ppm	CA AB OEL
		TWA	600 ppm	CA BC OEL
		STEL	750 ppm	CA BC OEL
		TWAEV	800 ppm 1,900 mg/m3	CA QC OEL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	OSHA P0
pentane	109-66-0	TWAEV	120 ppm 350 mg/m3	CA QC OEL
		TWA	120 ppm 350 mg/m3	NIOSH REL
		C	610 ppm 1,800 mg/m3	NIOSH REL
		TWA	1,000 ppm 2,950 mg/m3	OSHA Z-1
		TWA	600 ppm 1,800 mg/m3	OSHA P0
		STEL	750 ppm 2,250 mg/m3	OSHA P0
		TWA	120 ppm 350 mg/m3	NIOSH REL
		C	610 ppm 1,800 mg/m3	NIOSH REL
		TWA	1,000 ppm 2,950 mg/m3	OSHA Z-1

		TWA	600 ppm 1,800 mg/m3	OSHA P0
		STEL	750 ppm 2,250 mg/m3	OSHA P0
isobutane	75-28-5	TWA	800 ppm 1,900 mg/m3	NIOSH REL
		TWA	800 ppm 1,900 mg/m3	NIOSH REL
2-methylbutane	78-78-4	TWA	600 ppm 1,770 mg/m3	CA AB OEL
toluene	108-88-3	TWA	50 ppm 188 mg/m3	CA AB OEL
		TWA	20 ppm	CA BC OEL
		TWAEV	50 ppm 188 mg/m3	CA QC OEL
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
		TWA	20 ppm	ACGIH
		TWA	100 ppm 375 mg/m3	NIOSH REL
		ST	150 ppm 560 mg/m3	NIOSH REL
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm	OSHA Z-2
		TWA	100 ppm 375 mg/m3	OSHA P0
		STEL	150 ppm 560 mg/m3	OSHA P0
1,3-butadiene	106-99-0	TWA	2 ppm 4.4 mg/m3	CA AB OEL
		TWA	2 ppm	CA BC OEL
		TWAEV	2 ppm 4.4 mg/m3	CA QC OEL
		TWA	2 ppm	ACGIH
		TWA	1 ppm	OSHA Z-1
		STEL	5 ppm	OSHA Z-1
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	2 ppm	ACGIH
		TWA	1 ppm	OSHA Z-1
		STEL	5 ppm	OSHA Z-1
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants.

Personal protective equipment

Respiratory protection	:	Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Filter type	:	Wear a NIOSH-approved respirator/breathing apparatus in situations where there may be potential for airborne exposure.
Hand protection		
Material	:	nitrile, Viton(R).
Remarks	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Eye protection	:	Wear face-shield and protective suit for abnormal processing problems.
Skin and body protection	:	Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.
Protective measures	:	Wash contaminated clothing before re-use. No special protective equipment required.
Hygiene measures	:	Remove and wash contaminated clothing and gloves, including the inside, before re-use. Wash face, hands and any exposed skin thoroughly after handling.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	clear
Odour	:	hydrocarbon-like
Odour Threshold	:	No data available
pH	:	No data available
Melting point/range	:	No data available
Initial boiling point and boiling range	:	> 34 °C (> 93 °F) Method: ASTM D-86
Flash point	:	< -35 °C (< -31 °F)

		Method: ASTM D 93
Fire Point	:	No data available
Auto-Ignition Temperature	:	No data available
Evaporation rate	:	No data available
Flammability	:	Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back.
Upper explosion limit	:	No data available
Lower explosion limit	:	No data available
Vapour pressure	:	63 - 66 kPaMethod: ASTM D 323A
Relative vapour density	:	> 1
Relative density	:	0.71 - 0.72
Density	:	0.71 - 0.72 g/cm3
Solubility(ies)		
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	Pow: < 1
Viscosity		
Viscosity, kinematic	:	No data available
Explosive properties	:	Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. Liquid may accumulate static charge.

SECTION 10. STABILITY AND REACTIVITY

Possibility of hazardous reactions	:	Hazardous polymerisation does not occur. Stable under normal conditions.
Conditions to avoid	:	Extremes of temperature and direct sunlight.
Incompatible materials	:	Reactive with oxidising agents.
Hazardous decomposition products	:	May release COx, smoke and irritating vapours when heated to decomposition.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute toxicity

Product:

Acute oral toxicity	:	Remarks: No data available
Acute inhalation toxicity	:	Remarks: No data available
Acute dermal toxicity	:	Remarks: No data available

Components:

butane:

Acute inhalation toxicity	:	LC50 Rat: 658 mg/l Exposure time: 4 h Test atmosphere: gas

pentane:

Acute oral toxicity	:	LD50 Rat: > 2,000 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 364 mg/l Exposure time: 4 h

isobutane:

Acute inhalation toxicity	:	LC50 Rat: 658,000 mg/m3 Exposure time: 4 h Test atmosphere: gas

2-methylbutane:

Acute inhalation toxicity	:	LC50 Rat: 280 mg/l Exposure time: 4 h

xylene:

Acute oral toxicity	:	LD50 Rat: 4,300 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 5000 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: > 1,700 mg/kg,

toluene:

Acute oral toxicity	:	LD50 Rat: 636 mg/kg,
Acute inhalation toxicity	:	LC50 Rat: 7585 ppm Exposure time: 4 h Test atmosphere: vapour
Acute dermal toxicity	:	LD50 Rabbit: 12,125 mg/kg,

benzene:
Acute oral toxicity : LD50 Rat: 930 mg/kg,

Acute inhalation toxicity : LC50 Rat: 13700 ppm
Exposure time: 4 h
Test atmosphere: vapour

Acute dermal toxicity : LD50 Rabbit: > 8,240 mg/kg,

Skin corrosion/irritation

Product:

Remarks: No data available

Components:

2-methylbutane:
Result: Mild skin irritation

xylene:
Result: Skin irritation

toluene:
Result: Moderate skin irritant

benzene:
Result: Moderate skin irritant

Serious eye damage/eye irritation

Product:

Remarks: No data available

Components:

2-methylbutane:
Result: Mild eye irritation

toluene:
Result: Mild eye irritation

benzene:
Result: Moderate eye irritation

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

No data available

Reproductive toxicity

No data available

Naphtha (oil sand), hydrotreated:
butane:
pentane:
isobutane:
2-methylbutane:
xylene:
toluene:
1,3-butadiene:
benzene:

STOT - single exposure

No data available

STOT - repeated exposure

No data available

Aspiration toxicity

No data available

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Product:

Toxicity to fish	:	Remarks: No data available
Toxicity to daphnia and other aquatic invertebrates	:	Remarks: No data available
Toxicity to algae	:	Remarks: No data available
Toxicity to bacteria	:	Remarks: No data available

Persistence and degradability

Product:

Biodegradability	:	Remarks: No data available

No data available

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water	:	Pow: < 1

Components:
butane :

Partition coefficient: n-octanol/water	:	log Pow: 2.89

pentane :

Partition coefficient: n-octanol/water	:	log Pow: 3.39

isobutane :

Partition coefficient: n-octanol/water	:	log Pow: 2.76

Mobility in soil

No data available

Other adverse effects

No data available

Product:

Additional ecological information	:	This product has no known ecotoxicological effects.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues	:	The product should not be allowed to enter drains, water courses or the soil. Offer surplus and non-recyclable solutions to a licensed disposal company. Waste must be classified and labelled prior to recycling or disposal. Send to a licensed waste management company. Dispose of as hazardous waste in compliance with local and national regulations. Dispose of product residue in accordance with the instructions of the person responsible for waste disposal.

SECTION 14. TRANSPORT INFORMATION

International Regulation

IATA-DGR

UN/ID No.	:	1993
Proper shipping name	:	Flammable liquid, n.o.s. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
Packing instruction (cargo aircraft)	:	361

IMDG-Code

UN number	:	1993
Proper shipping name	:	FLAMMABLE LIQUID, N.O.S. (Naphtha)
Class	:	3

Packing group	:	I
Labels	:	3
EmS Code	:	F-E, S-E
Marine pollutant	:	no

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable for product as supplied.

49 CFR

UN/ID/NA number	:	1993
Proper shipping name	:	Flammable liquids, n.o.s. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

TDG

UN number	:	1993
Proper shipping name	:	FLAMMABLE LIQUID, N.O.S. (Naphtha)
Class	:	3
Packing group	:	I
Labels	:	3
ERG Code	:	128
Marine pollutant	:	no

Special precautions for user

Not applicable

SECTION 15. REGULATORY INFORMATION

WHMIS Classification : B2: Flammable liquid
D2A: Very Toxic Material Causing Other Toxic Effects
D2B: Toxic Material Causing Other Toxic Effects
Flammable liquid
Teratogen
Carcinogen
Moderate skin irritant
Mutagen

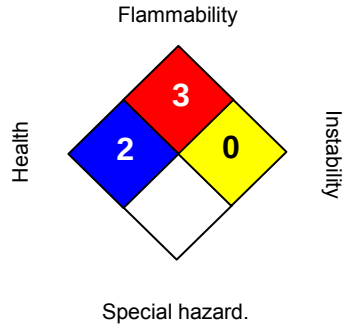
The components of this product are reported in the following inventories:

DSL All components of this product are on the Canadian DSL.

SECTION 16. OTHER INFORMATION

Further information

NFPA:



HMIS III:

HEALTH	2*
FLAMMABILITY	3
PHYSICAL HAZARD	0
PERSONAL PROTECTION	H

0 = not significant, 1 =Slight,
2 = Moderate, 3 = High
4 = Extreme, * = Chronic

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds
Canada-wide: telephone: 1-800-668-0220; fax: 1-800-837-1228
For Product Safety Information: 1 905-804-4752

Prepared by : Product Safety: +1 905-804-4752

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

SUNCOR OSQ

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D1A - Materials causing immediate and serious toxic effects, Very Toxic Material D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	4	Flashpoint below 73 F	Flammability	4
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSQ
Product type : Suncor Product
MSDS Number : V00000005570
Synonyms : Sour Bitumen Blend, Bitumen/ Coker Naphtha Blend
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oilsands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Petroleum Bitumen	8052-42-4	65.00 %
NAPHTHA (PETROLEUM), FULL-RANGE COKER	68513-02-0	35.00 %
Sulphur	7704-34-9	4.20 %
N-HEXANE	110-54-3	2.90 %
PENTANE	109-66-0	1.70 %
BENZENE	71-43-2	0.00 % - 0.50 %
METHANETHIOL	74-93-1	0.00 % - 0.20 %
HYDROGEN SULPHIDE	7783-06-4	0.00 PPM - 1.00 PPM
XYLENE, MIXTURE OF ISOMERS	1330-20-7	0.00 % - 1.90 %

Comment on components : Sulphur content includes hydrogen sulphide

SECTION 3. HAZARDS IDENTIFICATION

Potential Health Effects

Eyes	:	May cause eye irritation. Liquid may cause severe irritation, reddening and swelling.
Skin	:	May cause irritation, drying and blistering. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance. Toluene and benzene are readily absorbed through the skin.
Inhalation	:	May cause respiratory tract irritation. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath. Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death. Typical levels of hydrogen sulfide in product are below 100 ppm.
Ingestion	:	May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness. Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.
Chronic Exposure	:	Chronic exposure causes drying effect on the skin and eczema. May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory. Benzene can impair the formation of red and white blood cells and platelets. May cause kidney damage and enlargement of the liver. Benzene can cause cancer of the white blood cells.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system

Carcinogenicity:

Carcinogenic Effects	:	There is no data available for this product. Diluent naphtha and bitumen produced one squamous cell carcinoma in an animal study by Syncrude Canada Ltd. Dermal tumors were produced in a skin assay performed by Syncrude Canada Ltd using a similar product. Contains benzene, a confirmed human carcinogen.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do not induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	<-35 °C (-31 °F) Method: Pensky Martens closed cup
Lower explosion limit	:	estimated 1.1 %(V)
Upper explosion limit	:	estimated 7.5 %(V)
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.
Products of Combustion	:	carbon monoxide, carbon dioxide (CO2), sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	carbon dioxide (CO2), foam, dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be build around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn.

Wear face-shield if splashing hazard is likely.

Hand protection	:	Wear suitable gloves. The following materials are acceptable: nitrile rubber Neoprene
Skin and body protection	:	Wear as appropriate: long sleeved clothing A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

Petroleum Bitumen	8052-42-4	CAD AB OEL	TWA	5 mg/m3	
		CAD ON OEL	TWA	0.5 mg/m3	
		Expressed as		as benzene solubles	
		Form of exposure		Inhalable fume	
		ACGIH	TWA	0.5 mg/m3	
		Expressed as		as benzene solubles	
		Form of exposure		Inhalable fraction.	
		NIOSH	Ceil_Time	5 mg/m3	
		Form of exposure		Fume.	
Sulphur	7704-34-9	CAD AB OEL	TWA	10 mg/m3	
N-HEXANE	110-54-3	CAD AB OEL	TWA	50 ppm	176 mg/m3
		CAD ON OEL	TWA	50 ppm	176 mg/m3
		ACGIH	TWA	50 ppm	
		NIOSH	REL	50 ppm	180 mg/m3
		OSHA Z1	PEL	500 ppm	1,800 mg/m3
PENTANE	109-66-0	CAD AB OEL	TWA	600 ppm	1,770 mg/m3
		ACGIH	TWA	600 ppm	
		NIOSH	REL	120 ppm	350 mg/m3
		NIOSH	Ceil_Time	610 ppm	1,800 mg/m3
		OSHA Z1	PEL	1,000 ppm	2,950 mg/m3
		CAD ON OEL	TWA	600 ppm	1,770 mg/m3
		CAD ON OEL	STEL	750 ppm	2,210 mg/m3
BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3

		CAD ON OEL	TWA	1 ppm	
		CAD ON OEL	STEL	5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3
HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
XYLENE, MIXTURE OF ISOMERS	1330-20-7	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	150 ppm	651 mg/m3
		CAD ON OEL	TWA	100 ppm	435 mg/m3
		CAD ON OEL	STEL	150 ppm	650 mg/m3
		ACGIH	TWA	100 ppm	
		ACGIH	STEL	150 ppm	
		OSHA Z1	PEL	100 ppm	435 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	black
Odour	:	hydrocarbon-like
State of matter	:	liquid
pH	:	8.1
Boiling point/range	:	32.1 - 322 °C (89.8 - 612 °F)

Vapour pressure	:	49.7 kPa
Density	:	0.917 g/cm3
Specific gravity	:	0.917
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: <1

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide sulfur dioxide
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD 50Rat Dose: 3,500 - 9,800 mg/kg
Acute dermal toxicity	:	LD 50Rabbit Dose: 2,000 mg/kg
Acute inhalation toxicity	:	LC 50Rat Exposure time: 4 h Dose: > 5 mg/l
Skin irritation	:	Rabbit Result: Moderate skin irritant Method: OECD Test Guideline 404 Exposure time: 4 h
Eye irritation	:	Rabbit Result: slight irritation Method: OECD Test Guideline 405
Sensitization	:	Remarks: Did not cause sensitization on laboratory animals.
Further information	:	The toxicological data has been taken from products of similar

composition.
Weak response in Syncrude skin assay and two Suncor short-term tests could indicate a low carcinogenic potential.
Weak response on modified Ames test and UDS assay.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

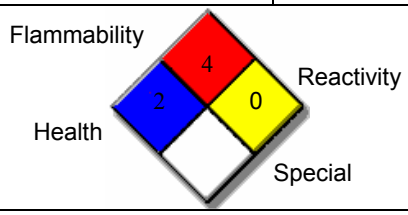
SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	:	Flammable liquid, n.o.s.
	UN-No	:	1993
	Class	:	3
	Packing group	:	I
TDG	Proper shipping name	:	Flammable liquid, n.o.s.
	UN-No	:	1993
	Class	:	3
	Packing group	:	I
IATA	UN Number	:	1993
	Description of the goods	:	Flammable liquid, n.o.s.
	Class	:	3
	Packaging group	:	I
	ADR/RID-Labels	:	3
	Packing instruction (cargo aircraft)	:	303
	Packing instruction (passenger aircraft)	:	302
IMDG	Substance No.	:	UN 1993
	Description of the goods	:	Flammable liquid, n.o.s.
	Class	:	3
	Packaging group	:	I
	ADR/RID-Labels	:	3
	EmS Number	:	F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	4

Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D1A - Materials causing immediate and serious toxic effects, Very Toxic Material, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

TSCA Status : Listed in TSCA

Petroleum Bitumen	8052-42-4
NAPHTHA (PETROLEUM), FULL-RANGE COKER	68513-02-0
Sulphur	7704-34-9
N-HEXANE	110-54-3
PENTANE	109-66-0
BENZENE	71-43-2
METHANETHIOL	74-93-1
2-Methylthiophene	554-14-3
HYDROGEN SULPHIDE	7783-06-4

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : EHS_RPGEND

References :

Suncor Energy Inc., Oil Sands, MSDS for Diluted Bitumen, December 2005
Hazelton Wisconsin, Primary Dermal Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Eye Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Eye Irritation/Corrosion Study of Naphtha in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Dermal Irritation/Corrosion Study of Naphtha in Rabbits (OECD Guidelines), January 22, 1991
The American Petroleum Institute Petroleum HPV Testing Group, Gasoline Blending Streams Test Plan, September 5, 2003
Maxxam Analytics Inc. Laboratory analysis, Job # A554826/ A26204, January 9, 2006.

SUNCOR OSQ

Suncor Energy Marketing Inc., Estimated Assay for Suncor Blend OSQ , December 15, 2005.

General contact information : [redacted]

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SUNCOR OSQ

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D1A - Materials causing immediate and serious toxic effects, Very Toxic Material D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	2
Flammability	4	Flashpoint below 73 F	Flammability	4
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSQ
Product type : Suncor Product
MSDS Number : V00000005570
Synonyms : Sour Bitumen Blend, Bitumen/ Coker Naphtha Blend
Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oilsands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Petroleum Bitumen	8052-42-4	65.00 %
NAPHTHA (PETROLEUM), FULL-RANGE COKER	68513-02-0	35.00 %
Sulphur	7704-34-9	4.20 %
N-HEXANE	110-54-3	2.90 %
PENTANE	109-66-0	1.70 %
BENZENE	71-43-2	0.00 % - 0.50 %
METHANETHIOL	74-93-1	0.00 % - 0.20 %
HYDROGEN SULPHIDE	7783-06-4	0.00 PPM - 1.00 PPM
XYLENE, MIXTURE OF ISOMERS	1330-20-7	0.00 % - 1.90 %

Comment on components : Sulphur content includes hydrogen sulphide

SECTION 3. HAZARDS IDENTIFICATION

Potential Health Effects

Eyes	:	May cause eye irritation. Liquid may cause severe irritation, reddening and swelling.
Skin	:	May cause irritation, drying and blistering. Prolonged or repeated contact may cause dermatitis, reddening of skin and a chapped appearance. Toluene and benzene are readily absorbed through the skin.
Inhalation	:	May cause respiratory tract irritation. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting. Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath. Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death. Typical levels of hydrogen sulfide in product are below 100 ppm.
Ingestion	:	May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness. Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.
Chronic Exposure	:	Chronic exposure causes drying effect on the skin and eczema. May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory. Benzene can impair the formation of red and white blood cells and platelets. May cause kidney damage and enlargement of the liver. Benzene can cause cancer of the white blood cells.
Primary Routes of Entry	:	Inhalation Eye contact Skin Absorption Skin contact Ingestion
Target Organs	:	Respiratory system Central nervous system

Carcinogenicity:

Carcinogenic Effects	:	There is no data available for this product. Diluent naphtha and bitumen produced one squamous cell carcinoma in an animal study by Syncrude Canada Ltd. Dermal tumors were produced in a skin assay performed by Syncrude Canada Ltd using a similar product. Contains benzene, a confirmed human carcinogen.

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	Take off all contaminated clothing immediately. Wash off with soap and water. For large exposures use a deluge shower.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do not induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	<-35 °C (-31 °F) Method: Pensky Martens closed cup
Lower explosion limit	:	estimated 1.1 %(V)
Upper explosion limit	:	estimated 7.5 %(V)
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.
Products of Combustion	:	carbon monoxide, carbon dioxide (CO2), sulfur dioxide, Polycyclic Aromatic Hydrocarbons

Fire fighting information

Suitable extinguishing media	:	carbon dioxide (CO2), foam, dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be build around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn.

Wear face-shield if splashing hazard is likely.

Hand protection	:	Wear suitable gloves. The following materials are acceptable: nitrile rubber Neoprene
Skin and body protection	:	Wear as appropriate: long sleeved clothing A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

Petroleum Bitumen	8052-42-4	CAD AB OEL	TWA	5 mg/m3	
		CAD ON OEL	TWA	0.5 mg/m3	
		Expressed as		as benzene solubles	
		Form of exposure		Inhalable fume	
		ACGIH	TWA	0.5 mg/m3	
		Expressed as		as benzene solubles	
		Form of exposure		Inhalable fraction.	
		NIOSH	Ceil_Time	5 mg/m3	
		Form of exposure		Fume.	
Sulphur	7704-34-9	CAD AB OEL	TWA	10 mg/m3	
N-HEXANE	110-54-3	CAD AB OEL	TWA	50 ppm	176 mg/m3
		CAD ON OEL	TWA	50 ppm	176 mg/m3
		ACGIH	TWA	50 ppm	
		NIOSH	REL	50 ppm	180 mg/m3
		OSHA Z1	PEL	500 ppm	1,800 mg/m3
PENTANE	109-66-0	CAD AB OEL	TWA	600 ppm	1,770 mg/m3
		ACGIH	TWA	600 ppm	
		NIOSH	REL	120 ppm	350 mg/m3
		NIOSH	Ceil_Time	610 ppm	1,800 mg/m3
		OSHA Z1	PEL	1,000 ppm	2,950 mg/m3
		CAD ON OEL	TWA	600 ppm	1,770 mg/m3
		CAD ON OEL	STEL	750 ppm	2,210 mg/m3
BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3

		CAD ON OEL	TWA	1 ppm	
		CAD ON OEL	STEL	5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3
HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	14 mg/m3
		CAD ON OEL	STEL	15 ppm	21 mg/m3
		ACGIH	TWA	10 ppm	
		ACGIH	STEL	15 ppm	
		ACGIH NIC	TWA	1 ppm	
		ACGIH NIC	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
XYLENE, MIXTURE OF ISOMERS	1330-20-7	CAD AB OEL	TWA	100 ppm	434 mg/m3
		CAD AB OEL	STEL	150 ppm	651 mg/m3
		CAD ON OEL	TWA	100 ppm	435 mg/m3
		CAD ON OEL	STEL	150 ppm	650 mg/m3
		ACGIH	TWA	100 ppm	
		ACGIH	STEL	150 ppm	
		OSHA Z1	PEL	100 ppm	435 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3
		NIOSH	REL	100 ppm	435 mg/m3
		NIOSH	STEL	150 ppm	655 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	black
Odour	:	hydrocarbon-like
State of matter	:	liquid
pH	:	8.1
Boiling point/range	:	32.1 - 322 °C (89.8 - 612 °F)

Vapour pressure	:	49.7 kPa
Density	:	0.917 g/cm3
Specific gravity	:	0.917
Water solubility	:	insoluble
Partition coefficient (n-octanol/water)	:	POW: <1

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Incompatible with oxidizing agents.
Hazardous decomposition products	:	Carbon monoxide carbon dioxide polycyclic aromatic hydrocarbons hydrogen sulfide sulfur dioxide
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD 50Rat Dose: 3,500 - 9,800 mg/kg
Acute dermal toxicity	:	LD 50Rabbit Dose: 2,000 mg/kg
Acute inhalation toxicity	:	LC 50Rat Exposure time: 4 h Dose: > 5 mg/l
Skin irritation	:	Rabbit Result: Moderate skin irritant Method: OECD Test Guideline 404 Exposure time: 4 h
Eye irritation	:	Rabbit Result: slight irritation Method: OECD Test Guideline 405
Sensitization	:	Remarks: Did not cause sensitization on laboratory animals.
Further information	:	The toxicological data has been taken from products of similar

composition.
Weak response in Syncrude skin assay and two Suncor short-term tests could indicate a low carcinogenic potential.
Weak response on modified Ames test and UDS assay.

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

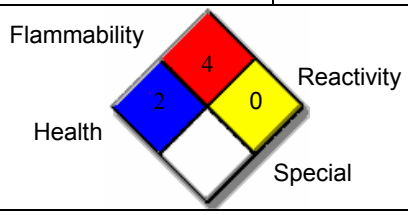
SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	:	Flammable liquid, n.o.s.
	UN-No	:	1993
	Class	:	3
	Packing group	:	I
TDG	Proper shipping name	:	Flammable liquid, n.o.s.
	UN-No	:	1993
	Class	:	3
	Packing group	:	I
IATA	UN Number	:	1993
	Description of the goods	:	Flammable liquid, n.o.s.
	Class	:	3
	Packaging group	:	I
	ADR/RID-Labels	:	3
	Packing instruction (cargo aircraft)	:	303
	Packing instruction (passenger aircraft)	:	302
IMDG	Substance No.	:	UN 1993
	Description of the goods	:	Flammable liquid, n.o.s.
	Class	:	3
	Packaging group	:	I
	ADR/RID-Labels	:	3
	EmS Number	:	F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	2
Flammability	4

Physical Hazard	0
Personal Protective Equipment	
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D1A - Materials causing immediate and serious toxic effects, Very Toxic Material, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

TSCA Status : Listed in TSCA

Petroleum Bitumen	8052-42-4
NAPHTHA (PETROLEUM), FULL-RANGE COKER	68513-02-0
Sulphur	7704-34-9
N-HEXANE	110-54-3
PENTANE	109-66-0
BENZENE	71-43-2
METHANETHIOL	74-93-1
2-Methylthiophene	554-14-3
HYDROGEN SULPHIDE	7783-06-4

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : EHS_RPGEND

References :

Suncor Energy Inc., Oil Sands, MSDS for Diluted Bitumen, December 2005
Hazelton Wisconsin, Primary Dermal Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Eye Irritation/Corrosion Study of Bitumen in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Eye Irritation/Corrosion Study of Naphtha in Rabbits (OECD Guidelines), January 22, 1991
Hazelton Wisconsin, Primary Dermal Irritation/Corrosion Study of Naphtha in Rabbits (OECD Guidelines), January 22, 1991
The American Petroleum Institute Petroleum HPV Testing Group, Gasoline Blending Streams Test Plan, September 5, 2003
Maxxam Analytics Inc. Laboratory analysis, Job # A554826/ A26204, January 9, 2006.

SUNCOR OSQ

Suncor Energy Marketing Inc., Estimated Assay for Suncor Blend OSQ , December 15, 2005.

General contact information : [redacted]

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SUNCOR OSU

WHMIS (Pictograms)	WHMIS (Classification)	Protective Clothing
	B2 - Flammable Liquid D1B - Materials causing immediate and serious toxic effects, Toxic Material D2A - Materials Causing Other Toxic Effects, Very Toxic Material D2B - Materials Causing Other Toxic Effects, Toxic Material	

NFPA Hazard Class			HMIS Hazard Class	
Health	2	Hazardous	Health	* 2 (chronic health hazard)
Flammability	3	Flashpoint below 100 F	Flammability	3
Reactivity	0	Stable	Physical Hazard	0
Specific hazards			Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

Product name : SUNCOR OSU

Product type : Suncor Product
MSDS Number : V00000004589
Synonyms : Sour Bitumen Blend

Intended Use : Refinery Feedstock
Manufacturer : Suncor Energy Inc.,
P.O. Box 4001
Fort McMurray, Alberta Canada
T9H 3E3

EMERGENCY CONTACT INFORMATION

Suncor Energy Inc., Oil Sands (780) 790-7001 (24-hr)

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS-No.	Concentration
Light Vacuum Gas Oil	64741-58-8	0 - 40 %
Vacuum Tower Condensate	64741-49-7	0 - 40 %
DISTILLATES (PETROLEUM), HEAVY THERMAL CRACKED	64741-81-7	0 - 80 %
Distillates (petroleum) , straight - run middle	64741-44-2	0 - 40 %
Naphtha (oil sand)	128683-32-9	0 - 24 %
BITUMEN	128683-24-9	0 - 40 %
BENZENE	71-43-2	<= 0.1 %

HYDROGEN SULPHIDE	7783-06-4	<= 200 PPM
sec-Butyl Mercaptan	513-53-1	0 - 1,000 PPM
n-Butyl Mercaptan	109-79-5	0 - 150 PPM
Isopropyl Mercaptan	75-33-2	0 - 125 PPM
ETHANETHIOL	75-08-1	0 - 100 PPM
METHANETHIOL	74-93-1	0 - 100 PPM

SECTION 3. HAZARDS IDENTIFICATION

Emergency Overview

Hazard Summary : Extremely flammable.Product may contain Hydrogen Sulfide.

Potential Health Effects

Eyes : May cause eye irritation.
Liquid may cause severe irritation, reddening and swelling.

Skin : May cause irritation, drying and blistering.
Can be absorbed through the skin in toxic amounts resulting in vomiting, diarrhea, and respiratory disorders.

Inhalation : Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
High concentration of vapours may induce unconsciousness.
May cause respiratory tract irritation.
Symptoms of hydrogen sulfide overexposure include respiratory tract irritation and shortness of breath.
In high doses hydrogen sulfide may produce pulmonary edema and respiratory depression or paralysis.
Exposure to very high levels of hydrogen sulfide (> 500 ppm) will result in unconsciousness and death.

Ingestion : May cause burning sensation in mouth, throat and stomach; vomiting and diarrhea, drowsiness.
Small amounts of liquid drawn into the lungs from swallowing or vomiting may cause fluid build up in the lungs or inflammation of the bronchi.

Chronic Exposure : May damage the nervous system characterized by chronic headache, dizziness, fatigue, impaired sense of balance, and loss of memory.
Chronic exposure causes drying effect on the skin and eczema.

Primary Routes of Entry : Inhalation
Eye contact
Skin Absorption
Skin contact

		Ingestion
Target Organs	:	Respiratory system Central nervous system Blood
Carcinogenic Effects	:	IARC Group 2A - Probable human carcinogen Contains benzene. IARC Group 1 - Known Human Carcinogen ACGIH A1 - Confirmed Human Carcinogen

SECTION 4. FIRST AID MEASURES

General advice	:	Consult physician and/or Poison Control Centre for all exposures except minor instances of inhalation or skin contact.
Eye contact	:	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Seek medical advice.
Skin contact	:	In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Seek medical advice. Wash contaminated clothing before reuse. Thoroughly clean shoes before reuse.
Inhalation	:	Move to fresh air. Artificial respiration and/or oxygen may be necessary. Seek medical advice.
Ingestion	:	Do NOT induce vomiting. If vomiting occurs have victim lean forward to reduce the risk of aspiration. Seek medical advice.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	:	<-35 °C (-31 °F) Method: ASTM D 93
Autoignition temperature	:	253 °C (487 °F) Method: ASTM E659
Lower explosion limit	:	0.39 %(V) Method: ASTM E681
Flammability in Presence of	:	Flammable material will readily ignite at normal temperatures. Risk of fire or explosion exists if static charge accumulates during transfer or flow of product.

		Increased risk of flammable or explosive concentrations if hydrogen sulfide builds up in unventilated spaces.
Explosibility in Presence of	:	Explosive in the form of a vapor when exposed to heat or flame.
Products of Combustion	:	carbon monoxide, Carbon dioxide (CO2), sulfur dioxide, nitrogen oxides, other toxic gases

Fire fighting information

Suitable extinguishing media	:	Carbon dioxide (CO2), Foam, Dry chemical
Special protective equipment for fire-fighters	:	Wear self contained breathing apparatus for fire fighting if necessary.
Further information	:	Do not extinguish with water unless flow can be stopped The use of water may spread fire. Do NOT use water jet. Do not cut, drill or weld empty containers.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions	:	Wear proper protective equipment as specified in the protective equipment section.
Environmental precautions	:	Do not flush into surface water or sanitary sewer system. Comply with all applicable Federal and Provincial regulations or guidelines.
Methods for cleaning up	:	Remove all sources of ignition. Ensure adequate ventilation. Turn off source, if possible. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

SECTION 7. HANDLING AND STORAGE

Handling Precautions

Handling	:	Keep away from open flames, hot surfaces and sources of ignition. Prevent the creation of flammable or explosive concentrations of vapour in air and avoid vapour concentration higher than the occupational exposure limits. When transferring from one container to another apply earthing measures and use conductive hose material. Dangerous concentrations of hydrogen sulfide may be present in the headspaces of storage tanks, vessels and bulk transport tanks which contain or may have contained sour product.

Storage

Advice on mixed storage	:	Store in a cool, well ventilated area away from incompatible materials. Storage tank should be vented to atmosphere. To avoid ignition of vapours by static electricity discharge, all metal parts of the equipment must be grounded. A containment dike should be built around tank. Small quantities should be stored in an approved safety solvent container. Store container in a fire-resistant grounded cabinet vented to the atmosphere.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering measures	:	Adequate ventilation to ensure that Occupational Exposure Limits are not exceeded.
Eye protection	:	Chemical resistant goggles must be worn. Wear face-shield if splashing hazard is likely.
Hand protection	:	Wear gloves as a standard industrial handling procedure. The following materials are acceptable: Nitrile rubber Neoprene polyvinyl alcohol
Skin and body protection	:	Wear long sleeve clothing or coveralls. Wear as appropriate: A neoprene or nitrile rain suit may be needed in certain situations. (e.g., vessel cleaning).
Respiratory protection	:	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Half-mask air purifying respirator with organic vapor/dust cartridges is acceptable to 10 times the exposure limit. Full-face air purifying respirator with organic vapor/dust cartridges is acceptable to 50 times the exposure limit not to exceed the cartridge limit of 1000 ppm. A positive pressure self-contained or air supplied breathing apparatus should be worn in areas with insufficient oxygen or if the presence or release of H2S is possible.
Hygiene measures	:	Wash hands and face before breaks and immediately after handling the product.

Legislated occupational threshold limits

BITUMEN	128683-24-9	TWA	5 mg/m3

		Expressed as Remarks		Bitumen fume OEL Established in agreement with Alberta Occupational Health and Safety, and Suncor Energy Inc., Oil Sands	
BENZENE	71-43-2	CAD AB OEL	TWA	1 ppm	3.2 mg/m3
		CAD AB OEL	STEL	5 ppm	16 mg/m3
		CAD ON OEL	TWA	0.5 ppm	
		CAD ON OEL	STEL	2.5 ppm	
		ACGIH	TWA	0.5 ppm	
		ACGIH	STEL	2.5 ppm	
		NIOSH	REL	0.1 ppm	
		NIOSH	STEL	1 ppm	
		OSHA Z2	TWA	10 ppm	
		OSHA Z2	Ceiling	25 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OSHA	TWA	1 ppm	
		OSHA	STEL	5 ppm	
		OSHA	OSHA_ACT	0.5 ppm	
		OEL (QUE)	TWA	1 ppm	3 mg/m3
		OEL (QUE)	STEL	5 ppm	15.5 mg/m3
HYDROGEN SULPHIDE	7783-06-4	CAD AB OEL	TWA	10 ppm	14 mg/m3
		CAD AB OEL	CEILING	15 ppm	21 mg/m3
		CAD ON OEL	TWA	10 ppm	
		CAD ON OEL	STEL	15 ppm	
		ACGIH	TWA	1 ppm	
		ACGIH	STEL	5 ppm	
		NIOSH	Ceil_Time	10 ppm	15 mg/m3
		OSHA Z2	Ceiling	20 ppm	
		OSHA Z2	MAX. CONC	50 ppm	
		OEL (QUE)	TWA	10 ppm	14 mg/m3
		OEL (QUE)	STEL	15 ppm	21 mg/m3
		CAD BC OEL	CEILING	10 ppm	
		CAD SK OEL	8 HR ACL	10 ppm	
		CAD SK OEL	15 MIN ACL	15 ppm	
n-Butyl Mercaptan	109-79-5	CAD AB OEL	TWA	0.5 ppm	1.8 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.8 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.8 mg/m3
		OSHA Z1	PEL	10 ppm	35 mg/m3
ETHANETHIOL	75-08-1	CAD AB OEL	TWA	0.5 ppm	1.3 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1.3 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1.3 mg/m3
		OSHA Z1	Ceiling	10 ppm	25 mg/m3
METHANETHIOL	74-93-1	CAD AB OEL	TWA	0.5 ppm	0.98 mg/m3
		CAD ON OEL	TWA	0.5 ppm	1 mg/m3
		ACGIH	TWA	0.5 ppm	
		NIOSH	Ceil_Time	0.5 ppm	1 mg/m3
		OSHA Z1	Ceiling	10 ppm	20 mg/m3

Note: State/Provincial, local or other agencies or advisory groups may have established more stringent limits. Consult an industrial hygienist or similar professional, or your local authorities for further information.

Other information

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Colour	:	brown
Odour	:	Petroleum-like odor
Physical state	:	liquid
Boiling point/boiling range	:	70 - 711 °C (158 - 1,312 °F) Method: ASTM D 5307
Vapour pressure	:	7.9 kPa Method: ASTM D 323A
Density	:	0.91 - 0.96 g/cm3
Specific gravity	:	0.91 - 0.96
Water solubility	:	insoluble
Partition coefficient: n-octanol/water	:	POW: < 1
Viscosity, kinematic	:	62 mm2/s at 30 °C (86 °F) 40 mm2/s at 40 °C (104 °F) 26 mm2/s at 50 °C (122 °F) Method: ASTM D 445

SECTION 10. STABILITY AND REACTIVITY

Conditions to avoid	:	Heat, flames and sparks.
Materials to avoid	:	Strong oxidizing agents
Hazardous decomposition products	:	Carbon monoxide carbon dioxide sulfur dioxide
Hazardous reactions	:	Hazardous polymerisation does not occur. Note: Stable under normal conditions.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute oral toxicity	:	LD50 Rat Dose: 5,000 mg/kg Test substance: Petroleum distillates

Acute dermal toxicity	:	LD50 Rabbit Dose: > 2,000 mg/kg Test substance: Petroleum distillates
Acute inhalation toxicity	:	LC50 Rat Exposure time: 4 h Dose: 1.7 mg/l Test substance: Petroleum distillates LC50 Rat Exposure time: 4 h Dose: 444 ppm Test substance: Hydrogen sulphide

SECTION 12. ECOLOGICAL INFORMATION

Additional ecological information	:	There is no data available for this product.

SECTION 13. DISPOSAL CONSIDERATIONS

Advice on disposal	:	Comply with all applicable Federal and Provincial regulations or guidelines.

SECTION 14. TRANSPORT INFORMATION

DOT	Proper shipping name	:	**PETROLEUM DISTILLATES, N.O.S.**
	UN-Number	:	1268
	Class	:	3
	Packing group	:	II
TDG	Proper shipping name	:	PETROLEUM DISTILLATES, N.O.S.
	UN-Number	:	1268
	Class	:	3
	Packing group	:	II
IATA	UN Number	:	1268
	Description of the goods	:	PETROLEUM DISTILLATES, N.O.S.
	Class	:	3
	Packaging group	:	II
	ADR/RID-Labels	:	3
	Packing instruction (cargo aircraft)	:	307
	Packing instruction (passenger aircraft)	:	305
	Packing instruction (passenger aircraft)	:	Y305
IMDG	Substance No.	:	UN 1268

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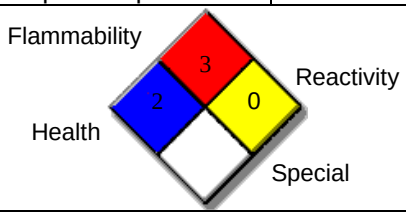
Description of the goods	:	PETROLEUM DISTILLATES, N.O.S.
Class	:	3
Packaging group	:	II
ADR/RID-Labels	:	3
EmS Number	:	F-E

SECTION 15. REGULATORY INFORMATION

HMIS Hazard Class

Health	* 2 (chronic health hazard)
Flammability	3
Physical Hazard	0
Personal Protective Equipment	Splash Goggles, Gloves, Apron, Vapor Respirator
NFPA Hazard Rating	

WHMIS Classification : B2 - Flammable Liquid, D1B - Materials causing immediate and serious toxic effects, Toxic Material, D2A - Materials Causing Other Toxic Effects, Very Toxic Material, D2B - Materials Causing Other Toxic Effects, Toxic Material

WHMIS (Pictograms)

DSL Status : All components of this product are on the Canadian DSL list.

SECTION 16. OTHER INFORMATION

Date Validated : 05/31/2012

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

Validation date of previous version : 04/16/2009

General contact information : [redacted]

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1. Product and Company Identification

Material name	**CRUDE OIL - CANADA**
Version #	05
Issue date	01-21-2011
Revision date	03-27-2014
MSDS number	7958
Synonym(s)	PETROLEUM CRUDE * RAW CRUDE
Supplier	Flint Hills Resources Canada, LP 1510, 111-5th Avenue SW Calgary, AB T2P 3Y6 CANADA
Telephone numbers – 24 hour emergency assistance	
Flint Hills Resources Canada, LP	403-716-7600
Chemtrec (United States)	800-424-9300
Canutec (Canada)	613-996-6666
Telephone numbers – general assistance	
8-5 (M-F, MST)	403-716-7600
8-5 (M-F, CST) MSDS Assistance	316-828-7988
Email:	msdsrequest@fhr.com

2. Hazards Identification

Emergency overview

DANGER!

BLACK, BROWN OR GREENISH LIQUID WITH AROMATIC OR PETROLEUM ODOR

HEALTH HAZARDS
CONTAINS HYDROGEN SULFIDE GAS. MAY BE FATAL IF INHALED
GAS MAY EVOLVE FROM THIS MATERIAL AND ACCUMULATE IN CONFINED SPACES
MAY BE HARMFUL OR FATAL IF SWALLOWED
MAY CAUSE LUNG DAMAGE
BREATHING HIGH CONCENTRATIONS CAN CAUSE IRREGULAR HEARTBEATS WHICH MAY BE FATAL
DANGER-CONTAINS BENZENE-CANCER HAZARD
CAN CAUSE LEUKEMIA AND OTHER BLOOD DISORDERS
MAY BE IRRITATING TO THE SKIN AND EYES
OVEREXPOSURE MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION
SEE "TOXICOLOGICAL INFORMATION" (SECTION 11) FOR MORE INFORMATION

FLAMMABILITY HAZARDS
EXTREMELY FLAMMABLE LIQUID AND VAPOR
VAPOR MAY CAUSE FLASH FIRE OR EXPLOSION
FLAMMABLE AND POISONOUS GAS MAY EVOLVE FROM THIS MATERIAL AND ACCUMULATE IN CONFINED SPACES

REACTIVITY HAZARDS
STABLE

Potential health effects

Routes of exposure

Inhalation, ingestion, skin and eye contact.

Eyes

Contact may cause pain and severe reddening and inflammation of the conjunctiva. Effects may become more serious with repeated or prolonged contact.

Vapors may cause eye irritation and sensitivity to light.

Skin

Contact may cause reddening, itching and inflammation. Skin contact may cause harmful effects in other parts of the body.

Inhalation

HIGHLY TOXIC.

May be harmful or fatal if inhaled.

Hydrogen sulfide can cause respiratory paralysis and death, depending on the concentration and duration of exposure. Do not rely on ability to smell vapors since odor fatigue rapidly occurs. Effects of overexposure include irritation of the nose and throat, nausea, vomiting, diarrhea, abdominal pain and signs of nervous system depression (e.g. headache, drowsiness, dizziness, loss of coordination and fatigue), irregular heartbeats, pulmonary edema, weakness and convulsions.

Breathing of the mists, vapors or fumes may irritate the nose, throat and lungs.

May cause central nervous system depression or effects.

Overexposure to this material may cause systemic damage including target organ effects listed under "Toxicological Information" (Section 11).

Ingestion

Swallowing this material may be harmful. May cause irritation of the mouth, throat and gastrointestinal tract. Symptoms may include salivation, pain, nausea, vomiting and diarrhea.

Aspiration into lungs may cause chemical pneumonia and lung damage.

Exposure may also cause central nervous system symptoms similar to those listed under "Inhalation" (see Inhalation section).

3. Composition / Information on Ingredients

Components	CAS #	Percent
CRUDE OIL	8002-05-9	100 %
N-HEXANE	110-54-3	5 - 8 %
BENZENE	71-43-2	1 - 5 %
TOLUENE	108-88-3	1 - 5 %
XYLENE	1330-20-7	1 - 5 %
HYDROGEN SULFIDE	7783-06-4	1 - 4 %
ETHYLBENZENE	100-41-4	1 - 3 %
POLYCYCLIC AROMATIC COMPOUNDS	130498-29-2	< 0.1 %

Composition comments

Values do not reflect absolute minimums and maximums; these values are typical which may vary from time to time.

This Material Safety Data Sheet is intended to communicate potential health hazards and potential physical hazards associated with the product(s) covered by this sheet, and is not intended to communicate product specification information. For product specification information, contact your Flint Hills Resources, LP representative.

4. First Aid Measures

First aid procedures

Eye contact

Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get medical attention if irritation persists.

Skin contact

Immediately wash skin with plenty of soap and water after removing contaminated clothing and shoes. Get medical attention if irritation develops or persists. Place contaminated clothing in closed container for storage until laundered or discarded. If clothing is to be laundered, inform person performing operation of contaminant's hazardous properties. Discard contaminated leather goods.

Inhalation

Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear and give oxygen. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR).

Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Ingestion

Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips to prevent aspiration and monitor for breathing difficulty.

Never give anything by mouth to an unconscious person.

Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Notes to physician

INHALATION: Inhalation exposure can produce toxic effects. Treat intoxications as hydrogen sulfide exposures. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

INGESTION: If ingested this material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. Fire Fighting Measures

Flammable properties

Material will burn in a fire.

Extremely flammable. Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back.

Explosion hazard if exposed to extreme heat.

Extinguishing media

Suitable extinguishing media

Use water spray, dry chemical, carbon dioxide or fire-fighting foam for Class B fires to extinguish fire.

Protection of firefighters

Specific hazards arising from the chemical

Combustion may produce COx, SOx, reactive hydrocarbons irritating vapors, and other decomposition products in the case of incomplete combustion.

Fire fighting equipment/instructions

Shut off source of flow, if possible.

Evacuate area and fight fire from a safe distance.

If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor, cool adjacent structures, and to protect personnel attempting to stop a leak.

Containers can build up pressure if exposed to heat (fire). Stay away from storage tank ends. Withdraw immediately in case of rising sound from venting safety device or any discoloration of storage tank due to fire.

Be aware that a BLEVE (Boiling Liquid Expanding Vapor Explosion) may occur unless surfaces are kept cool with water.

Firefighters must wear NIOSH approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

Explosion data

Sensitivity to static discharge

None known.

Sensitivity to mechanical impact

None known.

6. Accidental Release Measures

Environmental precautions

Eliminate all sources of ignition. Isolate hazard area and deny entry. If material is released to the environment, take immediate steps to stop and contain release. Caution should be exercised regarding personnel safety and exposure to the released material. Notify local, provincial and/or federal authorities, if required.

Other information

Keep unnecessary people away. Isolate area for at least 50 meters (164 feet) in all directions to preserve public safety. For large spills, if downwind consider initial evacuation for at least 300 meters (1000 feet).

Keep ignition sources out of area and shut off all ignition sources. Absorb spill with inert material (e. g. dry sand or earth) then place in a chemical waste container. Large Spills: Dike far ahead of liquid spill for later disposal.

Use vapor-suppressing foam to reduce vapors. Stop leak when safe to do so.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind. IF TANK, RAILCAR OR TANK TRUCK IS INVOLVED IN A FIRE, isolate for 800 meters (1/2 mile) in all directions. Evacuate area endangered by release as required. (See Exposure Controls/Personal Protection, Section 8.)

7. Handling and Storage

Handling

Bond and ground lines and equipment (tank, transfer lines, pump, floats, etc.) used during transfer to reduce the possibility of static spark-initiated fire or explosion. Use non-sparking tools. Do not cut, grind, drill, weld or reuse containers unless adequate precautions are taken against these hazards.

Good personal hygiene practices such as properly handling contaminated clothing, using wash facilities before entering public areas and restricting eating, drinking and smoking to designated areas are essential for preventing personal chemical contamination. Avoid contact with skin or eyes. Do not breathe fumes or vapor.

Storage

Store in tightly closed containers in a cool, dry, isolated, well-ventilated area away from heat, sources of ignition and incompatibles. Avoid contact with strong oxidizers.

Empty containers may contain material residue. Do not reuse without adequate precautions.

Hydrogen sulfide can build up in the head space of storage vessels containing this material. Use appropriate respiratory protection to prevent exposure. See Exposure Controls/Personal Protection (Section 8).

When entering a storage vessel that has previously contained this material, it is recommended that the atmosphere be monitored for the presence of hydrogen sulfide. See Occupational exposure limits (Section 8) for exposure limits.

Do not eat, drink or smoke in areas of use or storage.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH Biological Exposure Indices

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	BEI	25 µg/g	
ETHYLBENZENE (CAS 100-41-4)	BEI	0.7 g/g	
N-HEXANE (CAS 110-54-3)	BEI	0.4 mg/l	
TOLUENE (CAS 108-88-3)	BEI	0.3 mg/g	o-Cresol in urine
		0.03 mg/l	Urine
		0.02 mg/l	Blood
XYLENE (CAS 1330-20-7)	BEI	1.5 g/g	

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	STEL	2.5 ppm	Skin
	TWA	0.5 ppm	Skin
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm	
	TWA	20 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
N-HEXANE (CAS 110-54-3)	TWA	50 ppm	Skin
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
TOLUENE (CAS 108-88-3)	TWA	20 ppm	
XYLENE (CAS 1330-20-7)	STEL	50 ppm	
	TWA	100 ppm	

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm
	TWA	100 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	15 ppm
	TWA	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	TWA	50 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	20 ppm
TOLUENE (CAS 108-88-3)	TWA	20 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act)

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	STEL	2.5 ppm	
	TWA	0.5 ppm	
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
N-HEXANE (CAS 110-54-3)	TWA	50 ppm	
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)
TOLUENE (CAS 108-88-3)	TWA	20 ppm	
XYLENE (CAS 1330-20-7)	STEL	150 ppm	
	TWA	100 ppm	

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	15 ppm
	TWA	10 ppm

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	TWA	20 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm
	TWA	100 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	15 ppm
	TWA	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	STEL	150 ppm
	TWA	100 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
ETHYLBENZENE (CAS 100-41-4)	TWA	100 ppm
N-HEXANE (CAS 110-54-3)	TWA	500 ppm
XYLENE (CAS 1330-20-7)	TWA	100 ppm

US. OSHA Table Z-1-A (29 CFR 1910.1000)

Components	Type	Value
TOLUENE (CAS 108-88-3)	TWA	200 ppm

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	TWA	1 ppm	
CRUDE OIL (CAS 8002-05-9)	TWA	500 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	20 ppm	
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)
TOLUENE (CAS 108-88-3)	Ceiling	300 ppm	
	TWA	200 ppm	

Exposure guidelines NOTE: Only ingredients with validated exposure limits are shown in section 8.

Canada - Alberta OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

Canada - British Columbia OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
XYLENE (CAS 1330-20-7)	Can be absorbed through the skin.

Canada - Manitoba OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Canada - Ontario OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Canada - Quebec OELs: Skin designation

N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

Canada - Saskatchewan OELs: Skin designation

N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Engineering controls Ventilation and other forms of engineering controls are the preferred means for controlling exposures.

Personal protective equipment

Eye / face protection Keep away from eyes. Eye contact can be avoided by using chemical safety glasses, goggles and/or face shield. Have eye washing facilities readily available where eye contact can occur.

Skin protection Dermal exposure to this chemical may add to the overall exposure.

Avoid skin contact with this material. Use appropriate chemical protective gloves when handling. Additional protective clothing may be necessary.

Respiratory protection The use of air purifying respirators is not recommended where hydrogen sulfide levels may exceed exposure limits. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection. See OSHA 29 CFR 1910.134 for more information regarding respiratory protection and Assigned Protection Factors (APFs).

9. Physical & Chemical Properties

Appearance	
Physical state	Liquid.
Form	Not applicable
Color	Black, Brown, or green.
Odor	Aromatic or petroleum
Odor threshold	0.1 - 0.5 ppm
pH	Not available
Vapor pressure	Not available
Vapor density	> 1
Boiling point	< 100 °F (< 37.8 °C)
Melting point/Freezing point	Not available
Solubility (water)	Insoluble
Specific gravity	0.7 - 0.95 at 60/60 °F (15.6/15.6 °C)
Relative density	Not available.
Flash point	> -40 °F (> -40 °C)
Flammability limits in air, upper, % by volume	10 %
Flammability limits in air, lower, % by volume	1 %
Auto-ignition temperature	Not available
VOC	Not available
Evaporation rate	Variable
Viscosity	Varies
Percent volatile	Not available
Partition coefficient (n-octanol/water)	Not available

Pour point	Varies
Bulk density	5.84 - 7.85 Lb./Gal.
Molecular weight	Not available
Molecular formula	Mixture
Other data	
Chemical family	Hydrocarbon Mixture

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal conditions of use.
Conditions to avoid	Avoid unventilated areas, heat, open flames, sparks and ungrounded electrical equipment.
Incompatible materials	Avoid contact with strong acids and oxidizers. See precautions under Handling & Storage (Section 7).
Hazardous decomposition products	Not anticipated under normal conditions.
Possibility of hazardous reactions	Not anticipated under normal conditions.

11. Toxicological Information

Carcinogenicity

ACGIH Carcinogens

BENZENE (CAS 71-43-2)	A1 Confirmed human carcinogen.
ETHYL BENZENE (CAS 100-41-4)	A3 Confirmed animal carcinogen with unknown relevance to humans.
TOLUENE (CAS 108-88-3)	A4 Not classifiable as a human carcinogen.
XYLENE (O, M AND P ISOMERS) (CAS 1330-20-7)	A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

BENZENE (CAS 71-43-2)	1 Carcinogenic to humans.
CRUDE OIL (CAS 8002-05-9)	3 Not classifiable as to carcinogenicity to humans.
ETHYLBENZENE (CAS 100-41-4)	2B Possibly carcinogenic to humans.
TOLUENE (CAS 108-88-3)	3 Not classifiable as to carcinogenicity to humans.
XYLENE (CAS 1330-20-7)	3 Not classifiable as to carcinogenicity to humans.

Toxicological data

BENZENE: Studies of Workers Overexposed to Benzene: Studies of workers exposed to benzene show clear evidence that overexposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Some studies suggest overexposure to benzene may also be associated with other blood disorders including myelodysplastic syndrome. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely overexposed to benzene. Studies in Laboratory Animals: Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations. Benzene has been classified as a proven human carcinogen by OSHA and a Group 1 (Carcinogenic to Humans) material by IARC.

ETHYLBENZENE: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). The incidence of tumors was also elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals have demonstrated evidence of ototoxicity (hearing loss) following exposure levels as low as 300 ppm for 5 days. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

HYDROGEN SULFIDE: Hydrogen sulfide gas has an unpleasant odor that diminishes with increased exposure. Eye irritation may occur at levels above 4 ppm. Olfactory fatigue occurs rapidly at levels of 50 ppm or higher. Odor is not a reliable warning property. Respiratory effects include irritation with possible pulmonary edema at levels above 50 ppm. At 500 ppm immediate loss of consciousness and death can occur.

NIOSH has determined that 100 ppm hydrogen sulfide is immediately dangerous to life and health (IDLH).

N-HEXANE: Long-term or repeated exposure to n-hexane can cause peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, 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.

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs): Cancer is the most significant endpoint for PAHs. Certain PAHs are weak carcinogens which become carcinogenic after undergoing metabolism. Chronic or repeated exposure increases the likelihood of tumor initiation. Increased incidence of tumors of the skin, bladder, lung and gastrointestinal tract have been described in individuals overexposed to certain PAHs. Overexposure to PAHs has also been associated with photosensitivity and eye irritation. Inhalation overexposure of PAHs has been associated with respiratory tract irritation, cough, and bronchitis. Dermal overexposure has been associated with precancerous lesions, erythema, dermal burns, photosensitivity, acneiform lesions and irritation. Oral overexposure to PAHs has been associated with precancerous growths of the mouth (leukoplakia). Mild nephrotoxicity, congestion and renal cortical hemorrhages and elevated liver function tests, changes in the immune system and other effects have been observed in rats exposed to high levels of PAHs by ingestion.

TOLUENE: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Abuse of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system, and can cause CNS depression, cardiac arrhythmias, and death. Studies of workers indicate longterm exposure may be related to impaired color vision and hearing. Some studies of workers suggest longterm exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest longterm exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals have been largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Adverse effects on the liver, kidney, thymus and nervous system were observed in animal studies following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

XYLENES, ALL ISOMERS: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross overexposure. Effects from Prolonged or Repeated Exposure: Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. The relevance of these observations to humans is not clear at this time. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

CRUDE OIL: Lifetime dermal studies in rodents have shown in an increase in skin tumors with some crude oils. The International Agency for Research on Cancer (IARC) has concluded that there is limited evidence of carcinogenicity in animals and inadequate evidence of carcinogenicity in humans. The Overall IARC evaluation for crude oil is: "not classifiable as to its carcinogenicity to humans (Group 3)." Exposure to this material or its components may cause the following specific symptoms, depending on the concentration and duration of exposure: skin pigmentation changes, hyperkeratosis, folliculitis, warts, and anemia.

Exposure to this material may cause adverse effects or damage to the following organs or organ systems: blood, bone marrow, central nervous system, auditory system, peripheral nervous system, heart, immune system, kidneys, liver, lungs, lymphatic system, thymus, pituitary gland, thyroid, mucous membranes, respiratory tract, reproductive organs, testes, skin, and eyes.

12. Ecological Information

Ecotoxicological data

Product		Species	Test Results
CRUDE OIL - CANADA			
Aquatic			
Fish	LC50	Cutthroat trout (Oncorhynchus clarki)	2.1 - 4.3 mg/l, 96 hours

Ecotoxicity Toxic to aquatic organisms.

Persistence and degradability Not readily biodegradable.

Bioaccumulation / Accumulation May bioaccumulate in aquatic organisms.

Mobility in environmental media May partition into air, soil and water.

13. Disposal Considerations

Disposal instructions The transportation, storage, treatment and disposal of RCRA waste material must be conducted in compliance with federal regulations. Check state and local regulations for any additional requirements as these may be more restrictive than federal laws and regulations. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Disposal of this material must be conducted in compliance with all federal, state and local regulations.

In Canada, wastes should be disposed of according to federal, provincial and local regulations.

For additional handling information and protection of employees, see Section 7 (Handling and Storage) and Section 8 (Exposure Controls/Personal Protection).

14. Transport Information

General The above description may not cover shipping in all cases, please consult 49 CFR 100-185 for specific shipping information or Transport Compliance Specialist (CSO).

TDG

UN number	UN1267
UN proper shipping name	PETROLEUM CRUDE OIL (CRUDE OIL - CANADA)
Hazard class	3
Packing group	II
Marine pollutant	D
ERG code	128

TDG

15. Regulatory Information

Canadian regulations

All ingredients are on the Canadian Domestic Substance List (DSL), or are not required to be listed on the DSL.

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

WHMIS status

Controlled

WHMIS classification

B2 - Flammable Liquids
D1A - Immediate/Serious-VERY TOXIC
D2B - Other Toxic Effects-TOXIC

WHMIS labeling

16. Other Information

HMIS® ratings

Health: 3*
Flammability: 3
Physical hazard: 0
Personal protection:
* Indicates chronic health hazard

NFPA ratings

Health: 3
Flammability: 3
Instability: 0

Disclaimer

NOTICE: The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. Adequate training and instruction should be given by you to your employees and affected personnel. Appropriate warnings and safe handling procedures should be provided by you to handlers and users. Additionally, the user should review this information, satisfy itself as to its suitability and completeness, and pass on the information to its employees or customers in accordance with the applicable federal, state, provincial or local hazard communication requirements. This MSDS may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, expressed or implied, is made as to the accuracy or comprehensiveness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, vendor neither assumes nor retains any responsibility for any damage or injury resulting from abnormal use, from any failure to adhere to appropriate practices, or from any hazards inherent in the nature of the material. Moreover, unless an employee or a customer accesses or receives a MSDS directly from the company, there is no assurance that a document obtained from alternate sources is the most currently available MSDS.

This data sheet contains changes from the previous version in section(s):

This document has undergone significant changes and should be reviewed in its entirety.

Completed by

Flint Hills Resources, LP - Operations EH&S

1. Product and Company Identification

Material name	**CRUDE OIL - CANADA**
Version #	05
Issue date	01-21-2011
Revision date	03-27-2014
MSDS number	7958
Synonym(s)	PETROLEUM CRUDE * RAW CRUDE
Supplier	Flint Hills Resources Canada, LP 1510, 111-5th Avenue SW Calgary, AB T2P 3Y6 CANADA
Telephone numbers – 24 hour emergency assistance	
Flint Hills Resources Canada, LP	403-716-7600
Chemtrec (United States)	800-424-9300
Canutec (Canada)	613-996-6666
Telephone numbers – general assistance	
8-5 (M-F, MST)	403-716-7600
8-5 (M-F, CST) MSDS Assistance	316-828-7988
Email:	msdsrequest@fhr.com

2. Hazards Identification

Emergency overview

DANGER!

BLACK, BROWN OR GREENISH LIQUID WITH AROMATIC OR PETROLEUM ODOR

HEALTH HAZARDS
CONTAINS HYDROGEN SULFIDE GAS. MAY BE FATAL IF INHALED
GAS MAY EVOLVE FROM THIS MATERIAL AND ACCUMULATE IN CONFINED SPACES
MAY BE HARMFUL OR FATAL IF SWALLOWED
MAY CAUSE LUNG DAMAGE
BREATHING HIGH CONCENTRATIONS CAN CAUSE IRREGULAR HEARTBEATS WHICH MAY BE FATAL
DANGER-CONTAINS BENZENE-CANCER HAZARD
CAN CAUSE LEUKEMIA AND OTHER BLOOD DISORDERS
MAY BE IRRITATING TO THE SKIN AND EYES
OVEREXPOSURE MAY CAUSE CENTRAL NERVOUS SYSTEM DEPRESSION
SEE "TOXICOLOGICAL INFORMATION" (SECTION 11) FOR MORE INFORMATION

FLAMMABILITY HAZARDS
EXTREMELY FLAMMABLE LIQUID AND VAPOR
VAPOR MAY CAUSE FLASH FIRE OR EXPLOSION
FLAMMABLE AND POISONOUS GAS MAY EVOLVE FROM THIS MATERIAL AND ACCUMULATE IN CONFINED SPACES

REACTIVITY HAZARDS
STABLE

Potential health effects

Routes of exposure

Inhalation, ingestion, skin and eye contact.

Eyes

Contact may cause pain and severe reddening and inflammation of the conjunctiva. Effects may become more serious with repeated or prolonged contact.

Vapors may cause eye irritation and sensitivity to light.

Skin

Contact may cause reddening, itching and inflammation. Skin contact may cause harmful effects in other parts of the body.

Inhalation

HIGHLY TOXIC.

May be harmful or fatal if inhaled.

Hydrogen sulfide can cause respiratory paralysis and death, depending on the concentration and duration of exposure. Do not rely on ability to smell vapors since odor fatigue rapidly occurs. Effects of overexposure include irritation of the nose and throat, nausea, vomiting, diarrhea, abdominal pain and signs of nervous system depression (e.g. headache, drowsiness, dizziness, loss of coordination and fatigue), irregular heartbeats, pulmonary edema, weakness and convulsions.

Breathing of the mists, vapors or fumes may irritate the nose, throat and lungs.

May cause central nervous system depression or effects.

Overexposure to this material may cause systemic damage including target organ effects listed under "Toxicological Information" (Section 11).

Ingestion

Swallowing this material may be harmful. May cause irritation of the mouth, throat and gastrointestinal tract. Symptoms may include salivation, pain, nausea, vomiting and diarrhea.

Aspiration into lungs may cause chemical pneumonia and lung damage.

Exposure may also cause central nervous system symptoms similar to those listed under "Inhalation" (see Inhalation section).

3. Composition / Information on Ingredients

Components	CAS #	Percent
CRUDE OIL	8002-05-9	100 %
N-HEXANE	110-54-3	5 - 8 %
BENZENE	71-43-2	1 - 5 %
TOLUENE	108-88-3	1 - 5 %
XYLENE	1330-20-7	1 - 5 %
HYDROGEN SULFIDE	7783-06-4	1 - 4 %
ETHYLBENZENE	100-41-4	1 - 3 %
POLYCYCLIC AROMATIC COMPOUNDS	130498-29-2	< 0.1 %

Composition comments

Values do not reflect absolute minimums and maximums; these values are typical which may vary from time to time.

This Material Safety Data Sheet is intended to communicate potential health hazards and potential physical hazards associated with the product(s) covered by this sheet, and is not intended to communicate product specification information. For product specification information, contact your Flint Hills Resources, LP representative.

4. First Aid Measures

First aid procedures

Eye contact

Flush immediately with large amounts of water for at least 15 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. Get medical attention if irritation persists.

Skin contact

Immediately wash skin with plenty of soap and water after removing contaminated clothing and shoes. Get medical attention if irritation develops or persists. Place contaminated clothing in closed container for storage until laundered or discarded. If clothing is to be laundered, inform person performing operation of contaminant's hazardous properties. Discard contaminated leather goods.

Inhalation

Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear and give oxygen. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR).

Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Ingestion

Do not induce vomiting because of danger of aspirating liquid into lungs, causing serious damage and chemical pneumonitis. If spontaneous vomiting occurs, keep head below hips to prevent aspiration and monitor for breathing difficulty.

Never give anything by mouth to an unconscious person.

Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Notes to physician

INHALATION: Inhalation exposure can produce toxic effects. Treat intoxications as hydrogen sulfide exposures. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. This material (or a component) sensitizes the myocardium to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administration of sympathomimetic drugs should be avoided.

INGESTION: If ingested this material represents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended.

5. Fire Fighting Measures

Flammable properties

Material will burn in a fire.

Extremely flammable. Vapors form flammable or explosive mixtures with air at room temperature. Vapor or gas may spread to distant ignition sources and flash back.

Explosion hazard if exposed to extreme heat.

Extinguishing media

Suitable extinguishing media

Use water spray, dry chemical, carbon dioxide or fire-fighting foam for Class B fires to extinguish fire.

Protection of firefighters

Specific hazards arising from the chemical

Combustion may produce COx, SOx, reactive hydrocarbons irritating vapors, and other decomposition products in the case of incomplete combustion.

Fire fighting equipment/instructions

Shut off source of flow, if possible.

Evacuate area and fight fire from a safe distance.

If leak or spill has not ignited, ventilate area and use water spray to disperse gas or vapor, cool adjacent structures, and to protect personnel attempting to stop a leak.

Containers can build up pressure if exposed to heat (fire). Stay away from storage tank ends. Withdraw immediately in case of rising sound from venting safety device or any discoloration of storage tank due to fire.

Be aware that a BLEVE (Boiling Liquid Expanding Vapor Explosion) may occur unless surfaces are kept cool with water.

Firefighters must wear NIOSH approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

Explosion data

Sensitivity to static discharge

None known.

Sensitivity to mechanical impact

None known.

6. Accidental Release Measures

Environmental precautions

Eliminate all sources of ignition. Isolate hazard area and deny entry. If material is released to the environment, take immediate steps to stop and contain release. Caution should be exercised regarding personnel safety and exposure to the released material. Notify local, provincial and/or federal authorities, if required.

Other information

Keep unnecessary people away. Isolate area for at least 50 meters (164 feet) in all directions to preserve public safety. For large spills, if downwind consider initial evacuation for at least 300 meters (1000 feet).

Keep ignition sources out of area and shut off all ignition sources. Absorb spill with inert material (e. g. dry sand or earth) then place in a chemical waste container. Large Spills: Dike far ahead of liquid spill for later disposal.

Use vapor-suppressing foam to reduce vapors. Stop leak when safe to do so.

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind. IF TANK, RAILCAR OR TANK TRUCK IS INVOLVED IN A FIRE, isolate for 800 meters (1/2 mile) in all directions. Evacuate area endangered by release as required. (See Exposure Controls/Personal Protection, Section 8.)

7. Handling and Storage

Handling

Bond and ground lines and equipment (tank, transfer lines, pump, floats, etc.) used during transfer to reduce the possibility of static spark-initiated fire or explosion. Use non-sparking tools. Do not cut, grind, drill, weld or reuse containers unless adequate precautions are taken against these hazards.

Good personal hygiene practices such as properly handling contaminated clothing, using wash facilities before entering public areas and restricting eating, drinking and smoking to designated areas are essential for preventing personal chemical contamination. Avoid contact with skin or eyes. Do not breathe fumes or vapor.

Storage

Store in tightly closed containers in a cool, dry, isolated, well-ventilated area away from heat, sources of ignition and incompatibles. Avoid contact with strong oxidizers.

Empty containers may contain material residue. Do not reuse without adequate precautions.

Hydrogen sulfide can build up in the head space of storage vessels containing this material. Use appropriate respiratory protection to prevent exposure. See Exposure Controls/Personal Protection (Section 8).

When entering a storage vessel that has previously contained this material, it is recommended that the atmosphere be monitored for the presence of hydrogen sulfide. See Occupational exposure limits (Section 8) for exposure limits.

Do not eat, drink or smoke in areas of use or storage.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH Biological Exposure Indices

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	BEI	25 µg/g	
ETHYLBENZENE (CAS 100-41-4)	BEI	0.7 g/g	
N-HEXANE (CAS 110-54-3)	BEI	0.4 mg/l	
TOLUENE (CAS 108-88-3)	BEI	0.3 mg/g	o-Cresol in urine
		0.03 mg/l	Urine
		0.02 mg/l	Blood
XYLENE (CAS 1330-20-7)	BEI	1.5 g/g	

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	STEL	2.5 ppm	Skin
	TWA	0.5 ppm	Skin
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm	
	TWA	20 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
N-HEXANE (CAS 110-54-3)	TWA	50 ppm	Skin
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)

US. ACGIH Threshold Limit Values

Components	Type	Value	Form
TOLUENE (CAS 108-88-3)	TWA	20 ppm	
XYLENE (CAS 1330-20-7)	STEL	50 ppm	
	TWA	100 ppm	

Canada. Alberta OELs (Occupational Health & Safety Code, Schedule 1, Table 2)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm
	TWA	100 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	15 ppm
	TWA	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	TWA	50 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. British Columbia OELs. (Occupational Exposure Limits for Chemical Substances, Occupational Health and Safety Regulation 296/97, as amended)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	20 ppm
TOLUENE (CAS 108-88-3)	TWA	20 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. Manitoba OELs (Reg. 217/2006, The Workplace Safety And Health Act)

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	STEL	2.5 ppm	
	TWA	0.5 ppm	
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	5 ppm	
	TWA	1 ppm	
N-HEXANE (CAS 110-54-3)	TWA	50 ppm	
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)
TOLUENE (CAS 108-88-3)	TWA	20 ppm	
XYLENE (CAS 1330-20-7)	STEL	150 ppm	
	TWA	100 ppm	

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	2.5 ppm
	TWA	0.5 ppm
ETHYLBENZENE (CAS 100-41-4)	TWA	20 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	15 ppm
	TWA	10 ppm

Canada. Ontario OELs. (Control of Exposure to Biological or Chemical Agents)

Components	Type	Value
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	TWA	20 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

Canada. Quebec OELs. (Ministry of Labor - Regulation Respecting the Quality of the Work Environment)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm
ETHYLBENZENE (CAS 100-41-4)	STEL	125 ppm
	TWA	100 ppm
HYDROGEN SULFIDE (CAS 7783-06-4)	STEL	15 ppm
	TWA	10 ppm
N-HEXANE (CAS 110-54-3)	TWA	50 ppm
TOLUENE (CAS 108-88-3)	STEL	150 ppm
	TWA	100 ppm
XYLENE (CAS 1330-20-7)	STEL	150 ppm
	TWA	100 ppm

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Components	Type	Value
BENZENE (CAS 71-43-2)	STEL	5 ppm
	TWA	1 ppm

US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000)

Components	Type	Value
ETHYLBENZENE (CAS 100-41-4)	TWA	100 ppm
N-HEXANE (CAS 110-54-3)	TWA	500 ppm
XYLENE (CAS 1330-20-7)	TWA	100 ppm

US. OSHA Table Z-1-A (29 CFR 1910.1000)

Components	Type	Value
TOLUENE (CAS 108-88-3)	TWA	200 ppm

US. OSHA Table Z-2 (29 CFR 1910.1000)

Components	Type	Value	Form
BENZENE (CAS 71-43-2)	TWA	1 ppm	
CRUDE OIL (CAS 8002-05-9)	TWA	500 ppm	
HYDROGEN SULFIDE (CAS 7783-06-4)	Ceiling	20 ppm	
POLYCYCLIC AROMATIC COMPOUNDS (CAS 130498-29-2)	TWA	0.2 mg/m3	Coal tar pitch volatiles (benzene soluble fraction)
TOLUENE (CAS 108-88-3)	Ceiling	300 ppm	
	TWA	200 ppm	

Exposure guidelines NOTE: Only ingredients with validated exposure limits are shown in section 8.

Canada - Alberta OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

Canada - British Columbia OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
XYLENE (CAS 1330-20-7)	Can be absorbed through the skin.

Canada - Manitoba OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Canada - Ontario OELs: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Canada - Quebec OELs: Skin designation

N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

Canada - Saskatchewan OELs: Skin designation

N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.
TOLUENE (CAS 108-88-3)	Can be absorbed through the skin.

US ACGIH Threshold Limit Values: Skin designation

BENZENE (CAS 71-43-2)	Can be absorbed through the skin.
N-HEXANE (CAS 110-54-3)	Can be absorbed through the skin.

Engineering controls Ventilation and other forms of engineering controls are the preferred means for controlling exposures.

Personal protective equipment

Eye / face protection Keep away from eyes. Eye contact can be avoided by using chemical safety glasses, goggles and/or face shield. Have eye washing facilities readily available where eye contact can occur.

Skin protection Dermal exposure to this chemical may add to the overall exposure.

Avoid skin contact with this material. Use appropriate chemical protective gloves when handling. Additional protective clothing may be necessary.

Respiratory protection The use of air purifying respirators is not recommended where hydrogen sulfide levels may exceed exposure limits. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection. See OSHA 29 CFR 1910.134 for more information regarding respiratory protection and Assigned Protection Factors (APFs).

9. Physical & Chemical Properties

Appearance	
Physical state	Liquid.
Form	Not applicable
Color	Black, Brown, or green.
Odor	Aromatic or petroleum
Odor threshold	0.1 - 0.5 ppm
pH	Not available
Vapor pressure	Not available
Vapor density	> 1
Boiling point	< 100 °F (< 37.8 °C)
Melting point/Freezing point	Not available
Solubility (water)	Insoluble
Specific gravity	0.7 - 0.95 at 60/60 °F (15.6/15.6 °C)
Relative density	Not available.
Flash point	> -40 °F (> -40 °C)
Flammability limits in air, upper, % by volume	10 %
Flammability limits in air, lower, % by volume	1 %
Auto-ignition temperature	Not available
VOC	Not available
Evaporation rate	Variable
Viscosity	Varies
Percent volatile	Not available
Partition coefficient (n-octanol/water)	Not available

Pour point	Varies
Bulk density	5.84 - 7.85 Lb./Gal.
Molecular weight	Not available
Molecular formula	Mixture
Other data	
Chemical family	Hydrocarbon Mixture

10. Chemical Stability & Reactivity Information

Chemical stability	Stable under normal conditions of use.
Conditions to avoid	Avoid unventilated areas, heat, open flames, sparks and ungrounded electrical equipment.
Incompatible materials	Avoid contact with strong acids and oxidizers. See precautions under Handling & Storage (Section 7).
Hazardous decomposition products	Not anticipated under normal conditions.
Possibility of hazardous reactions	Not anticipated under normal conditions.

11. Toxicological Information

Carcinogenicity

ACGIH Carcinogens

BENZENE (CAS 71-43-2)	A1 Confirmed human carcinogen.
ETHYL BENZENE (CAS 100-41-4)	A3 Confirmed animal carcinogen with unknown relevance to humans.
TOLUENE (CAS 108-88-3)	A4 Not classifiable as a human carcinogen.
XYLENE (O, M AND P ISOMERS) (CAS 1330-20-7)	A4 Not classifiable as a human carcinogen.

IARC Monographs. Overall Evaluation of Carcinogenicity

BENZENE (CAS 71-43-2)	1 Carcinogenic to humans.
CRUDE OIL (CAS 8002-05-9)	3 Not classifiable as to carcinogenicity to humans.
ETHYLBENZENE (CAS 100-41-4)	2B Possibly carcinogenic to humans.
TOLUENE (CAS 108-88-3)	3 Not classifiable as to carcinogenicity to humans.
XYLENE (CAS 1330-20-7)	3 Not classifiable as to carcinogenicity to humans.

Toxicological data

BENZENE: Studies of Workers Overexposed to Benzene: Studies of workers exposed to benzene show clear evidence that overexposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Some studies suggest overexposure to benzene may also be associated with other blood disorders including myelodysplastic syndrome. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely overexposed to benzene. Studies in Laboratory Animals: Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations. Benzene has been classified as a proven human carcinogen by OSHA and a Group 1 (Carcinogenic to Humans) material by IARC.

ETHYLBENZENE: Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). The incidence of tumors was also elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as "possibly carcinogenic to humans" (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals have demonstrated evidence of ototoxicity (hearing loss) following exposure levels as low as 300 ppm for 5 days. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

HYDROGEN SULFIDE: Hydrogen sulfide gas has an unpleasant odor that diminishes with increased exposure. Eye irritation may occur at levels above 4 ppm. Olfactory fatigue occurs rapidly at levels of 50 ppm or higher. Odor is not a reliable warning property. Respiratory effects include irritation with possible pulmonary edema at levels above 50 ppm. At 500 ppm immediate loss of consciousness and death can occur.

NIOSH has determined that 100 ppm hydrogen sulfide is immediately dangerous to life and health (IDLH).

N-HEXANE: Long-term or repeated exposure to n-hexane can cause peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, 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.

POLYCYCLIC AROMATIC HYDROCARBONS (PAHs): Cancer is the most significant endpoint for PAHs. Certain PAHs are weak carcinogens which become carcinogenic after undergoing metabolism. Chronic or repeated exposure increases the likelihood of tumor initiation. Increased incidence of tumors of the skin, bladder, lung and gastrointestinal tract have been described in individuals overexposed to certain PAHs. Overexposure to PAHs has also been associated with photosensitivity and eye irritation. Inhalation overexposure of PAHs has been associated with respiratory tract irritation, cough, and bronchitis. Dermal overexposure has been associated with precancerous lesions, erythema, dermal burns, photosensitivity, acneiform lesions and irritation. Oral overexposure to PAHs has been associated with precancerous growths of the mouth (leukoplakia). Mild nephrotoxicity, congestion and renal cortical hemorrhages and elevated liver function tests, changes in the immune system and other effects have been observed in rats exposed to high levels of PAHs by ingestion.

TOLUENE: Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Abuse of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system, and can cause CNS depression, cardiac arrhythmias, and death. Studies of workers indicate longterm exposure may be related to impaired color vision and hearing. Some studies of workers suggest longterm exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest longterm exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals have been largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Adverse effects on the liver, kidney, thymus and nervous system were observed in animal studies following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

XYLENES, ALL ISOMERS: Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross overexposure. Effects from Prolonged or Repeated Exposure: Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. The relevance of these observations to humans is not clear at this time. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

CRUDE OIL: Lifetime dermal studies in rodents have shown in an increase in skin tumors with some crude oils. The International Agency for Research on Cancer (IARC) has concluded that there is limited evidence of carcinogenicity in animals and inadequate evidence of carcinogenicity in humans. The Overall IARC evaluation for crude oil is: "not classifiable as to its carcinogenicity to humans (Group 3)." Exposure to this material or its components may cause the following specific symptoms, depending on the concentration and duration of exposure: skin pigmentation changes, hyperkeratosis, folliculitis, warts, and anemia.

Exposure to this material may cause adverse effects or damage to the following organs or organ systems: blood, bone marrow, central nervous system, auditory system, peripheral nervous system, heart, immune system, kidneys, liver, lungs, lymphatic system, thymus, pituitary gland, thyroid, mucous membranes, respiratory tract, reproductive organs, testes, skin, and eyes.

12. Ecological Information

Ecotoxicological data

Product		Species	Test Results
CRUDE OIL - CANADA			
Aquatic			
Fish	LC50	Cutthroat trout (Oncorhynchus clarki)	2.1 - 4.3 mg/l, 96 hours

Ecotoxicity Toxic to aquatic organisms.

Persistence and degradability Not readily biodegradable.

Bioaccumulation / Accumulation May bioaccumulate in aquatic organisms.

Mobility in environmental media May partition into air, soil and water.

13. Disposal Considerations

Disposal instructions The transportation, storage, treatment and disposal of RCRA waste material must be conducted in compliance with federal regulations. Check state and local regulations for any additional requirements as these may be more restrictive than federal laws and regulations. Chemical additions, processing or otherwise altering this material may make the waste management information presented in this MSDS incomplete, inaccurate or otherwise inappropriate. Disposal of this material must be conducted in compliance with all federal, state and local regulations.

In Canada, wastes should be disposed of according to federal, provincial and local regulations.

For additional handling information and protection of employees, see Section 7 (Handling and Storage) and Section 8 (Exposure Controls/Personal Protection).

14. Transport Information

General The above description may not cover shipping in all cases, please consult 49 CFR 100-185 for specific shipping information or Transport Compliance Specialist (CSO).

TDG

UN number	UN1267
UN proper shipping name	PETROLEUM CRUDE OIL (CRUDE OIL - CANADA)
Hazard class	3
Packing group	II
Marine pollutant	D
ERG code	128

TDG

15. Regulatory Information

Canadian regulations

All ingredients are on the Canadian Domestic Substance List (DSL), or are not required to be listed on the DSL.

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

WHMIS status

Controlled

WHMIS classification

B2 - Flammable Liquids
D1A - Immediate/Serious-VERY TOXIC
D2B - Other Toxic Effects-TOXIC

WHMIS labeling

16. Other Information

HMIS® ratings

Health: 3*
Flammability: 3
Physical hazard: 0
Personal protection:
* Indicates chronic health hazard

NFPA ratings

Health: 3
Flammability: 3
Instability: 0

Disclaimer

NOTICE: The information presented herein is based on data considered to be accurate as of the date of preparation of this Material Safety Data Sheet. Adequate training and instruction should be given by you to your employees and affected personnel. Appropriate warnings and safe handling procedures should be provided by you to handlers and users. Additionally, the user should review this information, satisfy itself as to its suitability and completeness, and pass on the information to its employees or customers in accordance with the applicable federal, state, provincial or local hazard communication requirements. This MSDS may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, expressed or implied, is made as to the accuracy or comprehensiveness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, vendor neither assumes nor retains any responsibility for any damage or injury resulting from abnormal use, from any failure to adhere to appropriate practices, or from any hazards inherent in the nature of the material. Moreover, unless an employee or a customer accesses or receives a MSDS directly from the company, there is no assurance that a document obtained from alternate sources is the most currently available MSDS.

This data sheet contains changes from the previous version in section(s):

This document has undergone significant changes and should be reviewed in its entirety.

Completed by

Flint Hills Resources, LP - Operations EH&S

ENBRIDGE

Safety Data Sheet

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Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Heavy	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Premium Conventional Heavy (PCH), Conventional Heavy (CHV)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Petroleum distillate (naphtha)	8002-05-9	60-100	
Natural Gas Condensates (petroleum)	64741-47-5	60-100	
Asphalt	8052-42-4	50-90	
Butane	106-97-8	0-10	
Pentane	109-66-0	0-7	
Octane	111-65-9	0-5	
Nonane	111-84-2	0-5	
Heptane	142-82-5	0-5	
2-Methylbutane	78-78-4	0-5	
Isobutane	75-28-5	0-5	
Hexane	110-54-3	0-5	
Decane	124-18-5	0-5	
Benzene	71-43-2	0-2	
Xylene	1330-20-7	0-1	
Toluene	108-88-3	0-1	
Ethylbenzene	100-41-4	0-1	
1,2,4-Trimethylbenzene	95-63-6	0-1	
Hydrogen Sulfide	7783-06-4	0-1	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES

Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.

	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/ attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk. • LARGE FIRES: Use water spray or fog; do not use straight streams. • LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn. • LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen.
- Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.
Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up

- Clean up spill immediately.
- LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.
- SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.
- Use appropriate Personal Protective Equipment (PPE).
- Use clean non-sparking tools to collect absorbed material.
- Vacuum spilled material.
- Try to work upwind of spill.
- All equipment used when handling the product must be grounded.
- Recover and return free product to proper containers
- Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.
- Do not place spilled materials back in the original container.
- Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling

- All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces.
- The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).
- The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
- Take precautionary measures against static discharges.

Handling	• Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water. • Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
Petroleum distillate (naphtha)	–	–	TWA 350 mg/m^3 IDLH 1100 ppm Ceiling 1800 mg/m^3
Asphalt	TLV 0.5 mg/m^3		Ceiling 5 mg/m^3
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3

Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m^3	–	TWA 200 ppm TWA 1050 mg/m^3
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
2-Methylbutane	TWA 600 ppm	–	–
Isobutane	TWA 1000 ppm	–	–
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Decane	–	–	–
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm

1,2,4-Trimethylbenzene	TWA 25 ppm	–	TWA 25 ppm TWA 125 mg/m^3
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Petroleum like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Brown		

PROPERTIES

pH	No data available	**Vapor pressure**	No data available
Melting Point/ Freezing Point	No data available	**Vapor density**	2.5 to 5.0 Air=1
Boiling Point/ Boiling Range	34 to 260°C 93.2 to 500°F	**Relative density**	No data available
Flash Point	-40 to 260 °C -40 to 500 °F	**Water Solubility**	Negligible
Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
Upper Flammability Limit	No data available	**Decomposition temperature**	No data available

Lower Flammability Limit	No data available	**Specific Gravity**	0.65-0.98
Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Asphalt	>5000 mg/kg (Rat)	–	>94.4 mg/m^3 (Rat)
Butane	–	–	658 mg/L (Rat) 4 h
Pentane	>2000 mg/kg (Rat)	–	364 g/cu (Rat) 4 h
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
Nonane	–	–	= 3200 ppm (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
2-Methylbutane	–	–	= 150,000 mg/m^3 (Rat) 2 h

Isobutane	–	–	= 658,000 mg/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	–
Benzene	4800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
Hydrogen sulfide	–	–	= 444 ppm (Rat)

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen Sulfide Gas (H_2S)

- Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.

Hexane

- This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes

- Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

Toluene	**Carcinogenicity:** Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC. **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. **Reproductive Toxicity:** Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic. Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.
Ethylbenzene	**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. **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 (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA
Petroleum distillate (naphtha)	A2	–	Group 3		–
Asphalt	A4	–	Group 2B	Reasonably Anticipated	–
Hexane	–	X	–	–	–
Benzene	A1	X	Group 1	Known	X
Xylenes	A4	–	Group 3	Evidence	
Toluene	A4	–	Group 3	Evidence	–
Ethylbenzene	A3	–	Group 2B	Evidence	X

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY	• Suspected of damaging fertility or the unborn child.
STOT—SINGLE EXPOSURE	• May cause drowsiness and dizziness.
STOT—REPEATED EXPOSURE	• Causes damage to organs through prolonged or repeated exposure.
ASPIRATION HAZARD	May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Petroleum distillate (naphtha)	–	LC50: 258 mg/L Salmo gairdneri 96 h static	EC50 48 h: < 0.26 mg/L Static (Daphnia magna) EC50 24 h: = 36 mg/L (Daphnia magna)	–
Natural gas condensates (petroleum)	–	LC50 96 h: = 119 mg/L static (Alburnus alburnus) LC50 96 h: = 82 mg/L static (Cyprinodon variegatus)	EC50 24 h: = 170 mg/L (Daphnia magna)	–
Butane	–	–	–	–
Pentane	–	LC50 96 h: = 11.59 mg/L (Pimephales promelas) LC50 96 h: = 9.87 mg/L (Oncorhynchus mykiss) LC50 96 h: = 9.99 mg/L (Lepomis macrochirus)	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–
2-Methylbutane			EC50 48 h: = 2.3 mg/L (Daphnia magna)	
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: = 0.029 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)
Hydrogen sulfide	–	LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	–

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Asphalt	6.006
Butane	2.89
Pentane	3.39
Octane	5.18
Heptane	4.66
2-Methylbutane	2.72
Isobutane	2.76
Hexane	3.90
Decane	5.1
Benzene	1.83
Xylene	2.77-3.15
Toluene	2.65
Ethylbenzene	3.118

1,2,4-Trimethylbenzene	3.78
Hydrogen Sulfide	0.45

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
Petroleum distillate (naphtha)	High
Butane	Low
Pentane	High
Octane	Immobile
Nonane	Immobile
Heptane	Moderate
2-Methylbutane	Low
Isobutane	Very High
Hexane	High
Decane	Immobile
Benzene	High
Xylene	Very High to Moderate
Toluene	High to Moderate
Ethylbenzene	Low
1,2,4-Trimethylbenzene	Low

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum Crude Oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IMO/IMDG	UN1267	Petroleum Crude Oil	3	I	Marine Pullutant
IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed

Isobutane	75-28-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Decane	124-18-5	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	10 lb RQ
Xylene	1330-20-7	100 lb RQ
Toluene	108-88-3	1000 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	X
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	Not Listed
Pentane	109-66-0	Not Listed
Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	Not Listed
Isobutane	75-28-5	Not Listed
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	Not Listed
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
Petroleum distillate (naphtha)	8002-05-9	B2
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	A, B1
Pentane	109-66-0	B2

Octane	111-65-9	B2, D2B
Nonane	111-84-2	B2, D2B
Heptane	142-82-5	B2, D2B
2-Methylbutane	78-78-4	B2
Isobutane	75-28-5	A, B1 (listed under Methyl-2 propane)
Hexane	110-54-3	B2, D2A, D2B
Decane	124-18-5	B3, D2B
Benzene	71-43-2	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B
Toluene	108-88-3	B2, D2A, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
1,2,4-Trimethylbenzene	95-63-6	B3
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	Not Listed
Butane	106-97-8	X
Pentane	109-66-0	X

Octane	111-65-9	Not Listed
Nonane	111-84-2	Not Listed
Heptane	142-82-5	Not Listed
2-Methylbutane	78-78-4	X
Isobutane	75-28-5	X
Hexane	110-54-3	Not Listed
Decane	124-18-5	Not Listed
Benzene	71-43-2	X
Xylene	1330-20-7	X
Toluene	108-88-3	X
Ethylbenzene	100-41-4	X
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Hydrogen Sulfide	7783-06-4	X

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/4/15

REVISION DATE 5/4/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

MATERIAL SAFETY DATA SHEET

1. MATERIAL INFORMATION:

Material Identifier:	PSC
Manufacturer:	Nexen Inc.
Emergency Tel:	(780) 334-3911
Fax Number:	(780) 334-3310
Address:	PO Box 6610, Fort McMurray, AB, T9H-5R3
Description:	Liquid hydrocarbon mixture consisting of pentanes and higher hydrocarbons.
Chemical Identity:	Mixture consists of saturated aliphatic hydrocarbons but may contain traces of aromatic hydrocarbons.
Formula:	General formula C(n) H(2n+2)
Synonyms/Trade Names:	No other equivalent names in common use.
Material Use:	Refinery feedstock.

2. HAZARDOUS INGREDIENTS:

Ingredients	CONC%	CAS NO	PIN	LC50/LD50	SPECIES	ROUTE

The product consists of a complex mixture of hydrocarbons of variable composition. The product is defined as a complex mixture under the terms of Section 2 of the Controlled Products Regulations and the ingredients of the mixture are not required to be disclosed under Section 5 of the regulations. The product may also contain trace amounts of benzene and other aromatic hydrocarbons. Because of the presence of benzene it will be necessary to develop a code of practice to cover the storage, handling, use and disposal of the product, as required by provincial Occupational Health and Safety Regulations.

Benzene	0.5 - 1.5	71-43-2	1114	LD50: 3400 mg/kg oral LC50: 16000 ppm 4 hrs.		

3. REGULATORY CLASSIFICATION:

WHMIS:	Class B, Division 2 - Flammable Liquid
TDG:	Shipping Name - Petroleum Crude Oil Class 3 P.I.N. - UN 1267 Packing Group - II
Material Identifier:	Premium Sweet Crude

4. HEALTH HAZARD INFORMATION:

NATURE OF HAZARD

Inhalation: May cause headaches, dizziness, loss of appetite, loss of coordination, and unconsciousness if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Vapours are irritating to upper respiratory tract.

Eye Contact:	Vapours are moderately irritating to the eyes.
Skin Contact:	Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.
Ingestion:	Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects.
Toxicological Summary:	Sweet condensate may, on prolonged exposure, lead to signs and symptoms of hydrocarbon narcosis such as dizziness, nausea and disorientation and eventually may lead to unconsciousness. Chronic exposure to condensate may eventually lead to effects related to exposure to benzene and other aromatic hydrocarbons that may be present.

OCCUPATIONAL EXPOSURE LIMITS (OEL):

Benzene - 1 ppm for 8 hours.

5. FIRE HAZARD:

Flash Pt(C):	-40
Auto-ignition Temp(C):	260
Flammable Limits (% volume):	L.E.L. 0.6 U.E.L. 8.0
General Hazards:	Product is moderately flammable. May be easily ignited by heat, spark or open flame. Vapours may form explosive mixtures. Vapours are heavier than air and may travel a considerable distance to source of ignition and flashback. Vapours may enter confined spaces and create a fire/explosion hazard.
Means of extinction:	Cut off flow of fuel if possible. Fire extinguishing substances: foam, water spray and dry chemical. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse vapours.

Respiratory, fire retardant clothing, and eye protection required for fire fighting personnel. Self-contained breathing apparatus must be used in all enclosed areas.

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6. PHYSICAL DATA:

Physical State:	Liquid	Spec Gravity (Water=1): (Water=1)	0.7
Odour:	Mild hydrocarbon odour	Odour Threshold:	Variable
Appearance:	Colourless, yellow or brown liquid	Vapour Pressure:	53.4 - 133 kPa (25C)
Vapour Density (Air=1):	>1.5	pH:	N.A.
Boiling Pt(C):	10 - 1100	Freezing Pt(C):	N.A.
Evap Rate:	Variable	%Volatile:	100
Solubility in Water:	Negligible	Coeff Water/Oil Distribution:	Oil Soluble
Mol Wt:	N.A. - N.A.	Other:	No additional data.

7. PREVENTATIVE MEASURES:

Respiratory Protection:	Use in well ventilated areas. Where limits are likely to exceed 10% of the L.E.L then self-contained or pressure demand breathing apparatus must be worn.
Skin Protection:	Use chemical resistant gloves and protective wear to prevent exposure.
Eye Protection:	Wear chemical goggles.
Exposure Control:	General or local exhaust ventilation will prevent accumulations of vapours.
Waste Disposal:	Set up barricades to prevent spread of liquid. Eliminate all sources of ignition. Prevent liquid from entering drains and sewers. Allow small amounts of liquid to evaporate with adequate ventilation. Dispose according to applicable federal, provincial and local regulations.
Handling/Storage:	Bond and ground all pipelines, containers, and handling equipment. Eliminate all sources of ignition and ensure adequate ventilation.

8. REACTIVITY DATA:

Hazard:	Minimal
Stability:	This material is stable.
Incompatibility with:	Strong oxidizing agents.
Reactivity Conditions:	Heat or ignition sources may ignite product.
Decomposition Products:	Carbon monoxide and heavy smoke will be generated if condensate burns in a limited or restricted air supply.

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9. FIRST AID MEASURES:

Inhalation:	Remove victim to fresh air. Commence CPR if breathing has stopped and summon medical aid immediately.
Eye Contact:	Flush eyes with warm water for at least fifteen (15) minutes. Summon medical aid immediately.
Skin Contact:	Remove contaminated clothing as soon as possible. Wash affected areas with warm soapy water. If irritation is severe or prolonged then victim should seek medical advise.
Ingestion:	If this material is swallowed DO NOT induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Seek medical attention. Never give anything by mouth to an unconscious person.

10. MSDS PREPARATION:

Date:	Valid until January 15, 2013
Information sources:	Industry publications and company correspondence.
Additional Information:	L.E.L. - Lower Explosive Limit
	U.E.L. - Upper Explosive Limit
	P.I.N. - Product Identification Number
	WHMIS - Workplace Hazardous Material Information System
	TDG - Transportation Of Dangerous Goods
	NA - No data Available
	UN - United Nations

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The information contained herein relates only to the product or material set forth in Section 1 and may not be applicable or complete if such product or material is used in combination with any other product or material or in any process. The information may not be applicable or complete for all individual or if the product or material is used for a purpose or under conditions which are abnormal or not reasonably foreseeable. For greater certainty, uses other than those described in Section 1 must be reviewed with the supplier.

It is the user's obligation to consider, investigate, and verify the information, to use the product safely, and to comply with all applicable laws and regulations.

The supplier makes no warranties, guarantees, or conditions express or implied in respect of the information contained herein.

NEXEN INC.
Produced Water, Long Lake Operations
Material Safety Data Sheet

SECTION 1 – PRODUCT IDENTIFICATION & USE

Product Identifier: Long Lake Produced Water (Sweet)

Product Use: Oil Plant Feed

Manufacturer/Supplier: Nexen Inc.
Long Lake Operations
P.O. Box 6010, Ft. McMurray, Alberta
T9H 4V9
Emergency Telephone Number: (780) 334-3911

Chemical Name & Synonym: Produced Water, Formation Water

Chemical Name & Formula: Water, H_2O

WHMIS Class: Class D1A, D2

TDG Description: NR

SECTION 2 COMPOSITION

Ingredients	% w/w	CAS Number	UN Number	Exposure Limits
Disposal Water	100.0	n. ap.	n. ap.	n. ap.
Benzene	0-100 mg/L	71-43-2	1114	1 ppm (skin)

Water contains dissolved salts of Sodium and Potassium, specifically the chlorides, carbonates and bicarbonates.
Caution: Water may contain small amounts of benzene.
Flammable and or toxic gases may be released upon depressurizing of the water.

SECTION 3 – PHYSICAL DATA

Physical State:
Liquid

Odour and Appearance:
Hydrocarbon Odour, Cloudy

Odour Threshold:
n. av.

Vapour Pressure:
n. ap.

Vapour Density:
(Air = 1)
n. ap.

Evaporation Rate:
<1

Boiling Point:
100 °C est.

Pour Point:
0 °C est.

Critical Temperature
n. av.

Specific Gravity:
(Water = 1)
1.000

Solubility in Water:
100 %

Coeff. of Water/Oil Dist.:
>1

pH @ 15 °C
8.5

SECTION 4 – REACTIVITY, FIRE AND EXPLOSIVE DATA

Flash Point:

Auto Ignition:

LEL/UEL%:

>70 **	n. ap.	n. ap.

Hazardous Combustion Products:	Sensitivity to Mechanical Impact:	Sensitivity to Static Electricity:
CO_2 and SO_2 may be released	Not Sensitive	Vapours may ignite

Flammability: Volatile vapours that are emitted upon depressurising of the water are flammable.

Fire Fighting Procedures – Means of Extinguishing:
DRY CHEMICAL, WATER FOG, FOAM, SHUT FUEL SUPPLY OFF

Special Fire Fighting Procedures: n. ap.

Chemical Stability: Stable

Hazardous Polymerisation:
Will not occur

Sensitivity to Mechanical Impact: Not sensitive to impact.

Incompatibility:
Vapours may incompatible with strong oxidisers

Reactivity: Avoid open flames/strong oxidisers

SECTION 5 – TOXICOGICAL PROPERTIES

Routes of Entry:

Inhalation: X

Eye Contact: X

Skin Contact: X

Ingestion: X

Effects of Acute Exposure:

Inhalation: May cause headaches, dizziness, loss of appetite, loss of coordination, and unconsciousness if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Vapours are irritating to upper respiratory tract.

Skin Contact – Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.

Eye Contact: - Vapours may be moderately irritating to the eyes.

Ingestion – Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects.

Effects of Chronic Exposure:

Specific Species & Route

Ingredients	LD50 OF INGREDIENT	LC50 OF INGREDIENT
Benzene	**930 mg/kg oral rat**	**13,228 ppm rat**

Exposure Limits:
(8 hours) Occupational Exposure Limit

Carcinogenicity:
May contain benzene- a known carcinogen

Reproductive Effects: n. av.

Synergistic Materials: n. av.

Sensitising Capabilities: n. av.

SECTION 6 – PREVENTATIVE MEASURES

Engineering Controls: USE EXPLOSION-PROOF VENTILATION TO CONTROL VAPOUR CONCENTRATION, FOR PERSONNEL ENTRY INTO CONFINED SPACE, ENTRY PROCEDURE MUST INCLUDE VENTILATION AND TESTING OF ATMOSPHERE. MAKE UP AIR MUST BE SUPPLIED TO BALANCE AIR EXHAUSTED.

Personal Protective Equipment:

Respiratory Protection: SCBA should be worn in areas of insufficient oxygen.

Body Protection: Flame retardant clothing should be worn,

Eye Protection: Safety glasses with side shields

Leak and Spill Handling: ELIMINATE SOURCE OF IGNITION. PREVENT ADDITIONAL DISCHARGE OF MATERIAL. EVACUATE PERSONNEL NOT EQUIPPED WITH PROTECTIVE CLOTHING AND NIOSH APPROVED RESPIRATORY EQUIPMENT. CONTAIN SPILL WITH NONCOMBUSTABLE ABSORBENTS.

Environmental Effects and Hazards: CONSULT AN EXPERT AND ENSURE DISPOSAL IS IN COMPLIANCE WITH GOVERNMENT REQUIREMENTS.

Handling Procedure and Equipment: KEEP CONTAINERS CLOSED. STORE IN COOL, WELL VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS. DO NOT PRESSURIZE, HEAT, OR WELD EMPTY CONTAINERS. KEEP AWAY FROM OPEN FLAMES AND USE PROPER GROUNDING PROCEDURES.

Storage Requirements: STORE IN COOL, WELL VENTILATED PLACE AWAY FROM INCOMPATIBLE MATERIALS.

Special Shipping Information:
Per Transportation of Dangerous Goods Legislation.

SECTION 7 - FIRST AID MEASURES

Inhalation: IN EMERGENCY SITUATIONS USE PROPER RESPIRATORY PROTECTION AND IMMEDIATELY REMOVE THE VICTIM FROM EXPOSURE. ADMINISTER ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED. KEEP AT REST AND CALL FOR MEDICAL ATTENTION:

Skin Contact: FLUSH AREA WITH LARGE AMOUNTS OF WATER AND USE SOAP IF AVAILABLE. REMOVE SEVERELY CONTAMINATED CLOTHING AND LAUNDER BEFORE REUSE.

Eye Contact: FLUSH EYES WITH LARGE AMOUNTS OF WATER UNTIL IRRITATION SUBSIDES. CALL FOR MEDICAL ATTENTION IF IRRITATION PERSISTS.

SECTION 8 – PREPARATION INFORMATION

Prepared by: Maxxam Analytics International

Reference:

Date Prepared 2009-02-26

This MSDS information was developed for employees, customers and agents of Nexen Canada Inc. Long Lake Business Unit to provide safety information of the described product or material. The information may not be valid or complete if the product or material is used in combination with other products or materials, or in any process. This information is intended for reasonable normal usage and recommended practices, or does underscore the hazard inherent in the nature of the product or material. Although every effort is made to insure accuracy and completeness of the contained information, it is understood that Nexen Canada Inc., Long Lake Business Unit makes no warranty as to the accuracy or completeness of information and assumes no liability or any damage or loss suffered as result of any inaccuracy or incompleteness therein. This information is considered to accurate as of the date of preparation. Updated information will be forwarded to employees, customers or agents, however the reader is invited to contact the Long Lake Business Unit at the address shown to insure the most up to date information or obtain information related to an unusual or other use.

n. ap. = not applicable
n. av. = not available
est. = estimated

** Flash point is estimated based on the product containing no flammable additives such as methanol and that dissolved gases are not present.

MATERIAL SAFETY DATA SHEET

1. MATERIAL INFORMATION:

Material Identifier:	PSC
Manufacturer:	Nexen Inc.
Emergency Tel:	(780) 334-3911
Fax Number:	(780) 334-3310
Address:	PO Box 6610, Fort McMurray, AB, T9H-5R3
Description:	Liquid hydrocarbon mixture consisting of pentanes and higher hydrocarbons.
Chemical Identity:	Mixture consists of saturated aliphatic hydrocarbons but may contain traces of aromatic hydrocarbons.
Formula:	General formula C(n) H(2n+2)
Synonyms/Trade Names:	No other equivalent names in common use.
Material Use:	Refinery feedstock.

2. HAZARDOUS INGREDIENTS:

Ingredients	CONC%	CAS NO	PIN	LC50/LD50	SPECIES	ROUTE

The product consists of a complex mixture of hydrocarbons of variable composition. The product is defined as a complex mixture under the terms of Section 2 of the Controlled Products Regulations and the ingredients of the mixture are not required to be disclosed under Section 5 of the regulations. The product may also contain trace amounts of benzene and other aromatic hydrocarbons. Because of the presence of benzene it will be necessary to develop a code of practice to cover the storage, handling, use and disposal of the product, as required by provincial Occupational Health and Safety Regulations.

Benzene	0.5 - 1.5	71-43-2	1114	LD50: 3400 mg/kg oral LC50: 16000 ppm 4 hrs.		

3. REGULATORY CLASSIFICATION:

WHMIS:	Class B, Division 2 - Flammable Liquid
TDG:	Shipping Name - Petroleum Crude Oil Class 3 P.I.N. - UN 1267 Packing Group - II
Material Identifier:	Premium Sweet Crude

4. HEALTH HAZARD INFORMATION:

NATURE OF HAZARD

Inhalation: May cause headaches, dizziness, loss of appetite, loss of coordination, and unconsciousness if allowed to accumulate to concentrations that reduce oxygen below safe breathing levels. Vapours are irritating to upper respiratory tract.

Eye Contact:	Vapours are moderately irritating to the eyes.
Skin Contact:	Prolonged skin contact may result in defatting of the skin resulting in dry cracked skin and dermatitis.
Ingestion:	Minimal toxicity. Small amounts of this liquid ingested into the lungs from swallowing or vomiting may cause severe health effects.
Toxicological Summary:	Sweet condensate may, on prolonged exposure, lead to signs and symptoms of hydrocarbon narcosis such as dizziness, nausea and disorientation and eventually may lead to unconsciousness. Chronic exposure to condensate may eventually lead to effects related to exposure to benzene and other aromatic hydrocarbons that may be present.

OCCUPATIONAL EXPOSURE LIMITS (OEL):

Benzene - 1 ppm for 8 hours.

5. FIRE HAZARD:

Flash Pt(C):	-40
Auto-ignition Temp(C):	260
Flammable Limits (% volume):	L.E.L. 0.6 U.E.L. 8.0
General Hazards:	Product is moderately flammable. May be easily ignited by heat, spark or open flame. Vapours may form explosive mixtures. Vapours are heavier than air and may travel a considerable distance to source of ignition and flashback. Vapours may enter confined spaces and create a fire/explosion hazard.
Means of extinction:	Cut off flow of fuel if possible. Fire extinguishing substances: foam, water spray and dry chemical. Water may be ineffective, but water should be used to keep fire-exposed containers cool. If a leak or spill has not ignited, use water spray to disperse vapours.

Respiratory, fire retardant clothing, and eye protection required for fire fighting personnel. Self-contained breathing apparatus must be used in all enclosed areas.

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6. PHYSICAL DATA:

Physical State:	Liquid	Spec Gravity (Water=1): (Water=1)	0.7
Odour:	Mild hydrocarbon odour	Odour Threshold:	Variable
Appearance:	Colourless, yellow or brown liquid	Vapour Pressure:	53.4 - 133 kPa (25C)
Vapour Density (Air=1):	>1.5	pH:	N.A.
Boiling Pt(C):	10 - 1100	Freezing Pt(C):	N.A.
Evap Rate:	Variable	%Volatile:	100
Solubility in Water:	Negligible	Coeff Water/Oil Distribution:	Oil Soluble
Mol Wt:	N.A. - N.A.	Other:	No additional data.

7. PREVENTATIVE MEASURES:

Respiratory Protection:	Use in well ventilated areas. Where limits are likely to exceed 10% of the L.E.L then self-contained or pressure demand breathing apparatus must be worn.
Skin Protection:	Use chemical resistant gloves and protective wear to prevent exposure.
Eye Protection:	Wear chemical goggles.
Exposure Control:	General or local exhaust ventilation will prevent accumulations of vapours.
Waste Disposal:	Set up barricades to prevent spread of liquid. Eliminate all sources of ignition. Prevent liquid from entering drains and sewers. Allow small amounts of liquid to evaporate with adequate ventilation. Dispose according to applicable federal, provincial and local regulations.
Handling/Storage:	Bond and ground all pipelines, containers, and handling equipment. Eliminate all sources of ignition and ensure adequate ventilation.

8. REACTIVITY DATA:

Hazard:	Minimal
Stability:	This material is stable.
Incompatibility with:	Strong oxidizing agents.
Reactivity Conditions:	Heat or ignition sources may ignite product.
Decomposition Products:	Carbon monoxide and heavy smoke will be generated if condensate burns in a limited or restricted air supply.

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9. FIRST AID MEASURES:

Inhalation:	Remove victim to fresh air. Commence CPR if breathing has stopped and summon medical aid immediately.
Eye Contact:	Flush eyes with warm water for at least fifteen (15) minutes. Summon medical aid immediately.
Skin Contact:	Remove contaminated clothing as soon as possible. Wash affected areas with warm soapy water. If irritation is severe or prolonged then victim should seek medical advise.
Ingestion:	If this material is swallowed DO NOT induce vomiting. If vomiting begins, lower victim's head in an effort to prevent vomitus from entering lungs. Seek medical attention. Never give anything by mouth to an unconscious person.

10. MSDS PREPARATION:

Date:	Valid until January 15, 2013
Information sources:	Industry publications and company correspondence.
Additional Information:	L.E.L. - Lower Explosive Limit
	U.E.L. - Upper Explosive Limit
	P.I.N. - Product Identification Number
	WHMIS - Workplace Hazardous Material Information System
	TDG - Transportation Of Dangerous Goods
	NA - No data Available
	UN - United Nations

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The supplier makes no warranties, guarantees, or conditions express or implied in respect of the information contained herein.

ENBRIDGE

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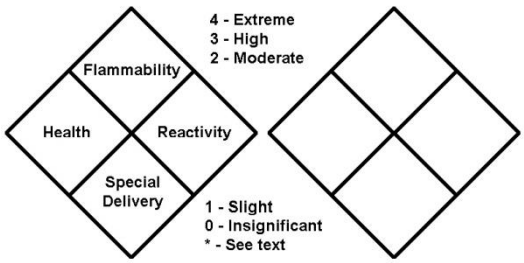
Safety Data Sheet

1. PRODUCT IDENTIFICATION

24-HOUR EMERGENCY ASSISTANCE	**GENERAL ASSISTANCE**	**NFPA DIAMOND ***
Gas Control **(888) 650-8099** CHEMTREC Assistance **(800) 424-9300**	Phone **(713) 650-8900** Fax **(713) 821-2080**	
SDS NUMBER **1014**		

MANUFACTURER/SUPPLIER: **Enbridge, (U.S.), Inc.**

1100 Louisiana Street, Suite 3300

Houston, Texas 77002

Name:
Produced Water

CAS NUMBER: 7732-18-5
(as a mixture)
Synonym/Product Name: Formation Water
Produced Brine

Hazardous Components:	**Percentage**
Dissolved mineral salts and water Mixture	100%
Natural Gas Condensate, Mixture of Hydrocarbons	0.1 – 0.9%
Hydrogen Sulfide	0.0 – 0.01%

Molecular Formula: H_2O
Molecular Weight: >18

Intended Use Water extract from oil or natural gas well production, process stream, and wasate

Hazard(s) Identification

Note: This material has not been tested by EP Energy to determine its specific health hazards. Therefore, the information provided in this section includes health hazard information on the product components.

GHS Classifications

H226: Flammable liquid & vapor

H350: Carcinogenicity, Category 1

H320: Eye Irritant, Category 2B

H315: Skin Irritant, Category 2

GHS Label Elements

Signal Word: Danger

GHS Hazard Statements

May contain or release poisonous hydrogen sulfide gas

H226: Flammable liquid & vapor

H350: May cause cancer.

H320: Causes eye irritation.

H315: Causes skin irritation.

Hazards Not Otherwise Classified

Precautionary Statement(s)

Prevention:

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.

P270: Do not eat, drink or smoke when using this product.

P281: Use personal protective equipment as required.

P264: Wash thoroughly after handling.

P280: Wear protective gloves/protective clothing/eye protection/face protection.

Response:

P308+P313: IF exposed or concerned: Get medical advice/attention.

P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue

rinsing.

P337+P313: If eye irritation persists: Get medical advice/attention.

P302+P352: IF ON SKIN: Wash with plenty of soap and water.

P332+P313: If skin irritation occurs: Get medical advice/attention.

P362: Take off contaminated clothing and wash before reuse.

P370: In case of fire: Use dry chemical, carbon dioxide, or foam for extinguishing.

Storage:

P405: Store locked up.

3. COMPOSITION OF INGREDIENTS

Component	CAS NO.	Typical %*	EXPOSURE GUIDELINE	
			PPM	TYPE (AGENCY)
Dissolved mineral salts and water Mixture	Mixture	100%	None	None
Crude oil, Mixture of hydrocarbons	8002-05-9	0.1 – 0.9%	None	None
Hydrogen Sulfide (dissolved and free)	7783-06-4	0.001 – 1%	20 10	OSHA (CEIL) ACGIH (TWA)

* Values do not reflect absolute minimums and maximums; those values may vary from time to time.

4. FIRST AID MEASURES

Inhalation: If respiratory symptoms develop, move victim to fresh air. Seek immediate medical attention if symptoms persist. If breathing has stopped and airway is clear, provide artificial respiration. Do not use mouth-to-mouth method if victim ingested the substance. Provide artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult, if qualified. Seek immediate medical attention.

Skin Contact: Remove and isolate contaminated clothing and shoes. Wash affected areas with soap and water. If irritation persists, seek medical attention. Decontaminate clothing before reuse.

Eye Contact: Flush eyes with large amounts of water for at least 15 minutes, occasionally lifting the eyelids. Seek medical attention.

Skin Contact: Wipe material from skin and remove contaminated shoes and clothing. Cleanse affected area(s) thoroughly by washing with mild soap and water and, if necessary, a waterless skin cleanser. If irritation or redness develops and persists, seek medical attention.

Ingestion: DO NOT INDUCE VOMITING. If spontaneous vomiting occurs, place on the left side with head down to prevent aspiration of liquid into the lungs. Have exposed individual rinse mouth thoroughly with water. Never give anything by mouth to an unconscious person. Do not leave victim unattended. Monitor for breathing difficulties. Seek immediate medical attention.

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.

5. FIRE FIGHTING MEASURES

General Fire Hazards:

Flammable. Fire is associated with crude oil and natural gas liquids floating on surface of produced water and their vapors. May be ignited by heat, sparks or flames or other sources of ignition. Vapors may reach an ignition source, and flashback. Runoff to sewer may create fire or explosion hazard downstream from the source. Gases may form explosive mixtures with air. BLEVE'S (Boiling Liquid Expanding Vapor Explosions) can occur when a liquid in a pressurized container is heated to temperatures beyond its boiling point. This can lead to failure of the container and damage to the surrounding area. May react with strong oxidizing materials and a wide variety of chemicals.

Hazardous combustion/decomposition products may include carbon monoxide, carbon dioxide, hydrocarbons, nitrogen oxides and sulfur oxides. Hydrogen sulfide may be present. Downwind personnel must be evacuated.

Extinguishing Media:

Dry chemical, foam, carbon dioxide or water spray. Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.

Unsuitable extinguishing media: Do not use a solid water stream. Water and foam should not be used together on the same surface as water destroys the foam. Water should be used as a spray to keep surrounding areas cool.

Fire Fighting Instructions:

Move containers from fire area if you can do it without risk. Use a smothering technique for extinguishing fire. Do not use a forced- water stream as this will scatter the fire. Use a water spray to cool fire-exposed containers and surrounding areas until well after fire is out. Do not direct water at source of leak or safety devices as icing may occur. Dike fire-control water for later disposal; do not scatter the material. Firefighters

6. ACCIDENTAL RELEASE MEASURES

Spill or Release to the Environment: Prevent spills from entering natural waterways, storm sewers or drains and contact with soil.

Emergency Action: Ensure ignition sources are isolated. Avoid contact with spilled or released material. Immediately remove all contaminated clothing. Be ready for fire or possible exposure. Stay upwind and keep out of low areas. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area and evacuate all personnel. Attempt to disperse the gas or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment. Monitor area with combustible gas meter. Attempt to disperse the vapor or to direct its flow to a safe location, for example by using fog sprays. Otherwise treat as for small spillage.

Spill or Leak Procedure: Stop flow of liquid. Prevent spilled material from entering sewers, storm drains, other unauthorized drainage systems, and natural waterways. Dike far ahead of spill for later recovery or disposal. Spilled material may be absorbed into an appropriate absorbent material. Eliminate all ignition sources. Remove leaking containers to detached area.

Methods for Containment and Clean Up:

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

7. HANDLING AND STORAGE

Handling/Storage:

Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146. The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.

Do not wear contaminated clothing or shoes. Use good personal hygiene practices. Before

Precautions for Safe Handling:

Handle as a flammable liquid. Keep away from heat, sparks and open flame. No smoking. Use only with adequate ventilation. May release or contain dangerous levels of H2S. Use only with adequate ventilation. Wear appropriate personal protective equipment and use exposure controls as indicated in Section 8. Vent slowly to the atmosphere when opening. Avoid all contact with skin and eyes. Avoid breathing product dust or vapors. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Non-sparking tools should be used. Ground and bond all transfer and storage equipment to prevent static sparks and equip with self-closing valves, pressure vacuum bungs and flame arrestors. Review all operations which have the potential of generating and accumulating electrostatic charge and/or flammable atmosphere. Use appropriate mitigating procedures. Do not enter confined spaces without following proper entry procedures. Remove contaminated clothing immediately. Wash with soap and water after working with this product.

Scales, deposits and sludge from equipment associated with this product may have accumulation of Naturally Occurring Radioactive Materials (NORM). Equipment should be assessed for external gamma radiation.

Conditions for Safe Storage:

Keep away from flame, sparks, excessive temperatures and open flame. No smoking. Maintain vessels closed and clearly labeled. Empty vessels may contain explosive vapors. Do not pressurize, cut, heat, weld or expose these vessels to sources of ignition. This material may contain or release H2S. In a tank or other closed container, the vapor space above this material may accumulate hazardous concentrations of H2S. Do not enter confined spaces without following proper entry procedures. Use appropriate containment to avoid environmental contamination.

Incompatibilities:

Keep away from strong oxidizers, ignition sources and heat.

8. EXSPOSURE AND CONTROLS

Components	CAS No	Wt %	OSHA	ACGIH	NIOSH
Crude Oil (Petroleum)	8002-05-9	<1	500 ppm	N/A	350 mg/m3
Hydrogen Sulfide	7783-06-4	<1	20Ceiling	5STEL	10Ceiling

Engineering Controls:

Provide adequate general and local exhaust ventilation to: (1) Maintain airborne chemical concentrations below applicable exposure limits, (2) Prevent accumulation of flammable vapors and formation of explosive atmospheres, and (3) Prevent formation of oxygen deficient atmospheres, especially in confined spaces.

Eye Protection:

Safety glasses are required standard PPE. Face shields are required when working with pressurized lines. Wear chemical goggles when working with liquid natural gas.

Skin Protection:

Fire Resistant Clothing (FRC) is required standard PPE. Insulated clothing and/or gloves should be worn where liquid or expanding gas may be generated.

Respiratory Protection:

A NIOSH-approved respirator must be worn where controls do not maintain airborne concentrations below occupational exposure limits. Positive-pressure, Full-face, self-contained breathing apparatus (SCBA) should be available for emergency use. H2S MAY BE PRESENT OR RELEASED. NIOSH-approved respiratory protection should be used when handling crude of high or unknown hydrogen sulfide content and to reduce airborne concentrations to allowable occupational exposure levels.

Work/Hygiene Practices:

Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. PHYSICAL AND CHEMICAL HAZARDS

Boiling Point:	212°F / 100°C (approximate)
Specific Gravity:	1.018-1.02
Melting Point:	29
% Volatile:	
Vapor Pressure:	17.5 mm Hg
Evaporation Rate (Water = 1):	NA
Bulk Density:	8.33 lb/gal
% Solubility in Water:	Complete except for possible crude oil component
Pour Point:	NA
pH:	NA
Freezing Point:	-1.3
Appearance:	Appearance: Water Color: Colorless
Odor:	Odor: Mild Hydrocarbon / Rotten Egg

10. STABILITY AND REACTIVITY

Stability/Incompatibility:

Stability: Stable

Incompatibility: Keep away from strong oxidizers and avoid heat, sparks, and open flames. Exposure to air. Avoid catalysts and conditions that promote oxidation, addition or substitution.

Chemical Stability:

Stable under anticipated conditions of use and normal temperature conditions

Conditions to Avoid/Incompatibilities:

Strong oxidizing agents, strong reducing agents, chlorine, fluorine, bromine and metal catalysts, heat, sparks, flame and build-up of static electricity.

Hazardous Decomposition Products:

Not anticipated under normal conditions of use. Combustion of H2S creates sulfur dioxide.

Hazardous Polymerization:

Not known to occur.

11. TOXICOLOGY INFORMATION

Aspiration Hazard: Not expected to be an aspiration hazard.

Skin Corrosion/Irritation: Not expected to be irritating.

Serious Eye Damage/Irritation: Not expected to be irritating.

Signs and Symptoms: No known effects of overexposure.

Skin Sensitization: Not expected to be a skin sensitizer.

Respiratory Sensitization: No information available on the mixture, however none of the components have been classified for respiratory sensitization (or are below the concentration threshold for classification).

Specific Target Organ Toxicity (Single Exposure): Not expected to cause organ effects from single exposure.

Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure.

Carcinogenicity: May cause cancer.

Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.

Reproductive Toxicity: Not expected to cause reproductive toxicity.

Target Organs: Laboratory animal studies of crude oil by the dermal and inhalation exposure routes have demonstrated toxicity to the liver, blood, spleen and thymus.

Reproductive Toxicity: 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.

Other Comments: This material may contain or liberate hydrogen sulfide, a poisonous gas with the smell of rotten eggs. 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 (sensitivity to light), and pulmonary edema (fluid accumulation in the lungs). Severe exposures can result in nausea, vomiting, muscle weakness or cramps, headache, disorientation and other signs of nervous system depression, irregular heartbeats, convulsions, respiratory failure, and death.

Information on Toxicological Effects of Components

Crude Oil (Petroleum)

Carcinogenicity: Chronic application of crude oil to mouse skin resulted in an increased incidence of skin tumors. 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.

Target Organs:

Laboratory animal studies of crude oil by the dermal and inhalation exposure routes have demonstrated toxicity to the liver, blood, spleen and thymus.

Reproductive Toxicity: 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.

12. ECOLOICAL INFORMATION

Keep out of sewers, drainage areas, and waterways. Report spills and releases, as applicable, under Federal and State regulations. May be hazardous to waterways/wildlife.

13. DISPOSAL CONCIDERATIONS

Waste Disposal: This material, if discarded as produced, is not a RCRA "listed" hazardous waste. However, it should be fully characterized for toxicity 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. 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 drum reconditioner. To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

14. TRANSPORTATION INFORMATION

General Transportation Information:

DOT Proper Shipping Name Flammable liquid (49 CFR 172.101):

DOT Hazard Classes (49 CFR 172.101):

UN/NA Code (49 CFR 172.101):

Packing Group (49 CFR 172.101):

Bill of Lading Description (49 CFR 172.202):

DOT Labels Required (49 CFR 172.101):

DOT Placards Required (49 CFR 172.504):

15. REGULATORY INFORMATION

Section 302 EPCRA Extremely Hazardous Substances (EHS):

Product Component CAS No. Wt% RQ, lb TPQ, lb
None

Section 304 CERCLA Hazardous Substances:

Product Component CAS No. Wt% RQ, lb
Benzene 71-43-2 <1 10
Hydrogen Sulfide 7783-06-4 <1 100

Section 311/312 Hazard Categorization:

Acute:	*Chronic:*	*Fire:*	*Pressure:*	*Reactive:*
Yes	Yes	Yes	Yes	No

Section 313 EPCRA Toxic Substances:

Ingredient CAS No. Wt.%
Benzene 71-43-2 <1
Hydrogen Sulfide 7783-06-4 <1

EPA TSCA

All components are either on the U.S. EPA TSCA Inventory List, or are not regulated under TSCA.

16. OTHER INFORMATION

REVISION DATE: **10/2/2015**

REPLACES SHEET DATED:

COMPLETED BY: **Enbridge Gas Transportation EH&S Department**

NOTE: The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDS's may not be used as a commercial specification sheet of manufacturer or seller, and no

warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

ENBRIDGE

Safety Data Sheet

REDACTED COPY

Section 1: Identification

PRODUCT IDENTIFIER	Petroleum Crude Oil—Light Synthetic	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1268
	Synonyms	Premium Synthetic (PSY), Hardisty Synthetic Crude (HSC), Synthetic Sweet Blend (SYN).
	Chemical Category	Crude oils—extremely flammable
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420-5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703-527-3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	
Skin Irritation	Category 2
Eye Irritation	Category 2
Germ Cell Mutagenicity	Category 1B
Carcinogenicity	Category 1A
Reproductive Toxicity	Category 2
Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
Specific Target Organ Toxicity (Repeated Exposure)	Category 1
Aspiration Toxicity	Category 1
Flammable liquids	Category 1

LABEL ELEMENTS

Signal Word

Danger

Hazard Pictograms

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.
- May cause drowsiness or dizziness.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- Keep container tightly closed.
- No smoking.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF EXPOSED or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- Do NOT induce vomiting.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- If SKIN irritation occurs: Get medical advice/attention.
- If EYE irritation persists: Get medical advice/attention.

Storage/Disposal

- Store locked up and keep cool.
- Store in a well-ventilated place. Keep container tightly closed.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-5	
Benzene	71-43-2	0-5	
Butane	106-97-8	0-5	
Cyclohexane	110-82-7	0-5	
Decane	124-18-5	0-10	
Distillates (petroleum), hydrotreated middle	64742-46-7	0-60	
Ethylbenzene	100-41-4	0-5	
Fuels, diesel, No. 2	68476-34-6	0-30	
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	0-100	
Heptane	142-82-5	0-7	
Hexane	110-54-3	0-7	
Methylcyclohexane	108-87-2	0-7	
Naphtha (petroleum), hydrotreated light	64742-49-0	0-7	
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	0-60	
Octane	111-65-9	0-7	
o-Xylene	95-47-6	0-5	
Petroleum distillate (naphtha)	8002-05-9	0-100	
Toluene	108-88-3	0-5	
Xylene	1330-20-7	0-5	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed—can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO_2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions. • FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions. • Move containers from fire area if you can do it without risk.

- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO_2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen.
- Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions	• Evacuate personnel to safe areas. • Remove all sources of ignition. • Deny entry to unauthorized and unprotected personnel. • Use personal protective equipment. • Avoid contact with skin, eyes and clothing. • Stop leak if you can do it without risk. • Keep people away from and upwind of spill/leak. • Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. • Ventilate enclosed areas. • Do not walk through spilled material.
Protective Equipment	• Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures	• ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk. • Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

• Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment	• Stop leak if you can do it without risk. • Contain and recover liquid when possible. • A vapor suppressing foam may be used to reduce vapors. • Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming. • Use water spray to reduce vapors or divert vapor cloud drift. • A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.
Methods for Cleaning Up	• Clean up spill immediately. • LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST. • SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal. • Use appropriate Personal Protective Equipment (PPE). • Use clean non-sparking tools to collect absorbed material. • Vacuum spilled material. • Try to work upwind of spill. • All equipment used when handling the product must be grounded. • Recover and return free product to proper containers • Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids. • Do not place spilled materials back in the original container. • Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling	• All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces. • The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes). • The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits. • Take precautionary measures against static discharges. • Do not cut drill, grind or weld on empty containers since they may contain explosive residues. • Stay upwind and vent open hatches before uploading. • Avoid contact with skin, eyes and clothing. • Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

Handling	• Wear personal protective equipment. • Remove and wash contaminated clothing before re-use. • Do not eat, drink or smoke when using this product. • Do not take internally. • Wash thoroughly after handling. • Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage	• Ventilate enclosed areas. • Store in a well-ventilated place. • Keep container tightly closed. • Store locked up. • Avoid shock, impact, friction, and rough handling. Do not use sparking tools. • Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources. • Keep away from sources of ignition. • No Smoking. • Do not enter confined spaces such as tanks or pits without following proper entry procedures. • Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. • Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments. • Keep away from open flames, hot surfaces and sources of ignition. • Keep product and empty container away from heat and sources of ignition. • Storage containers should be grounded and bonded. • Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge. • Store away from incompatible materials.
Incompatible Products	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	–	–	TWA 25 ppm TWA 125 mg/m^3
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Butane	STEL 1000 ppm	–	TWA 800 ppm TWA 1900 mg/m^3
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm

Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Fuels, diesel, No. 2	TLV 100 mg/m^3	–	–
Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
o-Xylene	TLV 100 ppm STEL 150 ppm	–	TLV 100 ppm STEL 150 ppm
Petroleum distillate (naptha)	–	–	TWA 350 mg/m^3 Ceiling 1800 mg/m^3
Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES	**Eye and Face**	• Wear face shield and eye protection.
	Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
	Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
	General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION	**Physical State**	Liquid	**Odor**	Petroleum like odor
	Substance Type	Mixture	**Odor Threshold**	No data available
	Appearance	Yellow/green to Brown/black liquid		
PROPERTIES	**pH**	No data available	**Vapor pressure**	No data available
	Melting Point/ Freezing Point	No data available	**Vapor density**	No data available
	Boiling Point/ Boiling Range	-18 to 560°C -0.4 to 1040°F	**Relative density**	No data available
	Flash Point	>-35 °C >-31 °F	**Water Solubility**	Negligible
	Evaporation Rate	No data available	**Partition coefficient: n-octanol/water**	No data available
	Flammability (solid, gas)	No data available	**Decomposition temperature**	No data available
	Upper Flammability Limit	No data available	**Specific Gravity**	No data available
	Lower Flammability Limit	No data available		
	Viscosity	No data available		

Section 10: Stability and Reactivity

REACTIVITY	Chlorine Dioxide
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure

POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides, chlorine
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, sulfur dioxide, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE

Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
Eye Contact	• Causes serious eye irritation.
Skin Contact	• Causes skin irritation.
Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
1,2,4-Trimethylbenzene	5 g/kg (Rat)	–	18000 mg/m^3 (Rat) 4h
Benzene	=1800 mg/kg (Rat)	–	13050 - 14380 ppm (Rat) 4 h
Butane	–	–	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Decane	–	–	>1369 ppm (Rat) h h 72300 mg/m^3 (Rat) 2 h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Heptane	–	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
Methylcyclohexane	> 3200 mg/kg (Rat)	–	–
Naphtha, (petroleum), heavy, hydrotreated	= >6 g/kg (Rat)	–	= 8500 mg/m^3 (Rat)
Octane	–	–	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
o-Xylene	= 3910 mg/kg (Rat)	–	–
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	–

Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene

- Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in humans. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hexane

- This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.

Xylenes

- Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

Toluene

Carcinogenicity: Exposure of rats and mice to toluene at concentrations ranging from 120-1200 ppm for two years did not demonstrate evidence of carcinogenicity. Toluene has not been listed as a carcinogen by IARC.

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.

Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and increased skeletal variations in both inhalation and oral studies, but only at doses that were maternally toxic. No fetal toxicity was seen at doses that were not maternally toxic.

Decreased sperm counts have been observed in male rats in the absence of a reduction in fertility. Toluene has been reported to cause mental or growth retardation in the children of solvent abusers who directly inhale toluene during pregnancy.

Ethylbenzene

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.

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 (eosinophilio foci, hypertrophy, necrosis), lung (alveolar epithelium metaplasia), thyroid (hyperplasia), thyroid (hyperplasia) and pituitary (hyperplasia). In animal models (particularly rats), ethyl benzene affects the auditory function mainly in the cochlear mid-frequency range and ototoxicity was observed after combined exposure to noise and ethyl benzene. There is no evidence of either ethyl benzene-induced hearing losses or ototoxicity with combined exposure to ethyl benzene and noise in workers.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	ACGIH SKIN	IARC	NTP	OSHA
Benzene	A1	X	Group 1	Known	X
Fuels, diesel, No. 2	A3	X	–	–	–
Ethylbenzene	A3	–	Group 2B	Evidence	X
Hexane	–	X	–	–	–
Petroleum distillate (naphtha)	–	–	Group 3	–	–
Toluene	A4	–	Group 3	Evidence	–
o-Xylene	A4	–	Group 3	Evidence	–
Xylenes	A4	–	Group 3	Evidence	–

**ACGIH Skin designation refers to the potential significant contribution of overall exposure by cutaneous route, including mucous membranes and eyes, from airborne exposure to gases, vapor, or liquid OR by direct skin contact.*

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT—SINGLE EXPOSURE

• May cause drowsiness and dizziness.

STOT—REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
1,2,4-Trimethylbenzene	–	LC50 96 h: 7.72 mg/L (Pimephales promelas)	EC50 48h: 30 mmol/cu (Daphnia magna)	LC50 24h: 100 mmol/cu Artemia salina (Brine Shrimp)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	–
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Decane	EC50 24 h: = 0.043 mg/L (Chlorella vulgaris)	–	EC50 48 h: >90-280 mg/L (Daphnia magna)	–
Distillates (petroleum), hydrotreated middle	–	LC50 96h : 35 mg/L (Pimephales promelas) LC50 96h: >10000 mg/L (Pimephales promelas)	–	–
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)
Fuels, diesel, No. 2	–	LC50 96 h: = 35 mg/L (Pimephales promelas)	–	–
Gas Oils, Petroleum, Hydrodesulfurized	LC50 96 h: = 35 mg/L (Pimephales promelas)	–	LC50 96 h: < 1.00 ppm (Diatomus forbesi)	–
Heptane	–	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	–

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Hexane	–	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	–
Methylcyclohexane	–	LC50 96hr: 72.0 mg/l (Golden Shiner)	–	–
Naphtha (petroleum), hydrotreated light	–	–	LC50 96 h: = 2.6 mg/L (Chaetogammarus marinus)	–
Naphtha, (petroleum), heavy, hydrotreated	–	LC50 96 h: = 2200 mg/L (Pimephales promelas)	LC50 96 h: = 2.6 mg/L (Chaetogammarus marinus)	–
Octane	–	–	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
o-Xylene	EC50 24 h: = 55000 ug/L (Chlorella vulgaris)	–	–	LC50 96h: 1.3 ppm Crangon franciscorum (Shrimp)
Petroleum distillate (naphtha)	–	LC50: 258 mg/L Salmo gairdneri 96 h static	EC50 48 h: < 0.26 mg/L Static (Daphnia magna) EC50 24 h: = 36 mg/L (Daphnia magna)	–
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	–

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
1,2,4-Trimethylbenzene	3.78
Benzene	1.83
Butane	2.89
Cyclohexane	3.44
Decane	5.1
Ethylbenzene	3.118
Heptane	4.66
Hexane	3.90
Methylcyclohexane	3.61
Octane	5.18
o-Xylene	3.12
Toluene	2.65
Xylene	2.77-3.15

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Decane	Immobile
Ethylbenzene	Low
Heptane	Moderate
Hexane	High

Octane	Immobile
o-Xylene	Very High to Moderate
Petroleum distillate (naptha)	High
Toluene	High to Moderate
Xylene	Very High to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste	• This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility. • This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP). • This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). • It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.
Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1268	Petroleum Distillate, N.O.S.	3	I	Emergency response guide number: 128
TDG	UN1268	Petroleum Distillate, N.O.S.	3	I	–
IMO/IMDG	UN1268	Petroleum Distillate, N.O.S.	3	I	EmS No. F-E, S-E
IATA/ICAO	UN1268	Petroleum Distillate, N.O.S.	3	I	ERG Code 3L

SPECIAL RECAUTIONS FOR USER

- None

Section 15: Regulatory Information

U.S.—CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	1000 lb final RQ; 454 kg final RQ
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ

U.S.—CWA (CLEAN WATER ACT)—REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	10 lb RQ
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	1000 lb RQ
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	1000 lb RQ
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ

U.S.—CWA (CLEAN WATER ACT)—HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	X
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed

Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	X
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

U.S.—CWA (CLEAN WATER ACT)—PRIORITY POLLUTANTS

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Not Listed
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed

Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed
Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed

X= The component is listed

CANADA-WHMIS—CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
1,2,4-Trimethylbenzene	95-63-6	B3
Benzene	71-43-2	B2, D2A, D2B
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Decane	124-18-5	B3, D2B
Distillates (petroleum), hydrotreated middle	64742-46-7	Uncontrolled product according to WHMIS classification criteria
Ethylbenzene	100-41-4	B2, D2A, D2B
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Methylcyclohexane	108-87-2	B2
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	B3
Octane	111-65-9	B2, D2B
o-Xylene	95-47-6	B2, D2B

Petroleum distillate (naphtha)	8002-05-9	B2
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT—WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA—ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	X
Cyclohexane	110-82-7	X
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed
Ethylbenzene	100-41-4	X
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphtha, (petroleum), heavy, hydrotreated	64742-48-9	Not Listed

Octane	111-65-9	Not Listed
o-Xylene	95-47-6	Not Listed
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 4	**Instability:** 0	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 5/13/15

REVISION DATE 5/13/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDSs may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

Material Safety Data Sheet

Statoil Cheecham Blend

1. Product and Company Identification

Prepared on: 22-01-2014/ LBN

Use: Refinary Feed.
The product is a complex combination of hydrocarbons having carbon numbers predominantly in the range of C1 through C30 and boiling in the range of approximately 20℃ to >565℃. (Petroleum Crude, Diluted Bitumen, Blended Bitumen.)

Manufacturer/supplier:
Statoil
Leismer SE2-079-10-W4M Conklin, Alberta
T0A 2C0 Canada
Tel: Fax:
Emergency Phone: +1-877-5PSCNOW (+1-877-577-2669)
The emergency telephone is open 24 hours.

2. Composition/Information on Ingredients

CAS No.	Designation	LD50 / LC50 of Ingredient	w/w%
64741-56-6	Residues (petroleum) vacuum	N/A	35-50
68955-27-1	Distillates (petroleum), petroleum residues vacuum: Heavy Fuel oil	N/A	10-30
64742-49-0	Naphtha (petroleum), hydrotreated light: Low boiling point hydrogen treated naphtha	N/A	0-30
64741-47-5	Natural gas condensates (petroleum): Low boiling point naphtha-unspecified	N/A	0.05-30
64741-44-2	Distillates (petroleum), straight-run middle	N/A	7-15
64741-41-9	Naphtha (petroleum), heavy straight-run: Low boiling point naphtha	N/A	0.1-5
110-54-3	n-Hexane	LD50, oral, rat: 25000 mg/kg LC50, inhalation, rat: 48000 ppm	0-5
71-43-2	Benzene	LD50, oral, rat: 930 mg/kg LC50, inhalation, mouse: 9980 ppm	0.01-1
108-88-3	Toluene	LD50, oral, rat: 3500 mg/kg LC50, inhalation, rat: 4000 ppm/4h	0.01-1
100-41-4	Ethylbenzene	LD50, oral, rat: 3500 mg/kg LC50, inhalation, rat: 4000 ppm/4h	0.01-1
1330-20-7	Xylene	LD50, oral, mouse: 1590 mg/kg LC50, inhalation, rat: 6350 ppm/4h	0.01-1

3. Hazards Identification

Routes of Entry:
Inhalation, skin contact

Potential Health and Environmental effects:
Highly flammable. May cause cancer. May cause heritable genetic damage. Harmful: May cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

4. First Aid Measures

By inhalation:
Seek fresh air. Seek medical advice in case of persistent discomfort.

By ingestion:
Wash out mouth thoroughly and drink 1-2 glasses of water in small sips. Do not induce vomiting. If vomiting occurs, keep head low so that stomach contents do not enter lungs. Seek medical advice immediately.

By skin contact:
Remove contaminated clothing. Wash skin with soap and water. Seek medical advice in case of persistent discomfort.

By eye contact:
Flush with water (preferably using eye wash equipment) until irritation subsides. Seek medical advice if symptoms persist.

By burns:
Flush with water until pain ceases. Remove clothing that is not stuck to the skin - seek medical advice/transport to hospital. If possible, continue flushing until medical attention is obtained.

Other information:
When obtaining medical advice, show the safety data sheet or label. Symptoms: See section 11.

5. Firefighting Measures

Flammability Yes	**If yes, under which conditions?** Combustible liquid. Keep away from heat, sparks and flames.

Means of Extinction
Extinguish with powder, foam, carbon dioxide or water mist. Do not use water stream, as it may spread the fire. Use water or water mist to cool non-ignited stock. Move containers from danger area if it can be done without risk. Avoid inhalation of vapour and flue gases - seek fresh air.

Flashpoint (°C) and Method -35 (PMCC)	**Upper Flammable Limit (% by volume)** N/A	**Lower Flammable Limit (% by volume)** N/A
Autoignition Temperature (°C) 537	**Explotion Data - Sensitivity to Impact** Not sensitive	**Explotion Data - Sensitivity to Static Discharge** Static spark may cause ignition

Hazardous Combustion Products
Nitrous gases, Carbon monoxide and Carbon dioxide.

6. Accidental Release Measures

Use the same personal protective equipment as stated in section 8. Smoking and open flames prohibited. Prevent spillage from entering drains and/or surface water. Contain and absorb spill with sand or other absorbent, non-flammable material and transfer to suitable waste containers. See section 13 for instructions on disposal. Notify proper authorities in case of contamination of soil or aquatic environment or discharge to drains.

7. Handling and Storage

Handling:
Smoking and open flames prohibited. See section 8 for information about precautions for use and personal protective equipment.

Storage:
Store safely, out of reach of children and away from food, animal feeding stuffs, medicines, etc. Do not store together with oxidizing agents. Keep in tightly closed original packaging. Do not expose to heat (e.g. sunlight).

8. Exposure Control/Personal Protection

Design of technical systems:
Work under effective process ventilation (e.g. local exhaust ventilation). Running water and eye wash equipment should be available. Smoking and open flames prohibited. Take precautionary measures against static discharges. Use spark-free tools and explosion proof equipment. Wash hands before breaks, before using restroom facilities, and at the end of work. Do not store, use and/or consume foods, beverages or tobacco products in the work room. Store personal protective equipment separately from other clothing.

Respiratory protection:
In case of insufficient ventilation, wear respiratory protective equipment. Use air-supplying respiratory protective equipment as the product contains liquids with a low boiling point which are poorly adsorbed on charcoal filters.

Hand and body protection:
Wear protective gloves made of nitrile rubber.) Change gloves immediately if contaminated, and wash hands with soap and water.

Eye protection:
Wear safety goggles if there is a risk of eye splash.

Occupational exposure limits:

Substance	Exposure limit	Remarks
Ethylbenzene	TWA: 20 ppm	OHS (2B)
Xylenes	TWA: 100 ppm STEL: 150 ppm	OHS
Toluene	TWA: 20 ppm	OHS (R)
n-Hexane	TWA: 20 ppm	OHS(Skin)
Benzene	TWA: 0.5 ppm STEL: 2.5 ppm	OHS(Skin,,A1,1)

TWA: time-weighted average STEL: short-term exposure limit

Remarks:
1: Carcinogenic to humans
2B: Possibly carcinogenic to humans
A1: Confirmed human carcinogen
R: The substance has an adverse reproductive effect
Skin: possibility of significant uptake through the skin

Control methods:
Compliance with the stated occupational exposure limits may be checked by occupational hygiene measurements.

9. Physical and Chemical Properties

Appearance: Dark brown Liquid
Odor: Characteristic (rotten egg if hydrogen sulphide is present)
Odor threshold: N/A
Physical state: Liqiud
pH: N/A
Melting/freezing point: N/A
Boiling point: 20- >565°C
Flash point: -35°C
Evaporation rate: N/A
Flammability: N/A
Upper/lower flammability or explosive limits: N/A
Vapor pressure: 38.0 kPa
Vapor density: N/A
Specific gravity or relative density: 0.9286
Solubility: Negligible in water
Partition coefficient: n-octanol/water: < 1
Auto-ignition temperature: appr. 537°C
Decomposition temperature: N/A

10. Stability and Reactivity

Chemical Stability *Stable* Yes	**If no, under which conditions?**
Incompatibility with Other Substances Yes	**If yes, which ones?** Oxidizing agents
Reactivity, and Under What Conditions? N/A	
Hazardous Decomposition Products N/A	

11. Toxicological Information

Immediate effects

Inhalation:
The product releases organic solvent vapours which may cause lethargy and dizziness. At high concentrations, the vapours may cause headache and intoxication. Inhalation of vapours may cause irritation to the upper airways.

Ingestion:
May cause chemical pneumonia if ingested or vomited. Irritates mucous membranes in mouth and gastrointestinal tract.

Skin contact:
Degreases the skin. Long-term exposure may cause irritation and possible infection. Can be absorbed through the skin with the same symptoms as for inhalation.

Eye contact:
Temporary irritation.

Sensitisation:
Skin, respiratory: None.

Long-term effects

Cancer:
The product contains benzene and ethylbenzene which may cause cancer.

Risk of damage to reproduction, teratogenicity and embryotoxicity:
The product contains toluene, which is a suspected reproductive hazard.

Risk of damage to the central nervous system:
Prolonged or repeated inhalation of vapours may cause damage to the central nervous system.

Risk of damage to genes:
The product contains benzene and toluene which may cause heritable genetic damage.

Risk of irreversible damages:
Synergistic effects: None known.

12. Ecological Information

Avoid discharge to drain or surface water.

Ecotoxicity:
Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Mobility:
The product contains a substance which is insoluble in water, and it will consequently spread on water surfaces.

13. Disposal Considerations

Unusable material should be properly drummed. Consult local, provincial, and federal agencies for proper methods of disposal. Do not contaminate water supply when disposing of wastes or containers.

14. Transport Information

The product must be transported in accordance with national and/or international rules for transport of dangerous goods by road and sea according to TDG and IMDG.

PIN: 1267
TDG: UN 1267 ; PETROLEUM CRUDE OIL ; 3 ; I ;
IMDG: UN 1267 ; PETROLEUM CRUDE OIL ; 3 ; I

Label TDG: 3 Flash point: -35°C Label IMDG: 3 IMDG EmS.: F-E, S-E

15. Regulatory Information

WHMIS Symbol:

WHMIS Classification:
B2; D2A

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

16. Other Information

Restrictions in use:
None.

Training advise:
No special training is required, but a thorough knowledge of this safety data sheet should be a prerequisite condition.

Sources:
OHS Guidelines Part 5, Table of Exposure Limits for Chemical and Biological Substances, May 2013. Consult local authorities for acceptable exposure limits.

Other information:
This safety data sheet was prepared from information provided by the supplier about the product at the time of preparation (e.g. data sheets and the like).
N/A: Not available or not applicable.

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Material Safety Data Sheet

Statoil Cheecham Blend

1. Product and Company Identification

Prepared on: 22-01-2014/ LBN

Use: Refinary Feed.
The product is a complex combination of hydrocarbons having carbon numbers predominantly in the range of C1 through C30 and boiling in the range of approximately 20℃ to >565℃. (Petroleum Crude, Diluted Bitumen, Blended Bitumen.)

Manufacturer/supplier:
Statoil
Leismer SE2-079-10-W4M Conklin, Alberta
T0A 2C0 Canada
Tel: Fax:
Emergency Phone: +1-877-5PSCNOW (+1-877-577-2669)
The emergency telephone is open 24 hours.

2. Composition/Information on Ingredients

CAS No.	Designation	LD50 / LC50 of Ingredient	w/w%
64741-56-6	Residues (petroleum) vacuum	N/A	35-50
68955-27-1	Distillates (petroleum), petroleum residues vacuum: Heavy Fuel oil	N/A	10-30
64742-49-0	Naphtha (petroleum), hydrotreated light: Low boiling point hydrogen treated naphtha	N/A	0-30
64741-47-5	Natural gas condensates (petroleum): Low boiling point naphtha-unspecified	N/A	0.05-30
64741-44-2	Distillates (petroleum), straight-run middle	N/A	7-15
64741-41-9	Naphtha (petroleum), heavy straight-run: Low boiling point naphtha	N/A	0.1-5
110-54-3	n-Hexane	LD50, oral, rat: 25000 mg/kg LC50, inhalation, rat: 48000 ppm	0-5
71-43-2	Benzene	LD50, oral, rat: 930 mg/kg LC50, inhalation, mouse: 9980 ppm	0.01-1
108-88-3	Toluene	LD50, oral, rat: 3500 mg/kg LC50, inhalation, rat: 4000 ppm/4h	0.01-1
100-41-4	Ethylbenzene	LD50, oral, rat: 3500 mg/kg LC50, inhalation, rat: 4000 ppm/4h	0.01-1
1330-20-7	Xylene	LD50, oral, mouse: 1590 mg/kg LC50, inhalation, rat: 6350 ppm/4h	0.01-1

3. Hazards Identification

Routes of Entry:
Inhalation, skin contact

Potential Health and Environmental effects:
Highly flammable. May cause cancer. May cause heritable genetic damage. Harmful: May cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

4. First Aid Measures

By inhalation:
Seek fresh air. Seek medical advice in case of persistent discomfort.

By ingestion:
Wash out mouth thoroughly and drink 1-2 glasses of water in small sips. Do not induce vomiting. If vomiting occurs, keep head low so that stomach contents do not enter lungs. Seek medical advice immediately.

By skin contact:
Remove contaminated clothing. Wash skin with soap and water. Seek medical advice in case of persistent discomfort.

By eye contact:
Flush with water (preferably using eye wash equipment) until irritation subsides. Seek medical advice if symptoms persist.

By burns:
Flush with water until pain ceases. Remove clothing that is not stuck to the skin - seek medical advice/transport to hospital. If possible, continue flushing until medical attention is obtained.

Other information:
When obtaining medical advice, show the safety data sheet or label. Symptoms: See section 11.

5. Firefighting Measures

Flammability Yes	**If yes, under which conditions?** Combustible liquid. Keep away from heat, sparks and flames.

Means of Extinction
Extinguish with powder, foam, carbon dioxide or water mist. Do not use water stream, as it may spread the fire. Use water or water mist to cool non-ignited stock. Move containers from danger area if it can be done without risk. Avoid inhalation of vapour and flue gases - seek fresh air.

Flashpoint (°C) and Method -35 (PMCC)	**Upper Flammable Limit (% by volume)** N/A	**Lower Flammable Limit (% by volume)** N/A
Autoignition Temperature (°C) 537	**Explotion Data - Sensitivity to Impact** Not sensitive	**Explotion Data - Sensitivity to Static Discharge** Static spark may cause ignition

Hazardous Combustion Products
Nitrous gases, Carbon monoxide and Carbon dioxide.

6. Accidental Release Measures

Use the same personal protective equipment as stated in section 8. Smoking and open flames prohibited. Prevent spillage from entering drains and/or surface water. Contain and absorb spill with sand or other absorbent, non-flammable material and transfer to suitable waste containers. See section 13 for instructions on disposal. Notify proper authorities in case of contamination of soil or aquatic environment or discharge to drains.

7. Handling and Storage

Handling:
Smoking and open flames prohibited. See section 8 for information about precautions for use and personal protective equipment.

Storage:
Store safely, out of reach of children and away from food, animal feeding stuffs, medicines, etc. Do not store together with oxidizing agents. Keep in tightly closed original packaging. Do not expose to heat (e.g. sunlight).

8. Exposure Control/Personal Protection

Design of technical systems:
Work under effective process ventilation (e.g. local exhaust ventilation). Running water and eye wash equipment should be available. Smoking and open flames prohibited. Take precautionary measures against static discharges. Use spark-free tools and explosion proof equipment. Wash hands before breaks, before using restroom facilities, and at the end of work. Do not store, use and/or consume foods, beverages or tobacco products in the work room. Store personal protective equipment separately from other clothing.

Respiratory protection:
In case of insufficient ventilation, wear respiratory protective equipment. Use air-supplying respiratory protective equipment as the product contains liquids with a low boiling point which are poorly adsorbed on charcoal filters.

Hand and body protection:
Wear protective gloves made of nitrile rubber.) Change gloves immediately if contaminated, and wash hands with soap and water.

Eye protection:
Wear safety goggles if there is a risk of eye splash.

Occupational exposure limits:

Substance	Exposure limit	Remarks
Ethylbenzene	TWA: 20 ppm	OHS (2B)
Xylenes	TWA: 100 ppm STEL: 150 ppm	OHS
Toluene	TWA: 20 ppm	OHS (R)
n-Hexane	TWA: 20 ppm	OHS(Skin)
Benzene	TWA: 0.5 ppm STEL: 2.5 ppm	OHS(Skin,,A1,1)

TWA: time-weighted average STEL: short-term exposure limit

Remarks:
1: Carcinogenic to humans
2B: Possibly carcinogenic to humans
A1: Confirmed human carcinogen
R: The substance has an adverse reproductive effect
Skin: possibility of significant uptake through the skin

Control methods:
Compliance with the stated occupational exposure limits may be checked by occupational hygiene measurements.

9. Physical and Chemical Properties

Appearance: Dark brown Liquid
Odor: Characteristic (rotten egg if hydrogen sulphide is present)
Odor threshold: N/A
Physical state: Liqiud
pH: N/A
Melting/freezing point: N/A
Boiling point: 20- >565°C
Flash point: -35°C
Evaporation rate: N/A
Flammability: N/A
Upper/lower flammability or explosive limits: N/A
Vapor pressure: 38.0 kPa
Vapor density: N/A
Specific gravity or relative density: 0.9286
Solubility: Negligible in water
Partition coefficient: n-octanol/water: < 1
Auto-ignition temperature: appr. 537°C
Decomposition temperature: N/A

10. Stability and Reactivity

Chemical Stability *Stable* Yes	**If no, under which conditions?**
Incompatibility with Other Substances Yes	**If yes, which ones?** Oxidizing agents
Reactivity, and Under What Conditions? N/A	
Hazardous Decomposition Products N/A	

11. Toxicological Information

Immediate effects

Inhalation:
The product releases organic solvent vapours which may cause lethargy and dizziness. At high concentrations, the vapours may cause headache and intoxication. Inhalation of vapours may cause irritation to the upper airways.

Ingestion:
May cause chemical pneumonia if ingested or vomited. Irritates mucous membranes in mouth and gastrointestinal tract.

Skin contact:
Degreases the skin. Long-term exposure may cause irritation and possible infection. Can be absorbed through the skin with the same symptoms as for inhalation.

Eye contact:
Temporary irritation.

Sensitisation:
Skin, respiratory: None.

Long-term effects

Cancer:
The product contains benzene and ethylbenzene which may cause cancer.

Risk of damage to reproduction, teratogenicity and embryotoxicity:
The product contains toluene, which is a suspected reproductive hazard.

Risk of damage to the central nervous system:
Prolonged or repeated inhalation of vapours may cause damage to the central nervous system.

Risk of damage to genes:
The product contains benzene and toluene which may cause heritable genetic damage.

Risk of irreversible damages:
Synergistic effects: None known.

12. Ecological Information

Avoid discharge to drain or surface water.

Ecotoxicity:
Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Mobility:
The product contains a substance which is insoluble in water, and it will consequently spread on water surfaces.

13. Disposal Considerations

Unusable material should be properly drummed. Consult local, provincial, and federal agencies for proper methods of disposal. Do not contaminate water supply when disposing of wastes or containers.

14. Transport Information

The product must be transported in accordance with national and/or international rules for transport of dangerous goods by road and sea according to TDG and IMDG.

PIN: 1267
TDG: UN 1267 ; PETROLEUM CRUDE OIL ; 3 ; I ;
IMDG: UN 1267 ; PETROLEUM CRUDE OIL ; 3 ; I

Label TDG: 3 Flash point: -35°C Label IMDG: 3 IMDG EmS.: F-E, S-E

15. Regulatory Information

WHMIS Symbol:

WHMIS Classification:
B2; D2A

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

16. Other Information

Restrictions in use:
None.

Training advise:
No special training is required, but a thorough knowledge of this safety data sheet should be a prerequisite condition.

Sources:
OHS Guidelines Part 5, Table of Exposure Limits for Chemical and Biological Substances, May 2013. Consult local authorities for acceptable exposure limits.

Other information:
This safety data sheet was prepared from information provided by the supplier about the product at the time of preparation (e.g. data sheets and the like).
N/A: Not available or not applicable.

Bureau Veritas HSE Denmark A/S Birkemosevej 7, DK-6000 Kolding T: +45 75508811, F: +45 75508810, E-mail: infohse@dk.bureauveritas.com, Web: www.hse.bureauveritas.dk (Made in Toxido®)

Material Safety Data Sheet

Statoil Cheecham Mix

1. Product and Company Identification

Prepared on: 22-01-2014/ LBN

Use: Refinary Feed.
The product is a complex combination of hydrocarbons having carbon numbers predominantly in the range of C1 through C30 and boiling in the range of approximately 20℃ to >565℃. (Petroleum Crude, Diluted Bitumen, Blended Bitumen.)

Manufacturer/supplier:
Statoil
Leismer SE2-079-10-W4M Conklin, Alberta
T0A 2C0 Canada
Tel: Fax:
Emergency Phone: +1-877-5PSCNOW (+1-877-577-2669)
The emergency telephone is open 24 hours.

2. Composition/Information on Ingredients

CAS No.	Designation	LD50 / LC50 of Ingredient	w/w%
64741-56-6	Residues (petroleum) vacuum	N/A	35-50
68955-27-1	Distillates (petroleum), petroleum residues vacuum: Heavy Fuel oil	N/A	10-30
64742-49-0	Naphtha (petroleum), hydrotreated light: Low boiling point hydrogen treated naphtha	N/A	0-30
64741-47-5	Natural gas condensates (petroleum): Low boiling point naphtha-unspecified	N/A	0.05-30
64741-44-2	Distillates (petroleum), straight-run middle	N/A	7-15
64741-41-9	Naphtha (petroleum), heavy straight-run: Low boiling point naphtha	N/A	0.1-5
110-54-3	n-Hexane	LD50, oral, rat: 25000 mg/kg LC50, inhalation, rat: 48000 ppm	0-5
71-43-2	Benzene	LD50, oral, rat: 930 mg/kg LC50, inhalation, mouse: 9980 ppm	0.01-1
108-88-3	Toluene	LD50, oral, rat: 3500 mg/kg LC50, inhalation, rat: 4000 ppm/4h	0.01-1
100-41-4	Ethylbenzene	LD50, oral, rat: 3500 mg/kg LC50, inhalation, rat: 4000 ppm/4h	0.01-1
1330-20-7	Xylene	LD50, oral, mouse: 1590 mg/kg LC50, inhalation, rat: 6350 ppm/4h	0.01-1

3. Hazards Identification

Routes of Entry:
Inhalation, skin contact

Potential Health and Environmental effects:
Highly flammable. May cause cancer. May cause heritable genetic damage. Harmful: May cause lung damage if swallowed. Vapours may cause drowsiness and dizziness. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

4. First Aid Measures

By inhalation:
Seek fresh air. Seek medical advice in case of persistent discomfort.

By ingestion:
Wash out mouth thoroughly and drink 1-2 glasses of water in small sips. Do not induce vomiting. If vomiting occurs, keep head low so that stomach contents do not enter lungs. Seek medical advice immediately.

By skin contact:
Remove contaminated clothing. Wash skin with soap and water. Seek medical advice in case of persistent discomfort.

By eye contact:
Flush with water (preferably using eye wash equipment) until irritation subsides. Seek medical advice if symptoms persist.

By burns:
Flush with water until pain ceases. Remove clothing that is not stuck to the skin - seek medical advice/transport to hospital. If possible, continue flushing until medical attention is obtained.

Other information:
When obtaining medical advice, show the safety data sheet or label. Symptoms: See section 11.

5. Firefighting Measures

Flammability Yes	**If yes, under which conditions?** Combustible liquid. Keep away from heat, sparks and flames.

Means of Extinction
Extinguish with powder, foam, carbon dioxide or water mist. Do not use water stream, as it may spread the fire. Use water or water mist to cool non-ignited stock. Move containers from danger area if it can be done without risk. Avoid inhalation of vapour and flue gases - seek fresh air.

Flashpoint (°C) and Method -11 (PMCC)	**Upper Flammable Limit (% by volume)** N/A	**Lower Flammable Limit (% by volume)** N/A
Autoignition Temperature (°C) 537	**Explotion Data - Sensitivity to Impact** Not sensitive	**Explotion Data - Sensitivity to Static Discharge** Static spark may cause ignition

Hazardous Combustion Products
Nitrous gases, Carbon monoxide and Carbon dioxide.

6. Accidental Release Measures

Use the same personal protective equipment as stated in section 8. Smoking and open flames prohibited. Prevent spillage from entering drains and/or surface water. Contain and absorb spill with sand or other absorbent, non-flammable material and transfer to suitable waste containers. See section 13 for instructions on disposal. Notify proper authorities in case of contamination of soil or aquatic environment or discharge to drains.

7. Handling and Storage

Handling:
Smoking and open flames prohibited. See section 8 for information about precautions for use and personal protective equipment.

Storage:
Store safely, out of reach of children and away from food, animal feeding stuffs, medicines, etc. Do not store together with oxidizing agents. Keep in tightly closed original packaging. Do not expose to heat (e.g. sunlight).

8. Exposure Control/Personal Protection

Design of technical systems:
Work under effective process ventilation (e.g. local exhaust ventilation). Running water and eye wash equipment should be available. Smoking and open flames prohibited. Take precautionary measures against static discharges. Use spark-free tools and explosion proof equipment. Wash hands before breaks, before using restroom facilities, and at the end of work. Do not store, use and/or consume foods, beverages or tobacco products in the work room. Store personal protective equipment separately from other clothing.

Respiratory protection:
In case of insufficient ventilation, wear respiratory protective equipment. Use air-supplying respiratory protective equipment as the product contains liquids with a low boiling point which are poorly adsorbed on charcoal filters.

Hand and body protection:
Wear protective gloves made of nitrile rubber.) Change gloves immediately if contaminated, and wash hands with soap and water.

Eye protection:
Wear safety goggles if there is a risk of eye splash.

Occupational exposure limits:

Substance	Exposure limit	Remarks
Ethylbenzene	TWA: 20 ppm	OHS (2B)
Xylenes	TWA: 100 ppm STEL: 150 ppm	OHS
Toluene	TWA: 20 ppm	OHS (R)
n-Hexane	TWA: 20 ppm	OHS(Skin)
Benzene	TWA: 0.5 ppm STEL: 2.5 ppm	OHS(Skin,,A1,1)

TWA: time-weighted average STEL: short-term exposure limit

Remarks:
1: Carcinogenic to humans
2B: Possibly carcinogenic to humans
A1: Confirmed human carcinogen
R: The substance has an adverse reproductive effect
Skin: possibility of significant uptake through the skin

Control methods:
Compliance with the stated occupational exposure limits may be checked by occupational hygiene measurements.

9. Physical and Chemical Properties

Appearance: Dark brown Liquid
Odor: Characteristic (rotten egg if hydrogen sulphide is present)
Odor threshold: N/A
Physical state: Liqiud
pH: N/A
Melting/freezing point: N/A
Boiling point: 20- >565°C
Flash point: -11°C
Evaporation rate: N/A
Flammability: N/A
Upper/lower flammability or explosive limits: N/A
Vapor pressure: 21.9 kPa
Vapor density: N/A
Specific gravity or relative density: 0.9318
Solubility: Negligible in water
Partition coefficient: n-octanol/water: < 1
Auto-ignition temperature: appr. 537°C
Decomposition temperature: N/A

10. Stability and Reactivity

Chemical Stability *Stable* Yes	**If no, under which conditions?**
Incompatibility with Other Substances Yes	**If yes, which ones?** Oxidizing agents
Reactivity, and Under What Conditions? N/A	
Hazardous Decomposition Products N/A	

11. Toxicological Information

Immediate effects

Inhalation:
The product releases organic solvent vapours which may cause lethargy and dizziness. At high concentrations, the vapours may cause headache and intoxication. Inhalation of vapours may cause irritation to the upper airways.

Ingestion:
May cause chemical pneumonia if ingested or vomited. Irritates mucous membranes in mouth and gastrointestinal tract.

Skin contact:
Degreases the skin. Long-term exposure may cause irritation and possible infection. Can be absorbed through the skin with the same symptoms as for inhalation.

Eye contact:
Temporary irritation.

Sensitisation:
Skin, respiratory: None.

Long-term effects

Cancer:
The product contains benzene and ethylbenzene which may cause cancer.

Risk of damage to reproduction, teratogenicity and embryotoxicity:
The product contains toluene, which is a suspected reproductive hazard.

Risk of damage to the central nervous system:
Prolonged or repeated inhalation of vapours may cause damage to the central nervous system.

Risk of damage to genes:
The product contains benzene and toluene which may cause heritable genetic damage.

Risk of irreversible damages:
Synergistic effects: None known.

12. Ecological Information

Avoid discharge to drain or surface water.

Ecotoxicity:
Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Mobility:
The product contains a substance which is insoluble in water, and it will consequently spread on water surfaces.

13. Disposal Considerations

Unusable material should be properly drummed. Consult local, provincial, and federal agencies for proper methods of disposal. Do not contaminate water supply when disposing of wastes or containers.

14. Transport Information

The product must be transported in accordance with national and/or international rules for transport of dangerous goods by road and sea according to TDG and IMDG.

PIN: 1267
TDG: UN 1267 ; PETROLEUM CRUDE OIL ; 3 ; I ;
IMDG: UN 1267 ; PETROLEUM CRUDE OIL ; 3 ; I

Label TDG: 3 Flash point: -11°C Label IMDG: 3 IMDG EmS.: F-E, S-E

15. Regulatory Information

WHMIS Symbol:

WHMIS Classification:
B2; D2A

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

16. Other Information

Restrictions in use:
None.

Training advise:
No special training is required, but a thorough knowledge of this safety data sheet should be a prerequisite condition.

Sources:
OHS Guidelines Part 5, Table of Exposure Limits for Chemical and Biological Substances, May 2013. Consult local authorities for acceptable exposure limits.

Other information:
This safety data sheet was prepared from information provided by the supplier about the product at the time of preparation (e.g. data sheets and the like).
N/A: Not available or not applicable.

Bureau Veritas HSE Denmark A/S Birkemosevej 7, DK-6000 Kolding T: +45 75508811, F: +45 75508810, E-mail: infohse@dk.bureauveritas.com, Web: www.hse.bureauveritas.dk (Made in Toxido®)

Material Safety Data Sheet

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : **Crude Oil, Sour (=>0.5% S)**
Uses : Refinery Feedstock.

Manufacturer/Supplier : **Shell Canada Limited**
PO Box 100 Station M
400 4th Avenue S.W.
Calgary-AB T2P 2H5
Canada
Telephone : (+1) 800-661-1600

Emergency Telephone Number
: Shell Canada: (+1) 800-661-7378
CANUTEC (24 hr): (+1) 613-996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture Description : Raw petroleum extracted in its natural state from the ground (excluding hydrocarbons from shale) and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds. Product is not a mixture according to regulation 1907/2006/EC.
Synonyms : Seal Heavy crude Oil
CAS No. : 8002-05-9

WHMIS Controlled Ingredients

Chemical Identity	CAS No.	Conc. W/W
Petroleum, Crude Oil	8002-05-9	60.00- 100.00 %

Contains Benzene, CAS # 71-43-2.
Contains Ethylbenzene, CAS # 100-41-4.
Contains n-Hexane, CAS # 110-54-3.
Contains Naphthalene, CAS # 91-20-3.
Contains hydrogen sulphide, CAS # 7783-06-4.
Contains Natural Gasoline, CAS # 8006-61-9.
Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil.

Refer to Chapter 8 for Occupational Exposure Guidelines.

Material Safety Data Sheet

3. HAZARDS IDENTIFICATION



WHMIS Class/Description	:	Class B2 Flammable Liquid Class D2A Other Toxic Effects - Carcinogen/Mutagen Class D2B Other Toxic Effects - Skin Irritant
Routes of Exposure	:	Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Health Hazards	:	Vapours may cause drowsiness and dizziness. Repeated exposure may cause skin dryness or cracking. Moderately irritating to eyes. Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed. Harmful: may cause lung damage if swallowed. Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome). Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers. May dull the sense of smell, so do not rely on odour as an indication of hazard. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure. Repeated exposure may cause skin dryness or cracking. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).
Signs and Symptoms	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye

		Irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
Safety Hazards	:	Extremely flammable. May ignite on surfaces at temperatures above auto-ignition temperature. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Flammable vapours may be present even at temperatures below the flash point.
Environmental Hazards	:	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Additional Information	:	This product is intended for use in closed systems only.

4. FIRST AID MEASURES

General Information	:	Vaporisation of H2S that has been trapped in clothing can be dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.
Inhalation	:	Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
Skin Contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
Eye Contact	:	Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.
Ingestion	:	If swallowed, do not induce vomiting: transport to nearest

		medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Advice to Physician	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

5. FIRE FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point	:	< 23 °C / 73 °F
Upper / lower Flammability or Explosion limits	:	0.6 - 8 %(V)
Auto ignition temperature	:	> 220 °C / 428 °F
Hazardous Combustion Products and Specific Hazards	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide. Oxides of nitrogen. Oxides of sulphur. Unidentified organic and inorganic compounds. Flammable vapours may be present even at temperatures below the flash point. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Suitable Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Protective Equipment for Firefighters	:	Wear full protective clothing and self-contained breathing apparatus.
Additional Advice	:	Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. If the fire cannot be extinguished the only course of action is to evacuate immediately.

6. ACCIDENTAL RELEASE MEASURES

Protective Measures	:	May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Clean Up Methods	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
Additional Advice	:	Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26.

7. HANDLING AND STORAGE

General Precautions	:	Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier.
Handling	:	The inherent toxic and olfactory (sense of smell) fatiguing properties of hydrogen sulphide require that air monitoring alarms be used if concentrations are expected to reach harmful levels such as in enclosed spaces, heated transport vessels and spill or leak situations. If the air concentration exceeds 50 ppm, the area should be evacuated unless respiratory protection is in use. Avoid prolonged or repeated contact with skin. When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Electrostatic charges may be generated during pumping. Electrostatic discharge may cause fire. Earth all equipment.
Storage	:	Drum and small container storage: Drums should be stacked to

		a maximum of 3 m high. Use properly labelled and closeable containers. Prevent ingress of water. Keep container in a well-ventilated place equipped with hydrogen sulphide detectors. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other sources of ignition.
Product Transfer	:	Avoid splash filling. Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes. Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling.
Recommended Materials	:	For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product. For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy. For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F, or Neoprene (CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).
Unsuitable Materials	:	Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyisobutylene. However, some may be suitable for glove materials.
Container Advice	:	Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.
Additional Information	:	Ensure that all local regulations regarding handling and storage facilities are followed. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning. Hydrogen sulphide (H2S or Sour Gas) may be present when loading and unloading transport vessels. Stay upwind and away from newly opened hatches and allow to vent thoroughly before handling material. Steam may be used to vent hatches. Keep all sources of ignition away from loading area. Use hydrogen sulphide monitors for detection.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

Occupational Exposure Limits

Material Safety Data Sheet

Material	Source	Type	ppm	mg/m3	Notation
Benzene	ACGIH	TWA	0.5 ppm		
	ACGIH	STEL	2.5 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	SHELL IS	TWA	0.5 ppm	1.6 mg/m3	
	SHELL IS	STEL	2.5 ppm	8 mg/m3	
Hydrogen Sulphide	ACGIH	TWA	1 ppm		
	ACGIH	STEL	5 ppm		
Ethylbenzene	ACGIH	TWA	20 ppm		
n-hexane	ACGIH	TWA	50 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
Naphthalene	ACGIH	TWA	10 ppm		
	ACGIH	STEL	15 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.

Consult local authorities for acceptable exposure limits within their jurisdiction.

Additional Information : SHELL IS is the Shell Internal Standard.

Biological Exposure Index (BEI) - See reference for full details

Material	Determinant	Sampling Time	BEI	Reference
Benzene	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)

Material Safety Data Sheet

	t,t Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in Creatinine in urine	Sampling time: End of shift at end of work week.	0.7 g/g	ACGIH BEL (2011)
	Ethyl benzene in End-exhaled air	Sampling time: Not critical.		ACGIH BEL (2011)
n-hexane	2,5-Hexanedion, without hydrolysis in Urine	Sampling time: End of shift at end of work week.	0.4 mg/l	ACGIH BEL (2011)

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits. Local exhaust ventilation is recommended. Eye washes and showers for emergency use.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. All respiratory protection equipment and use must be in accordance with local regulations. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for combined particulate/organic gases and vapours [boiling point >65 °C (149 °F)] meeting EN14387. Select a filter suitable for acid gases and vapours meeting EN14387.

Hand Protection : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: Longer term protection: Nitrile rubber. Incidental contact/Splash protection: PVC. Neoprene

		rubber. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, glove thickness, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. Breakthrough times for gloves varies depending on, e.g. chemical resistance, material thickness, frequency and duration of contact. Selection should also take into account other usage requirements, e.g. dexterity, heat resistance, other chemical substances handled.
Eye Protection	:	Chemical splash goggles (chemical monogoggles).
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron (where risk of splashing).
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Brown to black. Viscous liquid.
Odour	:	Potential smell of rotten eggs and sulphur..
Odour threshold	:	Data not available
pH	:	Not applicable
Initial Boiling Point and Boiling Range	:	10 - 400 °C / 50 - 752 °F
Freezing Point	:	Data not available
Vapour pressure	:	Typical 10 - 70 kPa
Specific gravity	:	Data not available
Density	:	< 1,010 g/cm3 at 15 °C / 59 °F
Water solubility	:	Insoluble.
n-octanol/water partition coefficient (log Pow)	:	2 - 6
Kinematic viscosity	:	3 - 1,000 mm2/s at 40 °C / 104 °F
Vapour density (air=1)	:	Data not available
Evaporation rate (nBuAc=1)	:	Data not available

10. STABILITY AND REACTIVITY

Stability	:	Stable under normal conditions of use.
Conditions to Avoid	:	Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid	:	Strong oxidising agents.
Hazardous Decomposition Products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly

dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

Hazardous Polymerisation	:	No, hazardous, exothermic polymerization cannot occur.
Sensitivity to Mechanical Impact	:	Data not available
Sensitivity to Static Discharge	:	Yes

11. TOXICOLOGICAL INFORMATION

Basis for Assessment	:	Information given is based on product data, a knowledge of the components and the toxicology of similar products.
Routes of Exposure	:	Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Acute Oral Toxicity	:	Low toxicity: LD50 > 5000 mg/kg , Rat.
Acute Dermal Toxicity	:	Low toxicity: LD50 >2000 mg/kg , Rabbit.
Acute Inhalation Toxicity	:	Extremely toxic: LC100 = 600ppm(v) , 30 min , Man. (Hydrogen Sulphide) Low toxicity by inhalation. (Petroleum, Crude Oil)
Skin Irritation	:	Not irritating to skin. Prolonged/repeated contact may cause defatting of the skin which can lead to dermatitis.
Eye Irritation	:	Expected to be moderately irritating to eyes (but insufficient to classify).
Respiratory Irritation	:	Not expected to be a respiratory irritant.
Sensitisation	:	Not expected to be a sensitiser.
Repeated Dose Toxicity	:	Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed.
Mutagenicity	:	Not expected to be mutagenic.
Carcinogenicity	:	Causes cancer in laboratory animals. May cause leukaemia (AML - acute myelogenous leukemia). (Benzene)

Material	:	**Carcinogenicity Classification**
Crude Oil	:	IARC: Not classifiable as to carcinogenicity to humans.
Natural Gasoline	:	IARC: Possibly carcinogenic to humans.
Benzene	:	ACGIH: Confirmed human carcinogen.
Benzene	:	IARC: Carcinogenic to humans.
Naphthalene	:	ACGIH: Not classifiable as a human carcinogen.
Naphthalene	:	IARC: Possibly carcinogenic to humans.
Ethylbenzene	:	ACGIH: Confirmed animal carcinogen with unknown relevance to humans.
Ethylbenzene	:	IARC: Possibly carcinogenic to humans.

Reproductive and Developmental Toxicity	:	Not expected to impair fertility. Not expected to be a developmental toxicant.
Additional Information	:	Can cause liver damage. H2S has a broad range of effects dependent on the airborne

concentration and length of exposure. 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure. May cause MDS (Myelodysplastic Syndrome).

12. ECOLOGICAL INFORMATION

Incomplete ecotoxicological data are available for this product. The information given below is based partly on a knowledge of the components and the ecotoxicology of similar products.

Acute Toxicity : Expected to be harmful:LL/EL/IL50 1-10 mg/l(to aquatic organisms)LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.

Mobility : Contains volatile constituents. Partly evaporates from water or soil surfaces, but a significant proportion will remain after one day. If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater.

Persistence/degradability : Major constituents are inherently biodegradable, but contains components that may persist in the environment.

Bioaccumulation : Contains constituents with the potential to bioaccumulate.

Other Adverse Effects : Films formed on water may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Material Disposal : Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Container Disposal : Send to drum recoverer or metal reclaimer. Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if

Material Safety Data Sheet

heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or waste disposal regulations.

Local Legislation : 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 and must be complied with.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification

UN/NA Number	UN 1267
Proper shipping name	PETROLEUM CRUDE OIL
Class Division	3
Packing group	II
Shipping Description	PETROLEUM CRUDE OIL, Class 3, UN 1267, PG II

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class/Description : Class B2 Flammable Liquid
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2B Other Toxic Effects - Skin Irritant

Inventory Status

EINECS	:	All components listed or polymer exempt.
DSL	:	All components listed.
TSCA	:	All components listed.

16. OTHER INFORMATION

MSDS Version Number : 1.0

MSDS Effective Date : 09-05-2012

MSDS Revisions : A vertical bar (|) in the left margin indicates an amendment from the previous version.

MSDS Prepared By : Shell Product Stewardship; 1-800-661-1600

MSDS Distribution : The information in this document should be made available to

all who may handle the product.

Disclaimer	:	The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

Material Safety Data Sheet

According to the Controlled Product Regulations

1. MATERIAL AND COMPANY IDENTIFICATION

Material Name : **Upgraded Crude**
Uses : Refinery Feedstock.
Product Code : 001B3899, 002D2308, 002D2312, 002D2315, 001B3607, 002D2316, 001D1767, 001D1777, 001B4221

Manufacturer/Supplier : **Shell Canada Products**
400 - 4th Avenue S.W
Calgary AB T2P 0J4
Canada
Telephone : (+1) 8006611600
Fax : (+1) 4033848345

Emergency Telephone Number
: Shell Canada: (+1) 800-661-7378
CANUTEC (24 hr): (+1) 613-996-6666

2. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture Description : Crude oil produced by an upgrading process and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

Synonyms :
CRU Albian Synthetic Blend
CRU Long Lake Premium Synthetic Crude
CRU Premium Newgrade Synthetic
CRU Shell Synthetic Blend
CRU Albian Heavy Synthetic
CRU Albian Premium Synthetic
CRU Shell Premium Synthetic (SPX)
CRU Syncrude
Husky Synthetic

WHMIS Controlled Ingredients

Chemical Identity	CAS No.	Conc. W/W
Distillates (petroleum), hydrotreated middle	64742-46-7	10.00- 30.00 %
Naphtha (petroleum), hydrotreated light	64742-49-0	10.00- 30.00 %
Gas oils (petroleum), hydrotreated vacuum	64742-59-2	10.00- 30.00 %
Gas oils (petroleum), hydrodesulfurized	64742-79-6	1.00- 5.00 %
Gas oil (petroleum), heavy atmospheric	68783-08-4	5.00- 10.00 %
Hydrocracked petroleum residues	64741-75-9	5.00- 10.00 %
Natural Gas Condensate	64741-47-5	10.00- 30.00 %
Naphtha (petroleum), heavy hydrocracked	64741-78-2	5.00- 10.00 %
Distillates (petroleum), straight-run, middle	64741-44-2	10.00- 30.00 %
Naphtha (petroleum), light straight-run	64741-46-4	5.00- 10.00 %

Residues (petroleum), vacuum	64741-56-6	5.00- 10.00 %
Clarified oils (petroleum), catalytic cracked	64741-62-4	1.00- 5.00 %

Contains Benzene, CAS # 71-43-2.
Contains n-Hexane, CAS # 110-54-3.
Contains hydrogen sulphide, CAS # 7783-06-4.
Contains Xylene (Mixed Isomers), CAS # 1330-20-7.
Contains Toluene, CAS # 108-88-3.
Hydrogen sulphide may be present both in the liquid and the vapour. Composition is complex and varies with the source of the crude oil.

Refer to Chapter 8 for Occupational Exposure Guidelines.

3. HAZARDS IDENTIFICATION

WHMIS Class/Description : Class B2 Flammable Liquid
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2A Other Toxic Effects - Reproductive Toxicity
Class D2B Other Toxic Effects - Skin Irritant
Class D2B Other Toxic Effects - Narcotic effects.
Class D2B Other Toxic Effects - Blood, Thymus,Liver.

Routes of Exposure : Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.

Health Hazards : Vapours may cause drowsiness and dizziness. Repeated exposure may cause skin dryness or cracking. Moderately irritating to eyes. Harmful: danger of serious damage to health by prolonged exposure in contact with skin and if swallowed. Harmful: may cause lung damage if swallowed. Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome). Hydrogen sulphide is highly toxic and may be fatal if inhaled. Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers. May dull the sense of smell, so do not rely on odour as an indication of hazard. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure. Repeated exposure may cause skin dryness or cracking. A component or components of this material may cause cancer. This product contains benzene which may cause leukaemia (AML - acute myelogenous leukaemia). May cause MDS (Myelodysplastic Syndrome).
Signs and Symptoms	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
Safety Hazards	:	Highly flammable. May ignite on surfaces at temperatures above auto-ignition temperature. Flammable vapours may be present even at temperatures below the flash point. This material is a static accumulator. Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.
Environmental Hazards	:	Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Additional Information	:	This product is intended for use in closed systems only.

4. FIRST-AID MEASURES

General Information	:	Vaporisation of H2S that has been trapped in clothing can be dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.
Inhalation	:	Remove to fresh air. If rapid recovery does not occur, transport to nearest medical facility for additional treatment.
Skin Contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
Eye Contact	:	Flush eyes with water while holding eyelids open. Rest eyes for 30 minutes. If redness, burning, blurred vision, or swelling persist transport to the nearest medical facility for additional treatment.
Ingestion	:	If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Give nothing by mouth. Do not induce vomiting. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Advice to Physician	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhinitis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance. Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death. Call a doctor or poison control center for guidance. Potential for chemical pneumonitis.

5. FIRE-FIGHTING MEASURES

Clear fire area of all non-emergency personnel.

Flash point	:	< 23 °C / 73 °F
Upper / lower Flammability or Explosion limits	:	0.6 - 8 %(V)
Auto ignition temperature	:	> 220 °C / 428 °F
Hazardous Combustion Products and Specific Hazards	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Oxides of sulphur. Unidentified organic and inorganic compounds. Oxides of nitrogen. The vapour is

		heavier than air, spreads along the ground and distant ignition is possible. Will float and can be reignited on surface water. Flammable vapours may be present even at temperatures below the flash point. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Suitable Extinguishing Media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable Extinguishing Media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Protective Equipment for Firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).
Additional Advice	:	If the fire cannot be extinguished the only course of action is to evacuate immediately. Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. Contain residual material at affected sites to prevent material from entering drains (sewers), ditches, and waterways.

6. ACCIDENTAL RELEASE MEASURES

Protective Measures	:	May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment. Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment (of product and fire fighting water) to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Clean Up Methods	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely. For small liquid spills (< 1 drum), transfer by mechanical means to a labelled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely.
Additional Advice	:	Notify authorities if any exposure to the general public or the

environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26. For guidance on selection of personal protective equipment see Chapter 8 of this Material Safety Data Sheet. For guidance on disposal of spilled material see Chapter 13 of this Material Safety Data Sheet.

7. HANDLING AND STORAGE

General Precautions : Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material. Properly dispose of any contaminated rags or cleaning materials in order to prevent fires. Prevent spillages. For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier.

Handling : When using do not eat or drink. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Never siphon by mouth. The vapour is heavier than air, spreads along the ground and distant ignition is possible. Avoid exposure. Use only non-sparking tools. Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols. Bulk storage tanks should be diked (bunded). Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur. Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges. These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements. These activities may lead to static discharge e.g. spark formation. Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (<= 1 m/s until fill pipe submerged to twice its diameter, then <= 7 m/s). Avoid splash filling. Do NOT use compressed air for filling, discharging, or handling operations.

Storage : Drum and small container storage: Keep containers closed when not in use. Drums should be stacked to a maximum of 3 high. Use properly labelled and closeable containers. Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat. Take suitable precautions when opening sealed containers, as pressure can build up during storage. Tank storage: Tanks must be specifically designed for use with this product. Bulk storage tanks should be diked (bunded). Locate tanks away from heat and other

sources of ignition. Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions. Electrostatic charges will be generated during pumping. Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk. The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable. Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Product Transfer : Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes.
Avoid splash filling. Keep containers closed when not in use. Do not use compressed air for filling, discharging or handling. Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.
Refer to guidance under Handling section.

Recommended Materials : For containers, or container linings use mild steel, stainless steel. Aluminium may also be used for applications where it does not present an unnecessary fire hazard. Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product. For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy. For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F, or Neoprene (CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex).

Unsuitable Materials : Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyisobutylene. However, some may be suitable for glove materials.

Container Advice : Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.

Additional Information : Ensure that all local regulations regarding handling and storage facilities are followed. Hydrogen sulphide (H2S) and toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning. Hydrogen sulphide (H2S or Sour Gas) may be present when loading and unloading transport vessels. Stay upwind and away from

newly opened hatches and allow to vent thoroughly before handling material. Steam may be used to vent hatches. Keep all sources of ignition away from loading area.
Use hydrogen sulphide monitors for detection.
See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). CENELEC CLC/TR 50404 (Electrostatics – Code of practice for the avoidance of hazards due to static electricity).

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

If the American Conference of Governmental Industrial Hygienists (ACGIH) value is provided on this document, it is provided for information only.

Occupational Exposure Limits

Material	Source	Type	ppm	mg/m3	Notation
Benzene	ACGIH	TWA	0.5 ppm		
	ACGIH	STEL	2.5 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
	SHELL IS	TWA	0.5 ppm	1.6 mg/m3	
	SHELL IS	STEL	2.5 ppm	8 mg/m3	
Hydrogen Sulphide	ACGIH	TWA	1 ppm		
	ACGIH	STEL	5 ppm		
Ethylbenzene	ACGIH	TWA	20 ppm		
n-hexane	ACGIH	TWA	50 ppm		
	ACGIH	SKIN_DES			Can be absorbed through the skin.
Naphthalene	ACGIH	TWA	10 ppm		
	ACGIH	STEL	15 ppm		

	ACGIH	SKIN_DES			Can be absorbed through the skin.

Consult local authorities for acceptable exposure limits within their jurisdiction.

Additional Information : SHELL IS is the Shell Internal Standard. Skin notation means that significant exposure can also occur by absorption of liquid through the skin and of vapour through the eyes or mucous membranes.

Biological Exposure Index (BEI)

Material	Determinant	Sampling Time	BEI	Reference
Benzene	t,t-Muconic acid in Creatinine in urine	Sampling time: End of shift.	500 µg/g	ACGIH BEL (2011)
	S-Phenylmercapturic acid in Creatinine in urine	Sampling time: End of shift.	25 µg/g	ACGIH BEL (2011)
Ethylbenzene	Sum of mandelic acid and phenylglyoxylic acid in Creatinine in urine	Sampling time: End of shift at end of work week.	0.7 g/g	ACGIH BEL (2011)
	Ethyl benzene in End-exhaled air	Sampling time: Not critical.		ACGIH BEL (2011)
n-hexane	2,5-Hexanedion, without hydrolysis in Urine	Sampling time: End of shift at end of work week.	0.4 mg/l	ACGIH BEL (2011)

Exposure Controls : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include: Use sealed systems as far as possible. Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.

Local exhaust ventilation is recommended. Eye washes and showers for emergency use. Firewater monitors and deluge systems are recommended. Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping. Define procedures for safe handling and maintenance of controls. Educate and train workers in the hazards and control measures relevant to normal activities associated with this product. Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation. Drain down system prior to equipment break-in or maintenance. Retain drain downs in sealed storage pending disposal or for subsequent recycle.

Personal Protective Equipment : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory Protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. All respiratory protection equipment and use must be in accordance with local regulations. Crude oil is a complex mixture with low and high boiling point components. When using an air-filtering respirator, careful attention to the filter breakthrough time is advised. If air-filtering respirators are suitable for conditions of use: Select a filter suitable for organic gases and vapours [boiling point >65 °C (149 °F)]. In areas where hydrogen sulphide vapours may accumulate, a positive-pressure air-supplied respirator is advised.

Hand Protection : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection: PVC. Longer term protection: Nitrile rubber. Incidental contact/Splash protection: Neoprene rubber. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognise that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time may be acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material.

		Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.
Eye Protection	:	Chemical splash goggles (chemical monogoggles).
Protective Clothing	:	Chemical resistant gloves/gauntlets, boots, and apron.
Monitoring Methods	:	Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate. Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory. Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available. National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/ Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods http://www.osha.gov/
Environmental Exposure Controls	:	Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour. Take appropriate measures to fulfil the requirements of relevant environmental protection legislation. Avoid contamination of the environment by following advice given in Chapter 6. If necessary, prevent undissolved material from being discharged to waste water. Waste water should be treated in a municipal or industrial waste water treatment plant before discharge to surface water.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Brown to black. Viscous liquid.
Odour	:	Potential smell of rotten eggs and sulphur..
Odour threshold	:	
pH	:	Not applicable
Initial Boiling Point and Boiling Range	:	Data not available
Freezing Point	:	Data not available
Vapour pressure	:	Data not available
Specific gravity	:	Data not available
Density	:	< 1.010 g/cm3 at 15 °C / 59 °F
Water solubility	:	Insoluble.
n-octanol/water partition coefficient (log Pow)	:	2 - 6
Kinematic viscosity	:	3 - 1,000 mm2/s at 40 °C / 104 °F
Vapour density (air=1)	:	Data not available
Electrical conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered

nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid.

Evaporation rate (nBuAc=1) : Data not available

10. STABILITY AND REACTIVITY

Stability : Stable under normal conditions of use.
Conditions to Avoid : Avoid heat, sparks, open flames and other ignition sources.
Materials to Avoid : Strong oxidising agents.
Hazardous Decomposition Products : Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.
Hazardous Polymerisation : No, hazardous, exothermic polymerization cannot occur.
Sensitivity to Mechanical Impact : No, product will not become self-reactive.
Sensitivity to Static Discharge : Yes, in certain circumstances product can ignite due to static electricity.

11. TOXICOLOGICAL INFORMATION

Basis for Assessment : Information given is based on data from components.
Routes of Exposure : Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.
Acute Oral Toxicity : May be harmful if swallowed. LD50 > 2000 - <= 5000 mg/kg , Rat.
Acute Dermal Toxicity : Expected to be of low toxicity: LD50 > 5000 mg/kg , Rabbit.
Acute Inhalation Toxicity : Expected to be of low toxicity if inhaled. (Hydrogen Sulphide)
Skin Irritation : Causes skin irritation.
Eye Irritation : Expected to be irritating to eyes.
Respiratory Irritation : Not expected to be a respiratory irritant.
Sensitisation : Not expected to be a sensitiser.
Repeated Dose Toxicity : Repeated exposure may cause skin dryness or cracking. May cause damage to organs or organ systems through prolonged or repeated exposure. Bone Marrow (Benzene) Can cause liver damage. Liver: can cause liver damage at chronic exposure to high concentrations.
Mutagenicity : May cause heritable genetic damage. (Benzene)
Carcinogenicity : Causes cancer in laboratory animals.

Material	:	**Carcinogenicity Classification**
Crude Oil	:	IARC 3: Not classifiable as to carcinogenicity to humans.
Crude Oil	:	GHS / CLP: No carcinogenicity classification

Natural Gasoline	:	IARC 2B: Possibly carcinogenic to humans.
Natural Gasoline	:	GHS / CLP: No carcinogenicity classification
n-hexane	:	GHS / CLP: No carcinogenicity classification
Benzene	:	ACGIH Group A1: Confirmed human carcinogen.
Benzene	:	NTP: Known To Be Human Carcinogen.
Benzene	:	IARC 1: Carcinogenic to humans.
Benzene	:	GHS / CLP: Carcinogenicity Category 1A
Naphthalene	:	ACGIH Group A4: Not classifiable as a human carcinogen.
Naphthalene	:	NTP: Reasonably Anticipated to be a Human Carcinogen.
Naphthalene	:	IARC 2B: Possibly carcinogenic to humans.
Naphthalene	:	GHS / CLP: Carcinogenicity Category 2
Ethylbenzene	:	ACGIH Group A3: Confirmed animal carcinogen with unknown relevance to humans.
Ethylbenzene	:	IARC 2B: Possibly carcinogenic to humans.
Ethylbenzene	:	GHS / CLP: No carcinogenicity classification
Sulphur	:	GHS / CLP: No carcinogenicity classification

Reproductive and Developmental Toxicity : Suspected of damaging fertility or the unborn child.

Additional Information : May cause MDS (Myelodysplastic Syndrome).
Can cause liver damage.
H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

12. ECOLOGICAL INFORMATION

Incomplete ecotoxicological data are available for this product. The information given below is based partly on a knowledge of the components and the ecotoxicology of similar products.

Acute Toxicity : LL/EL50 expressed as the nominal amount of product required to prepare aqueous test extract.

Fish : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Aquatic crustacea : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Algae/aquatic plants : Expected to be toxic: LL/EL/IL50 > 1 <= 10 mg/l

Microorganisms : Expected to be harmful: LL/EL/IL50 >10 <= 100 mg/l

Chronic Toxicity

Fish : Data not available

Aquatic crustacea	:	Data not available
Mobility	:	Floats on water. If product enters soil, one or more of its constituents will be moderately mobile and may contaminate groundwater.
Persistence/degradability	:	Oxidises rapidly by photo-chemical reactions in air. Readily biodegradable.
Bioaccumulation	:	Contains constituents with the potential to bioaccumulate.
Other Adverse Effects	:	Films formed on water may affect oxygen transfer and damage organisms.

13. DISPOSAL CONSIDERATIONS

Material Disposal	:	Recover or recycle if possible. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations. Do not dispose into the environment, in drains or in water courses. Do not dispose of tank water bottoms by allowing them to drain into the ground. This will result in soil and groundwater contamination. Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.
Container Disposal	:	Send to drum recoverer or metal reclaimer. Drain container thoroughly. After draining, vent in a safe place away from sparks and fire. Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums. Do not pollute the soil, water or environment with the waste container. Comply with any local recovery or waste disposal regulations.
Local Legislation	:	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 and must be in compliance.

14. TRANSPORT INFORMATION

Canadian Road and Rail Shipping Classification

UN/NA Number	UN 1267
Proper shipping name	PETROLEUM CRUDE OIL
Class Division	3
Packing group	II
Shipping Description	PETROLEUM CRUDE OIL, Class 3, UN 1267, PG II
Additional Information	MARPOL Annex 1 rules apply for bulk shipments by sea.

15. REGULATORY INFORMATION

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Class/Description : Class B2 Flammable Liquid
Class D2A Other Toxic Effects - Carcinogen/Mutagen
Class D2A Other Toxic Effects - Reproductive Toxicity
Class D2B Other Toxic Effects - Skin Irritant
Class D2B Other Toxic Effects - Narcotic effects.
Class D2B Other Toxic Effects - Blood, Thymus,Liver.

Inventory Status

DSL : All components listed.
:

16. OTHER INFORMATION

SDS Version Number : 2.2

SDS Effective Date : 2013-07-25

SDS Revisions : A vertical bar (|) in the left margin indicates an amendment from the previous version.

SDS Regulation : The content and format of this (M)SDS is in accordance with the Controlled Product Regulations.

SDS Prepared By : Shell Product Stewardship; 1-800-661-1600

Uses and Restrictions : This product must not be used in applications other than those recommended in Section 1, without first seeking the advice of the supplier.

SDS Distribution : The information in this document should be made available to all who may handle the product.

Disclaimer : The information contained herein is based on our current knowledge of the underlying data and is intended to describe the product for the purpose of health, safety and environmental requirements only. No warranty or guarantee is expressed or implied regarding the accuracy of these data or the results to be obtained from the use of the product.

SAFETY DATA SHEET
According to the Hazardous Products Regulations
CRU Shell Synthetic Blend (SSX)

Version	Revision Date:	SDS Number:	Print Date: 2017-02-11
4.0	2017-02-02	800001032248	Date of last issue: 19.10.2016
			Date of first issue: 05.02.2015

SECTION 1. IDENTIFICATION

Product name : CRU Shell Synthetic Blend (SSX)

Product code : 002D2316

Manufacturer or supplier's details

Manufacturer/Supplier : **Shell Trading Canada**
400 - 4th Avenue S.W.
Calgary-Alberta T2P 0J4
Canada

Telephone : (+1) 800-661-1600
Telefax :

Emergency telephone number : CHEMTREC (24 hr) (+1) 703-527-3887 or (+1) 800-424-9300 (US)
; CANUTEC (24 hr): (+1) 613-996-6666; Toll Free: 1-888-CANUTEC (226-8832)

Recommended use of the chemical and restrictions on use

Recommended use :
Refinery Feedstock.

Restrictions on use : This product must not be used in applications other than those listed in Section 1 without first seeking the advice of the supplier.

SECTION 2. HAZARDS IDENTIFICATION

GHS Classification

Flammable liquids : Category 1

Aspiration hazard : Category 1

Skin irritation : Category 2

Acute toxicity (Inhalation) : Category 4

Specific target organ toxicity - single exposure (Inhalation) : Category 3 (Central nervous system)

Germ cell mutagenicity	:	Category 1B
Carcinogenicity	:	Category 1B
Reproductive toxicity	:	Category 2
Specific target organ toxicity - repeated exposure	:	Category 2 (Blood, Liver, thymus, spleen)
Chronic aquatic toxicity	:	Category 2

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements :
PHYSICAL HAZARDS:
H224 Extremely flammable liquid and vapour.
HEALTH HAZARDS:
H304 May be fatal if swallowed and enters airways.
H315 Causes skin irritation.
H332 Harmful if inhaled.
H336 May cause drowsiness or dizziness.
H340 May cause genetic defects.
H350 May cause cancer.
H361 Suspected of damaging fertility or the unborn child.
H373 May cause damage to organs through prolonged or repeated exposure.
ENVIRONMENTAL HAZARDS:
H411 Toxic to aquatic life with long lasting effects.

Precautionary statements :
Prevention:
P201 Obtain special instructions before use.
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.
Response:
P301 + P310 IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P331 Do NOT induce vomiting.
Disposal:
P501 Dispose of contents and container to appropriate waste site or reclaimer in accordance with local and national regulations.

Other hazards which do not result in classification

Hydrogen sulphide (H2S), an extremely flammable and toxic gas, and other hazardous vapours may evolve and collect in the headspace of storage tanks, transport vessels and other enclosed containers.
May ignite on surfaces at temperatures above auto-ignition temperature.
Flammable vapours may be present even at temperatures below the flash point.
This material is a static accumulator.
Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.
If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance name : CRU Shell Synthetic Blend (SSX)

Chemical nature : Crude oil produced by an upgrading process and containing predominantly aliphatic, alicyclic and aromatic hydrocarbons. It may also contain small amounts of nitrogen, oxygen and sulphur compounds.

Hazardous components

Chemical name	CAS-No.	Concentration (% w/w)
Crude, Synthetic Petroleum (other e.g. oil sand)	Not Assigned	<= 100

Further information

Contains:

Chemical name	Identification number	Concentration [%]
n-Hexane	110-54-3, 203-777-6	0 - 2
toluene	108-88-3, 203-625-9	0 - 1
benzene	71-43-2, 200-753-7	0 - 0.5
Ethylbenzene	100-41-4, 202-849-4	0 - 0.5
cumene	98-82-8, 202-704-5	0 - 0.5
Naphthalene	91-20-3, 202-049-5	0 - 0.5
Hydrogen sulfide	7783-06-4, 231-977-3	0 - 0.01

SECTION 4. FIRST-AID MEASURES

General advice : Vapourisation of H2S that has been trapped in clothing can be dangerous to rescuers. Maintain respiratory protection to avoid contamination from the victim to rescuer. Mechanical ventilation should be used to resuscitate if at all possible.

If inhaled : Call emergency number for your location / facility.
Remove to fresh air. Do not attempt to rescue the victim unless proper respiratory protection is worn. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting, or unresponsive, give 100% oxygen with rescue breathing or Cardio-Pulmonary Resuscitation as required and transport to the nearest medical facility.

In case of skin contact	:	Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
In case of eye contact	:	Flush eye with copious quantities of water. Remove contact lenses, if present and easy to do. Continue rinsing. If persistent irritation occurs, obtain medical attention.
If swallowed	:	Call emergency number for your location / facility. If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. If any of the following delayed signs and symptoms appear within the next 6 hours, transport to the nearest medical facility: fever greater than 101° F (38.3°C), shortness of breath, chest congestion or continued coughing or wheezing.
Most important symptoms and effects, both acute and delayed	:	Defatting dermatitis signs and symptoms may include a burning sensation and/or a dried/cracked appearance. Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision. If material enters lungs, signs and symptoms may include coughing, choking, wheezing, difficulty in breathing, chest congestion, shortness of breath, and/or fever. The onset of respiratory symptoms may be delayed for several hours after exposure. Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, lightheadedness, headache and nausea. H2S has a broad range of effects dependent on the airborne concentration and length of exposure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.
Protection of first-aiders	:	When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings.
Notes to physician	:	Hydrogen sulphide (H2S) - CNS asphyxiant. May cause rhini-

tis, bronchitis and occasionally pulmonary oedema after severe exposure. CONSIDER: Oxygen therapy. Consult a Poison Control Center for guidance.
Exposure to hydrogen sulphide at concentrations above the recommended occupational exposure standard may cause headache, dizziness, irritation of the eyes, upper respiratory tract, mouth and digestive tract, convulsions, respiratory paralysis, unconsciousness and even death.
Call a doctor or poison control center for guidance.
Potential for chemical pneumonitis.

SECTION 5. FIRE-FIGHTING MEASURES

Suitable extinguishing media	:	Foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Unsuitable extinguishing media	:	Do not use direct water jets on the burning product as they could cause a steam explosion and spread of the fire. Simultaneous use of foam and water on the same surface is to be avoided as water destroys the foam.
Specific hazards during fire-fighting	:	Hazardous combustion products may include: A complex mixture of airborne solid and liquid particulates and gases (smoke). Carbon monoxide may be evolved if incomplete combustion occurs. Oxides of sulphur. Unidentified organic and inorganic compounds. Oxides of nitrogen The vapour is heavier than air, spreads along the ground and distant ignition is possible. Will float and can be reignited on surface water. Flammable vapours may be present even at temperatures below the flash point. Hydrogen sulphide (H2S) and other toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Specific extinguishing methods	:	Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
Further information	:	If the fire cannot be extinguished the only course of action is to evacuate immediately. Keep adjacent containers cool by spraying with water. If possible remove containers from the danger zone. Contain residual material at affected sites to prevent material from entering drains (sewers), ditches, and waterways.
Special protective equipment for firefighters	:	Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained

Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures	:	May ignite on surfaces at temperatures above auto-ignition temperature. Do not breathe fumes, vapour. Do not operate electrical equipment.
Environmental precautions	:	Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location for example by using fog sprays. Take precautionary measures against static discharge. Ensure electrical continuity by bonding and grounding (earthing) all equipment.
Methods and materials for containment and cleaning up	:	For large liquid spills (> 1 drum), transfer by mechanical means such as vacuum truck to a salvage tank for recovery or safe disposal. Do not flush away residues with water. Retain as contaminated waste. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely. Remove contaminated soil and dispose of safely For small liquid spills (< 1 drum), transfer by mechanical means to a labeled, sealable container for product recovery or safe disposal. Allow residues to evaporate or soak up with an appropriate absorbent material and dispose of safely Remove contaminated soil and dispose of safely. Observe all relevant local and international regulations. Remove contaminated clothing. Evacuate the area of all non-essential personnel. Avoid contact with skin, eyes and clothing. Ventilate contaminated area thoroughly.
Additional advice	:	For guidance on selection of personal protective equipment see Chapter 8 of this Safety Data Sheet. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. For guidance on disposal of spilled material see Chapter 13 of this Safety Data Sheet. Local authorities should be advised if significant spillages cannot be contained. Maritime spillages should be dealt with using a Shipboard Oil Pollution Emergency Plan (SOPEP), as required by MARPOL Annex 1 Regulation 26.

SECTION 7. HANDLING AND STORAGE

General Precautions : Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Prevent spillages.
For comprehensive advice on handling, product transfer, storage and tank cleaning refer to the product supplier.

Advice on safe handling : Ensure that all local regulations regarding handling and storage facilities are followed.
When using do not eat or drink.
Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks.
Never siphon by mouth.
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Avoid exposure.
Use only non-sparking tools.
Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.
Bulk storage tanks should be diked (bunded).

Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.
If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.
Be aware of handling operations that may give rise to additional hazards that result from the accumulation of static charges.
These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements.
These activities may lead to static discharge e.g. spark formation.
Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (≤ 1 m/s until fill pipe submerged to twice its diameter, then ≤ 7 m/s). Avoid splash filling.
Do NOT use compressed air for filling, discharging, or handling operations.

Hydrogen sulphide (H2S) and other toxic sulphur oxides may be given off when this material is heated. Do not depend on sense of smell for warning.
Hydrogen sulphide (H2S or Sour Gas) may be present when loading and unloading transport vessels. Stay upwind and

away from newly opened hatches and allow to vent thoroughly before handling material. Steam may be used to vent hatches. Keep all sources of ignition away from loading area. See National Fire Protection Association (NFPA) Code 655 for specific information on the crushing, grinding, pulverizing or handling of sulphur.

Avoidance of contact : Strong oxidising agents.

Product Transfer : Wait 2 minutes after tank filling (for tanks such as those on road tanker vehicles) before opening hatches or manholes. Wait 30 minutes after tank filling (for large storage tanks) before opening hatches or manholes.

Avoid splash filling Keep containers closed when not in use. Do not use compressed air for filling discharge or handling. Contamination resulting from product transfer may give rise to light hydrocarbon vapour in the headspace of tanks that have previously contained gasoline. This vapour may explode if there is a source of ignition. Partly filled containers present a greater hazard than those that are full, therefore handling, transfer and sampling activities need special care.

Storage

Other data : Drum and small container storage:
Keep containers closed when not in use.
Drums should be stacked to a maximum of 3 high.
Use properly labeled and closable containers.
Packaged product must be kept tightly closed and stored in a diked (bunded) well-ventilated area, away from, ignition sources and other sources of heat.
Take suitable precautions when opening sealed containers, as pressure can build up during storage.
Tank storage:
Tanks must be specifically designed for use with this product.
Bulk storage tanks should be diked (bunded).
Locate tanks away from heat and other sources of ignition.
Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.
Electrostatic charges will be generated during pumping.
Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk.
The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.
Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Packaging material	:	Suitable material: For containers, or container linings use mild steel, stainless steel., Aluminium may also be used for applications where it does not present an unnecessary fire hazard., Examples of suitable materials are: high density polyethylene (HDPE), polypropylene (PP), polyvinyl chloride (PVC), polyvinyl fluoride (PVDF), and fluoroelastomers (FKM), e.g. Viton, which have been specifically tested for compatibility with this product., For container linings, or coatings, use Epoxy (amine-cured), or Epoxy Novolac, or Phenolic Epoxy., For seals and gaskets use: fluoroelastomers (FKM), e.g. Viton A, B, or F , or Neoprene (CR), or nitrile (NBR, HNBR), or graphite, or expanded PTFE (e.g. Gore-Tex). Unsuitable material: Some synthetic materials may be unsuitable for containers or container linings depending on the material specification and intended use. Examples of materials to avoid are: natural rubber (NR), nitrile rubber (NBR), ethylene propylene rubber (EPDM), polymethyl methacrylate (PMMA), polystyrene, polyvinyl chloride (PVC), polyisobutylene., However, some may be suitable for glove materials.
Container Advice	:	Do not cut, drill, grind, weld or perform similar operations on or near containers. Containers, even those that have been emptied, can contain explosive vapours.
Specific use(s)	:	Not applicable. See additional references that provide safe handling practices for liquids that are determined to be static accumulators: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity). IEC/TS 60079-32-1: Electrostatic hazards, guidance

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
n-Hexane	110-54-3	TWA	500 ppm 1,800 mg/m3	OSHA Z-1
		TWA	50 ppm	ACGIH
benzene	71-43-2	TWA	0.5 ppm 1.6 mg/m3	Shell Internal Standard (SIS) for 8-12 hour TWA.
		STEL	2.5 ppm	Shell Internal

			8 mg/m3	Standard (SIS) for 15 min (STEL)
		TWA	0.5 ppm	ACGIH
		STEL	2.5 ppm	ACGIH
		PEL	1 ppm	OSHA CARC
		STEL	5 ppm	OSHA CARC
		TWA	10 ppm	OSHA Z-2
		CEIL	25 ppm	OSHA Z-2
		Peak	50 ppm (10 minutes)	OSHA Z-2
toluene	108-88-3	TWA	20 ppm	ACGIH
		TWA	200 ppm	OSHA Z-2
		CEIL	300 ppm	OSHA Z-2
		Peak	500 ppm (10 minutes)	OSHA Z-2
Ethylbenzene	100-41-4	TWA	20 ppm	ACGIH
		TWA	100 ppm 435 mg/m3	OSHA Z-1
cumene	98-82-8	TWA	50 ppm 245 mg/m3	OSHA Z-1
		TWA	50 ppm	ACGIH
Naphthalene	91-20-3	TWA	10 ppm 50 mg/m3	OSHA Z-1
		TWA	10 ppm	ACGIH
Hydrogen sulfide	7783-06-4	TWA	5 ppm 7 mg/m3	2009/161/EU
	Further information: This value is for information where there is no national limit value available.			
		STEL	10 ppm 14 mg/m3	2009/161/EU
	Further information: This value is for information where there is no national limit value available.			
		CEIL	20 ppm	OSHA Z-2
		Peak	50 ppm (10 minutes once only if no other measured exposure occurs)	OSHA Z-2
		TWA	1 ppm	ACGIH
		STEL	5 ppm	ACGIH

Biological occupational exposure limits

Components	CAS-No.	Control parameters	Biological specimen	Sampling time	Permissible concentration	Basis
n-Hexane	110-54-3	2,5-Hexanedione	Urine	End of shift at end of workweek	0.4 mg/l	ACGIH BEI

benzene	71-43-2	S-Phenylmer-capturic acid	Urine	End of shift (As soon as possible after exposure ceases)	25 µg/g creatinine	ACGIH BEI
		t,t-Muconic acid	Urine	End of shift (As soon as possible after exposure ceases)	500 µg/g creatinine	ACGIH BEI
toluene	108-88-3	Toluene	In blood	Prior to last shift of work-week	0.02 mg/l	ACGIH BEI
		Toluene	Urine	End of shift (As soon as possible after exposure ceases)	0.03 mg/l	ACGIH BEI
		o-Cresol	Urine	End of shift (As soon as possible after exposure ceases)	0.3 mg/g Creatinine	ACGIH BEI
Ethylbenzene	100-41-4	Sum of mandelic acid and phenyl gly-oxylic acid	Urine	End of shift (As soon as possible after exposure ceases)	0.15 g/g creatinine	ACGIH BEI

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.
Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.
Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.
National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods http://www.cdc.gov/niosh/
Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods

http://www.osha.gov/
Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances http://www.hse.gov.uk/
Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA) , Germany http://www.dguv.de/inhalt/index.jsp
L'Institut National de Recherche et de Securité, (INRS), France http://www.inrs.fr/accueil

Engineering measures : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:
Use sealed systems as far as possible.
Firewater monitors and deluge systems are recommended.
Adequate explosion-proof ventilation to control airborne concentrations below the exposure guidelines/limits.
Local exhaust ventilation is recommended.
Eye washes and showers for emergency use.

General Information:

Always observe good personal hygiene measures, such as washing hands after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned.
Practice good housekeeping.
Define procedures for safe handling and maintenance of controls.
Educate and train workers in the hazards and control measures relevant to normal activities associated with this product.
Ensure appropriate selection, testing and maintenance of equipment used to control exposure, e.g. personal protective equipment, local exhaust ventilation.
Drain down system prior to equipment break-in or maintenance.
Retain drain downs in sealed storage pending disposal or for subsequent recycle.

Personal protective equipment

Hand protection
Remarks : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. PVC. Longer term protection: Nitrile rubber. Incidental contact/Splash protection: Neoprene rubber. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same, but recognize that suitable gloves offering this level of protection

may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced.

Eye protection : Wear goggles for use against liquids and gas.

Skin and body protection : Wear chemical resistant gloves/gauntlets, boots, and apron.

Protective measures : Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Environmental exposure controls

General advice : Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.
Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	liquid
Colour	:	Not applicable
Odour	:	Unstenched
Odour Threshold	:	Data not available
pH	:	Not applicable
Melting / freezing point	:	Data not available
Boiling point/boiling range	:	>= 10 °C / 50 °F Method: Unspecified
Flash point	:	<= 23 °C / 73 °F Method: Unspecified
Evaporation rate	:	Data not available
Flammability (solid, gas)	:	Not applicable

Upper explosion limit	:	no data available
Lower explosion limit	:	no data available
Vapour pressure	:	(38 °C / 100 °F) Method: Unspecified Data not available (50 °C / 122 °F) Method: Unspecified Data not available
Relative vapour density	:	Data not available
Relative density	:	Data not available
Density	:	868.0 kg/m3 (15.0 °C / 59.0 °F)Method: Unspecified
Solubility(ies)		
Water solubility	:	insoluble
Solubility in other solvents	:	Data not available
Partition coefficient: n-octanol/water	:	Data not available
Auto-ignition temperature	:	> 220 °C / 428 °F
Decomposition temperature	:	Data not available
Viscosity		
Viscosity, kinematic	:	3 - 1000 mm2/s (40 °C / 104 °F) Method: Unspecified
Explosive properties	:	Classification Code: NOT CLASS: Not classified
Oxidizing properties	:	Not applicable
Conductivity	:	Low conductivity: < 100 pS/m, The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10 000 pS/m., Whether a liquid is nonconductive or semiconductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid

SECTION 10. STABILITY AND REACTIVITY

Reactivity	:	Oxidises on contact with air.
Chemical stability	:	Stable under normal conditions of use.
Possibility of hazardous reactions	:	No hazardous reaction is expected when handled and stored according to provisions
Conditions to avoid	:	Avoid heat, sparks, open flames and other ignition sources. In certain circumstances product can ignite due to static electricity.
Incompatible materials	:	Strong oxidising agents.
Hazardous decomposition products	:	Hazardous decomposition products are not expected to form during normal storage. Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation.

SECTION 11. TOXICOLOGICAL INFORMATION

Basis for assessment : Information given is based on data from components.

Information on likely routes of exposure
Exposure may occur via inhalation, ingestion, skin absorption, skin or eye contact, and accidental ingestion.

Acute toxicity

Product:

Acute oral toxicity	:	(Rat): Remarks: Low toxicity: LD50 >5000 mg/kg
Acute inhalation toxicity	:	Remarks: Harmful if inhaled. LC50 > 1.0 - <= 5.0 mg/l
Acute dermal toxicity	:	(Rabbit): Remarks: Low toxicity: LD50 >2000 mg/kg
Acute toxicity (other routes of administration)	:	Remarks: Inhalation of vapours or mists may cause irritation to the respiratory system.

Skin corrosion/irritation

Product:

Remarks: Irritating to skin.

Serious eye damage/eye irritation

Product:
Remarks: Expected to be moderately irritating to eyes (but insufficient to classify).

Respiratory or skin sensitisation

Product:
Remarks: Not expected to be a sensitiser.

Germ cell mutagenicity

Product:

Genotoxicity in vivo	:	Remarks: May cause heritable genetic damage Contains Benzene, CAS # 71-43-2. Mutagenicity studies on gasoline and gasoline blending streams have shown predominantly negative results.

Carcinogenicity

Product:
Remarks: Known human carcinogen.
Contains Benzene, CAS # 71-43-2.
May cause leukaemia (AML - acute myelogenous leukaemia).
Inhalation exposure to mice causes liver tumours, which are not considered relevant to humans.

IARC	Group 1: Carcinogenic to humans	
	benzene	71-43-2
	Group 2B: Possibly carcinogenic to humans	
	cumene	98-82-8
	Naphthalene	91-20-3
OSHA	OSHA specifically regulated carcinogen	
	benzene	71-43-2
NTP	Known to be human carcinogen	
	benzene	71-43-2
	Reasonably anticipated to be a human carcinogen	
	Naphthalene	91-20-3

Reproductive toxicity

Product:

Effects on fertility : Remarks: Many case studies involving abuse during pregnancy indicate that toluene can cause birth defects, growth retardation and learning difficulties.
Causes foetotoxicity at doses which are maternally toxic.
Contains Toluene, CAS # 108-88-3.
May impair fertility at doses which produce other toxic effects.
Contains n-Hexane, CAS # 110-54-3.

STOT - single exposure

Product:

Remarks: High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea; continued inhalation may result in unconsciousness and/or death.

STOT - repeated exposure

Product:

Remarks: May cause damage to organs or organ systems through prolonged or repeated exposure.
Blood
Liver
thymus
spleen
Kidney: caused kidney effects in male rats which are not considered relevant to humans
Peripheral nervous system: repeated exposure causes peripheral neuropathy in animals.
Contains n-Hexane, CAS # 110-54-3.

Aspiration toxicity

Product:

Aspiration into the lungs when swallowed or vomited may cause chemical pneumonitis which can be fatal.

Further information

Product:

Remarks: Exposure to very high concentrations of similar materials has been associated with irregular heart rhythms and cardiac arrest.
Prolonged and repeated exposures to high concentrations have resulted in hearing loss in rats.
Solvent abuse and noise interaction in the work environment may cause hearing loss.
Abuse of vapours has been associated with organ damage and death.
Contains Toluene, CAS # 108-88-3.
Myelodysplastic syndrome (MDS) was observed in individuals exposed to very high levels (50 ppm to 300 ppm range) of benzene over a long period of time in the workplace. The relevance of these results to lower levels of exposure is not known.
H2S has a broad range of effects dependent on the airborne concentration and length of expo-

sure: 0.02 ppm odour threshold, smell of rotten eggs; 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 oedema after >20-30 minutes; 500 ppm loss of consciousness after short exposures, potential for respiratory arrest; >1000ppm immediate loss of consciousness, may lead rapidly to death, prompt cardiopulmonary resuscitation may be required. Do not depend on sense of smell for warning. H2S causes rapid olfactory fatigue (deadens sense of smell). There is no evidence that H2S will accumulate in the body tissue after repeated exposure.

SECTION 12. ECOLOGICAL INFORMATION

Basis for assessment : Incomplete ecotoxicological data are available for this product. The information given below is based partly on a knowledge of the components and the ecotoxicology of similar products.
Remarks

Ecotoxicity

Product:

Toxicity to fish (Acute toxicity) :
Remarks: Expected to be toxic:
LL/EL/IL50 1-10 mg/l

Toxicity to crustacean (Acute toxicity) :
Remarks: Expected to be toxic:
LL/EL/IL50 1-10 mg/l

Toxicity to algae/aquatic plants (Acute toxicity) :
Remarks: Expected to be toxic:
LL/EL/IL50 1-10 mg/l

Toxicity to fish (Chronic toxicity) : Remarks: Data not available

Toxicity to crustacean (Chronic toxicity) : Remarks: Data not available

Toxicity to microorganisms (Acute toxicity) : Remarks: Expected to be harmful:
LL/EL/IL50 10-100 mg/l

Persistence and degradability

Product:

Biodegradability : Remarks: Oxidises rapidly by photo-chemical reactions in air.
Expected to be inherently biodegradable.

Bioaccumulative potential

Product:

Bioaccumulation : Remarks: Contains components with the potential to bioac-

cumulate.

Partition coefficient: n-octanol/water : Remarks: Data not available

Mobility in soil

Product:

Mobility : Remarks: Floats on water.
If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater.

Other adverse effects

Product:

Additional ecological information : Films formed on water may affect oxygen transfer and damage organisms.

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.
Do not dispose into the environment, in drains or in water courses
Do not dispose of tank water bottoms by allowing them to drain into the ground.
Waste arising from a spillage or tank cleaning should be disposed of in accordance with prevailing regulations, preferably to a recognised collector or contractor. The competence of the collector or contractor should be established beforehand.

Contaminated packaging : Send to drum recoverer or metal reclaimer.
Drain container thoroughly.
After draining, vent in a safe place away from sparks and fire.
Residues may cause an explosion hazard if heated above the flash point. Do not puncture, cut or weld uncleaned drums.
Do not pollute the soil, water or environment with the waste container.
Comply with any local recovery or waste disposal regulations.

SECTION 14. TRANSPORT INFORMATION

TDG

UN number	:	1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3
Marine pollutant	:	no

International Regulations

IATA-DGR

UN/ID No.	:	UN 1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3

IMDG-Code

UN number	:	UN 1267
Proper shipping name	:	PETROLEUM CRUDE OIL
Class	:	3
Packing group	:	I
Labels	:	3
Marine pollutant	:	yes

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Pollution category	:	Not applicable
Ship type	:	Not applicable
Product name	:	Not applicable

Special precautions for user

Not applicable

Additional Information : MARPOL Annex 1 rules apply for bulk shipments by sea.

SECTION 15. REGULATORY INFORMATION

Safety, health and environmental regulations/legislation specific for the substance or mixture

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.

The components of this product are reported in the following inventories:

DSL : All components listed or polymer exempt.

SECTION 16. OTHER INFORMATION

Full text of other abbreviations

AICS - Australian Inventory of Chemical Substances; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; CPR - Controlled Products Regulations; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

This product is intended for use in closed systems only.

Due to a change of detail in Section 1, this document has been released as a significant change.

Revision Date : 2017-02-02

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

CA / EN

Material Safety Data Sheet

MACKAY RIVER BLEND

1 . Product and company identification

Product name : MACKAY RIVER BLEND

Synonym : MacKay River Bitumen/Synthetic Crude Oil Blend, Synbit Blend

Code : 90000125

Material uses : Used as refinery feedstock.

Manufacturer : PETRO-CANADA
P.O. Box 2844
150 – 6th Avenue South-West
Calgary, Alberta
T2P 3E3

In case of emergency : Petro-Canada: 403-296-3000
Canutec Transportation: 613-996-6666
Poison Control Centre: Consult local telephone directory for emergency number(s).

2 . Hazards identification

Physical state : Viscous liquid.

Odour : Pungent.

WHMIS (Canada) :

Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

FLAMMABLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

Flammable liquid. Irritating to eyes and skin. May cause sensitisation by skin contact. Keep away from heat, sparks and flame. Avoid exposure - obtain special instructions before use. Do not breathe vapour or mist. Do not get on skin or clothing. Avoid contact with eyes. Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Routes of entry : Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation : Inhalation of this product may cause respiratory tract irritation and Central Nervous System (CNS) Depression, symptoms of which may include; weakness, dizziness, slurred speech, drowsiness, unconsciousness and in cases of severe overexposure; coma and death.

Ingestion : Ingestion of this product may cause gastro-intestinal irritation. Aspiration of this product may result in severe irritation or burns to the respiratory tract.

Skin : Irritating to skin. May cause sensitisation by skin contact.

Eyes : Irritating to eyes.

Potential chronic health effects

Chronic effects : Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : Contains material which may cause heritable genetic effects.

Teratogenicity : Contains material which may cause birth defects, based on animal data.

2 . Hazards identification

Developmental effects : No known significant effects or critical hazards.

Fertility effects : Contains material which may impair male fertility, based on animal data. Contains material which may impair female fertility, based on animal data.

Medical conditions aggravated by over-exposure : Pre-existing skin disorders may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Synthetic crude oil*	64742-59-2	45 - 55
Bitumen	128683-24-9	45 - 55
Sulphur	7704-34-9	1-5

*A complex combination of hydrocarbons extracted from oil sands. Contains small amounts of benzene, polynuclear aromatic hydrocarbons (PNAs), sulphur compounds and oxygenated compounds.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4 . First-aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with soap and water or use recognised skin cleanser. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5 . Fire-fighting measures

Flammability of the product : May be combustible at high temperature.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

5 . Fire-fighting measures

Products of combustion : Carbon oxides (CO, CO2), nitrogen oxides (NOx), sulphur oxides (SOx), sulphur compounds (H2S), hydrocarbons, smoke and irritating vapours as products of incomplete combustion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Special remarks on fire hazards : Easily ignites under almost all normal temperature conditions. Extremely flammable in presence of open flames, sparks, shocks, heat, oxidizing materials. Vapours are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks), and may travel considerable distance to sources of ignition and flash back. Hydrogen sulphide may be released if the product is overheated.

Special remarks on explosion hazards : Do not pressurise, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Container explosion may occur under fire conditions or when heated. Vapours may form explosive mixtures with air. Runoff to sewer may create fire or explosion hazard. This product can accumulate static charge and ignite.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilt material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapour or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach the release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilt product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapour or mist. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by earthing and bonding containers and equipment before transferring material. Empty containers retain

7 . Handling and storage

product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabelled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Benzene	**ACGIH TLV (United States). Absorbed through skin.** TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s).

Consult local authorities for acceptable exposure limits.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapour or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: organic vapour cartridge or canister may be permissible under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air-purifying respirators is limited. Use a positive-pressure, air-supplied respirator if there is any potential for uncontrolled release, exposure levels are unknown, or any other circumstances where air-purifying respirators may not provide adequate protection.

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
Recommended: neoprene, nitrile, polyvinyl alcohol (PVA), Viton®.

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state : Viscous liquid.
Flash point : Closed cup: <0°C (<32°F) [Closed cup]
Auto-ignition temperature : Not available.
Flammable limits : Not available.
Colour : Black.
Odour : Pungent.
Odour threshold : Not available.
pH : Not available.
Boiling/condensation point : Initial boiling point: 25°C (77°F)
Melting/freezing point : Not available.
Relative density : 940 kg/m³ @ 15°C (59°F)
Vapour pressure : Not available.
Vapour density : Heavier than air.
Volatility : Not available.
Evaporation rate : Not available.
Viscosity : 90 cSt @ 40°C (104°F)
Pour point : <-27°C (-17°F)
Solubility : Insoluble in water.

10 . Stability and reactivity

Chemical stability : The product is stable.
Hazardous polymerisation : Under normal conditions of storage and use, hazardous polymerisation will not occur.
Materials to avoid : Reactive with oxidising agents.
Hazardous decomposition products : May release COx, NOx, SOx, H_2S, hydrocarbons, smoke and irritating vapours when heated to decomposition.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Benzene	LD50 Dermal	Rabbit	>8240 mg/kg	-
	LD50 Oral	Rat	930 mg/kg	-
	LC50 Inhalation Vapour	Rat	13700 ppm	4 hours

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Conclusion/Summary : Not available.

Sensitiser

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Gas oils, petroleum, hydrotreated vacuum	-	2A	-	-	-	-
Benzene	A1	1	A	+	Proven.	+
Polycyclic aromatic hydrocarbons	A2	1	-	-	Possible	-

11 . Toxicological information

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12 . Ecological information

Environmental effects : No known significant effects or critical hazards.

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13 . Disposal considerations

Waste disposal : The generation of waste should be avoided or minimised wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilt material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
TDG Classification	UN1267	Petroleum crude oil	3	I		**Special provisions** IATA Class: Petroleum crude oil, Class 3, UN1267, Packing group I
DOT Classification	UN1267	Petroleum crude oil	3	-		**Remarks** As limited quantity: inner packages not to exceed 0.5 L and the package not to exceed 30 kg, marking to be UN1267 within a diamond.

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Flammable liquid
Irritating material
Sensitising material
Carcinogen

Canada

WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

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.

International regulations

Canada inventory : All components are listed or exempted.

United States inventory (TSCA 8b) : All components are listed or exempted.

Europe inventory : Not determined.

16 . Other information

Label requirements : FLAMMABLE LIQUID AND VAPOUR. CAUSES EYE AND SKIN IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

Hazardous Material Information System (U.S.A.) :

Health	2
Flammability	3
Physical hazards	0
Personal protection	H

National Fire Protection Association (U.S.A.) :

References : Available upon request.
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Date of printing : **5/25/2012.**

Date of issue : 25 May 2012

Date of previous issue : 11/19/2009.

Responsible name : **Product Safety - DSR**

Indicates information that has changed from previously issued version.

For Copy of (M)SDS : Internet: www.petro-canada.ca/msds

Western Canada, telephone: 403-296-7672; fax: 403-296-5147

For Product Safety Information: (905) 804-4752

Notice to reader

16 . Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Syncrude
Securing Canada's Energy Future

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT & COMPANY IDENTIFICATION

PRODUCT: **Synthetic Crude Oil** **SAN 0930**
Syncrude Sweet Blend; Syncrude Sweet Premium

MANUFACTURER:

Syncrude Canada Ltd.
P.O. Bag 4009
Fort McMurray, AB
Canada T9H 3L1
[redacted]

SYNONYMS: Synthetic Crude Oil; SSB; SSP
Syncrude sample Tag # 200000

PRODUCT USE: Refinery feedstock for petroleum and petrochemical refining.

PREPARED BY: Industrial Hygiene
[redacted]

DATE OF PREPARATION/REVISION: March 16, 2009

2. COMPOSITION, INFORMATION ON INGREDIENTS

CAS #: 8002-05-9

A low sulfur blend of treated naphtha, light gas oil, and heavy gas oil petroleum fractions derived from bitumen. It consists predominantly of paraffins, cyclic paraffins, and cyclic aromatic hydrocarbons having carbon numbers predominantly in the range of C3 to C50, boiling between -20 and 550 °C. It may also contain small amounts of benzene and oxygenated compounds.

Hazardous Ingredients	Composition	CAS #
Benzene	0.2 Wt.%	CAS # 71-43-2

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW:

A yellow, translucent, slightly viscous liquid with a hydrocarbon odour. Extremely flammable. Crude oil can cause eye, skin, gastrointestinal, and respiratory tract irritation. May cause serious health effects if inhaled or swallowed. Aspirated crude oil is a threat to life.

ROUTE OF ENTRY: Skin contact, skin absorption, eye contact, inhalation, and ingestion.

EFFECTS OF ACUTE EXPOSURE:

EYES: May cause irritation.

SKIN: May cause irritation. May cause moderate inflammatory redness, fluid build-up, and slight burning on exposed skin. May damage the liver and kidneys.

INGESTION: May cause irritation and inflammation of the gastrointestinal tract. May cause vomiting, bloating, weight loss, mild mental depression, decreased plasma glucose level, nausea, diarrhea, and abdominal pain. May cause liver and kidney damage. May cause excitement of the central nervous system, as expressed by jerking eye movements, muscle tremors, and short sudden seizures. May affect blood clotting and cellular respiration. May affect reproduction, and cause developmental effects.

Ingestion of crude oil may result in aspiration into the lungs. Symptoms of aspiration may include coughing, choking, shortness of breath, increased respiration, chemical pneumonitis, and pulmonary edema. Liver and kidney damage can occur following aspiration.

INHALATION: Inhalation of crude oil may cause respiratory tract irritation. May cause central nervous system depression, chemical pneumonitis, respiratory arrest, euphoria, and cardiac dysrythmia. May damage the liver, kidneys, and lungs.

EFFECTS OF CHRONIC EXPOSURE:

EYES: Effects not reported.

SKIN: May cause irritation characterized by inflammation, dryness, pigmentation, and/or lesions of the hair follicles. May aggravate existing skin conditions. May affect the blood, liver, and kidneys. May cause changes to the skin.

INGESTION: Effects not reported.

INHALATION: May cause irritation.

4. FIRST AID MEASURES

INHALATION: Move victim to uncontaminated area. If breathing has stopped, trained personnel should begin artificial respiration, or, if the heart has stopped, cardiopulmonary resuscitation (CPR) immediately. Apply oxygen if available. Obtain medical attention.

EYES: Immediately flush eyes with water for at least 15 minutes. If irritation persists, seek medical attention.

SKIN: Remove contaminated clothing. Wash affected area with soap and water. If irritation persists, seek medical attention.

INGESTION: DO NOT INDUCE VOMITING BECAUSE OF DANGER OF ASPIRATING LIQUID INTO LUNGS. If spontaneous vomiting occurs, monitor for breathing difficulty. Get immediate medical attention.

GENERAL: In all cases seek medical attention.

5. FIRE FIGHTING MEASURES

FLASH POINT (Tag Closed Cup): below -20 °C
FLAMMABLE LIMITS IN AIR: Not available
AUTO-IGNITION TEMPERATURE: 245 °C

FIRE & EXPLOSION HAZARDS:
Flammable near any source of ignition with vapour concentration within explosion limits.

EXTINGUISHING MEDIA:
Class B fire extinguishers: Carbon Dioxide, dry powder, foam, and polymer foam. Water fog can be used by trained fire prevention personnel.

FIRE FIGHTING PROCEDURES:
Evacuate all personnel from danger area. Exposed firefighters must wear full bunker gear, including a NIOSH approved positive pressure self-contained breathing apparatus with full-face mask. Shut off sources of fuel and ignition. Stop flow of material, and contain spill. Cover with extinguishing media. Use water spray to cool fire-exposed containers, and as a protective screen. To avoid spreading fire, do not point solid water stream directly into burning material.

6. ACCIDENTAL RELEASE MEASURES

LEAK AND SPILL PROCEDURE:
Shut off all sources of ignition and evacuate area. Ventilate area of spill. Dike large spill with non-flammable material. Absorb on inert material and place in closed container for recycling or disposal. Personal Protective Equipment must be worn by clean-up crew.

7. HANDLING AND STORAGE

HANDLING PROCEDURES AND EQUIPMENT:
Avoid prolonged or repeated exposure to vapours. Avoid skin contact. Wash thoroughly after handling. Contact lens may absorb vapours and cause eye irritation.

STORAGE REQUIREMENTS:
Keep away from direct sunlight, heat, flame, or sources of spark. Do not store near oxidizing material. Provide adequate ventilation. Keep containers tightly closed and grounded.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

ENGINEERING CONTROLS:
Ventilate confined space before entry. Provide local exhaust where appropriate to minimize fugitive vapours or mists. Provide adequate general ventilation to dilute vapour concentrations within buildings.

PERSONAL PROTECTIVE EQUIPMENT:

Gloves:	Acrylonitrile or neoprene
Respirator:	NIOSH approved air purifying organic vapour at low concentrations (< 1000 ppm)
Eye:	Monogoggles
Footwear:	Not required under normal conditions. Remove and change footwear if contaminated.
Clothing:	Coveralls/apron as required.

EXPOSURE LIMITS:
8-hour OEL= 300 ppm (total hydrocarbon)
8-hour OEL = 5 mg/m^3 (aerosol)
Benzene 8-hour OEL = 1 ppm
Benzene 15-minute OEL = 5 ppm

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Yellow translucent, slightly viscous
ODOUR: Hydrocarbon odour
PHYSICAL STATE: Liquid
pH: Not applicable
VAPOUR PRESSURE: 3 - 6 psi (Reid Method)
VAPOUR DENSITY (Air = 1): 2.7
FREEZING POINT: -45 °C
BOILING RANGE: -20 to 560 °C
SPECIFIC GRAVITY: 0.85 to 0.87 at 20 °C
EVAPORATION RATE (n-Butyl Acetate = 1): 0.28
COEFFICIENT OF WATER/OIL DISTRIBUTION: Water insoluble, Oil soluble
ODOUR THRESHOLD: Not available

10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: Avoid exposure to sources of ignition

MATERIALS TO AVOID: Strong oxidizing materials. This material might soften or dissolve some plastics.

HAZARDOUS COMBUSTION PRODUCTS: Carbon dioxide, carbon monoxide, uncombusted hydrocarbons, soot.

11. TOXICOLOGICAL INFORMATION

LD50: >2 g/kg (dermal) - species not reported
>3.16 g/kg (dermal) - rabbits
>5 g/kg (oral) - mice, rats

LC50: 4 g/m3 (6 hr) - mice

ACUTE:
An acute oral, dermal, ocular and inhalation toxicity study was performed using synthetic crude oil from the Alberta oil sands. No animals (rats and mice) died following a single oral dose of 5 g/kg. No animals (rabbits) died following a single dermal dose of 3.16 g/kg. The rabbits did experience moderate skin irritation (Draize score of 3/8), desquamation, ocular discharge and decreased food consumption. Rabbits experienced slight eye irritation (Draize score of 4/110) with conjunctival redness. Five of 10 mice and no rats died following a 6-hour exposure to 4.0 g/m3. Additional effects following inhalation included extreme hair loss in mice, possible liver and kidney involvement, increased liver weight in mice and female rats and decreased lung weight in female rats. (Reference 1)

CHRONIC:
Observed skin effects among petroleum field workers and crude oil transport workers include dryness, pigmentation, hyperkeratosis, pigmented plane warts, eczematous reaction and follicular lesions.

Two crude oils were dermally applied to rats at doses of 30, 125 and 500 mg/kg (5 day/wk) for 13 weeks. At the 500 mg/kg dose level, observed effects included a reduced weight gain, depressed red blood cell counts, hemoglobin, hematocrit and platelet counts, increased relative and absolute liver weights, decreased absolute and relative thymus weight, changes in the relative kidney, spleen and adrenal weights and atrophy of the thymus. Hyperplasia and an associated dermal inflammatory cell infiltration at the site of application and hypertrophy and hyperplasia of the follicular epithelium in the thyroid gland were observed at all dose levels. (Reference 2)

SENSITIZATION TO PRODUCT:
An acute dermal toxicity study was performed to assess the effect of ultraviolet light on petroleum oil toxicity. Mice were painted with 50 L of oil 5 days per week for 2 weeks. The petroleum oil was found to be non-toxic to the skin of mice, however, the mice that were painted with the oil and then exposed to ultraviolet light for 2 hours experienced some skin damage (distinct erythema). (Reference 3)

CARCINOGENICITY:
Crude oil was applied to the skin of mice (3 times/wk, 6 months followed by 2 times/wk for life) for up to 13 months. Hyperkeratosis was observed at the site of treatment. Many cases of keratotic changes and epithelioma on the exposed skin of workers exposed to crude oil. (Reference 4)

An evaluation of the dermal carcinogenic potential of synthetic crude oil from the Athabasca oil sands was conducted. Mice were dermally applied crude oil three times per week (75 mL/wk) for life. Out of fifty animals 13 developed tumors with a mean latency of 113 weeks. This was significantly different from the controls. The authors concluded that synthetic crude oil from the Athabasca oil sands is a moderately active dermal carcinogen, however, results are consistent with conventional crude oil. (Reference 1)

REPRODUCTIVE TOXICITY:
A single dose (5 mL/kg bw) of crude oil to pregnant rats on gestation days 11, 15 or 17 resulted in induction in both placental and fetal hepatic enzyme systems. (Reference 4)

Oral administration to pregnant rats as a single dose (5 mL/kg bw on gestation days 3, 6, 11, 15 or 17), as a single variable dose (2-10 mL/kg bw on gestation day 6), or as daily doses (1 or 2 mL/kg bw on gestation days 6-17) resulted in significantly increased number of resorptions and decreased fetal weight and length. Daily doses of crude oil also caused a significant reductive in maternal body weight. (Reference 4)

TERATOGENICITY:
Crude oil was dermally applied to pregnant rats on days 0-19 of gestation. Parturition was delayed in the dams at 500 mg/kg. Fetal body weight was decreased at 500 mg/kg and the 4-day viability index was decreased at all dose levels (30, 125 and 500 mg/kg). Also observed were increased in utero death and reduced ossification. (Reference 5)

MUTAGENICITY:
Several studies have reported on the mutagenicity of crude oil to Salmonella typhimurium. Crude oil did not induce mutagenicity either in the presence or absence of an exogenous metabolic system, however, some neutral/aromatic fractions were mutagenic. (Reference 4)

A weak positive result was reported for two crude oil samples in the Syrian hamster embryo cell-transformation assay. (Reference 6)

No significant differences were noted in the number of spontaneous streptomycin-resistant mutants in Chlamydomonas reinhardtii. (Reference 7)

The photomutagenicity of crude oil was assessed using a modification of the Salmonella histidine reversion test. Crude oil was non-mutagenic without the added light and was non-mutagenic in the presence of visible light. (Reference 8)

SYNERGISTIC EFFECTS:
May act as a synergist to pesticides. The combination of crude oil and ultraviolet radiation may potentiate the suppressive effect on Langerhans cell density and contact hypersensitivity. (Reference 9)

Ultraviolet light may increase the severity of the effects to the skin. (Reference 10)

12. ECOLOGICAL INFORMATION

Not available.

13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Recover for reuse and recycling. Comply with relevant regulations with regards to disposal, recycling, treatment, transportation and storage.
This material would be considered a hazardous waste in Alberta due to its low flashpoint.

14. TRANSPORT INFORMATION:

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:

Hazard Class: 3 **Packing Group:** I

PRODUCT IDENTIFICATION NUMBER (PIN): UN1268

PROPER SHIPPING NAME: PETROLEUM DISTILLATES, N.O.S.

15. REGULATORY INFORMATION

WHMIS CLASS: B-2, D-2B

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

All compounds in this product are listed in the Canada Domestic Substances List (DSL) and the United States Toxic Substances Control Act (TSCA) Chemical Substance Inventory (1985).

16. OTHER INFORMATION

REFERENCES:

1. McKee, R., W. Stubblefield, S. Lewis, R. Scala, G. Simon and L. DePass. Evaluation of the Dermal Carcinogenic Potential of Tar Sands Bitumen-Derived Liquids. Fund. and Appl. Toxicol. 7:228-235. 1986.

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3. Burnham, K. and M. Bey. Effects of Crude Oil and Ultraviolet Radiation on Immunity Within Mouse Skin. J. Toxicol. Environ. Health. 34(1):83-93. 1991.

4. World Health Organization. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. World Health Organization. Lyon. 1988.

5. Kerstetter, S. L. and K. R. Bodnar. Developmental Toxicity of Dermally Applied Crude Oils in Rats. Teratology. 45:500. 1992.

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7. Vandermeulen, J. H. and R. W. Lee. Lack of Mutagenic Activity of Crude and Refined Oils in the Unicellular Alga Chlamydomonas Reinhardtii. Bull. Environ. Contam. Toxicol. 36:250-253.

8. Selby, C., J. Calkins and H. Enoch. Detection of Photomutagens in Natural and Synthetic Fuels. Mutation Research. 124(1):53-60. 1983.

9. Burnham, K. and M. Rahman. Effects of Petrochemicals and Ultraviolet Radiation on Epidermal IA. Expression in Vitro. J. Toxicol. Environ. Health. 35(3):175-185. 1992.

10. Gomer, C. J. and D. M. Smith. Acute Skin Phototoxicity in Hairless Mice Following Exposure to Crude Shale Oil or Natural Petroleum Oil. Toxicol. 18:75-85. 1980.

DISCLAIMER

TURBOFLO® SVX

Safety Data Sheet

According to regulation: (US) paragraph (d) of 1910.1200

Revision date: 25-NOV-2015 Date of issue: 25-NOV-2015

Version: 1.3

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form : Mixture

Product Name : **TURBOFLO® SVX**

Product code : 3451

1.2. Relevant identified uses of the substance or mixture and uses advised against

1.2.1. Relevant identified uses

Use of the substance/mixture : **TURBOFLO® SVX**, drag reducing additive (DRA) injected in petroleum pipeline systems to reduce frictional pressure.

1.2.2. Uses advised against

No additional information available

1.3.1. Details of the chemcial manufacture:

Flowchem LLC
20333 Blinka Road
Waller, TX 77484
T: (936) 372-5347
http://www.flowchem-dra.com/

1.3.2. Details of party who prepared SDS:

Flowchem LLC
c/o VelocityEHS SDS Authoring Services
350 North Orleans, Suite 950
Chicago, IL 60654 -- h: +1(312) 881-2000
http://www.msdsonline.com/

1.4. Emergency telephone number

Emergency number : 1-800-424-9300 CHEMTREC (FOR U.S. ONLY)
+358(0) 9 412 3055 REACHLaw Ltd (Canada, Eastern Hemisphere)

SECTION 2: Hazards identification

(2.1.a). Classification of the chemical in accordance with paragraph (d) of §1910.1200 : **MAY BE HARMFUL IF SWALLOWED & ENTERS AIRWAYS CATAGORY 2**

For the full text of the H-Statements mentioned in this Section, see Section 16

16 (2.1.b). GHS Pictogram : **NO LABELING APPLICABLE**

(2.1.c). Signal Word : **WARNING**

(2.1.d). Hazard Statement(s) : **MAY BE HARMFUL IF SWALLOWED AND ENTERS AIRWAYS**

(2.1.e). Precautionary Statement(s) : **STORE LOCKED UP. DISPOSE OFCONTENTS/CONTAINER IN ACCORDANCE WITH LOCAL/REGINAL REGULATION. AVOIDE RELEASE TO THE ENVIROMENT. COLLECT SPILLAGE. IF SWALLOWED: IMMEDIATELY CALL A POISON CENTER OR DOCTOR/PHYSICIAN DO NOT INDUCE VOMITING.**

SECTION 3: Composition/information on ingredients

3.1. Substance

Not applicable

3.2. Mixture

Name	Product Identifier	%	Classification according to Regulation (US) PARAGRAPH (d) OF §1910.1200
Soybean Oil	(CAS No) 8001-22-7		Not Clacssified
Rubber, synthetic.polyolenfin	(CAS No) 308070-26-0		Not Classifed
Calcium Stearate	(CAS No) 1592-23-0-7		Not Classified

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : When symptoms occur: go into open air and ventilate suspected area. Obtain medical attention if breathing difficulty persists.

First-aid measures after skin contact : Remove contaminated clothing. Drench affected area with water for at least 15 minutes. Obtain medical attention if irritation develops or persists.

First-aid measures after eye contact : Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Obtain medical attention.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Obtain medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : Not expected to present a significant hazard under anticipated conditions of normal use.

Symptoms/injuries after inhalation : Prolonged exposure may cause irritation.

Symptoms/injuries after skin contact : Prolonged exposure may cause skin irritation.

Symptoms/injuries after eye contact : May cause slight irritation to eyes.

Symptoms/injuries after ingestion : Ingestion may cause adverse effects.

4.3. Indication of any immediate medical attention and special treatment needed

If exposed or concerned, get medical advice and attention. If medical advice is needed, have product container or label at hand.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Water spray, dry chemical, foam, carbon dioxide.

Unsuitable extinguishing media : Do not use a heavy water stream. Use of heavy stream of water may spread fire.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Not considered flammable but may burn at high temperatures.

Explosion hazard : Product is not explosive.

Reactivity : Hazardous reactions will not occur under normal conditions.

5.3. Advice for firefighters

Precautionary measures fire : Exercise caution when fighting any chemical fire.

Firefighting instructions : Use water spray or fog for cooling exposed containers.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Avoid prolonged contact with eyes, skin and clothing. Avoid breathing dust.

6.1.1. For non-emergency personnel

Protective equipment : Use appropriate personal protection equipment (PPE).

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.

Emergency procedures : Ventilate area. Upon arrival at the scene, a first responder is expected to recognize the presence of dangerous goods, protect oneself and the public, secure the area, and call for the assistance of trained personnel as soon as conditions permit.

6.2. Environmental precautions

Prevent entry to sewers and public waters.

6.3. Methods and material for containment and cleaning up

For containment : Contain solid spills with appropriate barriers and prevent migration and entry into sewers or streams.

Methods for cleaning up : Clean up spills immediately and dispose of waste safely. Recover the product by vacuuming, shoveling or sweeping. Transfer spilled material to a suitable container for disposal. Contact competent authorities after a spill.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection. See Section 13, Disposal Considerations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Avoid prolonged contact with eyes, skin and clothing. Avoid breathing dust.

Hygiene measures : Handle in accordance with good industrial hygiene and safety procedures.

7.2. Conditions for safe storage, including any incompatibilities.

Technical Measures: Comply with applicable regulations.

Storage Conditions: : Keep container closed when not in use. Store in a dry, cool place. Keep/Store away from direct sunlight, extremely high or low temperatures and incompatible materials.

Incompatible products: : Strong acids, strong bases, strong oxidizers.

Incompatible materials: : Sources of ignition. Direct sunlight.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Not Classified		
Not Applicable		

8.2. Exposure controls

Appropriate engineering controls : Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Ensure adequate ventilation, especially in confined areas. Ensure all national/local regulations are observed.

Personal protective equipment : Gloves. Protective clothing. Protective goggles.

Materials for protective clothing : Chemically resistant materials and fabrics.

Hand protection : Wear protective gloves.

Eye protection : Chemical safety goggles.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : If exposure limits are exceeded or irritation is experienced, approved respiratory protection should be worn. In case of inadequate ventilation, oxygen deficient atmosphere, or where exposure levels are not known wear approved respiratory protection.

Other information : When using, do not eat, drink or smoke.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

a. Physical state : Liquid Suspension
b. Colour : Pale Yellow
c. Odour : Lard / Vegetable Oil
d. Odour threshold : No Data Available
e. pH : Not Applicable
f. Evaporation rate : No Data Available
g. Melting / Freezing point : 0.1°F (-17.7°C)
h. Boiling point : No Data Available
i. Flash point : 210°F (99°C)
j. Auto-ignition temperature : No Data Available
k. Decomposition temperature : No Data Available
l. Flammability (solid, gas) : No Data Available
m. Vapour pressure : No Data Available
n. Relative vapour density at 20 C : No Data Available
o. Solubility in Water : Insoluble in Water
p. Solubility in other : Miscible in Hydrocarbons
q. Partition coefficient: n-octanol/ : No Data Available
r. water Viscosity : No Data Available
s. Explosive properties : No Data Available
t. Oxidising properties : No Data Available
u. Secific Gravity : No Data Available
v. Density : 0.89g/ml
w. Explosive Limits : No Data Available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

Hazardous eactions will not occur under normal conditions.

10.2. Chemical stability
Stable under recommended handling and storage conditions (see section 7).

10.3. Possibility of hazardous reactions
Hazardous polymerization will not occur.

10.4. Conditions to avoid
Direct sunlight, extremely high or low temperatures, and incompatible materials.

10.5. Incompatible materials
Strong acids, strong bases, strong oxidizers.

10.6. Hazardous decomposition products
Thermal decomposition generates : Carbon monoxide, carbon dioxide and non-combusted hydrocarbons (smoke). Oxides of calcium.

SECTION 11: Toxicological information

11.1. Information on toxicological effects
Acute toxicity : Not classified

Calcium Stearate [(CAS No) 1592-23-0 / (EC No) 216-472-8]	
LD50 oral rat	> 10 g/kg

Skin corrosion/irritation : Not classified
Serious eye damage/irritation : Not classified
Respiratory or skin sensitisation : Not classified
Germ cell mutagenicity : Not classified
Carcinogenicity : Not classified
Reproductive toxicity : Not classified
Specific target organ toxicity (single exposure) : Not classified
Specific target organ toxicity (repeated exposure) : Not classified
Aspiration hazard : Not classified
Symptoms/Injuries After Inhalation : Prolonged exposure may cause irritation.
Symptoms/Injuries After Skin Contact : Prolonged exposure may cause skin irritation.
Symptoms/Injuries After Eye Contact : May cause slight irritation to eyes.
Symptoms/Injuries After Ingestion : Ingestion may cause adverse effects.
Potential adverse human health effects & symptoms : Based on available data, the classification criteria are not met.

SECTION 12: Ecological information

12.1. Toxicity
Ecology - general : Not classified.

12.2. Persistence and degradability

TURBOFLO® SVX	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

TURBOFLO® SVX	
Bioaccumulative potential	Not established.

12.4. Mobility in soil
No additional information available

12.5. Results of PBT and vPvB assessment
No additional information available

12.6. Other adverse effects
Other information : Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Waste disposal recommendations : Dispose of contents/container in accordance with local, regional, national, and international regulations.
Additional information : Container may remain hazardous when empty. Continue to observe all precautions.
Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

In accordance with ADR / RID / IMDG / IATA / ADN

ADR	IMDG	IATA	ADN	RID
14.1. UN number				
Not regulated for transport				
14.2. UN proper shipping name				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.3. Transport hazard class(es)				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.4. Packing group				
Not applicable	Not applicable	Not applicable	Not applicable	Not applicable
14.5. Environmental hazards				
Dangerous for the environment : No	Dangerous for the environment : No Marine pollutant : No	Dangerous for the environment : No	Dangerous for the environment : No	Dangerous for the environment : No

14.6. Special precautions for user

No additional information available

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

Not applicable

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

15.1.1. EU-Regulations

Contains no substances with Annex XVII restrictions
Contains no substance on the REACH candidate list
Contains no REACH Annex XIV substances

Calcium Stearate [(CAS No) 1592-23-0 / (EC No) 216-472-8]
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

Soybean Oil [(CAS No) 8001-22-7 / (EC No) 232-274-4]
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.1.2. National regulations

No additional information available

15.2. Chemical safety assessment

No chemical safety assessment has been carried out

SECTION 16: Other information

Revision date : 24-NOV-2015
Data sources : According to regulations
EU GHS SDS
- (US) paragraph (d) of 1910.1200

HMIS - Hazardous Material Information System

HEALTH	1
FLAMMABILTIY	1
REACTIVITY	0
PERSONAL PROTECTION	C

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

ENBRIDGE

Safety Data Sheet

REDACTED COPY

Section 1: Identification

PRODUCT IDENTIFIER	High Sweet Clearbrook	
OTHER MEANS OF IDENTIFICATION	**UN-Number**	UN1267
	Synonyms	Bakken Crude Oil; High Sweet Clearbrook (UHC); Hydrocarbons of Petroleum; North Dakota Sweet (NSW)
RECOMMENDED USE	No information available	
RESTRICTIONS OF USE	No information available	
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 10201 Jasper Avenue Edmonton, Alberta T5J 3N7 Canada TEL: 1-780-420- 5210	
EMERGENCY CONTACT INFORMATION	**CHEMTREC**	1-800-424-9300 for US 703- 527- 3887 outside US
	CANUTEC (Canadian Transportation)	613-996-6666

Section 2: Hazards Identification

CLASSIFICATION	Skin Corrosion/Irritation	Category 2
	Eye Irritation	Category 2
	Germ Cell Mutagenicity	Category 1B
	Carcinogenicity	Category 1A
	Reproductive Toxicity	Category 2
	Specific Target Organ Systemic Toxicity (Single Exposure)	Category 3
	Specific Target Organ Toxicity (Repeated Exposure)	Category 1
	Aspiration Toxicity	Category 1
	Flammable liquids	Category 1
LABEL ELEMENTS	**Signal Word**	Danger
	Hazard Pictograms	

Hazard Statements

- Causes skin irritation.
- Causes serious eye irritation.
- May cause genetic defects.
- May cause cancer.
- Suspected of damaging fertility or the unborn child.
- May cause respiratory irritation.
- Causes damage to organs through prolonged or repeated exposure.
- May be fatal if swallowed and enters airways.
- Extremely flammable liquid and vapor.

PRECAUTIONARY STATEMENTS

Prevention

- Wash face, hands and any exposed skin thoroughly after handling.
- Wear protective gloves/protective clothing/eye protection/face protection.
- Obtain special instructions before use.
- Do not handle until all safety precautions have been read and understood.
- Use personal protective equipment as required.
- Do not breathe dust/fume/gas/mist/vapors/spray.
- Use only outdoors or in a well-ventilated area.
- Do not eat, drink or smoke when using this product.
- Keep away from heat/sparks/open flames/hot surfaces.
- No smoking.
- Keep container tightly closed.
- Ground/bond container and receiving equipment.
- Use explosion-proof electrical/ventilating/lighting/equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- In case of inadequate ventilation wear respiratory protection.

Response

- IF exposed or concerned: Get medical advice/attention.
- IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
- Call a POISON CENTER or doctor/physician if you feel unwell.
- Get medical advice/attention if you feel unwell.
- IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
- IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- In case of fire: Use CO_2, dry chemical, or foam for extinction.
- IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- Do NOT induce vomiting.

Storage/Disposal

- Store locked up.
- Store in a well-ventilated place. Keep container tightly closed.
- Keep cool.
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

OTHER INFORMATION

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.
- Very toxic to aquatic life with long lasting effects.

Section 3: Composition/Information on Ingredients

COMPONENT NAME	CAS NUMBER	PERCENTAGE (%)*	NOTES
Petroleum Hydrocarbons	68919-39-1	100	
Trans-1, 2-dimethylcyclopentane	28729-52-4	1.8	
2-Methylhexane	591-76-4	1.0	
2-Methylpentane	107-83-5	1.8	
3-Methylhexane	589-34-4	1.6	
3-Methylpentane	96-14-0	1.3	
2-Methylheptane	592-27-8	1.4	
Benzene	71-43-2	0.4	
Cyclohexane	110-82-7	1.0	
i-Pentane	109-66-0	1.8	
MethylCyclohexane	108-87-2	2.3	
Methylcyclopentane	96-37-7	2.2	
n-Butane	106-97-8	1.9	
n-Heptane	142-82-5	3.4	
n-Hexane	110-54-3	3.4	
n-Pentane	109-66-0	3.4	
n-Octane	111-65-9	3.0	
n-Nonane	111-84-2	2.2	
n-Decane	124-18-5	2.0	
n-Undecane	1120-21-4	1.7	
n-Dodecane	112-40-3	1.5	
n-Tridecane	629-50-5	1.3	
Toluene	108-88-3	0.9	
Hydrogen sulfide	7783-06-4	<0.00001	
Ethylbenzene	100-41-4	0.6	
Xylenes	1330-20-7	0-5	

**Values do not reflect absolute minimums and maximums; those values may vary from time to time.*

Section 4: First Aid Measures

DESCRIPTION OF NECESSARY MEASURES	**Inhalation**	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.
	Skin	• IF ON SKIN: Wash with plenty of soap and water. If skin irritation occurs: Get medical advice/attention. Take off contaminated clothing and wash before reuse.
	Eye	• IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/attention.
	Ingestion	• Do NOT induce vomiting. Call a physician or poison control center. • Aspiration hazard if swallowed - can enter lungs and cause damage.
MOST IMPORTANT SYMPTOMS AND EFFECTS, BOTH ACUTE AND DELAYED	**Refer to Section 11 - Toxicological Information**	
INDICATION OF IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY	**Note to the Physician**	• Aspiration hazard. Symptoms may be delayed. • Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations of this material (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 development of cardiac arrhythmias. • Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	**Suitable Extinguishing Media**	• SMALL FIRES: Dry chemical, CO2, water spray or regular foam. • LARGE FIRE: Water spray, fog or regular foam.
	Unsuitable Extinguishing Media	• CAUTION: Use of water spray when fighting fire may be inefficient. • Do not use straight streams.
FIREFIGHTING PROCEDURES		• FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. • FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out. • Stay upwind. • Ventilate closed spaces before entering. • Fire fighters should wear complete protective clothing including self-contained breathing apparatus. • FIRE: If tank, rail car or tank truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial evacuation for 1600 meters (1 mile) in all directions.

- FIRE: When a large quantity of this material is involved in a major fire, consider an initial evacuation distance of 300 meters (1000 feet) in all directions.
- Move containers from fire area if you can do it without risk.
- LARGE FIRES: Use water spray or fog; do not use straight streams.
- LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.
- LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.

SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE

- Vapors may travel to source of ignition and flash back.
- Air/vapor mixtures may explode when ignited.
- Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).
- Will be easily ignited by heat, sparks or flames.
- Runoff to sewer may create fire or explosion hazard.
- Vapor explosion hazard indoors, outdoors or in sewers.
- MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.
- May create vapor/air explosion hazard indoors, outdoors or in sewers.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).

EXPLOSION DATA

Hazardous Combustion Products	• Carbon monoxide. Carbon dioxide (CO2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.
Sensitivity to Mechanical Impact	• None.
Sensitivity to Static Discharge	• Yes.

PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.
- Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for extinguishment, unless used under favorable conditions by experienced firefighters.
- Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.
- Water spray may be useful in minimizing or dispersing vapors.
- Long-duration fires involving diluent stored in tanks may result in a boilover.
- For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear.

Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES

Personal Precautions

- Evacuate personnel to safe areas.
- Remove all sources of ignition.
- Deny entry to unauthorized and unprotected personnel.
- Use personal protective equipment.
- Avoid contact with skin, eyes and clothing.
- Stop leak if you can do it without risk.
- Keep people away from and upwind of spill/leak.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

- Ventilate enclosed areas.
- Do not walk through spilled material.

Protective Equipment

- Wear appropriate breathing apparatus (if applicable) and protective clothing.

Emergency Procedures

- ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area) Keep unauthorized personnel away Evacuate area Keep out of low areas. Stop leak if you can do it without risk.
- Report spills to local or federal authorities as appropriate or required.

ENVIRONMENTAL PRECAUTIONS

- Avoid run off to waterways and sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or confined areas. Runoff from fire control may cause pollution.

METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP

Methods for Containment

- Stop leak if you can do it without risk.
- Contain and recover liquid when possible.
- A vapor suppressing foam may be used to reduce vapors.
- Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.
- Use water spray to reduce vapors or divert vapor cloud drift.
- A fine water spray remotely directed to the edge of the spill pool can be used to direct and maintain a hot flare fire which will burn the spilled material in a controlled manner.

Methods for Cleaning Up

- Clean up spill immediately.
- LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.
- SMALL LIQUID SPILLS: Use a non-combustible material like vermiculite or sand to soak up the product and place into a container for later disposal.
- Use appropriate Personal Protective Equipment (PPE).
- Use clean non-sparking tools to collect absorbed material.
- Vacuum spilled material.
- Try to work upwind of spill.
- All equipment used when handling the product must be grounded.
- Recover and return free product to proper containers
- Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.
- Do not place spilled materials back in the original container.
- Do not flush to sewer or allow to enter waterways.

Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING

Handling

- All equipment used when handling the product must be grounded. Avoid contact with heat and ignition sources and oxidizers. Do not breathe (dust, vapor or spray mist). Do not use in areas without adequate ventilation. Do not use sparking tools. Keep away from heat, sparks, and flame. No open flames, no sparks and no smoking. Use only with adequate ventilation. Do not use or store near heat or open flame. Keep away from fire, sparks and heated surfaces.
- The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).

- The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
- Take precautionary measures against static discharges.

Handling

- Do not cut drill, grind or weld on empty containers since they may contain explosive residues.
- Stay upwind and vent open hatches before unloading.
- Avoid contact with skin, eyes and clothing.
- Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.
- Wear personal protective equipment.
- Remove and wash contaminated clothing before re-use.
- Do not eat, drink or smoke when using this product.
- Do not take internally.
- Wash thoroughly after handling.
- Empty containers pose a potential fire and explosion hazard.

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY INCOMPATIBILITIES

Storage

- Ventilate enclosed areas.
- Store in a well-ventilated place.
- Keep container tightly closed.
- Store locked up.
- Avoid shock, impact, friction, and rough handling. Do not use sparking tools.
- Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources.
- Keep away from sources of ignition.
- No Smoking.
- Do not enter confined spaces such as tanks or pits without following proper entry procedures.
- Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area.
- Harmful concentrations of hydrogen sulfide (H_2S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.
- Keep away from open flames, hot surfaces and sources of ignition.
- Keep product and empty container away from heat and sources of ignition.
- Storage containers should be grounded and bonded.
- Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.
- Store away from incompatible materials.

Incompatible Products

- Strong oxidizers such as nitrates, chlorates, peroxides.

Section 8: Exposure Controls/Personal Protection

CONTROL PARAMETERS: EXPOSURE GUIDELINES

CHEMICAL NAME	ACGIH	OSHA	NIOSH
2-Methylpentane	-	-	TWA 100 ppm TWA 350 mg/m^3 Ceiling 510 ppm Ceiling 1800 mg/m^3

3-Methylpentane	-	-	TWA 100 ppm TWO 350 mg/m^3 Ceiling 510 ppm Ceiling 1800 mg/m^3
Benzene	TLV 0.5 ppm TLV 1.6 mg/m^3 STEL 2.5 ppm STEL 8 mg/m^3	PEL 1 ppm STEL 5 ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Cyclohexane	TLV 100 ppm TLV 334 mg/m^3	PEL 300 ppm PEL 1050 mg/m^3	TWA 300 ppm TWA 1050 mg/m^3 IDLH 1300 ppm
i-Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
MethylCyclohexane	TLV 400 ppm TLV 1610 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 400 ppm TWA 1600 mg/m^3 IDLH 1200 ppm
n-Butane	TLV 1000 ppm	-	TWA 800 ppm TWA 1900 mg/m^3
n-Heptane	TLV 400 ppm TLV 1640 mg/m^3 STEL 500 ppm STEL 2000 mg/m^3	PEL 500 ppm PEL 2000 mg/m^3	TWA 85 ppm TWA 350 mg/m^3 Ceiling 440 ppm Ceiling 1800 mg/m^3 IDLH 750 ppm
n-Hexane	TLV 50 ppm TLV 176 mg/m^3	PEL 500 ppm PEL 1800 mg/m^3	TWA 50 ppm TWA 180 mg/m^3 IDLH 1100 ppm
n-Pentane	TLV 600 ppm TLV 1770 mg/m^3	PEL 1000 ppm PEL 2950 mg/m^3	TWA 120 ppm TWA 350 mg/m^3 Ceiling 610 ppm Ceiling 1800 mg/m^3 IDLH 1500 ppm
n-Octane	TLV 300 ppm TLV 1401 mg/m^3	PEL 500 ppm PEL 2350 mg/m^3	TWA 75 ppm TWA 350 mg/m^3 Ceiling 385 ppm Ceiling 1800 mg/m^3 IDLH 1000 ppm
n-Nonane	TLV 200 ppm TLV 1050 mg/m^3	-	TWA 200 ppm TWA 1050 mg/m^3

Toluene	TLV 20 ppm TLV 75 mg/m^3	PEL 200 ppm STEL 300 mg/m^3	TWA 100 ppm TWA 375 mg/m^3 STEL 150 ppm STEL 560 mg/m^3 IDLH 500 ppm
Hydrogen sulfide	TLV 1 ppm TLV 1.4 mg/m^3 STEL 5 ppm STEL 7 mg/m^3	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m^3 IDLH 100 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 125 ppm STEL 545 mg/m^3 IDLH 800 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m^3 STEL 150 ppm STEL 651 mg/m^3	PEL 100 ppm PEL 435 mg/m^3	TWA 100 ppm TWA 435 mg/m^3 STEL 150 ppm STEL 655 mg/m^3 IDLH 900 ppm

APPROPRIATE ENGINEERING CONTROLS

- Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold limit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.

INDIVIDUAL PROTECTION MEASURES

Eye and Face	• Wear face shield and eye protection.
Skin and Body	• The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation. • Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.
Respiratory	• Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.
General Hygiene Measures	• Handle in accordance with good industrial hygiene and safety practice.

Section 9: Physical and Chemical Properties

MATERIAL DESCRIPTION

Physical State	Liquid	**Odor**	Rotten egg, petroleum-like odor
Substance Type	Mixture	**Odor Threshold**	No data available
Appearance	Clear to brown liquid		

PROPERTIES				
	pH	No data available	**Vapor pressure**	72.3 to 101.35 kPa @ 37.8°C (100.4°F)
	Melting Point/ Freezing Point	No data available	**Vapor density**	1.0 to 3.9 Air=1
	Boiling Point/ Boiling Range	82.6 to 133.0 °F 28.1 to 72.1 °C	**Relative density**	41.2 to 42.6
	Flash Point	-38 to -36 °F -38.8 to -37.7 °C	**Water Solubility**	Negligible
	Evaporation Rate	(Ethyl Ether =1) >1	**Partition coefficient: n-octanol/water**	No data available
	Flammability (solid, gas)	No data available	**Autoignition temperature**	No data available
	Upper Flammability Limit	No data available	**Decomposition temperature**	No data available
	Lower Flammability Limit	No data available	**Specific Gravity**	0.82
	Viscosity	5.43 mm^2/s		

Section 10: Stability and Reactivity

REACTIVITY	No data available
CHEMICAL STABILITY	Stable at 70 °F, 760 mm Hg pressure
POSSIBILITY OF HAZARDOUS REACTIONS	None under normal processing
CONDITIONS TO AVOID	Excessive heat, sources of ignition, sparks, open flames, and buildup of static electricity
INCOMPATIBLE MATERIALS	Strong oxidizers such as nitrates, chlorates, peroxides
HAZARDOUS DECOMPOSITION PRODUCTS	Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons
HAZARDOUS POLYMERIZATION	Will not occur

Section 11: Toxicological Information

INFORMATION ON THE LIKELY ROUTES OF EXPOSURE		
	Inhalation	• May cause irritation of respiratory tract. May cause drowsiness and dizziness.
	Eye Contact	• Causes serious eye irritation.
	Skin Contact	• Causes skin irritation.

Ingestion	• Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea. • Potential for aspiration if swallowed. • Aspiration may cause pulmonary edema and pneumonitis.

TOXICOLOGICAL DATA

CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION
Benzene	>300 mg/kg (Rat)	-	13050 - 14380 ppm (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
i-Pentane	>2000 mg/kg (Rat)	-	364 g/cu (Rat) 4 h
MethylCyclohexane	> 3200 mg/kg (Rat)	-	-
n-Butane	-	-	658 mg/L (Rat) 4 h
n-Heptane	-	= 3000 mg/kg (Rabbit)	= 103 g/m^3 (Rat) 4 h
n-Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h
n-Pentane	>2000 mg/kg (Rat)	-	364 g/cu (Rat) 4 h
n-Octane	-	-	= 118 g/m^3 (Rat) 4 h = 25260 ppm (Rat) 4 h
n-Nonane	-	-	= 3200 ppm (Rat) 4 h
n-Decane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rat)	-
Toluene	2.6 to 7.5 g/kg (Rat)	14.1 ml/kg (Rabbit)	-
Hydrogen sulfide	-	-	= 444 ppm (Rat)
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Xylenes	= 3500 mg/kg (Rat)	> 4350 mg/kg (Rabbit) > 1700 mg/kg (Rabbit)	= 29.08 mg/L (Rat) 4 h = 5000 ppm (Rat) 4 h

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

Benzene	• Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may cause serious injury to blood-forming organs. Significant chronic exposure to benzene vapor has been reported to produce various blood disorders ranging from anemia to certain forms of leukemia (cancer) in man. Benzene produced tumors in rats and mice in lifetime chronic toxicity studies, but the response has not been consistent across species, strain, sex or route of exposure. Animal studies on benzene have demonstrated immune toxicity, chromosomal aberrations, testicular effects and alterations in reproductive cycles and embryo/fetotoxicity, but not teratogenicity.

Hydrogen Sulfide Gas (H_2S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H_2S vapors can produce eye and respiratory tract irritation. Higher concentration (250-600 ppm) for 15-30 minutes can produce headache, dizziness, nervousness, nausea and pulmonary edema or bronchial pneumonia. Concentrations of >1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H_2S, 6 hrs/day, 5 days/week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H_2S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 50 ppm H_2S, respectively. Over the years a number of acute cases of H_2S poisoning 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.
Hexane	• This product may contain hexane at a level of >1.0%. Studies in laboratory animals have produced systemic toxicity in blood, spleen and lungs. Fetotoxicity has been observed at hexane concentrations that produced maternal toxicity. Long term exposure to high concentrations of hexane has been shown to cause testicular effects and nervous system damage.
Xylenes	• Gross overexposure or severe poisoning incidents in humans to xylenes has been reported to cause lung, liver, kidney, heart and brain damage as well as neurologic disturbances. Laboratory animals exposed to high dose of xylenes showed evidence of effects in the liver, kidneys, lungs, spleen, heart and adrenals, Exposure of pregnant rats, mice and rabbits during gestation to significant concentrations of xylenes produced maternal, fetal and developmental toxicity (skeletal retardation, cleft palate, and wavy ribs) generally at maternally toxic doses. These types of fetotoxic effects have been associated with maternal toxicity. Repeated inhalation of high xylene concentrations has shown impairment of performance abilities (behavioral tests) in animals and man. Xylenes produced a mild frequency hearing loss in rats subchronically exposed to high concentrations of xylenes.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

Sensitization	• No information available
Mutagenic Effects	• May cause genetic defects
Carcinogenicity	• May cause cancer

CARCINOGENIC INFORMATION

CHEMICAL NAME	ACGIH	IARC	NTP	OSHA
Benzene	A1	Group 1	Known	X
Toluene	A4	Group 3	Evidence	-
Ethylbenzene	A3	Group 2B	Evidence	X
Xylenes	A4	Group 3	Evidence	-

REPRODUCTIVE TOXICITY

• Suspected of damaging fertility or the unborn child.

STOT - SINGLE EXPOSURE

• No information available.

STOT - REPEATED EXPOSURE

• Causes damage to organs through prolonged or repeated exposure.

ASPIRATION HAZARD

May be fatal if swallowed and enters airways Risk of serious damage to the lungs (by aspiration).

Section 12: Ecological Information

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC50 72 h: = 29 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 10.7 - 14.7 mg/L flow-through (Pimephales promelas) LC50 96 h: = 5.3 mg/L flow-through (Oncorhynchus mykiss) LC50 96 h: = 22.49 mg/L static (Lepomis macrochirus) LC50 96 h: = 28.6 mg/L static (Poecilia reticulata) LC50 96 h: 22330 - 41160 µg/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	-
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow-through (Pimephales promelas) LC50 96 h: 23.03 - 42.07 mg/L static (Pimephales promelas) LC50 96 h: 24.99 - 44.69 mg/L static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L static (Poecilia reticulata)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min (Microorganisms)
Pentane	-	-	EC50 48h: 135 mmol/cu	LC50 24h: 165 mmol/cu Artemia salina (Brine Shrimp)
MethylCyclohexane	-	LC50 96hr: 72.0 mg/l (Golden Shiner)	-	-
n-Heptane	-	LC50 96 h: = 375.0 mg/L (Cichlid fish)	EC50 24 h: > 10 mg/L (Daphnia magna)	-
n-Hexane	-	LC50 96 h: 2.1 - 2.98 mg/L flow-through (Pimephales promelas)	EC50 24 h: > 1000 mg/L (Daphnia magna)	-
n-Octane	-	-	EC50 48 h: = 0.38 mg/L (water flea) EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 = 890 mg/L 30 min (Microorganisms) EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
n-Undecane	-	-	-	-
n-Dodecane	-	-	-	-
n-Tridecane	-	-	-	-

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through LC50: 12.6 mg/L Pimephales promelas 96 h static LC50: 5.89 - 7.81 mg/L Oncorhynchus mykiss 96 h flow-through LC50: 14.1 - 17.16 mg/L Oncorhynchus mykiss 96 h static LC50: 5.8 mg/L Oncorhynchus mykiss 96 h semi-static LC50: 11.0-15.0 mg/L Lepomis macrochirus 96 h static LC50: 54 mg/L Oryzias latipes 96 h static LC50: 28.2 mg/L Poecilia reticulata 96 h semi-static LC50: 50.87-70.34 mg/L Poecilia reticulata 96 h static	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 1.5 mg/L (Daphnia magna)	EC50 = 19.7 mg/L 30 min (Microorganisms)
Hydrogen sulfide		LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella subcapitata) EC50 96 h: > 438 mg/L (Pseudokirchneriella subcapitata) EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella subcapitata) EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss) LC50 96 h: = 4.2 mg/L semi-static (Oncorhynchus mykiss) LC50 96 h: 7.55 - 11 mg/L flow-through (Pimephales promelas) LC50 96 h: = 32 mg/L static (Lepomis macrochirus) LC50 96 h: 9.1 - 15.6 mg/L static (Pimephales promelas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h (Microorganisms)

ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	LC50 96 h: = 13.4 mg/L flow-through (Pimephales promelas) LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss) LC50 96 h: 13.5 - 17.3 mg/L (Oncorhynchus mykiss) LC50 96 h: 13.1 - 16.5 mg/L flow-through (Lepomis macrochirus) LC50 96 h: = 19 mg/L (Lepomis macrochirus) LC50 96 h: 7.711 - 9.591 mg/L static (Lepomis macrochirus) LC50 96 h: 23.53 - 29.97 mg/L static (Pimephales promelas) LC50 96 h: = 780 mg/L semi-static (Cyprinus carpio) LC50 96 h: > 780 mg/L (Cyprinus carpio) LC50 96 h: 30.26 - 40.75 mg/L static (Poecilia reticulata)	EC50 48 h: = 3.82 mg/L (water flea) LC50 48 h: = 0.6 mg/L (Gammarus lacustris)	-

PERSISTENCE AND DEGRADABILITY

- No information available

BIOACCUMULATIVE POTENTIAL

CHEMICAL	LOG POW
Benzene	1.83
Cyclohexane	3.44
Butane	2.89
Octane	5.18
Heptane	4.66
Decane	5.1
Xylene, mixed isomers	2.77 - 3.15
Toluene	2.65
Ethylbenzene	3.118

MOBILITY IN SOIL

CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylpentane	Low
3-Methylpentane	Slight
Benzene	High

Cyclohexane	Moderate
Pentane	High
MethylCyclohexane	Low
Butane	Low
Heptane	Moderate
Hexane	High
Octane	Immobile
Nonane	Immobile
Decane	Immobile
Undecane	Immobile
Dodecane	Immobile
Tridecane	Immobile
Toluene	High to Moderate
Ethylbenzene	Low
Xylenes	Very high to Moderate

OTHER ADVERSE EFFECTS

- No information available

Section 13: Disposal Considerations

WASTE TREATMENT METHODS

Product Waste

- This product, if it must be discarded, may meet the criteria of a hazardous waste as defined by US EPA RCRA (40 CFR 261), Environment Canada, or other State, Provincial, and local regulations. If this product is classified as a hazardous waste, federal law requires disposal at a licensed hazardous waste disposal facility.
- This product could also contain benzene at >0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).
- This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).
- It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

Packaging Waste	• Container contents should be completely used and containers should be emptied prior to discard. • Container 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 drum re-conditioner. • To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.

Section 14: Transport Information

****CHART NAME****

	UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
DOT	UN1267	Petroleum crude oil	3	I	Emergency response guide number: 128
TDG	UN1267	Petroleum crude oil	3	I	-
IMO/IMDG	UN1267	Petroleum crude oil	3	I	EmS No. F-E, S-E
IATA/ICA	UN1267	Petroleum crude oil	3	I	-

SPECIAL RECAUTIONS FOR USER

• None

Section 15: Regulatory Information

U.S. - CERCLA/ SARA - HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIES

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
Toluene	108-88-3	1000 lb final RQ; 454 kg final RQ
Xylene	1330-20-7	100 lb final RQ; 45.4 kg final RQ
Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ

U.S. - CWA (CLEAN WATER ACT) - REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	100 lb RQ
Ethylbenzene	100-41-4	1000 lb RQ
Toluene	108-88-3	1000 lb RQ
Xylene	1330-20-7	100 lb RQ
Benzene	71-43-2	10 lb RQ

U.S. - CWA (CLEAN WATER ACT) - RECOMMENDED WATER QUALITY CRITERIA - CCC FOR FRESHWATER LIFE

COMPONENT	CAS #	AMOUNT
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC

U.S. - CWA (CLEAN WATER ACT) - RECOMMENDED WATER QUALITY CRITERIA - CCC FOR SALTWATER LIFE

COMPONENT	CAS #	AMOUNT
HydrogenSulfide	7783-06-4	2.0 µg/L CCC

U.S. - CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Hydrogen Sulfide	7783-06-4	X
MethylCyclohexane	108-87-2	Not Listed
3- Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	Not Listed
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed
Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X
Benzene	71-43-2	X

Butane	106-97-8	Not Listed
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed
Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed

X= The component is listed

U.S. - CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

COMPONENT	CAS #	LISTED
Hydrogen Sulfide	7783-06-4	Not Listed
MethylCyclohexane	108-87-2	Not Listed
3- Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	Not Listed
Pentane	109-66-0	Not Listed
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed
Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	Not Listed
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed

Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed

X= The component is listed

US-STATE-RIGHT-TO-KNOW

CHEMICAL	NEW JERSEY	MASSACHUSETTS	PENNSYLVANIA	ILLINOIS	RHODE ISLAND
Nonane	X	X	X	-	X
Decane	X	-	X	-	X
Hexane	X	X	X	X	X
MethylCyclohexane	X	X	X	-	X
Octane	X	X	X	-	X
n-Heptane	X	X	X	-	X
Butane	X	X	X	-	X
Ethylbenzene	X	X	X	X	X
Toluene	X	X	X	X	X
Cyclohexane	X	X	X	-	X
Xylene, mixed isomers	X	X	X	X	X
Benzene	X	X	X	X	X

CANADA-WHMIS-CLASSIFICATIONS OF SUBSTANCES

COMPONENT	CAS #	CLASSIFICATION
2-Methylhexane	591-76-4	B2
2-Methylpentane	107-83-5	B2
3-Methylhexane	589-34-4	B2
3-Methylpentane	96-14-0	B2
Benzene	71-43-2	B2, D2A, D2B
MethylCyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	-
n-Butane	106-97-8	A, B1
n-Heptane	142-82-5	B2, D2B
n-Hexane	110-54-3	B2, D2A, D2B

n-Pentane	109-66-0	B2
n-Octane	111-65-9	B2, D2B
n-Decane	124-18-5	B3, D2B
n-Undecane	1120-21-4	B3, D2B
n-Dodecane	112-40-3	B3
n-Tridecane	629-50-5	B3
Toluene	108-88-3	B2, D2A, D2B
Hydrogen sulfide	7783-06-4	A, B1, D1A, D2B
Ethylbenzene	100-41-4	B2, D2A, D2B
Xylenes	1330-20-7	B2, D2A, D2B

X= The component is listed

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

COMPONENT	CAS #	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L

CANADA - ENVIRONMENTAL EMERGENCIES

COMPONENT	CAS #	LISTED
Hydrogen sulfide	7783-06-4	X
MethylCyclohexane	108-87-2	Not Listed
3-Methylhexane	589-34-4	Not Listed
Hexane, 2-methyl-	591-76-4	Not Listed
Dimethylcyclopentane	28729-52-4	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Pentane	109-66-0	X
Decane	124-18-5	Not Listed
Octane	111-65-9	Not Listed

Dodecane	112-40-3	Not Listed
Ethylbenzene	100-41-4	X
Heptane	142-82-5	Not Listed
Toluene	108-88-3	X
Xylene	1330-20-7	X
Benzene	71-43-2	X
Butane	106-97-8	X
Hexane	110-54-3	Not Listed
2-Methylpentane	107-83-5	Not Listed
3-Methylpentane	96-14-0	Not Listed
Tridecane	629-50-5	Not Listed
Undecane	1120-21-4	Not Listed
2-Methylheptane	592-27-8	Not Listed
Petroleum Hydrocarbons	68919-39-1	Not Listed

X= The component is listed

Section 16: Other Information

NFPA

Health Hazard: 2	**Flammability:** 3	**Instability:** 1	**Physical and Chemical Hazards:** X

HMIS	**Health Hazard:** 2	**Flammability:** 4	**Instability:** 0	**Personal Protection:** X

ISSUING DATE 3/2/15

REVISION DATE 3/2/15

DISCLAIMER

- The information presented herein is based on data considered to be accurate as of the date of preparation of this Safety Data Sheet (SDS). However, SDS's may not be used as a commercial specification sheet of manufacturer or seller, and no warranty or representation, express or implied, is made as to the accuracy or completeness of the foregoing data and safety information, nor is any authorization given or implied to practice any patented invention without a license. In addition, no responsibility can be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended practices or from any hazards inherent in the nature of the product.

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Annex 2 – Table of Contents Page

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2.0 Notifications Overview

Immediate actions are required at the onset of an emergency response to limit the extent of a release, minimize the potential hazard to human health and the environment, and implement an effective response. It is also important to act decisively to create a professional working atmosphere among Company personnel and stakeholders. This section is intended to provide guidance for determining the appropriate initial response and notification actions that should be carried out in the event of a release or other emergency incident.

This section outlines general guidelines on the procedures and sequence for making the various internal and external notifications following discovery of a pipeline release or other emergency incident.

The internal notification procedures are essentially the same for all emergency incidents although the external notifications will vary depending on the type of incident, type and quantity of material released, and the consequences (injuries, deaths and property damage).

Company personnel have the authority and obligation to terminate any operation in response to an abnormal, threatening or hazardous situation.

2.0.1 Emergency Notification / Activation

The chart on the following page is an overview of roles personnel or groups fill upon initial discovery, from reporting the emergency to activating Emergency Response Teams to manage an emergency.

The chart on the following page is an overview of roles personnel or groups fill upon initial discovery, reporting the emergency to activating Emergency Response Teams to manage an emergency.

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2.0.1 Central Region Notification Chart

ENBRIDGE

Last Updated 2018-02-14

Incident Observer

- Member of the Public calls the toll free number
- Industrial User or Local Police contacts Control Center
- Enbridge Employee discovery
- Edmonton Control Center [redacted]
- Internal Alarm is Sounded

Control Center Operations

- Document incoming call from incident observer
- Contact Regional On-Call Point of Contact to dispatch company first responder
- Alert Police
- Implement CCO notifications

Regional Management

During Regular Work Hours and Outside Regular Work Hours: [redacted]

Dispatch First Responder (nearest employee or on-call person)

IF CONFIRMED ACTIVATE THE EMERGENCY RESPONSE PLAN

Notify Edmonton Senior Management

Gov't Notification

TSB/NEB	1-819-997-7887
Sask Ministry Environment	800-667-7525
Manitoba Conservation & Water Stewardship	1-204-944-4888

Subsequent Notification

(Call Police & Fire Dept. if required)
Area VR-1 Husky Phone: [redacted]
Area N EnCana [redacted]
Area U Bromby Welding 780-888-1095
Area I/J Dick's Welding 780-983-3416 (24)
Area 6 ER Co-operative 306-791-5058

See Annex 2 – Notification Procedures to activate the Incident Management Team and consult the Emergency Response Directory in the Field Emergency Response Plan for additional support resources

Edmonton Senior Management

- Primary [redacted] VP Canadian Operations [redacted]
- Alternate [redacted] Sr. VP Operations [redacted]
- Crisis Management

*** 1. Any party is to continue through the next step if contact cannot be made**

***2. Emergency reports may be received from Police, Public, Employees or Alarms**

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2.1 Emergency Responsibilities

All Personnel	
The most important thing is individual personal safety!	
✓	Always think before responding.
✓	Never rush into the scene of an incident.
✓	Always assess the situation first and know the hazards.
✓	Never perform any actions that may put your safety at risk.

Initial Response Checklist	
The first employee who responds to the scene of an emergency should take the following actions:	
✓	For emergencies reported or observed, contact the Control Center and Area Management
✓	Upon initial discovery, employees should notify local emergency services as needed. If anyone is seriously injured, or the emergency is beyond the Response Zone's abilities, dial 911 or local emergency responder immediately. Be sure to give your name, phone number, nature of emergency, exact location, and the number of injuries
✓	If safe, take prompt action to eliminate any dangers
✓	If necessary, evacuate everyone from the danger area to a safe location
✓	Contact a spill response contractor if product has been released or discharged
✓	Promptly decide whether or not the emergency situation can be readily brought under control and if immediate action can be taken. (Always use the correct PPE)
✓	If there is a spill, deploy necessary local equipment and absorbent material and begin mitigation procedures
✓	Direct the initial phase of control, containment, and response until a supervisor arrives
✓	Regional Management (or designee) notifies the following: • Initial Company response personnel • Response resources (if not already done) • Applicable regulatory agencies.

2.2 Incident Reporting

Utilize the General Incident Report Form, in Section 4 - Forms of the ICP Core Plan, to log all pertinent information relative to the Central Response Zone incident response. When filling out this form, try to complete as much information as possible. Additional incident reporting guidance is located in the General Compliance Reference Manual located on the Company website.

A list of emergency contact information detailing required internal notifications and external agency contacts is located in this section. The following summarizes who should be contacted in an emergency.

Detailed external incident reporting requirements are found in OMM Book 1 Incident Reporting.

2.2.1 Required Notifications

- The Enbridge Control Center
- Regional Management
- Regulatory Agencies.

2.2.2 Incident Management Team

The Region has designated personnel that will be activated based on the needs of the incident response to fill command and general staff roles in the Incident Command System.

2.2.3 External Agencies and Support Resources

After the initial situational assessment and regulatory reporting are completed, call external agencies for support. Refer to Emergency Contact List in this Annex.

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2.2.3a Emergency Contacts

CONTROL CENTER			
Central Region		877-420-8800	
ENBRIDGE MEDIA HOTLINE			
Canada		888-992-0997	
ENBRIDGE QUALIFIED INDIVIDUALS			
Job Title	Name	Office #	Cell #
Regional Director, Prairie Region	[redacted]	[redacted]	[redacted]
Manager, Regional Services	[redacted]	[redacted]	[redacted]
Spvr. Maint. Mgmt. Svcs.	[redacted]	[redacted]	[redacted]
Central Response Units (Manned/Unmanned)			
INTERNAL			
Enbridge Central Region Response Units (Manned)			
Regina Unit	[redacted]	[redacted]	
Cromer Unit		[redacted]	
Gretna Unit		[redacted]	
EXTERNAL			
Area U Co-op Zone 2 Spill Response Trailer Bromby Welding (Hardisty) [redacted]		[redacted]	
Area 6 Emergency Response Co-Operative Dispatch Call-Out		[redacted]	
Area 2 Spill Co-operative Spill Response Trailer [redacted]		[redacted]	

WATER SYSTEMS	
PORTAGE LA PRAIRIE	
The Water Treatment Plant	
City of Portage la Prairie 97 Saskatchewan Avenue East Portage la Prairie MB R1N 0L8	Telephone: (204) 239-8374 E-mail: wtpoperators@city-plap.com
ST. EUSTACHE	
Cartier Regional Water Plant	
Cartier Regional Water Cooperative Inc. P.O. Box 217 St. Eustache MB R0H 1H0	Telephone: (204) 353-4055 Fax: (204) 353-4068 E-mail: crwc@mymts.net

2.2.3b Incident Management Team List

ICS Position	Normal Job Title	Name	Office Number	Alt. Number
Command Staff				
Incident Commanders (IC)	Director, Western Region	[redacted]	[redacted]	[redacted]
Alternate IC	Regional Services Manager	[redacted]		[redacted]
Alternate IC	Regional Services Manager			
Scribe/Recorders	Admin III			
Scribe/Recorders	Admin III			
ICS ER Advisors	Coord, Emergency Response			[redacted]
ICS ER Advisors	Coord, Emergency Response			
Safety Officers (SOFR)	Safety Advisor	[redacted]		[redacted]
Alternate SOFR	Safety Advisor	[redacted]		[redacted]
Alternate SOFR	Safety Advisor			
Alternate SOFR	Safety Advisor			
Liaison Officers (LNO)	Compliance Advisor	[redacted]		[redacted]
Alternate LNO	Compliance Advisor	[redacted]		[redacted]
Alternate LNO	Agent, ROW			
Alternate LNO	Agent, ROW			
Alternate LNO	Agent, ROW			
Public Information Officers (PIO)	Community Relations Advisor	[redacted]		[redacted]
Alternate PIO	Community Engagement Strategist	[redacted]		[redacted]
Alternate PIO	*Refer to PIO On Call Roster*			
Operations Section				
Operations Section Chiefs (OSC)	Team Lead, Maintenance Services	[redacted]	[redacted]	[redacted]
Alternate OSC	Advisor, PLM Maintenance	[redacted]		[redacted]
Alternate OSC	Integrity Coordinator			
Deputy OSCs				
Deputy OSC –EP	Mgr, Edmonton Area Operations	[redacted]		[redacted]
Deputy OSC –YP	Mgr, Hardisty Area Operations			
Deputy OSC –KB	Mgr, Kerrobert Area Operations	ler		
Deputy OSC –QU	Mgr, Regina Area Operations			
Deputy OSC –CM	Mgr, Cromer Area Operations			
Deputy OSC –GF	Mgr, Gretna Area Operations			
Staging Area Managers	Planner, Pipeline Maintenance	[redacted]		[redacted]
Alternate STAM	Team Lead Maintenance Services	[redacted]		[redacted]
Alternate STAM	Operations Engineer	[redacted]		[redacted]
Unit Lead / Team Leads	Coord. ROW Projects	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Team Lead Operations	[redacted]		[redacted]

ICS Position	Normal Job Title	Name	Office Number	Alt. Number
Operations Section Continued…				
Alt. Unit Lead / Team Leads	Coord. ROW Projects	[redacted]	[redacted]	[redacted]
Alt. Unit Lead / Team Leads	Project Integration	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Project Integration Coordinator	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Sr. Regional Engineer	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Project Coordinator	[redacted]		[redacted]
Planning Section				
Planning Section Chiefs (PSC)	Svr, Engineering Services	[redacted]	[redacted]	[redacted]
Alternate PSC	Svr, Maintenance Services	[redacted]		[redacted]
Alternate PSC	Svr Maintenance Support	[redacted]		[redacted]
Resource Unit Leaders (RESL)	Planner, Maintenance	[redacted]		[redacted]
Alternate RESL	Sr. Engineer	[redacted]		[redacted]
Alternate RESL	Sr. Technical Specialist	[redacted]		[redacted]
Situation Status Unit Leads (SITL)	Engineer	[redacted]		[redacted]
Alternate SITL	Coord. Technical Training	[redacted]		[redacted]
Alternate SITL	Coord. Technical Training	[redacted]		[redacted]
Documentation Unit Leaders (DOCL)	RMA Maximo	[redacted]		
Alternate DOCL	Records Management Analyst	[redacted]		
Alternate DOCL	Admin	[redacted]		
Alternate DOCL	Technical Records Coord	[redacted]		[redacted]
Environmental Unit Leaders (ENVL)	Environmental Advisor	[redacted]		[redacted]
Alternate ENVL	Environmental Advisor	[redacted]		[redacted]
Alternate ENVL	Supervisor Environment	[redacted]		[redacted]
Alternate ENVL	Environmental Analyst	[redacted]		[redacted]
Logistics Section				
Logistics Section Chiefs (LSC)	Coord. ROW Projects	[redacted]	[redacted]	[redacted]
Alternate LSC	Coord, Project Integration	[redacted]		[redacted]
Alternate LSC	Technical Specialist	[redacted]		[redacted]
Unit Lead / Team Leads	Engineer	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	IT Support	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	IT Support	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Work Order Administrator	[redacted]		
Alt. Unit Lead / Team Leads	SSC Buyer	[redacted]		

ICS Position	Normal Job Title	Name	Office Number	Alt. Number
Logistics Section Continued...				
Alt. Unit Lead / Team Leads	Coord. Project Integration	[redacted]	[redacted]	[redacted]
Alt. Unit Lead / Team Leads	Advisor, Project Integration	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Microprocessor Coord.	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Sr. Microprocessor Coord.	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Coordinator SCM Logistics	[redacted]		[redacted]
Alt. Unit Lead / Team Leads	Coordinator SCM Logistics	[redacted]		[redacted]
Finance Section				
Finance Section Chiefs (FSC)	Analyst, Project Controls	[redacted]	[redacted]	[redacted]
Alternate FSC	Sr. Operations Financial Analyst	[redacted]		[redacted]
Alternare FSC	Analyst, Operations Financial	[redacted]		[redacted]

2.2.3c Government Contacts

GOVERNMENT AGENCIES	
FEDERAL AGENCIES	
Canadian Nuclear Safety Commission (CNSC)	(613) 995-0479
Canadian Wildlife Service/Environment & Climate Change	(800) 668-6767
	204-944-4888
Environment Canada (National Environmental Emergency Center)	(866) 283-2333
Environment Tip Line Poachers	(800) 667-7561
Fisheries and Oceans Canada – Marine Pollution Emergencies	(800) 889-8852
Human Resources and Skills Development Canada (HRSDC)	(800) 622-6232
Sustainable Development Manitoba – Aquatic Invasive Species	(877) 867-2470
Transportation of Dangerous Goods	(800) 272-9600
Transport Canada Navigation Protection Program & Receiver of Wreck	(780) 495-8215
CANUTEC or see provincial list for local office	(613) 996-6666
Transportation Safety Board of Canada (TSB) Note: TSB will report to the NEB.	(819) 997-7887
National Energy Board (NEB) Note: 24/7 Incident Line	(403) 807-9473
PROVINCIAL AGENCIES	
Saskatchewan	
Saskatchewan Government Insurance (SGI)	(800) 667-9868
Saskatchewan Ministry of Environment	(800) 667-7525
Saskatchewan Ministry of Economy (Estevan)	(306) 637-4541
Saskatchewan Ministry of Economy (Kindersley)	(306) 463-5400
Saskatchewan Ministry of Economy (Swift Current)	(306) 778-8252
Saskatchewan Ministry of Labour Relations and Workplace Safety	(800) 567-7233
Saskatchewan Workers' Compensation Board (WCB)	(800) 667-7590
Manitoba	
Manitoba Sustainable Development	(204) 945-4888
Manitoba Growth, Enterprise and Trade (Virden)	(204) 748-4260
Manitoba Growth, Enterprise and Trade (Waskada)	(204) 673-2472
Manitoba Public Insurance (MPI)	(800) 665-2410
Manitoba Workplace Safety & Health	(866) 888-8186
Workers' Compensation Board of Manitoba	(855) 954-4321

2.2.3d Other Pipelines

OTHER PIPELINES	
OIL AND GAS	
Alliance Pipeline Ltd.	800-884-8811
ConocoPhillips Canada Ltd.	800-661-9525
Consumers' Co-operative Refineries Ltd.	306-719-4353
Corex Resources Ltd.	403-265-1805
Crescent Point Energy Corp.	888-799-0043
Harvest Operations Corp.	800-760-2826
Imperial Oil Ltd.	877-304-8725
Lightstream Resources Ltd.	866-413-7800
Nal Resources Management Ltd.	403-746-2222
Pemoco Ltd.	403-616-0750
Plains Midstream Canada ULC	866-875-2554
Ridgeback Resources Inc.	866-413-7800
Sask Water Corp.	888-230-1111/ 800-667-5799
Suncor Energy Inc.	403-296-3000
TAQA North Ltd.	800-216-8062
Teine Energy Ltd.	866-900-2711
TransCanada Pipelines Ltd.	888-982-7222
Transgas Ltd.	306-777-9800
Tundra Oil & Gas Partnership	204-748-3095
Zargon Oil & Gas Ltd.	403-264-9992
RAILWAYS	
Canadian National Railway Emergency	800-661-3963
Canadian Pacific Railway	800-716-9132
Canadian Pacific Railway - Trains Blocking a Crossing	800-795-7851

2.2.3e Saskatchewan Police, Fire, Ambulance, Hospital and EMO Directory

Saskatchewan Mile 171 - Mile 587 Regina, Saskatchewan 306-780-6607

Location	Police	Fire	Ambulance	Hospital	EMO
Enbridge Pipelines Inc. - Saskatchewan					
MP 314 - 340 Loreburn MP 334.35	911 or 1-800-667-6662 306-867-5440 Outlook	911 or (306) 644-2177 Loreburn	911 or (306) 975-8800 Saskatoon	911 or (306) 567-2801 Davidson	RM of Loreburn C: (306) 567-7330
MP 340 - 346.3	911 or 1-800-667-6662	911 or (306) 644-2177 Loreburn	911 or (306) 975-8800 Saskatoon	911 or (306) 567-2801 Davidson (306) 734-2288 Craik	RM of Willner C: (306) 567-7063 W: (306) 567-3103
MP 346.3 - 389 Craik Station 367.1	911 or 1-800-667-6662 (306) 734-5200 Craik	911 or (306) 567-8093 Craik (306) 692-2792 Moose Jaw	911 or (306) 975-8800 Saskatoon	911 or (306) 734-2288 Craik	RM of Craik W: (306) 734-2242 C: (306) 331-7563 RM of Huron C: (306) 567-7654
MP 389 - 412 Bethune Station 405.8	911 or 1-800-667-6662	911 or (306) 731-7458 Bethune	911	911 or Regina General / Pasqua (306) 766-4444 or 2222	RM of Dufferin C: (306) 536-5711
MP 412 - 460 Stony Beach 410.6 Please check MP	911 or 1-800-667-6662	911 or (306) 731-8024 Lumsden (306) 345-2424 Pense (306) 536-3097 Grand Coulee	911	911 or Regina General / Pasqua (306) 766-4444 or 2222	RM of Pense C: (306) 345-2230 RM of Sherwood W: (306) 525-5237 C: (639) 571-8213
Regina City Limits Regina Terminal 437.5	911 or 1-800-667-6662 Regina Police Service (306) 777-6368	911 or Regina Fire & Protective Services (306) 777-7000	911 or Regina Qu'Appelle Health Region (306) 766-6267	911 or Regina General / Pasqua (306) 766-4444 or 766-2222	City of Regina W: (306) 777-7040 C: (306) 536-4245
White City Station MP 455.1	911 or 1-800-667-6662 Regina RCMP (306) 780-5050	911 or (306) 306-781-2355 White City (306) 527-7582 Pilot Butte (306) 501-8802 Balgonie	911 or Regina Qu'Appelle Health Region (306) 766-6267	911 or Regina General / Pasqua (306) 766-4444 or 766-2222	Town of White City C: (306) 306-531-4981 RM of Edenwold C: (306) 536-4151/(306) 552-7839

Location	Police	Fire	Ambulance	Hospital	EMO
MP 460 - 468	911 or 1-800-667-6662 Regina RCMP (306) 780-5050 Indian Head / 306-695-5200 Montmartre 306-424-6400	911 or (306) 501-8802 Balgonie	911 or Regina Qu'Appelle Health Region (306) 766-6267 Indian Head W: (306) 695-2191	911 or Regina General / Pasqua (306) 766-4444 or 2222 Indian Head Union Hospital (306) 695-4000	Town of White City C: (306) 306-531-4981 RM of Edenwold C: (306) 536-4151 MR of South Qu'Appelle C: (306) 699-7917
MP 468 - 501.5 Odessa Station 473.4	911 or 1-800-667-6662 Regina RCMP (306) 780-5050 Indian Head / 306-695-5200 Montmartre 306-424-6400	911 or (306) 537-7313 Odessa (306) 537-3154 Montmartre	911 or Indian Head W: (306) 695-2191	911 or Indian Head Union Hospital (306) 695-4000	RM of Lajord C: (306) 539-0689 RM of Francis W: (306) 245-3256 C: (306) 540-2165 RM of Montmartre / Village of Montmartre C: (306) 424-7327
MP 501.5 -524 Glenavon 504.7	911 or 1-800-667-6662 Indian Head / 306-695-5200 Montmartre 306-424-6400 Broadview / 306-696-5200 Kipling (306) 736-6400	911 or (306) 736-8031 Glenavon (306) 736-7804 Windthorst	911 or Grenfell JT Ambulance Service (306) 697-2707 Kipling & District (306) 736-2553	911 or Indian Head Union Hospital (306) 695-4000 Kipling Health Centre (Sun Country) (306) 736-2553	RM of Chester C: (306) 535-4798 RM of Kingsley / Town of Kipling W: (306) 736-2272 C: (306) 538-2221
MP 524 - 559 Langbank Station MP 543.8	911 or 1-800-667-6662 Broadview / 306-696-5200 Kipling (306) 736-6400	911 or (306) 736-8606 Kipling (306) 735-7380 White Wood (306)736-8967 Kennedy	911 or Kipling & District W: (306) 736-2553 Wawota & District EMS (306) 739-2306	911 or Kipling Health Centre (Sun Country) (306) 736-2553	RM of Silverwood C: (306) 306-435-8051 RM of Wawken (306) 575-9601 RM of Walpole (306) 306-435-7224

Location	Police	Fire	Ambulance	Hospital	EMO
MP 559 - 587.1	911 or 1-800-667-6662 Moosomin (306) 435-3361	911 or (306) 739-2755 Wawota (204) 851-2398 Maryfield	911 or Wawota & District EMS (306) 739-2306 Hutch Ambulance Moosomin (306) 435-2962 Maryfield C: (306) 646-7870	911 or Southeast Integrated Care Centre (Moosomin) (306) 435-3303	RM of Wawken (306) 575-9601 RM of Walpole (306) 306-435-7224 RM of Maryfield/ Village of Maryfield C: (306) 646-7627

Note: When using the 911 service in rural areas, be prepared to give your exact location (using the grid road system if possible).

2.2.3f Manitoba Police, Fire, Ambulance, Hospital and EMO Directory

Manitoba Winnipeg, Manitoba 204-983-5462

Location	Police	Fire	Ambulance	Hospital	EMO
Enbridge Pipelines Inc. - Manitoba					
MP 587.1 - 613 Cromer Terminal MP 596.1	911 or Virden Emerg. (204) 748-2135 Reston Emerg: (204) 877-3701	911 or (204) 851-2487 Virden/Elkhorn	911 or Virden / Prairie Mountain Health EMS (204) 483-6226	911 or Virden District Hospital (204) 748-1230 Ext 1	RM of Wallace RM of Sifton (204) 851-0101 (204) 855-2423 RM of Pipestone W: (204) 877-3327 C: (204) 851-7157
MP 613 - 631.8	911 or Virden Emerg. (204) 748-2135 Reston Emerg: (204) 877-3701	911 or (204) 851-4816 Reston (204) 851-0380 Oak Lake / Sifton	911 or Reston / Prairie Mountain Health EMS (204) 483-6226	911 or Virden District Hospital (204) 748-1230 Ext 1	RM of Wallace RM of Sifton (204) 851-0101 (204) 855-2423 RM of Pipestone W: (204) 877-3327 C: (204) 851-7157
MP 631.8 - 670 West Souris 641.0 East Souris 646.2	911 or Souris Emerg: (204) 483-2123	911 or (204) 724-6197 Souris	911 or Souris / Prairie Mountain Health EMS (204) 483-6226	911 or Souris Health Centre (204) 483-6207	Municipaity of Souris/Glenwood W: (204) 483-5200 C: (204) 483-0324
MP 670 - 688.7 Glenboro Station 685.5	911 or Brandon Emerg: (204) 726-7500 Carberry Emerg: (204) 834-2131	911 or (204) 729-2400 Brandon (204) 725-6593 Wawanesa	911 or Wawanesa / Prairie Mountain Health EMS (204) 483-6226	911 or Prairie Mountain – Glenboro Hospital (204) 827-2438/ (204) 827-5300	Municipality of Oakland/Wawanesa C: (204) 526-0569 RM of South Cypress (204) 827-2308

Location	Police	Fire	Ambulance	Hospital	EMO
Enbridge Pipelines Inc. - Manitoba					
MP 688.7 - 695	**911 or** Carberry Emerg: (204) 834-2131	**911 or** (204) 761-0424 Glenboro (204) 825-7854 Baldur	**911 or** Prairie Mountain Health EMS / Baldur Health Centre (204) 483-6226	**911 or Prairie Mountain – Glenboro Hospital (204) 827-2438/. (204) 827-5300**	**RM of South Cypress** (204) 827-2308 **RM of Argyle** (204) 535-2585
MP 695 - 718 St. Leon Station MP 718.0	**911 or** Manitou (204) 242-2121	**911 or** (204) 526-7336 Cypress River (204) 204-744-2133 Swan Lake (204) 825-8164 Somerset (204) 825-0251 St. Leon	**911 or** Lorne Memorial Hospital & EMS (Swan Lake/Manitou) (204) 871-0047	**911 or** Lorne Memorial Hospital & EMS – Swan Lake (204) 836-2132	**RM of Lorne** C: (204) 825-7215 **RM of Pembina** C: (204) 825-8286
MP 718 - 736 Manitou Station 723.9	**911 or** **Manitou** (204) 242-2121 **Morden** Emerg: (204) 822-5469 **Morden Police Service** 24 Hour: (204) 822-4900	**911 or** (204) 242-4234 La Riviere (204) 242-4544 Manitou (204) 823-0476 Darlingford (204) 745-8812 Miami	**911 or** Manitou EMS (204) 871-0047	**911 or** Boundary Trails Health Centre (204) 331-8800	**RM of Pembina** C: (204) 825-8286 **RM of Thompson** (204) 435-2114 (204) 823-2828
MP 736 - 756	**911 or** **Morden** Emerg: (204) 822-5469 **Carman** (204) 745-6760	**911 or** (204) 822-3888 Morden (204) 325-8151 Winkler (204) 361-8185 Plum Coulee	**911 or** Boundary Trails EMS (204) 871-0047	**911 or** **Boundary Trails Health Centre** (204) 331-8800 **Altona Community Memorial Health Centre** (204) 324-6411	**RM of Stanley / City of Morden - Winkler** W: (204) 325-0829 C: (204) 332-3473

Location	Police	Fire	Ambulance	Hospital	EMO
Enbridge Pipelines Inc. - Manitoba					
P 756 - 773 Gretna Station MP 771.9	**911 or** **Morden** Emerg: (204) 822-5469 **Altona** Emerg: (204) 324-6970 **IBET Altona** (204) 324-9144 **Emerson** Emerg: (204) 373-2428 **Morris** Emer: (204) 746-2323	**911 or** (204) 361-8185 Plum Coulee (204) 324-8500 Altona (204) 324-7373 Gretna (204) 770-2048 Emerson	**911 or** Altona Ambulance Services (204) 871-0047	**911 or Altona** **Community Memorial Health Centre** (204) 324-6411	**RM of Rhineland** W: (204) 324-5357 C: (204) 712-6351 **Municipality of Emerson-FRanklin** C: (204) 319-0645

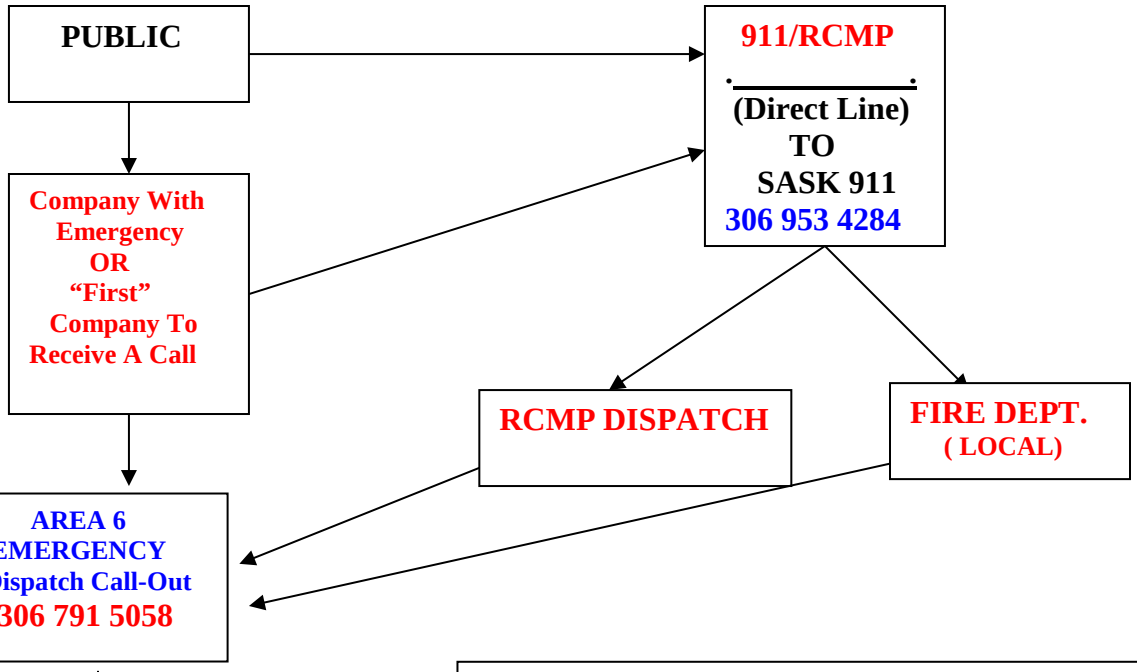
Note: When using the 911 service in rural areas, be prepared to give your exact location (using the grid road system if possible).

REDACTED COPY

2.2.3g Area 6 Callout Chart

September 30. 2014

CALL-OUT CHART



SaskEnergy/TransGas
306 777 9800
Enbridge Pipelines
877 420 8800
Alliance Pipelines
800 884 8811
Kinder Morgan (Cochin)
800 265 6000
Co-op Refineries
306 719-4222
Plains Midstream
866 875 2554
Imperial Oil (24/7 Intouch)
306 757 4342
Trans Canada
888-982-7222
Gibsons Moose Jaw Refinery
306 691 7800

MEMBER INSTRUCTIONS

*** The "First" Company to receive a call or have a PIPELINE EMERGENCY, shall contact the AREA 6 Emergency Call-Out and announce the following summary message:

"(your company)" is calling on behalf of the Area 6 Emergency Response Co-operative.

There is an "Pipeline Emergency" at the following (location).

The company involved is (state name if known) or state (unknown).

Please "ACTIVATE" the Area 6 Emergency Response Co-operative "Call-Out Procedure".

SPECIAL INSTRUCTIONS: Please state if you are requesting assistance, or this is for notification purposes only. Also if you require equipment, manpower or any special requests.

2.2.3h Radio System

Operating Procedures

Mobile/Handheld - Mobile/Handheld – Direct

For short range communication between mobile units and/or handheld units.By selecting talk around Channels 2, 4 or 6, mobile/handheld units can communicate with each other without making use of the radio repeater. This move is useful when units are travelling in convoy or are operating in the same vicinity.

Mobile to Repeater to Mobile

To extend the range of mobile to mobile communication by using the nearest tower as a repeater. Select the correct channel 1, 3, or 7 for the repeater in your radio range. Voice call the mobile unit by call sign.

Speed Dial - Mobile to Location

1. Select channel number on your mobile radio to correspond to the channel number of the radio repeater tower in your vicinity.
2. From the attached list find the 2 digit speed dial code for desired location.
3. Using a microphone with a touch tone pad, enter the 2 digit speed dial code (eg. 00 will dial the Control Centre, 02 will dial the Central Region Office). Hold each digit at least two seconds. If a mistake is made in the two digit speed dial code, press # and enter the correct 2 digit code.
4. You will hear a number of short beeps and the telephone ring for the desired location.
5. When the location answers, talk as if they were another mobile radio.

Upon completion of the call or no answer, press # for about 3 seconds to disconnect the telephone system.

Speed Call - Mobile to Another Radio Repeater

1. Select channel number on your mobile radio to correspond to the channel number of the radio repeater tower in your vicinity.
2. Enter the 2-digit code for desired repeater.
3. When you hear a short beep, press 88 on the microphone pad, then listen for one phone ring and a second beep. This indicates that you are now on the air through the repeater.
4. Voice call the person desired followed by your call sign (eg. KB-30 this is YP-30).
5. Upon completion of the call, state your call sign and say "clear", then press # for about 3 seconds to disconnect.

Manual Dial - Mobile to Any Telephone Number

1. Select channel number on your mobile radio to correspond to the channel number of the radio repeater (tower) in your vicinity.
2. Pick up the microphone and enter 9 * (asterisk) followed by the desired phone number. No pause required after 9 *. For long distance calls press 9-*-1-area code-phone number. When desired person answers identify yourself giving your call sign and name. At completion of conversation sign off and press # for about 3 seconds to disconnect the circuit.

Air Weapons Range Radio Information

For access to the Air Weapons Range, select the correct channel 8 or 9 for the repeater in your radio range.

Channel 8 – Southgate Entry to Air Weapons Range
Channel 9 – Emergency Channel for Air Weapons Range

Last updated March 2014

LEAD AGENCY ROLES

*Ministry of the Economy (ECON)

BEFORE THE INCIDENT

The Petroleum and Natural Gas Division is responsible for regulating environmental aspects of the oil and gas industry. This division has major responsibilities in all areas related to provincial jurisdiction over oil and gas resources.

- ❑ Act as the lead provincial government organization in petroleum industry emergency responses.
- ❑ Participate in selected licensee ERP exercises.
- ❑ Review and recommend changes to Emergency Response Plans.
- ❑ Maintain a 24 hour telephone contact where petroleum industry incidents can be reported.
- ❑ Maintain 24 hour emergency contact numbers where resources can be accessed to carry out a response to Emergency Response Plans.
- ❑ Approve applications for wells, production facilities, pipelines and gas plants under the authority of the Oil and Gas Conservation Act/Regulations, the Pipelines Act, and the Crown Mineral Act/Regulations.
- ❑ Inspect and monitor field operations associated with the petroleum industry.
- ❑ Approve exploration programs.
- ❑ Control produced water disposal.

DURING THE INCIDENT

- ❑ Receive information pertaining to petroleum industry incidents.
- ❑ Initiate notification of other government agencies.
- ❑ May directly alert the following agencies as required:
  - ❑ Closest RCMP detachment
  - ❑ Local / Municipal / Regional authorities
  - ❑ Other government agencies
- ❑ Assist the National Energy Board if required.

AFTER THE INCIDENT

- ❑ Participate in a lessons learned process based on the scope of their involvement and the outcome.
- ❑ Monitor spills and cleanup, and approve specific waste treatment and remediation programs.

*Emergency Management & Fire Safety

BEFORE THE INCIDENT

Emergency Management and Fire Safety is committed to promoting emergency preparedness, 9-1-1, fire and life safety education across Saskatchewan. The various programs offered have one common goal – to better prepare and protect the residents, property and environment of the province of Saskatchewan.

- ❑ Prepare to assist the Ministry of the Economy with response to petroleum industry incidents.
- ❑ Review and recommend changes to Emergency Response Plans.
- ❑ Make the plan available to stakeholders.
- ❑ Train personnel to carry out functions as assigned by their Emergency Plan or procedures.
- ❑ Participate in selected licensee ERP exercises.
- ❑ Communicate changes to the plan to plan holders.
- ❑ Maintain 24 hour emergency contact numbers.
- ❑ Maintain a 24 hour duty manager system.
- ❑ Maintain GEOC readiness.

DURING THE INCIDENT

- ❑ If notified of an emergency, inform the Ministry of the Economy, Saskatchewan Ministry of Environment and the local authority of the notification.
- ❑ Upon notification of an emergency event of moderate (level 2) or high (level 3) impact, complete the provincial government notification and call down.
- ❑ The Emergency Management & Fire Safety duty manager obtains a SitRep from Ministry of the Economy, industrial operator or the local authority and confirms the level of impact.
- ❑ The duty manager notifies the appropriate provincial officials as per operating procedures.
- ❑ Prepare briefing notes, as appropriate.
- ❑ When requested by the local authority, dispatch an Emergency Management & Fire Safety district officer (liaison officer) to the municipal EOC.
- ❑ When requested, activate the GEOC for the Ministry of the Economy to use as the off-site REOC until the REOC is established near the event site.
- ❑ Upon request from the Ministry of the Economy, dispatch a Emergency Management & Fire Safety representative to the REOC near the event site.
- ❑ Upon request of the Ministry of the Economy or the local authority, activate the GEOC to coordinate and support response activities to the event with provincial resources.
- ❑ Provide ongoing SitReps or briefing notes to appropriate provincial officials.

AFTER THE INCIDENT

- ❑ Notify plan holders when the event is over.
- ❑ Debrief GEOC participants.
- ❑ Compile GEOC log.
- ❑ Properly shut down GEOC.
- ❑ Participate in event debriefings.
- ❑ Communicate any changes of the plan to all plan holders.
- ❑ Complete report in relations to the activation of the Emergency Response Plan and the incident.

Ministry of Environment

BEFORE THE INCIDENT

- ❑ Maintain 24 hour emergency contact number for reporting environmental emergencies.
- ❑ Review project applications to assess potential impacts on fish and wildlife and associated habitat (including fish and wildlife development fund lands and conservation easements), endemic flora, endangered flora and fauna species, timber resources, provincial parks, resource lands, recreational resources waters (wetlands, creeks, rivers and lakes)..
- ❑ Administer the Saskatchewan environment assessment and review process as outline in the Environmental Review Guidelines for Oil and Gas Activities to assess, regulate, and mitigate the impact of alterations to the natural environment by oil and gas activities.
- ❑ Grant surface leases and easement agreements on Crown resource lands under the authority of several Acts. Provide advice on project development in environmentally sensitive areas, including guidance on environmentally acceptable construction and development practices.
- ❑ Provide administration and management of Crown Lands in regard to habitat concerns to ensure sustainability and biological diversity.
- ❑ Establish conditions for the management and protection of natural resources including forests, fish, wildlife, lands, waters and parks.
- ❑ Protection of primary resources including air, water, and soil using regulatory and non-regulatory controls (i.e., pollution prevention and regulation of waste dangerous goods).
- ❑ Conduct field inspections to ensure that project development and operation comply with relevant regulatory requirements.

Wildfire Protection Operations

- ❑ Wildfire management on all crown lands (including parks) within the province to protect values at risk within those areas. This includes policy, prevention, mitigation detection, response and reclamation associated with wildfires.
- ❑ Wildfire priorities are: (1) Human Life; (2) Communities; (3) Major public and industrial infrastructure; (4) commercial timber; and (5) Structures, natural resources and commercial/ industrial operations.
- ❑ Supported by provincial aircraft fleet, staff, equipment as well as contracted aviation, personnel and equipment services primarily based out of Prince Albert/ La Ronge and northern parts of the province.
- ❑ The Wildfire Management Branch is often required to provide significant support to the Province's Emergency Management Organization for non-wildfire type events.

Forest Services

- ❑ Operating plan approvals and permit issuance.
- ❑ Compliance, tree planting, site preparation, stand-tending, and contract management.
- ❑ Review and approval of timber harvesting dispositions.

DURING THE INCIDENT

- ❑ Monitor discharges and mitigates impact of release related substances.
- ❑ Mobilize wildfire management resources as required in the event of a wildfire or situation that has the potential to create a wildfire.
- ❑ Develop weather forecasts and wildfire hazard forecasts in cooperation with federal and provincial partners.
- ❑ Carry-out wildfire response to protect values at risk from wildfire.
- ❑ Assist in locating transients for evacuation.
- ❑ Provide advice as to the effects of igniting the released product.
- ❑ As requested, will provide and approve burning permit to ignite a spill or release.
- ❑ Provide advice regarding the effects of the contaminants on livestock, plants and soil.
- ❑ Provide advice and assistance in developing procedures to mitigate affected livestock, plants, soil or farmsteads.
- ❑ Responsible Party is responsible to provide a plan regarding the effects of the contaminants on livestock, plants and soil to be approved by the ministry.
- ❑ Responsible Party is responsible to provide a plan to develop procedures to mitigate affected livestock, plants, soil or farmsteads to be approved by the ministry.

AFTER THE INCIDENT

- ❑ Provide regulatory oversight on development and execution of Environmental Site Assessment.
- ❑ Review restoration statements or release requests from operators following facility abandonment and reclamation on Crown Lands administered by Saskatchewan Environment and Resource Management.
- ❑ Provide regulatory oversight on development and execution of Corrective Action Plans.
- ❑ Provide regulatory oversight on development and execution of Corrective Action Plans.

* Emergency Services – as managed / operated by the Local Authority

SUPPORTING AGENCY ROLES

	BEFORE THE INCIDENT	DURING THE INCIDENT	AFTER THE INCIDENT
MINISTRY LABOUR RELATIONS & WORPLACE SAFETY	❑ This ministry works with employers and employees, as well as industry stakeholders to reduce and eliminate workplace injuries and create a positive work environment. ❑ Maintain 24 hour emergency contact number where resources can be accessed for a response related to Emergency Response Plans. ❑ Receive Emergency Response Plans.	❑ Dispatches representatives to monitor compliance of regulations and provide support and advice regarding safety of workers and responders under provincial and territorial jurisdiction. ❑ Ensure that the company is monitoring the health and safety of all contractors and other personnel who are not under the Canada Labour Code Jurisdiction.	❑ Assist with the investigation of incidents that result in serious injuries or death to workers under provincial and territorial jurisdiction.
MINISTRY HIGHWAYS & INFRASTRUCTURE	❑ Ministry of Highways manages Saskatchewan's network of highways and infrastructure. ❑ Manages Saskatchewan's Highway Hotline, ensuring Saskatchewan people, the trucking industry, and visitors have information on highway construction, road closures, and road conditions. ❑ Maintain 24 hour emergency contact number where resources can be accessed for a response related to Emergency Response Plans.	❑ Provide authorization and assistance for establishing emergency roadblocks with company officials, local authorities and the RCMP. ❑ Provide assistance with the closure of provincial highways and the establishment of suitable detour routes. ❑ Provide advice and assistance with procurement of roadblock equipment.	❑ Work with appropriate local and federal entities to facilitate the restoration of roadways and utilities.
MINISTRY OF HEALTH	The Minister of Health and the regional health authority boards have interdependent roles and responsibilities to each other. Both are involved in meeting expectations in relation to the following key areas: ❑ Strategic planning ❑ Fiscal management and reporting ❑ Relationships ❑ Quality management ❑ Monitoring, evaluation and reporting ❑ Management and performance	❑ Provide advice on health and safety levels for the more vulnerable residents, including those in health care or special care facilities. ❑ Work with Saskatchewan Ministry of Environment and others to establish health and safety levels for the escaping of contaminants. ❑ Advise on appropriate remedial measures. ❑ Consult with applicable environmental protection agencies to provide advice on existing and potential health effects of the incident.	❑ The Ministry and Regional Health Authorities will conduct After Action Reviews to review operations and lessons learned to enhance emergency preparedness and response plans for potential future events. ❑ Ensure appropriate data is collected to monitor the health effects of the incident. ❑ Recommend further investigation or research after the event is warranted.
TECHNICAL SAFETY AUTHORITY	❑ Review, accept and register pressure equipment designs and construction procedures that relate to pressure equipment. ❑ Issue certificate of inspection permits for pressure equipment before the equipment is placed into service. ❑ Ensure that regular inspections of in-service pressure equipment are conducted. ❑ Keep records for pressure equipment that has been registered for use, or manufactured, in Saskatchewan. ❑ Examine, certify and register Pressure Welders and Welding Examiners, Power Engineers, and Pressure Equipment Inspectors. ❑ Conduct safety education and training.	❑ Receive notification of an incident involving a Boiler, Pressure Vessel, Elevator or Amusement Ride in Saskatchewan.	❑ Investigate accidents or unsafe conditions that involve boilers or pressure equipment.
SASKPOWER ELECTRICAL SAFETY	❑ SaskPower generates safe, reliable and sustainable power for the people of Saskatchewan. ❑ SaskPower is the principal electric utility in Saskatchewan, Canada.	❑ SaskPower would disconnect electrical services for residents that would be affected by flooding to ensure safety.	❑ SaskPower would be present in mobile command posts to assist residents with the safe restoration of electricity as quickly as possible.
SASKENERGY	❑ SaskEnergy delivers the benefits of safe, convenient and environmentally friendly natural gas to more than 380,000 residential, farm, commercial and industrial customers throughout Saskatchewan. ❑ Purchase natural gas from independent suppliers and transport it through our 68,500-kilometer distribution system to 93% of Saskatchewan communities.	❑ SaskEnergy would disconnect gas services for residents that would be affected by flooding to ensure safety.	❑ Residents are to arrange with SaskEnergy to have gas service turned back on.
MINISTRY OF AGRICULTURE	An agricultural industry emergency will be defined according to the following: ❑ There is an imminent threat to livestock, public safety, personal property, the food chain or the environment. ❑ There is irrevocable harm. ❑ An epidemic with the potential to spread. ❑ When the cost of stopping the event is less than the cost of not doing anything. ❑ Notification of an animal disease case.	❑ Provides advice and assistance in relation to agricultural matters. ❑ Provides emergency veterinary services. ❑ Provides plant and animal health safety services. ❑ Arranges emergency evacuation and/or feeding of livestock/poultry. ❑ Manages livestock feeding services in the event of an emergency. ❑ Operates under the Foreign Animal Disease Emergency Support (FADES), in coordination with federal agencies.	❑ The EPO will initiate a debriefing of any emergency situations. ❑ Updating and approval will occur in the following circumstances: ❑ Update the plan after a debriefing. ❑ Update the plan after a test of the plan. ❑ Update the appendices once a year. ❑ Update the plan at least once a year. ❑ EPO will initiate any plan reviews. ❑ Ministry Emergency Management Team updates the plan. ❑ Deputy Minister communicates the plan to staff through the directors. ❑ EPO to communicate plan to Corrections, Public Safety and Policing. ❑ Plan posted on the Ministry's website (without the phone numbers of staff). ❑ Communicate the plan to producer associations, SARM and other agriculture organizations.

*Ministry of Environment - only contact if the incident impacts sensitive or natural areas, crown lands, farm lands, wildlife, or wet areas / water bodies.

LEAD AGENCY ROLES

*Growth, Enterprise & Trade - Petroleum Branch

BEFORE THE INCIDENT	DURING THE INCIDENT	AFTER THE INCIDENT
❒ The Petroleum Branch of Manitoba Growth, Enterprise & Change administers provisions under The Oil and Gas Act and The Oil and Gas Production Tax Act relating to exploration, development, production and transportation of oil and gas. ❒ The Branch develops, recommends, implements and administers policies and legislation, to provide for the sustainable development of Manitoba's oil and gas resources. The Branch deals with matters relating to well spacing, production allowable, pool designation, salt water disposal, enhanced recovery projects and unitization. The Branch publishes several reports each year, providing the public, industry and government with information on the petroleum industry in Manitoba. ❒ Establish processes to receive and address community concerns.	❒ Advise and assist in the implementation of petroleum demand restraint measures prior to or during a declared petroleum emergency. ❒ Liaise with the Government of Canada respecting the implementation of the *Energy Supplies Emergency Act (Canada).* ❒ Receive information pertaining to petroleum industry incidents. ❒ Determine the emergency level of an incident through consultation with the licensee. ❒ Dispatch representative to the site of the incident, as required. ❒ Confirm that local resources have been notified as appropriate. ❒ Identify and request initial provincial resources to support the incident, to be coordinated at the regional level if necessary through a local or regional EOC. ❒ Either notify all government agencies or instruct the operator on which government agencies they are to notify during an emergency ❒ Send a representative to the OSCP. ❒ Bring in expertise from other areas, as required. ❒ Provide timely situation reports to other government departments activated by this plan. ❒ Petroleum Branch inspectors are also Workplace Health and Safety officers and are responsible for enforcing a safe work environment. They should be notified of any situations that have potential for serious injury or death.	❒ As part of the "lessons-learned" process, recommend any mitigative actions that may reduce the event from re-occurring. ❒ Carry out investigations. ❒ Notify all participants when the event has concluded and there is no longer any hazard to the public.

*Manitoba Emergency Measures Organization - Trade

❒ The Manitoba Emergency Measures Organization (EMO) is responsible for overseeing and coordinating all aspects of emergency preparedness in the Province, and managing, directing and coordinating the response of all departments to a disaster or major emergency.
❒ EMO is responsible for maintaining the Manitoba Emergency Plan. The Plan is the linchpin in EMO's capacity to provide a coordinated and effective response to emergencies and disasters. It explains the provincial emergency response concept, emergency response structure, and the roles and responsibilities of provincial departments and agencies responding to emergencies and disasters.
❒ EMO assists with major emergencies and disasters through coordination of the disaster response process, including the coordination of provincial, federal and non-government agency resources to assist municipalities. Services provided to the municipalities include consulting, planning support, event activity, post emergency reports, and public information on response activities.
❒ EMO is responsible to conceive, develop and coordinate a range of recovery programs and policy. EMO provides leadership in developing holistic recovery strategies for implementation in the wake of a major disaster. As such EMO has strong connections to non-governmental organizations who contribute to the overall recovery strategy.
❒ Prepare and maintain disaster assistance policies and guidelines for emergencies and disasters in Manitoba.
❒ Develop and maintain policy and procedures for the submission and processing of claims for disaster assistance.
❒ Prepare a provincial emergency preparedness program and a provincial emergency plan, and conduct regular reviews and revisions of the program and plan.
❒ Establish and main a registry containing a copy of every emergency plan and emergency management program in effect in the province.
❒ Review, modify and approve emergency preparedness programs and emergency plans.
❒ Assist local authorities in practicing their local emergency plans by conducting table top exercises.
❒ Development and maintenance of procedures for submitting and processing of claims.
❒ Provide a public disaster assistance awareness program.
❒ Consulting with government departments and the private sector on establishing and implementing disaster assistance programs.
	❒ Provide assistance to local authorities and provincial departments in the implementation of emergency plans, establishing Emergency Operations Centres, reception centres for evacuees.
	❒ Alert provincial departments and agencies likely to be involved in the emergency.
	❒ Manage, direct and coordinate the response of all departments to a major emergency or disaster. This includes Provincial agencies, Crown Corporations, National Parks, First Nations or other properties within federal jurisdictions.
	❒ Dispatch Emergency Preparedness advisor to the affected community.
	❒ Provision, operation and administration of the Emergency Mobile Command Centre.
	❒ Activation, operation and administration of the Manitoba Emergency Coordination Centre. In addition to the static MECC in Winnipeg, EMO maintains a deployable MECC that can be dispatched closer to the site of the emergency.
	❒ Submission of "Requests for Emergency Response Assistance" to the Government of Canada and / or the Canadian Forces when the Province's capacity to deal with the emergency is exceeded or where specialized resources are required.
	❒ Requesting the assistance of the Director of Communication Services (CH&T) to:
	  ❒ Establish and coordinate Media and/or Public Information Centres, which shall report to the Executive Coordinator, the Deputy Minister and / or the Minister.
	  ❒ Coordinate the activities and media releases of all Departmental Communication Officers required, at departmental emergency operation centres and emergency sites.
	  ❒ Coordinate news releases and public service announcements related to the emergency response.
	  ❒ Coordinate and manage local and visiting media personnel.
	❒ Communication and administration of Government Policy on disaster assistance in accordance with the Emergency Measures Act and Disaster Financial Assistance Policy.
	❒ EMO is the provincial aggregator for the National Public Alerting System. EMO has the capability to provide broadcast interrupted emergency messages through radio and television where and when required.
	❒ EMO will take primary responsibility of an emergency or disaster where unusual circumstances exist:
	  ❒ No local government exists.
	  ❒ The local government no longer has the capacity to respond.
	  ❒ The local government is unable to implement an appropriate on-site system of emergency management.
		❒ Provide an accurate record of the provincial and municipal experience in dealing with the emergency.
		❒ Provide a means of assessing the strengths and deficiencies of the province's response to the emergency, including departmental, municipal and voluntary organizations.
		❒ Identify methods of enhancing the response and subsequently, the development of programs to implement proposals.
		❒ Investigate claims.
		❒ As required, MEMO will be responsible for the preparation of a provincial report which may include:
		  ❒ An executive summary.
		  ❒ Provincial Emergency Response (including local response).
		  ❒ Chronological sequence of significant events.
		  ❒ Overall emergency costs on a departmental basis.
		  ❒ The overall comments and recommendations (from debriefing meetings, departmental / municipal reports).
		  ❒ Department / agency / municipal reports.
		  ❒ The printing and distribution of the provincial report.
		❒ Receive and assess all disaster assistance claims from local authorities, government departments, the Government of Canada or the private sector.
		❒ Compilation and publication of the provincial post-emergency report.

Local Authority / Rural Municipality

❒ Work with the operator to effectively prepare for a petroleum industry incident. Provide input to the industrial operator's site-specific plan to ensure it is compatible with the Municipal Emergency Plan (MEP), where feasible.
❒ Participate in industrial operators' preparatory training and exercises where possible.
❒ Train personnel to carry out functions as assigned by MEP or procedures.
❒ Maintain 24 hour emergency contact numbers.
❒ May enter into mutual aid agreements with the government, any local authority, any department or any person with respect to the establishment, development or implementation of emergency preparedness programs and emergency plans and the conduct of emergency operations.
❒ Must review and revise its emergency preparedness programs ad emergency plans from time to time as required by the regulations, to ensure that they continue to meet the standards prescribed by regulation.
❒ Provide fire protection services within its boundaries to reduce the danger of fire.
	❒ Respond to and assess the emergency incident.
	❒ Establish contact with the industrial operator in order to:
	  ❒ Obtain additional hazard information.
	  ❒ Determine where road blocks should be or are established.
	  ❒ Determine the direction of approach to the incident.
	  ❒ Determine if there are any injuries.
	  ❒ Find out what response and public protection actions have been taken.
	  ❒ Identify the location of the On-site Command Post (OSCP) and any Emergency Operations Centres (EOCs).
	❒ Activate the MEP, when required.
	❒ Manage the Local Authority's emergency response.
	❒ Activate the emergency public warning system to alert people to life threatening hazards, as required.
	❒ Activate the Municipal EOC (MEOC), as required.
	❒ Initiate public protection measures, as necessary.
	❒ May dispatch a representative to the Government EOC (GEOC), when it is established, to coordinate the response, if requested.
	❒ In the event of an emergency or disaster in a municipality, the local authority may declare a state of local emergency for a period of 14 days from the date of the making thereof with respect to part or all of the municipality affected or likely to be affected by the emergency or disaster.
	  ❒ A local authority that has declared a state of local emergency must give the coordinator any information he or she requests about the authority's response to the disaster or emergency and its effects on the municipality.
	  ❒ Notify Manitoba EMO that an Emergency Prevention Order or State of Local Emergency has been declared.
	❒ When possible, work with all other responders to establish a single Regional EOC (REOC).
	❒ Establish a public information service, including the use of the news media to inform and instruct the public of the emergency and of any protective actions to be taken.
	❒ Coordinate news releases with the licensee, if required.
	❒ Inform Manitoba EMO and the public when the emergency is over.
	❒ At the site of an emergency or disaster, a local authority must:
	  ❒ carry out an action,
	  ❒ cease an action it is carrying out, or
	  ❒ change the way it is carrying out an action if directed to do so by the fire commissioner.
		❒ Complete a "lessons learned" process based on the scope of involvement and provide any feedback to the industrial operator.
		❒ Participate in multi-agency debriefings.

*GET - Manitoba Growth, Enterprise & Change - Petroleum Branch *EMO - Manitoba Emergency Measures Organization

January 2017

H2Safety Services Inc.

Manitoba

SUPPORTING AGENCY ROLES

	BEFORE THE INCIDENT	DURING THE INCIDENT	AFTER THE INCIDENT
***OFFICE OF THE FIRE COMMISSIONER**	❒ Promote methods of fire prevention and public safety. ❒ Collect and disseminate information and statistics about fires. ❒ Give advice and assistance to local authorities about emergency response and fire protection services, including training of persons who provide those services. ❒ Equipment and adequate water supply for emergency response and fire protection services, and ❒ By-laws and agreements respecting emergency response and ❒ Provide critical incident stress management for emergency response personnel and provide and coordinate resources used for search and rescue. ❒ Establish an incident management system for directing and managing emergency response services at the site of an emergency or disaster. ❒ Issue directives about how to dispose of combustibles and explosive materials or other things that may constitute a fire menace. ❒ Provides emergency response services on behalf of the province of Manitoba.	❒ Monitors emergency incidents throughout the province. ❒ The Fire Commissioner has the authority to exercise certain powers at the scene of an emergency or disaster if deemed necessary to meet the needs of the emergency and to eliminate or reduce its effect. ❒ Order the evacuation of land or premises, and / or calling on peace officers or a police force to assist with an evacuation. ❒ Provide an Incident Commander during the response phase of an emergency if it has been determined that an adequate Incident Command system may not be in place at a particular site or location. ❒ Provide on-site technical advice and / or assistance to municipal fire services. ❒ Provide and coordinate rescue activities and resources during a provincial emergency. ❒ Provide assistance to the Mutual Aid coordinators respecting municipal fire services emergency response. ❒ Provide logistical support to the RCMP for provincial ground search and rescue and clandestine drug operations. ❒ Provide building / structure safety inspection services. ❒ Coordinate and / or provide fire protection for communities during Department of Conservation Fire Program forest fires. ❒ Coordinate the Provincial Volunteer Ground Search and Rescue (GSAR) network. ❒ Operate the Provincial Urban Search and Rescue (USAR) ❒ Coordinate 3 Hazardous Materials Technician response teams (CBRN): ❒ Chemical, Biological, and Radiological & Nuclear	❒ Fire investigators work closely with law enforcement to determine the cause and origin of every fire in Manitoba. ❒ Information gathered at the fire scene is compiled and used to design fire and life safety programs for target groups and to reduce fire loss across Manitoba. ❒ Complete a "lessons learned" process based on the scope of involvement and provide any feedback to the industrial operator. ❒ Participate in multi-agency debriefings.
***SUSTAINABLE DEVELOPMENT**	❒ When necessary, specialized expertise from any of the Department's program areas may be called out to assist in the response to an environmental accident. The response team has access to all of the resources of the provincial government and, through agreement, the resources of the federal government as well. ❒ The Manitoba Emergency Plan identifies Manitoba Sustainable Development as the lead provincial agency for dangerous goods incidents. ❒ Provide advice and assistance in waste disposal.	General ❒ Provide support to regulatory enforcement services. ❒ Provide supplementary emergency radio communication. ❒ Provide specialized transportation equipment and operations, e.g., ATVs, snowmobiles, boats and bombardiers. ❒ Assist in acquiring helicopter / aircraft resources. ❒ Assist the Office of the Fire Commissioner in search and rescue operations. ❒ Administer public access and egress systems within the flood plain and community rink dikes, in cooperation with Infrastructure and Transportation, Water Stewardship, and Justice. ❒ Provide other regional resource, staff, equipment, and infrastructure in support of emergency operations. Fire ❒ Direct forest fire operations. ❒ Provide forest fire fighting equipment. ❒ Provide technical advice and assistance to other departments and local authorities about forest fire operations. Environmental Emergency Response Program ❒ Operates within the mandates of *The Dangerous Goods Handling and Transportation Act* and *The Environment Act*. This Act gives Environment Officers and Inspectors special powers in emergencies to enter any land or building, control and clean up releases and take any emergency actions required to protect persons, property and the environment. ❒ The Emergency Response Team responds to releases or potential releases of contaminants that may have a detrimental effect on the physical environment or public health. ❒ Direct the on-site response to environmental accidents. ❒ Oversee operations for contaminant monitoring and analysis. ❒ Direct environmental accident spill control, clean-up operations, and disposal arrangements. ❒ Arrange for the provision of technical personnel and equipment resources in support of law enforcement for dealing with Clandestine Drug Labs and as part of the provincial Chemical, Biological, Radiological, Nuclear, and Explosive (CBRNE) Response Team. ❒ Provide technical environmental advice to local authorities, departments, and agencies. ❒ Provide advice on public protection measures (evacuation, shelter-in-place and reentry). ❒ Provide support to the Department of Water Stewardship - Office of Drinking Water by undertaking initial sampling, testing and assessment at the emergency site. ❒ Provide assistance in monitoring discharges and ensuring appropriate mitigation and response actions are taken to reduce the impact of liquid releases for land based spills and to ensure watercourses are protected. Water Stewardship ❒ Coordinate, plan, and direct flood control operations. ❒ Plan collection of aerial photography and other aerial imagery. ❒ Plan ice jam mitigation program, and deploy ice jam mitigation equipment. ❒ Provide flood forecasting and monitoring services. ❒ Provide public information on flood forecasts, regulation of water control structures, and flood-related activities. ❒ Coordinate and provide provincial direction for the operation of flood control works (e.g. Red River Floodway, Portage Diversion). ❒ Administer public access and egress system within the flood plain and community ring dikes, in cooperation with the Departments of Conservation, Infrastructure and Transportation, and Justice. ❒ Coordinate with Department of Infrastructure and Transportation in the distribution of sandbags, sandbagging equipment, and water barriers. ❒ Coordinate with Department of Infrastructure and Transportation in the provision of engineering and technical advice and assistance to municipalities concerning flood protection measures. ❒ Provide advice to municipalities and Departments of Conservation and Infrastructure and Transportation on the most efficient and effective use of flood fighting resources. ❒ Provide permission to cut roads and create water diversions.	❒ Complete a "lessons learned" process based on the scope of involvement and provide any feedback to the industrial operator. ❒ Participate in multi-agency debriefings. Environmental Emergency Response Program ❒ Participate in the evaluation of the incident and the potential area at risk from product releases.
MANITOBA HEALTH, HEALTHY LIVING & SENIORS	❒ Manitoba Public Health aims to provide the leadership and coordination for an integrated approach to public health programs and services. ❒ The core functions of public health are population health assessment, health surveillance, disease, injury prevention, health promotion and health protection. ❒ To focus on the prevention and control of diseases and the promotion of health. ❒ Liaise, collaborate and coordinate on health-related matters with all federal and provincial agencies. ❒ Ensure continuity of care at health care organizations providing health services that are the responsibility of Manitoba Health and Healthy Living.	❒ Monitor and support Regional Health Authority (RHA) and health care organization emergency / disaster management activities. ❒ Evaluate the risk of negative health outcomes to the public. ❒ Provide information, advice and guidance to the public on health-related issues. ❒ Contribute health-related information to other sectors, organizations, and agencies. ❒ Secure, coordinate, and distribute necessary medical resources (e.g. human resources, supplies, vaccines, etc.) to support RHAs and health care organizations in response to the requirements of an emergency / disaster. ❒ Coordinate air ambulance evacuations (i.e. Lifeflight and basic air ambulance carriers) and ground medical evacuations. ❒ Coordinate the deployment of National Emergency Stockpile System (NESS) resources in Manitoba. ❒ Ensure the provision of institutional and community-based (public) health services in response to community needs during and immediately after an emergency / disaster. ❒ Support RHAs and health care organizations in the coordination of evacuations of health care facilities as required. ❒ Assign liaison officers and / or on-site response personnel to support RHAs and health care organizations as required.	❒ Assist with the investigation of incidents that result in serious injuries or death to workers under provincial and territorial jurisdiction. ❒ Complete a "lessons learned" process based on the scope of involvement and provide any feedback to the industrial operator. ❒ Participate in multi-agency debriefings.

*OFC - Office of the Fire Commissioner *SD - Sustainable Development

FEDERAL AGENCY ROLES

	BEFORE THE INCIDENT	DURING THE INCIDENT	AFTER THE INCIDENT
*Environment & Climate Change Canada	Environment & Climate Change Canada's Environmental Emergencies Program (EEP) protects Canadian and their environment fro the effects of environmental emergencies through provision of science-based expert advice and regulations. The key Acts and Regulations that govern ECCC's role in environmental emergencies that allow it to deliver its mandate are: ❒ *Canadian Environmental Protection Act, 1999* ❒ *Fisheries Act—Pollution Prevention Provisions;* ❒ *Migratory Birds Convention Act, 1994;* ❒ *Statutory Notification Requirements—EC's Environmental Notification System.* ❒ *Environmental Emergencies Regulations*.	During an environmental emergency, *The National Environmental Emergencies Centre (NEEC)* is the focal point for ECCC. ECCC's services during an environmental emergency: ❒ Collaborate with federal, provincial, territorial and international environmental protectin agencies to enable rapid sharing of information. ❒ Convene and chair a Science Table of experts and stakeholders to develop consensus based advice to the Lead Agency. ❒ Identify environmentally sensitive areas and priorities (sensitivity and resource at risk mapping). ❒ Advise on mitigation and cleanup measures. ❒ Provide support and guidance in the assessment of oiled shorelines to prioritize their protection and cleanup (Shoreline Cleanup Assessment Technique (SCAT)). ❒ Advice on the fate and behavior of the spilled product. ❒ Advice on sampling and laboratory analysis. ❒ Provide weather forecasting and spill dispersion modelling to identify where these substances are likely to move in the environment. ❒ Provided expertise on the migratory bird resources and species at risk, including on-site assessment and determination of wildlife impact. ❒ Can conduct post-emergency assessments.	❒ ECCC can conduct post-emergency assessments. ❒ Provide specialized advice in shoreline clean-up assessment techniques (SCAT). ❒ Provide Advise on mitigation and cleanup measures..
*DFO Canadian Coast Guard	The Canadian Coast Guard is the lead federal agency for ensuring appropriate response to all ship-source and unknown mystery spills in Canadian waters and waters under international agreements. ❒ Establishes appropriate and nationally consistent level of preparedness and response services in Canadian waters. ❒ Design and develop related regulations, policies, strategies and tools. ❒ Review, assess and monitor activities associated with fish habitat to ensure their compliance with the Fisheries Act and Species at Risk Act. ❒ Conduct environmental assessments under the Canadian Environmental Assessment Act. ❒ Design, develop and implement communication and education strategies.	❒ Any amount of hydrocarbons entering a waterway frequented by fish or occupied by waterfowl is deemed to be in contravention of the Federal Fisheries Act and must be reported to the Department of Fisheries and Oceans. ❒ Work together with provincial environment protection agencies and may be initially notified by ECCC. ❒ May send personnel to the site if there has been or could potentially be an impact to fish or fish habitat. ❒ Monitors and investigates all reports of marine pollution in Canada in conjunction with other federal departments. ❒ Maintains communications with the program's partners, including Transport Canada and ECCC, to ensure a consistent coordinated approach to marine pollution incident response. ❒ Aids in search and rescue operations.	❒ Work closely with ECCC, The Canadian Coast Guard and other provincial environmental agencies.
NAV Canada	NAV Canada is a private company who coordinates the safe and efficient movement of aircraft in Canadian domestic airspace and international airspace assigned to Canadian control. Flight Information Centre (FIC) – FIC Services Each Flight Information Centre is responsible for providing its particular service area with the following services, which pilots rely upon for safe flight planning and operations: ❒ Emergency ❒ Aviation Weather Briefing ❒ Flight Planning ❒ En-route Flight Information Services ❒ Remote Aerodrome Advisory Services (RAAS)	❒ As requested by the provincial oil and gas regulator, the Flight Information Centre will issue a NOTAM (Notice to Airmen). ❒ To close air space beyond an airport (e.g. above a sour gas release), the Flight Information Centre can be contacted by the provincial oil and gas regulator. Depending on the situation, the Flight Information Centre may issue a NOTAM to close the air space in a defined area.	❒ Rescind the NOTAM and re-open air space that was closed due to emergency.
Health Canada	❒ Sets national standards to keep the environment healthy, keep water and air pollution low and Canadians safe. ❒ Maintains a nationwide network of radiation monitoring stations and can act if levels spike. ❒ Under Chemicals Management Plan, assess health risks from chemicals used in manufacturing and agriculture and require users to prove they actually need the chemicals to make their products ❒ Sets strict rules on how chemicals are used in order to limit human exposure. ❒ Preparedness exercises are designed to test how well the plans and procedures work during simulated emergency situations. Such exercises help the government identify strengths as well as any problems or inadequacies in preparedness plans and procedures so that these can be addressed before, not after, an actual emergency.	❑ During a health emergency or disaster, Health Canada and the Public Health Agency of Canada are responsible for supporting emergency health and social services in the provinces and territories.	❒ Work collaboratively with the provinces and territories to test ways in which the Canadian health care system can be improved and ensure its sustainability for the future.
Public Health Agency of Canada	The Centre for Emergency Preparedness and Response (CEPR) is responsible for: ❒ Developing and maintaining national emergency response plans for the Public Health Agency of Canada and Health Canada. ❒ Assessing public health risks during emergencies. ❒ Contribution to keeping Canada's health and emergency policies in line by collaborating with other federal and international health and security agencies. ❒ The health authority in the Government of Canada on bioterrorism, emergency health services and emergency response. ❒ Strengthen intergovernmental collaboration on public health and facilitate national approaches to public health policy and planning. ❒ Manages emergency preparedness and emergency response plans and keeps them up to date. ❒ Develops and runs exercises to train emergency workers. ❒ Develops and delivers training courses that teach health workers how to respond to emergencies.	❑ In an emergency situation, the Office of Emergency Response Services (OERS) is responsible for supporting emergency health and social services in the provinces, territories or abroad. It manages the National Emergency Stockpile System (NESS), which includes medical, pharmaceutical and related emergency supplies. The Office is responsible for the federal response to emergencies that have health repercussions; this includes the deployment of health emergency response teams (HERT). ❑ If a public health emergency grows beyond one province and/or territory, the Public Health Agency of Canada usually gets involved.	❒ Work with Health Canada to test ways in which the Canadian health care system can be improved and ensure its sustainability for the future.
*Aboriginal Affairs and Northern Development Canada	❒ Provide government leadership in response to Arctic Seas contingencies related to oil and gas exploration and production activities. ❒ Ensure that the First Nation communities have emergency management services comparable to those of Canadians in similar situations. ❒ Work to establish an all-hazards approach for responding to emergencies that impact First Nation communities. ❒ Responsible for developing, exercising, implementing and maintaining regional emergency management plans. ❒ Responsible for negotiating agreements with their respective provincial government for the delivery of management services in First Nations communities. ❑ Each region is responsible for working with First Nations communities and emergency management organizations to evaluate the threat and risks associated with emergencies and take steps to mitigate potential emergencies. ❑ Regions and HQ are responsible for activities arising from the preparedness phase of emergency planning, including on-going training, exercising and supporting the development and maintenance of First Nations Emergency Management Plans. ❑ Responsible for conducting national or regional exercises, including table top exercises. ❑ The Emergency and Issues Management Directorate (EIMD) is responsible for developing, exercising, implementing and maintaining AANDC's National Emergency Management Plan. ❑ EIMD will work collaboratively with regional counterparts, Communications Branch, and other stakeholders to update this plan and the annexes, as required by changes in policy, legislation, or to incorporate lessons learned from exercises and actual emergencies. ❑ The plan will undergo a full review at a minimum of every 3 years.	❑ The AANDC HQ EM Operations Centre liaises with the Government of Canada (GOC) in an effort to ensure an integrated GOC response to emergencies in First Nations communities. ❑ If an emergency becomes significant, Operations can activate AANDC's National Emergency Operations Centre which provides an enhanced scalable response including 24/7 service. ❑ The AANDC HQ Emergency Management (EM) Operations Centre is responsible for coordinating and monitoring emergency management activities impacting First Nations communities form a national perspective. ❑ Operations staff are responsible for monitoring, validating, and providing situational awareness products such as notifications, summaries, fire and flood reports to senior management, the Government Operations Centre, law enforcement, and other agencies on emergencies impacting First Nations communities. ❑ Regional emergency management coordinators are responsible for coordinating and liaising with First Nations and the local emergency management organizations. ❑ AANDC headquarters and regions must work closely together to ensure timely flow of information. ❑ Regions are responsible for reporting any emergencies to AANDC's operations centre located within EIMD in headquarters. ❑ EIMD is responsible for ensuring senior management is kept informed of any emergencies threatening First Nations communities through the preparation of various briefing reports, notifications and summaries as the event develops. ❑ EIMD is committed to search and recovery based on compassionate grounds. When a search and rescue operation is terminated and the individual(s) have not been located, the department may fund the extension of search and recovery activities. ❑ Regions should identify and communicate with non-government organizations located within their area of responsibility to determine what they can offer First Nations during emergencies. ❑ Mitigation of the effects of emergencies on First Nations reserves for which the department has legal responsibility, including arrangements for community evacuation and temporary shelter, and provision of territorial support. ❑ Coordination of federal assistance and response to emergencies in response to requests from territorial government authorities, for all cases in which the mandate does not clearly fall to another federal Minister. ❑ Provide an assurance to the province that AANDC will provide funding to cover costs related to emergency assistance in First Nations communities. ❑ Response activities include emergency public communication, search and rescue, emergency medical assistance and evacuation.	❒ Once an incident is terminated, key staff and stakeholders are to be regrouped as soon as possible to conduct a formal debrief to identify areas for improvement and to identify key lessons learned. ❒ A lessons learned and after action report should be completed no later than 30 calendar days after the conclusion of the emergency. It is to be shared nationally and on a constructive basis to enhance the department's emergency management capabilities. ❒ Mitigate the effects of an emergency on First Nations people in the area. ❒ Work with the Chief and Council to assess the situation, determine the most effective way to repair damage and ensure delivery of programs and services to the community. ❒ AANDC will compile statistical data pertaining to which First Nations communities that are impacted by emergencies, the causes and severity of the emergency as well as other trends that will assist with preparation initiatives in future years. ❒ Recovery activities include the return of evacuees, trauma counselling, reconstruction, economic impact studies and financial assistance for eligible costs. ❒ Returning a community to a state of normalcy is a priority.

*DFO – Canadian Department of Fisheries & Oceans *PSC - Public Safety Canada *AANDC – Aboriginal Affairs and Northern Development Canada *ECCC - Environment & Climate Change Canada

November 2017 H2Safety Services Inc.

Canada

FEDERAL AGENCY ROLES

Canada

	BEFORE THE INCIDENT	DURING THE INCIDENT	AFTER THE INCIDENT
*FNIH	❒ Deliver public health and emergency management for on-reserve First Nations and Inuit communities. ❒ Maintain a 24 hour emergency telephone service. ❒ Receive Emergency Response Plans.	❑ Monitor the health effects of the incident on the First Nations people of the area.	❒ Ensure appropriate data is collected to monitor the health effects of the incident. ❒ Recommend further investigation or research after the event is warranted.
TRANSPORT CANADA *CANUTEC	❒ Regulate the handling, offering for transport and the transport of dangerous goods by all modes in order to ensure public safety. ❒ Maintain a 24 hour emergency telephone service. ❒ Federal regulations require that CANUTEC be contacted in the event of an incident or accident involving dangerous goods and infections substances. ❒ Maintains records of over 2 million Safety Data Sheets (SDS).	❑ Assist emergency response personnel in handling dangerous good emergencies including advice on ❑ Chemical, physical and toxicological properties and incompatibilities of the dangerous goods ❑ Health hazards and first aid ❑ Fire, explosion, spill or leak hazards ❑ Remedial actions for the protection of life, property and the environment ❑ Evacuation distances ❑ Personal protective clothing and decontamination ❑ CANUTEC staff does not go to the site of an incident, however, should on-site assistance be required, CANUTEC can assist in the activation or industry emergency response plans. ❑ Provide communication links with the appropriate industry, government or medical specialists.	❒ Maintain voice communication and written information records for two years for the protection of all parties.
*EMERGENCY RESPONSE ASSISTANCE CANADA	Emergency Response Assistance Canada (ERAC) is a not for profit cooperative organization built by industry for industry providing safe, timely effective, sustainable, cost effective flammable liquids and gases emergency preparedness and response assistance to all Plan Participants and Stakeholders of ERAC. ❒ ERAC will act on behalf of the Plan Participant to develop, submit, update, and respond to the requirements of the Plan Participant ERAP submitted to and approved by Transport Canada. ❒ ERAC provides a network of experienced, trained Technical Advisors (TAs), Remedial Measures Advisors (RMAs) and Response Teams who respond to rail, road and stationary tank incidents involving flammable gases, Class 2.1 Liquefied Petroleum Gas (LPG) emergencies and Flammable Liquids Class 3 rail transport emergencies. The emergency responders are constantly available through a 24-hour activation telephone number. ❒ Once a year, there is Regional Training that is held in each region for the Remedial Measures Advisors, Technical Advisors, Response Team Leaders, Alternate Team Leaders as well as all Response Team Members to test their skills and update them on any new developments. Also, once every two years, National Training Session is held for all the Remedial Measures Advisors, Technical Advisors, Response Team Leaders and Alternate Team leaders across Canada.	Provides emergency response to plan participants who transport the following products by road or rail, or those who store these products in tanks with capacities of 450 litres or greater. These products are gases at standard temperatures and pressure, and include: Propane (UN1978), Butane (UN1011), Propylene (UN1077), Butylene (UN1012), Isobutene (UN1969), Isobutylene (UN1055). It is recognized that these products may contain a concentration of condensate and/or quantities of other elements including hydrogen sulphide. ❒ Response is also provided to emergencies involving Butadiene – 1,3 (stabilized) (UN1010). In addition we respond to the following Flammable Liquids transported by rail only: UN1170 Ethanol; UN1202 Diesel Fuel; UN1203 Gasoline; UN1267 Petroleum Crude Oil; UN1268 Petroleum Distillates N.O.S.; UN1863 Fuel Aviation, Turbine Engine; UN1987 Alcohols, N.O.S.; UN1993 Flammable Liquid, N.O.S.; UN3295 Hydrocarbons, Liquid, N.O.S.; UN3475 Ethanol and Gasoline Mixture; UN3494 Petroleum Sour Crude Oil, Flammable, Toxic ❒ If LPG/Flammable Liquid Incident, Emergency Call Centre Operator receives an activation (notification) phone call. ❒ Emergency Call Centre Operator sends group email to Home Based Coordinator. ❒ Home Based Coordinator / Technical Advisor conferenced into call to assist with information gathering. ❒ Caller requires technical advice. ❒ Home Based Coordinator / Technical Advisor provides technical advice. ❒ Caller requests response team. ❒ Confirm plan participant involvement. ❒ Plan participant notified of activation. ❒ Home Based Coordinator / Technical Advisor activate plan. ❒ Mobilization phase ERAC-002. ❒ Initial incident size-up. ❒ Damage and spill assessment. ❒ Develop Incident Action Plan. ❒ Execute IAP & initiate planning for next operational period. ❒ Update Emergency Call Centre Operator and Home Based Coordinator.	❒ Terminate and de-mobilize. ❒ Post-incident assessment and communication program.
*PSC	❒ Public Safety Canada works with provincial and territorial officials to ensure first responders and emergency management personnel are well-prepared through education, support and exercises. ❒ Responsible for promoting and coordinating the preparation of departmental emergency management plans as well as coordinating the government's response to an emergency through the Government Operations Centre (GOC).	❑ Public Safety Canada houses the Government Operations Centre at the hub of the national emergency management system. It's an advanced centre for monitoring and coordinating the federal response to an emergency.	❒ In the event of a large-scale natural disaster where response and recovery costs exceed what individual provinces and territories could reasonably be expected to bear on their own, PS provides financial assistance to the provincial and territorial governments through the Disaster Financial Assistance Arrangements (DFAA). Assistance is paid to the province or territory – not directly to individuals or communities. The provincial or territorial governments design, develop and deliver disaster financial assistance, determining the amounts and types of assistance that will be provided to those who have experienced losses.

*NATIONAL ENERGY BOARD ROLES & RESPONSIBILITIES

The NEB's top priority in any emergency is to make sure that people are safe and secure, and that property and the environment are protected. Any time there is a serious incident, NEB inspectors may attend the site to oversee a company's immediate response. The NEB will require that all reasonable actions are taken to protect employees, the public and the environment. Further, the NEB will verify that the regulated company conducts adequate and appropriate clean-up and remediation of any environmental effects caused by the incident.

And/or

As lead regulatory agency, the NEB:

- ❑ Monitors, observes and assesses the overall effectiveness of the company's emergency response in terms of:
  - Emergency Management
  - Safety
  - Security
  - Environment
  - Integrity of operations and facilities; and
  - Energy Supply.
- ❑ Investigates the event, either in cooperation with the Transportation Safety Board of Canada, under the Canada Labour Code, or as per the National Energy *Board Act or Canada Oil & Gas Operations Act* (whichever is applicable)
- ❑ Inspects the pipeline or facility
- ❑ Examines the integrity of the pipeline or facility
- ❑ Requires appropriate repair methods are being used
- ❑ Appropriate environmental remediation of contaminated areas is conducted
- ❑ Coordinate stakeholder and Aboriginal community feedback regarding environmental clean-up and remediation
- ❑ Confirms that a company is following its Emergency Procedures Manual (s), commitments, plans, procedures, and NEB regulations and identifies non-compliances
- ❑ Initiates enforcement actions as required
- ❑ Approves the restart of the pipeline.

DEFINITIONS

INCIDENT

An occurrence that results in:

- ❑ The death of or serious injury to a person (as defined in the OPR or TSB regulations);
- ❑ Missing person [as reportable pursuant to the Canada Oil and Gas Drill and Production Regulations (DPR) under the Canada Oil and Gas Operations Act (COGOA) or the Oil and Gas Operations Act (OGOA)];
- ❑ Releases that may have significant adverse impact on the environment;
- ❑ Unintended fire or explosion that causes a pipeline or facility to be inoperative;
- ❑ Unintended or unplanned release of LVP hydrocarbons in excess of 1.5 m3 that leaves company property or the right of way;
- ❑ Unintended or uncontrolled release of gas or HVP hydrocarbons; and
- ❑ Operation of a pipeline beyond its design limits as defined by CSA Z662, CSA Z276 or any operating limits imposed by the NEB.
- ❑ A rupture; or
- ❑ A toxic plume as defined in CSA Z662.

RELEASE

Includes discharge, spray, spill, leak, seep, pour, emit, dump and exhaust.

SERIOUS INJURY

Includes an injury that results in:

- ❑ the fracture of a major bone;
- ❑ the amputation of a body part;
- ❑ the loss of sight in one or both eyes;
- ❑ internal hemorrhage;
- ❑ third degree burns;
- ❑ unconsciousness; or
- ❑ the loss of a body part or function of a body part.

National Energy Board definitions according to the definition provided by "Onshore Pipeline Regulations, 1999"

*TRANSPORTATION SAFETY BOARD MANDATE

The Canadian Transportation Accident Investigation and Safety Board Act provides the legal framework that governs TSB activities. Our mandate is to advance transportation safety in the marine, pipeline, rail and air modes of transportation by:

- ❑ conducting independent investigations, including public inquiries when necessary, into selected transportation occurrences in order to make findings as to their causes and contributing factors;
- ❑ identifying safety deficiencies, as evidenced by transportation occurrences;
- ❑ making recommendations designed to eliminate or reduce any such safety deficiencies; and
- ❑ reporting publicly on our investigations and on the findings in relation thereto.

As part of its ongoing investigations, the TSB also reviews developments in transportation safety, and identifies safety risks that they believe the government and the transportation industry should address to reduce injury and loss.

To instill confidence in the public regarding the transportation accident investigation process, it is essential that an investigating agency be independent and free from any conflicts of interest when investigating accidents, identifying safety deficiencies, and making safety recommendations. As such, the TSB is an independent agency, separate from other government agencies and departments, that reports to Parliament through the President of the Queen's Privy Council for Canada. Our independence enables us to be fully objective in making findings as to causes and contributing factors, and in making transportation safety recommendations.

In identifying the causes and contributing factors of a transportation incident, it is not the function of the Board to assign fault or determine civil or criminal liability. However, the Board does not refrain from fully reporting on the causes and contributing factors merely because fault or liability might be inferred from the Board's findings. No finding of the Board should be construed as assigning fault or determining civil or criminal liability. Findings of the Board are not binding on the parties to any legal, disciplinary, or other proceedings.

http://www.bst-tsb.gc.ca/eng/qui-about/mission-mandate.asp

*ERAC - Emergency Response Assistance Canada *CANUTEC - Canadian Transport Emergency Centre *NEB - National Energy Board *TSB - Transportation Safety Board PSC - Public Safety Canada *FNIH – First Nations & Inuit Health

November 2017

H2Safety Services Inc.

Purpose

To provide guidance on regulatory and company reporting and notification requirements to internal stakeholders. This standard may not cover every possible regulatory reporting scenario so must be used in conjunction with applicable regulations, standards, directives and regulatory guidance documents.

Scope

This includes verbal and written reporting. Verbal reports include immediate notification to appropriate internal departments, as well as external reporting to federal/provincial/municipal agencies on provincially and federally regulated lines (see *Terms & Definitions*).

Figure 1 – Incident Reporting Table Usage Guide

Table 1 – Significant Incident Notifications

Table 2 – Releases/Leaks/Spills

- Table 2A – Commodities
- Table 2B – Transport of Dangerous Goods
- Table 2C – Non-Commodities
- Table 2D – Halocarbons

Table 3 – People (Occupational Illness/Injury)

- Table 3A – Fatality/ Serious Injury
- Table 3B – Loss of Consciousness/ Electric Shock/ Toxic Atmosphere/ Oxygen Deficient Atmosphere
- Table 3C – Medical Aid/ Modified Work
- Table 3D – First Aid

Table 4 – Property Damage

- Table 4A – Structural Integrity/ Structural Threat to the Pipeline/ Operating Beyond Design Limits (i.e., Overpressures)
- Table 4B – Fires/ Explosions
- Table 4C – Lifting/Elevating Devices & Other Property Damage
- Table 4D – Motor Vehicle Incident/Damage
- Table 4E – Nuclear Densitometer Damage/ Explosives Near Densitometer
- Table 4F – Pressure Vessels/ Boilers/Heaters/ Heat Exchangers
- Table 4G – Alberta Transmission Facilities

Table 5 – Rescue/Near Misses

Table 6 – Environment - Adverse Environmental Effects or Environmental Non-Compliance

Table 7 – Security

Figure 2 – TSB/NEB Regulatory Incident Reporting
Figure 3 – AER Regulatory Incident Reporting
Appendix I – Agency Contact Phone Numbers
Appendix II – Reportable Quantities of Transported Dangerous Goods
Appendix III – TSB Verbal Notification Guidance Worksheet
Appendix IV - Commentary

Responsibilities

Workers

Workers are responsible for:

- notifying their immediate supervisor of any incidents

Regions/Projects

Regions/projects are responsible for:

- initiating incident reporting to applicable regulators, agencies, local police and/or other stakeholder departments as outlined in the Incident Reporting Tables
- completing the incident investigation within the timelines specified and documented within the incident management systems
- completing region-identified reporting in accordance with the Incident Reporting Tables
- completing the High Value Learning Event (HVLE) in EnCompass, where applicable

Control Center

Control Center is responsible for:

- initiating incident reporting to applicable regulators in the event of overpressure incidents, as more specifically outlined in the Incident Reporting Tables
- initiating internal email notifications for temperature threshold exceedances
- contacting regional on-call individual when potential contaminated soil is discovered

Land Services

Land Services is responsible for:

- initiating internal incident reporting as outlined in the Incident Reporting Table 5.3
- notifying the region when consent of a 3rd party crossing or proximity agreement has been suspended

Mainline Projects

Mainline Projects (MLP) is responsible for notifying the control center when potential contaminated soil is discovered.

Petroleum Quality

Petroleum Quality is responsible for:

- initiating internal incident reporting as outlined in the Incident Reporting Table 4A.2
- contacting Regulatory Affairs when an inappropriate product is discovered

Pipeline Integrity

Pipeline Integrity (PI) is responsible for:

- completing PI identified reporting in accordance with the Incident Reporting Tables (i.e., abnormalities that reduce the structural integrity of the pipeline)
- providing support to Operations and control center during incident investigations

Regional Right-of-Way Services

Regional Right-of-Way Services is responsible for:

- sending the preliminary notification to applicable regulators and notifying internal stakeholders for any activity in the immediate vicinity of the pipeline which poses a threat to the structural integrity of the pipeline

Regulatory Affairs, Health & Safety, Damage Prevention, Environment and Radiation Safety Officer

Regulatory Affairs, Health & Safety (H&S), Damage Prevention, Environment and Radiation Safety Officer are responsible for:

- completing written regulatory reports and submitting them to applicable regulators or agencies
- providing guidance on regulatory reporting requirements

Requirements

Using the Incident Reporting Tables

Regulators and outside agencies should not be contacted until the incident (i.e., suspected leak, suspected pressure drop, etc.) is confirmed to have occurred.

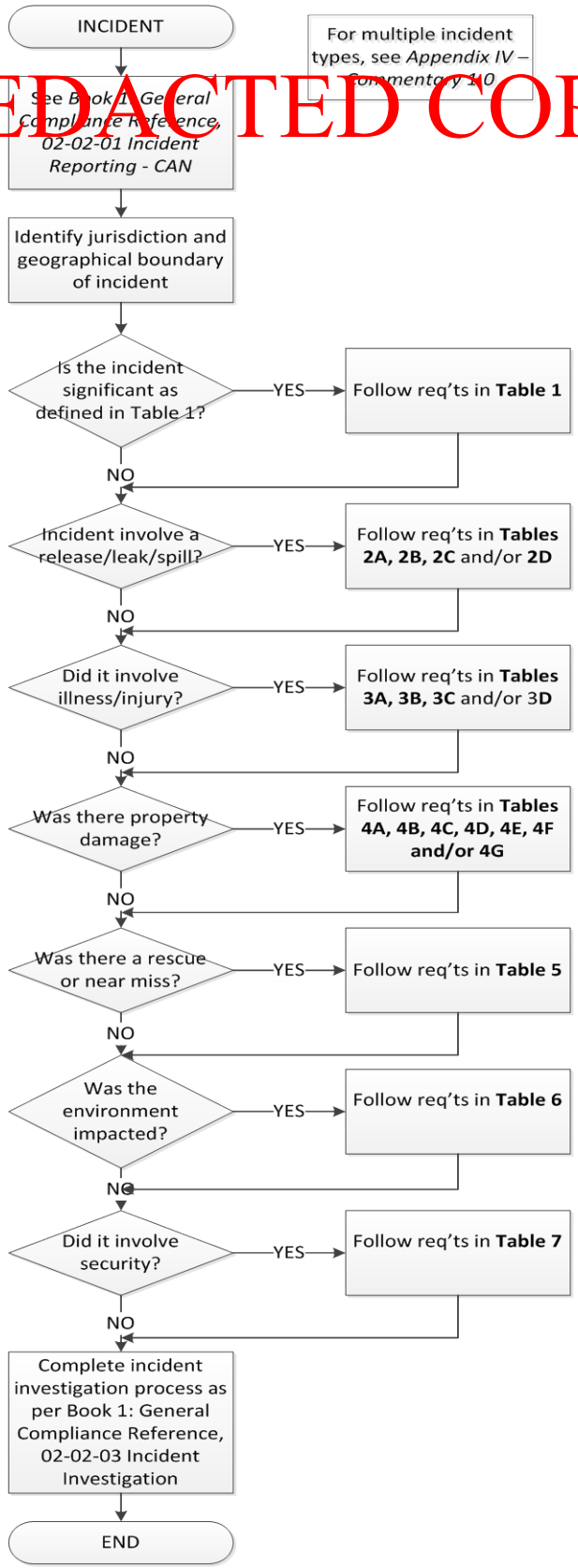


Figure 1
Incident Reporting Table Usage Guide

Table 1
Significant Incident Notifications

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines Immediately
Federally or Provincially-regulated pipelines	**[1.1] In all Provinces and Territories** Pipeline incident that results in any of the following: • release on or off property during normal operations or maintenance activities - ≤ 0.8 m^3 (5 bbl) but may be a risk to workers, public or environment (i.e., NGL release, liquid release into waterbody, etc.) - > 0.8 m^3 (5 bbl) • immediately reportable to the National Energy Board and the Transportation Safety Board [federally-regulated pipeline] or Alberta Energy Regulator [Alberta provincially-regulated pipeline] • results in hospitalization or death of an employee or contract worker • affects the pipeline system - in excess of 4 hours o on a pipeline that is in apportionment; or o simultaneous outage of multiple pipelines or a terminal facility, with multiple incoming/outgoing lines (i.e., power outage, odor call in, etc.) - in excess of 12 hours on a pipeline that is not in apportionment - results in a feeder line being shut-out, a refinery running out of crude or significant customer issue likely to be escalated • has a reasonable likelihood of being picked up by media as event of significance ***NOTE***: *For additional guidance, see Appendix IV – Commentary (1.1)*	Send email notification to mailing group 'LP Significant Incident Notifications' * (*Regional / Department Director or designate*) Initiate call-up notification process** (*Regional / Department Director or designate*)

Table 2A
Releases/Leaks/Spills – Commodities

The Canadian Environmental Protection Act, Environmental Emergency Regulations apply to any product that has a flashpoint ≤ 23°C or a boiling point ≤ 35°C; or any product that is subject to the TDG Act and is being loaded or unloaded at a facility. A release of these products (e.g., condensates, diluents, gasoline) triggers reporting to Environment Canada via the provincial agency. Volume thresholds are aligned with provincial requirements and no further work is required with the initial report. The requirement to report is addressed by complying with the applicable provincial reporting criteria outlined below.

- *If release had/has potential to migrate offsite or affects a natural habitat within a facility (including impact to fish and fish habitat), see Table 6*
- *If release, regardless of volume, has entered water or may cause/is causing/has caused an adverse environmental effect, see Table 6*
- *If historical contamination is discovered, contact Environment as provincial and/or federal reporting may be required*
- *Pipeline right-of-way is considered offsite, outside of facility, off-lease*
- *Record in EnCompass all commodity releases > 1 L and any commodity releases < 1 L that, if left unattended, are likely to exceed the threshold or result in increased risk or trigger regulatory reporting (for recording guidance, see Appendix IV Commentary, Section 2A)*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*
- *The Saskatchewan Ministry of Economy Integrated Resource Information System (IRIS) is located at http://www.saskatchewan.ca/IRIS*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**Within 7 days****	**Within 30 days**	**Within 12 weeks**
Federally-regulated pipelines	**[2A.1] In all Provinces and Territories** An event that includes any of the following: – an unintended or uncontrolled LVP hydrocarbon release in excess of 1.5m^3 (9.4 bbls) that leaves company property or occurs on or off the right-of-way – a rupture (an instantaneous release that immediately impacts operation of a pipeline segment such that the pressures of the segment cannot be maintained) – a toxic plume - a band of service fluid or other contaminant (e.g., hydrogen sulfide, smoke) resulting from an incident that causes people, including employees, to take protective measures (e.g., muster, shelter in place, evacuation). – an unintended or uncontrolled sweet natural gas or HVP release > 30,000 m^3 – any unintended or uncontrolled release of sour natural gas or hydrogen sulfide	Verbal to TSB* [3 hours] (*Region*) Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Initial Submission in OERS to NEB and TSB [3 hours] (*Region*) Notify Regulatory Affairs of OERS submission *(Region)* * *see Appendix III for guidance*	---	Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*) Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	Final Submission in OERS to NEB (*Regulatory Affairs*)

Table 2A
Releases/Leaks/Spills – Commodities

The Canadian Environmental Protection Act, Environmental Emergency Regulations apply to any product that has a flashpoint ≤ 23°C or a boiling point ≤ 35°C; or any product that is subject to the TDG Act and is being loaded or unloaded at a facility. A release of these products (e.g., condensates, diluents, gasoline) triggers reporting to Environment Canada via the provincial agency. Volume thresholds are aligned with provincial requirements and no further work is required with the initial report. The requirement to report is addressed by complying with the applicable provincial reporting criteria outlined below.

- *If release had/has potential to migrate offsite or affects a natural habitat within a facility (including impact to fish and fish habitat), see Table 6*
- *If release, regardless of volume, has entered water or may cause/is causing/has caused an adverse environmental effect, see Table 6*
- *If historical contamination is discovered, contact Environment as provincial and/or federal reporting may be required*
- *Pipeline right-of-way is considered offsite, outside of facility, off-lease*
- *Record in EnCompass all commodity releases > 1 L and any commodity releases < 1 L that, if left unattended, are likely to exceed the threshold or result in increased risk or trigger regulatory reporting (for recording guidance, see Appendix IV Commentary, Section 2A)*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*
- *The Saskatchewan Ministry of Economy Integrated Resource Information System (IRIS) is located at http://www.saskatchewan.ca/IRIS*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**Within 7 days****	**Within 30 days**	**Within 12 weeks**
Federally-regulated pipelines	**[2A.2] In all Provinces and Territories** – Unintended or uncontained release of LVP hydrocarbons in excess of 1.5 m³ (9.4 bbls) that is contained on company property (LVP hydrocarbons include refined and/or unrefined hydrocarbons from within the pipeline) a) Immediately reportable LVP incidents > 1.5m^3 (9.4 bbls) include, but are not limited to: – crude oil on tank roofs – crude oil on building concrete floors – pump seals – if drain system overflows (i.e. blocked drain, pump seal failure causing flow above system capacity, etc.) – releases from facility equipment (i.e., valves, traps, meters, mixers, flanges, threaded connections, etc.) – Unintended or uncontrolled release of gas or high-vapour pressure (HVP) hydrocarbons a) HVP includes natural gas liquids (NGL) b) 'Unintended' or 'uncontrolled' in this context means an event that is not part of planned pipeline maintenance or operation and occurs during construction, operation or abandonment and results in: – a release of gas or HVP hydrocarbons occurring at a rate > 0.1 kg/second from any malfunctioning or faulty part of a pipeline, facility or appurtenance including, but not limited to, seals, packing, gaskets, O-rings, plugs, valves; OR – a release of any size that occurs through the body of the pipeline of a welded connection – Unintended or uncontrolled release of a commodity other than gas, HVP hydrocarbons or LVP hydrocarbons ***NOTE***: *For additional guidance and rate of release calculation, see Appendix IV – Commentary (2A.2)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Initial submission in OERS to NEB and TSB [24 hours] (*Region*) Notify Regulatory Affairs of OERS submission *(Region)*	---	Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*) Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	Final Submission in OERS to NEB (*Regulatory Affairs*)
Federally or Provincially – regulated pipelines	**[2A.3] In all Provinces and Territories** – Unintended or uncontained release of LVP hydrocarbons < 1.5 m³ (9.4 bbls) ***NOTE***: *For additional guidance, see Appendix IV – Commentary (2A.3)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---

Table 2A
Releases/Leaks/Spills – Commodities

The Canadian Environmental Protection Act, Environmental Emergency Regulations apply to any product that has a flashpoint ≤ 23°C or a boiling point ≤ 35°C; or any product that is subject to the TDG Act and is being loaded or unloaded at a facility. A release of these products (e.g., condensates, diluents, gasoline) triggers reporting to Environment Canada via the provincial agency. Volume thresholds are aligned with provincial requirements and no further work is required with the initial report. The requirement to report is addressed by complying with the applicable provincial reporting criteria outlined below.

- *If release had/has potential to migrate offsite or affects a natural habitat within a facility (including impact to fish and fish habitat), see Table 6*
- *If release, regardless of volume, has entered water or may cause/is causing/has caused an adverse environmental effect, see Table 6*
- *If historical contamination is discovered, contact Environment as provincial and/or federal reporting may be required*
- *Pipeline right-of-way is considered offsite, outside of facility, off-lease*
- *Record in EnCompass all commodity releases > 1 L and any commodity releases < 1 L that, if left unattended, are likely to exceed the threshold or result in increased risk or trigger regulatory reporting (for recording guidance, see Appendix IV Commentary, Section 2A)*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*
- *The Saskatchewan Ministry of Economy Integrated Resource Information System (IRIS) is located at http://www.saskatchewan.ca/IRIS*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**Within 7 days****	**Within 30 days**	**Within 12 weeks**
Federally-regulated pipelines	**[2A.4] In all Provinces and Territories** Release of any amount of commodity from line pipe body. ***GUIDANCE:*** *For the purpose of this reporting requirement, any volume of commodity from the line pipe body that occurs on the right-of-way or any commodity release that exceeds 1.5 m^3 within a facility must be reported.* ***NOTE***: *For additional guidance, see Appendix IV – Commentary (2A.4)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Initial submission in OERS to TSB [24 hours] (Region) Notify Regulatory Affairs of OERS submission *(Region)* **see Appendix III for guidance*	---	Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*) Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---
Federally-regulated pipelines	**[2A.5] In Alberta** – any release that is reported to the NEB	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to AER (*Region*)	Written Release Report to AER *(Env Dept)*	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---
Federally-regulated pipelines	**[2A.6] In Saskatchewan** – any release ≥ 500 L (onsite) – any release ≥ 200 L (offsite) – any subsurface release	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to SK Ministry of Environment (*Region*)	---	Discharge Report Form to SK Ministry of Environment *(Env Dept)* Complete Incident Investigation Form and other applicable forms in EnCompass	---

Table 2A
Releases/Leaks/Spills – Commodities

The Canadian Environmental Protection Act, Environmental Emergency Regulations apply to any product that has a flashpoint ≤ 23°C or a boiling point ≤ 35°C; or any product that is subject to the TDG Act and is being loaded or unloaded at a facility. A release of these products (e.g., condensates, diluents, gasoline) triggers reporting to Environment Canada via the provincial agency. Volume thresholds are aligned with provincial requirements and no further work is required with the initial report. The requirement to report is addressed by complying with the applicable provincial reporting criteria outlined below.

- *If release had/has potential to migrate offsite or affects a natural habitat within a facility (including impact to fish and fish habitat), see Table 6*
- *If release, regardless of volume, has entered water or may cause/is causing/has caused an adverse environmental effect, see Table 6*
- *If historical contamination is discovered, contact Environment as provincial and/or federal reporting may be required*
- *Pipeline right-of-way is considered offsite, outside of facility, off-lease*
- *Record in EnCompass all commodity releases > 1 L and any commodity releases < 1 L that, if left unattended, are likely to exceed the threshold or result in increased risk or trigger regulatory reporting (for recording guidance, see Appendix IV Commentary, Section 2A)*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*
- *The Saskatchewan Ministry of Economy Integrated Resource Information System (IRIS) is located at http://www.saskatchewan.ca/IRIS*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**Within 7 days****	**Within 30 days**	**Within 12 weeks**
		Verbal to landowner, as soon as practicable *(Region)*		(*Region*)	
Federally-regulated pipelines	**[2A.7] In Manitoba** – any commodity release that results in an environmental adverse effect	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to MB Sustainable Development (*Region*)	Written Spill Report to MB Sustainable Development, if requested *(Env Dept)*	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---
Federally-regulated pipelines	**[2A.8] In Ontario** – any release (includes deposit, leak, emission or addition) of any solid, liquid, gas or odour that involves all of the following: – into natural environment (i.e., air, land, water); and – from or out of a man-made structure/container (i.e., pipeline); and – abnormal in quality or quantity in circumstances	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to MOECC (via Spills Action Center), Verbal to affected municipality and Verbal to owner of spilled pollutant (where the Company does not own pollutant) *(Region)*	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---

Table 2A
Releases/Leaks/Spills – Commodities

The Canadian Environmental Protection Act, Environmental Emergency Regulations apply to any product that has a flashpoint ≤ 23°C or a boiling point ≤ 35°C; or any product that is subject to the TDG Act and is being loaded or unloaded at a facility. A release of these products (e.g., condensates, diluents, gasoline) triggers reporting to Environment Canada via the provincial agency. Volume thresholds are aligned with provincial requirements and no further work is required with the initial report. The requirement to report is addressed by complying with the applicable provincial reporting criteria outlined below.

- *If release had/has potential to migrate offsite or affects a natural habitat within a facility (including impact to fish and fish habitat), see Table 6*
- *If release, regardless of volume, has entered water or may cause/is causing/has caused an adverse environmental effect, see Table 6*
- *If historical contamination is discovered, contact Environment as provincial and/or federal reporting may be required*
- *Pipeline right-of-way is considered offsite, outside of facility, off-lease*
- *Record in EnCompass all commodity releases > 1 L and any commodity releases < 1 L that, if left unattended, are likely to exceed the threshold or result in increased risk or trigger regulatory reporting (for recording guidance, see Appendix IV Commentary, Section 2A)*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*
- *The Saskatchewan Ministry of Economy Integrated Resource Information System (IRIS) is located at http://www.saskatchewan.ca/IRIS*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	Within 7 days**	Within 30 days	Within 12 weeks
Federally-regulated pipelines	**[2A.9] In Quebec** – any commodity release	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to MDDELCC (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---
Federally-regulated pipelines	**[2A.10] In Northwest Territories** – crude oil release of any volume	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Internal notification to Regulatory Affairs (*Region*)	---	Monthly Report to NEB (*Regulatory Affairs*)	---
Federally-regulated pipelines	**[2A.11] In Northwest Territories (…continued)** – any release from a pipeline that exceeds 100 L – any release, or potential release, of any volume that: - is near or in an open water body - is near or in a designated sensitive environment or habitat - poses an imminent threat to human health or safety, or to a listed species at risk or its critical habitat	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Spill Report Form to NT-NU 24-hr Spill Report Line (*Region*) If spill on land regulated under land use permits: Verbal notification to Gov't of NWT Land Use Inspector within 24 hrs	---	If spill on land regulated under land use permits: Detailed report to MVLWB and Gov't of NWT Land Use Inspector (*Env Dept*) Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---

Table 2A
Releases/Leaks/Spills – Commodities

The Canadian Environmental Protection Act, Environmental Emergency Regulations apply to any product that has a flashpoint ≤ 23°C or a boiling point ≤ 35°C; or any product that is subject to the TDG Act and is being loaded or unloaded at a facility. A release of these products (e.g., condensates, diluents, gasoline) triggers reporting to Environment Canada via the provincial agency. Volume thresholds are aligned with provincial requirements and no further work is required with the initial report. The requirement to report is addressed by complying with the applicable provincial reporting criteria outlined below.

- *If release had/has potential to migrate offsite or affects a natural habitat within a facility (including impact to fish and fish habitat), see Table 6*
- *If release, regardless of volume, has entered water or may cause/is causing/has caused an adverse environmental effect, see Table 6*
- *If historical contamination is discovered, contact Environment as provincial and/or federal reporting may be required*
- *Pipeline right-of-way is considered offsite, outside of facility, off-lease*
- *Record in EnCompass all commodity releases > 1 L and any commodity releases < 1 L that, if left unattended, are likely to exceed the threshold or result in increased risk or trigger regulatory reporting (for recording guidance, see Appendix IV Commentary, Section 2A)*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*
- *The Saskatchewan Ministry of Economy Integrated Resource Information System (IRIS) is located at http://www.saskatchewan.ca/IRIS*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	Within 7 days**	Within 30 days	Within 12 weeks
		(*Region*)			
Federally-regulated pipelines	**[2A.12] In Northwest Territories (…continued)** – uncontrolled spill or escape of a toxic or hazardous substance	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to NWT Chief Safety Officer (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---
Provincially-regulated pipelines	**[2A.13] In Alberta** any release of unrefined product (i.e., crude diluent condensate, produced water) from a pipeline that: - is outside facility boundaries, - leaves facility boundaries, or - is greater than (>) $2m^3$ and is contained within a facility	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to AER (*Region*)	Written Release Report to AER, if requested (Env Dept)	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---

Table 2B
Releases/Leaks/Spills – Transport of Dangerous Goods

- *If the release/anticipated release meets a quantity threshold set out in Appendix II - Reportable Quantities of Transported Dangerous Goods, and the release/anticipated release endangers/could endanger public safety, an Emergency Report is required to any local authority responsible for responding to emergencies (e.g., police) at the geographic location of the release.*
- *The reporting threshold for flammable liquids is 30 L or 30 Kg. For all other reportable quantities, see Appendix II - Reportable Quantities of Transported Dangerous Goods.*
- *If goods are transported by an external source and the release meets the criteria listed above, the Company must complete an Emergency Report.*
- *For details of reporting content, see the Transport Canada website (https://www.tc.gc.ca/tdg/clear-part8-379.htm).*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines		
		Immediately	As Soon as Possible	Within 30 days
Federally or provincially-regulated pipelines	**[2B.1] All Provinces and Territories** – Any release that results in any of the following: - death of a person - person sustaining injuries that require immediate medical attention - evacuation of people - closure of a facility where dangerous goods are loaded or unloaded - closure of a road, main railway line or main waterway	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to local police, verbal to CANUTEC (*Region*)	Release or Anticipated Release Report to CANUTEC, the consignor of the dangerous goods, the Canadian Nuclear Safety Commission (if radioactive materials are involved)	30-Day Followup Report to Director General, Department of Transport (*Region*) Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally or Provincially-regulated pipelines	**[2B.2] In Alberta**	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to local police, verbal to AB Transportation (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally - regulated pipelines	**[2B.3] In Saskatchewan**	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to local police, verbal to SK Ministry of Environment (*Region*)	---	Dangerous Occurrence Report to Transport Canada (*Region*) Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally - regulated pipelines	**[2B.4] In Manitoba**	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to local police, verbal to MB Sustainable Development (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)

Table 2B
Releases/Leaks/Spills – Transport of Dangerous Goods

- *If the release/anticipated release meets a quantity threshold set out in Appendix II - Reportable Quantities of Transported Dangerous Goods, and the release/anticipated release endangers/could endanger public safety, an Emergency Report is required to any local authority responsible for responding to emergencies (e.g., police) at the geographic location of the release.*
- *The reporting threshold for flammable liquids is 30 L or 30 Kg. For all other reportable quantities, see Appendix II - Reportable Quantities of Transported Dangerous Goods.*
- *If goods are transported by an external source and the release meets the criteria listed above, the Company must complete an Emergency Report.*
- *For details of reporting content, see the Transport Canada website (https://www.tc.gc.ca/tdg/clear-part8-379.htm).*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines		
		Immediately	As Soon as Possible	Within 30 days
Federally or Provincially-regulated pipelines	**[2B.5] In Ontario**	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to local police, Verbal to MOECC (via Spills Action Center), Verbal to municipality, Verbal to product owner and Verbal to conservation authority (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally - regulated pipelines	**[2B.6] In Quebec**	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to local police (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally - regulated pipelines	**[2B.7] In Northwest Territories**	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to local police (*Region*) Spill Report Form to NT-NU 24-hr Spill Report Line (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)

Table 2C
Releases/Leaks/Spills – Non-Commodities

- *If a release, regardless of volume, has entered water or may cause, is causing or has caused an adverse environmental effect, see Table 6.*
- *Record in EnCompass all non-commodity releases > 1 L, regardless of regulatory thresholds.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines		
		Immediately	**Within 7 Days**	**Within 30 Days**
Federally - regulated pipelines	**[2C.1] All Provinces and Territories** – release of non-commodity product > 1 L	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region/Project*)		Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally or Provincially-regulated pipelines	**[2C.2] In Alberta** – release > 30 L of flammable liquid – release of hazardous material in an amount ≥ reportable quantities listed in Appendix II - Reportable Quantities of Transported Dangerous Goods	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to AEP, if federally regulated *(Region)* Verbal to AER, if provincially regulated (*Region*)	Written Release Report to AEP (if federally regulated) *(Env Dept)* Written Release Report to AER (if provincially regulated) *(Env Dept)*	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally - regulated pipelines	**[2C.3] In Saskatchewan** – flammable liquid: - release > 500 L onsite - release > 200 L offsite - any amount subsurface – glycols (antifreeze): - release > 100 L onsite - release > 50 L offsite – lubricating oils/hydraulic fluids: - release > 500 L onsite - release > 200 L offsite	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to SK Ministry of Environment (*Region*) Verbal to landowner, as soon as practicable *(Region)*	---	Discharge Report Form to SK Ministry of Environment (*Env Dept*) Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally - regulated pipelines	**[2C.4] In Manitoba** – release > 100 L of flammable liquid	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to MB Sustainable Development (*Region*)	Written Spill Report to MB Sustainable Development, if requested *(Env Dept)*	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally or Provincially-regulated pipelines	**[2C.5] In Ontario** – any release (includes deposit, leak, emission or addition) of any solid, gas or odour: - into natural environment (i.e., air, land, water) - from, or out of, man-made structure/container (i.e., pipeline) - abnormal in quality or quantity in circumstances	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)

Table 2C
Releases/Leaks/Spills – Non-Commodities

- *If a release, regardless of volume, has entered water or may cause, is causing or has caused an adverse environmental effect, see Table 6.*
- *Record in EnCompass all non-commodity releases > 1 L, regardless of regulatory thresholds.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines		
		Immediately	**Within 7 Days**	**Within 30 Days**
	EXCEPTION: Releases do not need to be reported if <u>both</u> of the following conditions are met: – release is ≤ 100 L of fluid from the fuel system or other operating system of a motor vehicle; AND – release has not caused, and is not likely to cause, any adverse effects other than those immediately remediated through cleanup/restoration of surfaces prepared for vehicle traffic or to the paved/gravel/sod areas adjacent to those surfaces	Verbal to MOECC (via Spills Action Center), Verbal to affected municipality and owner of spilled pollutant (where the Company does not own pollutant), Verbal to conservation authority (*Region*)		
Federally - regulated pipelines	**[2C.6] In Quebec** – any release of contaminant (including solid, liquid, gas, micro-organism, sound, vibration, rays, heat, odour) or hazardous material	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept, verbal to Environment Canada, verbal to MDDELCC (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)
Federally - regulated pipelines	**[2C.7] In Northwest Territories** – release > 100 L of flammable liquid, waste oil or other vehicle fluids – any release/potential release of any volume that: - is near or in an open waterbody - is near or in a designated sensitive environment or habitat - poses an imminent threat to human health or safety, or to a listed species at risk or its critical habitat	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept (*Region*) Spill Report Form to NT-NU 24-hr Spill Report Line (*Region*)	---	---
Federally- regulated pipelines	**[2C.8] In Northwest Territories (…continued)** – any release on land regulated under land use permits	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal notification to the Gov't of NWT Land Use Inspector within 24 hrs, if release on land regulated under land use permits (*Region*)	---	Detailed report to MVLWB and Gov't of NWT Land Use Inspector, if release on land regulated under land use permits (*Env Dept*)

Table 2D
Releases/Leaks/Spills – Halocarbons

Chemical substances that include, among other things, halogen (bromine, chlorine and/or fluorine) and carbon. They are used specifically as refrigerants in air-conditioning and refrigeration systems, fire extinguishing agents in fire extinguishing systems, blowing agents in the manufacture of foams and as solvents.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**Within 14 Days**	**Within 30 Days**	**Within 6 Months**
Federally-regulated pipelines	**[2D.1] All Provinces and Territories** – release < 10 kg	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept *(Region)*	---	Complete Incident Investigation form and other applicable forms in EnCompass (*Region*)	---
Federally-regulated pipelines	**[2D.2] In all Provinces and Territories** – release 10 kg – 100 kg	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept *(Region)*	---	Complete Incident Investigation form and other applicable forms in EnCompass (*Region*)	Written report to Environment Canada (*Env Dept*) ***Note**: report due by Jan 31 or July 31, whichever comes first*
Federally-regulated pipelines	**[2D.3] In all Provinces and Territories** – release > 100 kg	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept [24 hours] *(Region)* Verbal to Environment Canada [24 hours] (Region)	Written report to Environment Canada (*Env Dept*)	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---
Federally or Provincially-regulated pipelines	**[2D.4] In Alberta** – release > 10 kg	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept *(Region)* Verbal to AEP (federally-regulated pipelines), Verbal to AER (provincially-regulated pipelines) (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*) Written Release Report to AER *(Env Dept)*	---

Table 2D
Releases/Leaks/Spills – Halocarbons

Chemical substances that include, among other things, halogen (bromine, chlorine and/or fluorine) and carbon. They are used specifically as refrigerants in air-conditioning and refrigeration systems, fire extinguishing agents in fire extinguishing systems, blowing agents in the manufacture of foams and as solvents.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**Within 14 Days**	**Within 30 Days**	**Within 6 Months**
Federally - regulated pipelines	**[2D.5] In Saskatchewan** – any quantity that could pose a public safety risk or 100 kg	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept *(Region)* Verbal to SK Ministry of Environment (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*) Written Spill Report to SK Ministry of Environment (*Env Dept)*	---
Federally - regulated pipelines	**[2D.6] In Manitoba** – release > 10 kg	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept *(Region)* Verbal to MB Conservation and Water Stewardship *(Region)*	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---
Federally or Provincially-regulated pipelines	**[2D.7] In Ontario** – release > 100 kg	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept *(Region)* Verbal to MOECC (via Spills Action Center), Verbal to municipality, Verbal to conservation authority Verbal to Pollutant Owner *(Region)*	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---

Table 2D
Releases/Leaks/Spills – Halocarbons

Chemical substances that include, among other things, halogen (bromine, chlorine and/or fluorine) and carbon. They are used specifically as refrigerants in air-conditioning and refrigeration systems, fire extinguishing agents in fire extinguishing systems, blowing agents in the manufacture of foams and as solvents.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	Within 14 Days	Within 30 Days	Within 6 Months
Federally - regulated pipelines	**[2D.8] In Quebec** – release > 25 kg	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Env Dept *(Region)* Verbal to QC MDDELCC *(Region)*	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---

Table 3A
People (Occupational Illness/Injury) – Fatality or Serious Injury

- *In the event of an incident that results in a fatality, the local police must be alerted first.*
- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 weeks**
Federally regulated pipelines	**[3A.1] All Provinces and Territories** – A death or serious injury to a person where the death or injury is a result of an occurrence related to the construction, operation or abandonment of a pipeline. Injuries include: a) fracture of any bone, except simple fractures of fingers, toes or nose b) Lacerations that cause severe hemorrhage or nerve, muscle or tendon damage c) loss of sight in one or both eyes d) Internal hemorrhage e) loss of function, amputation, or loss of a body part; f) Injury to an internal organ g) Second and third degree burns or any burn covering more than 5% of the body; h) Verified exposure to infectious substance or injurious radiation i) injury that is likely going to require hospitalization (checked into the hospital) j) Injury to an internal organ k) Unconsciousness (also see Table 3B) ***NOTE***: *For additional guidance, see Appendix IV – Commentary (3A.1)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to TSB [3 hours] (*Region*) Initial submission in OERS to NEB and TSB [3 hours] (*Region*) Notify Regulatory Affairs of OERS submission (*Region*)	---	---	Complete Report, including investigation report, in EnCompass (*Region*) ***Note****: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office* Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*)	Final Submission in OERS to NEB (*Regulatory Affairs*)

Table 3A
People (Occupational Illness/Injury) – Fatality or Serious Injury

- *In the event of an incident that results in a fatality, the local police must be alerted first.*
- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 weeks**
Federally - regulated pipelines	**[3A.2] In all Provinces and Territories** – fatality – loss by an employee of a body member or part thereof, or the complete loss of the usefulness of a body member or a part thereof – the permanent impairment of a body function of an employee; – disabling injury of two or more employees that prevents the employee from reporting for work or from effectively performing all the duties connected with the employee's regular work on any day subsequent to the day on which the injury or disease occurred, whether or not that subsequent day was a working day for that employee – the fracture of a major bone – the amputation of a body part – the loss of sight in one or both eyes – internal hemorrhage or – third degree burns	Initiate investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to ESDC (*Region*) Complete First Report of Injury (*Region*)	Employers' Report to compensation agency* (H&S Dept) **AB – WCB [3 days]* **MB – WCB [5 days]* **SK – WCB [5 days]* **ON – WSIB [3 days]* **QC – CSST [2 days]* **NWT – WSCC [3 days]*	Hazardous Occurrence Report to ESDC (*H&S Dept*)	Complete Report, including investigation report, in EnCompass (*Region*) ***Note**: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office*	---
Federally or Provincially-regulated pipelines	**[3A.3] In all Provinces and Territories** – disabling injury to one employee that prevents the employee from reporting for work or from effectively performing all the duties connected with the employee's regular work on any day subsequent to the day on which the injury or disease occurred, whether or not that subsequent day was a working day for that employee	Initiate investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Complete First Report of Injury (*Region*)	Employers' Report to compensation agency* (H&S Dept) **AB – WCB [3 days]* **MB – WCB [5 days]* **SK – WCB [5 days]* **ON – WSIB [3 days]* **QC – CSST [2 days]* **NWT – WSCC [3 days]*	Hazardous Occurrence Report to ESDC (*H&S Dept*)	Complete Report, including investigation report, in EnCompass (*Region*) ***Note**: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office*	---

Table 3A
People (Occupational Illness/Injury) – Fatality or Serious Injury

- *In the event of an incident that results in a fatality, the local police must be alerted first.*
- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 weeks**
Federally or Provincially-regulated pipelines	**[3A.4] In all Provinces and Territories** – resulted in implementation of rescue, revival or other similar emergency procedure	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to immediate supervisor (injured/ill person) Complete First Report of Injury *(Region)*	---	Hazardous Occurrence Report to ESDC (*H&S Dept*)	Complete Report, including investigation report, in EnCompass (*Region*) ***Note**: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office*	---
Federally or Provincially-regulated pipelines	**[3A.5] In Ontario** – incident occurs in connection with an elevating device (as per TSSA) that results in the death of a person or a critical injury	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to WSIB, verbal to SAC or TSSA, (*Region*) Complete TSSA online Elevating Devices Incident Form (*Region*) Complete First Report of Injury *(Region)*	Written Report to ON Ministry of Labour [2 days] (Region) Employers' Report to WSIB [3 days] *(H&S Dept)*	---	Complete Report, including investigation report, in EnCompass (*Region*) ***Note**: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office*	---

Table 3A
People (Occupational Illness/Injury) – Fatality or Serious Injury

- *In the event of an incident that results in a fatality, the local police must be alerted first.*
- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 weeks**
Federally or Provincially-regulated pipelines	**[3A.6] In Ontario (…continued)** – person is killed – person is critically injured from any cause in at a workplace – if a person is disabled from performing his or her usual work – occupational illness	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to WSIB verbal to Inspector (*Region*) Complete First Report of Injury *(Region)*	Written Report to ON Ministry of Labour [2 days] (Region) Employers' Report to WSIB [3 days] *(H&S Dept)*	---	Complete Report, including investigation report, in EnCompass (*Region*) ***Note**: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office*	---
Federally - regulated pipelines	**[3A.7] In Quebec** – death of a worker; loss of a limb or a part of a limb, total or partial loss of the use of the limb or a significant physical trauma to a worker – such serious injuries to several workers as probably to prevent them from performing their work for another working day	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to CSST (*Region*) Complete First Report of Injury *(Region)*	Employers' Report to CSST [2 days] *(H&S Dept)*	---	Complete Report, including investigation report, in EnCompass (*Region*) ***Note**: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office*	---

Table 3A
People (Occupational Illness/Injury) – Fatality or Serious Injury

- *In the event of an incident that results in a fatality, the local police must be alerted first.*
- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 weeks**
Federally - regulated pipelines	**[3A.8] In Northwest Territories** – concussion, major blood loss, serious fracture, or amputation – accident resulting in the death of any employee – an accident of a serious nature involving any employee	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Chief Safety Officer (*Region*) Incident Report to WSCC (*Region*) Complete First Report of Injury *(Region)*	Employers' Report to WSCC [3 days] *(H&S Dept)*	---	Complete Report, including investigation report, in EnCompass (*Region*) ***Note**: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office*	---
Provincially-regulated pipelines	**[3A.9] In Alberta** – injury or accident that results in death – injury or accident that results in a worker's being admitted to the hospital for more than 2 days	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to AB Workplace H&S (*Region*) Complete First Report of Injury *(Region)*	Employers' Report to WCB [3 days] *(H&S Dept)*	---	Complete Report, including investigation report, in EnCompass (*Region*) ***Note**: complete fatality reporting requirements in accordance with IMS-01 under guidance of the Ethics & Compliance Office*	---

Table 3B
People (Occupational Illness/Injury) – Loss of Consciousness/Electric Shock/ Toxic Atmosphere/Oxygen Deficient Atmosphere

- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 Weeks**
Federally or Provincially-regulated pipelines	**[3B.1] In all Provinces and Territories** – electric shock, toxic atmosphere or oxygen deficient atmosphere that caused an employee to lose consciousness – implementation of rescue, revival or other similar emergency procedures	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to immediate supervisor (*injured/ill person*) Complete First Report of Injury (*Region*)	Employers' Report to compensation agency* (*H&S Dept*) **AB – WCB [3 days]* **MB – WCB [5 days]* **SK – WCB [5 days]* **ON – WSIB [3 days]* **QC – CSST [2 days]* **NWT – WSCC [3 days]*	Hazardous Occurrence Report to ESDC (*H&S Dept*)	Complete Report, including investigation report, in EnCompass (*Region*)	---
Federally or Provincially-regulated pipelines	**[3B.2] In all Provinces and Territories** A person loses consciousness as a result of an occurrence related to the construction, operation or abandonment of a pipeline	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to immediate supervisor (*injured/ill person*) Verbal to TSB, Verbal to ESDC [3 hours] (*Region*) Initial submission in OERS to NEB and TSB [3 hours] (Region) *Note: If the incident does not relate to a field/regional office employee, then only the* ESDC *needs to be contacted.* Notify Regulatory Affairs of OERS submission (*Region*) Complete First Report of Injury (*Region*)	Employers' Report to compensation agency* (*H&S Dept*) **AB – WCB [3 days]* **MB – WCB [5 days]* **SK – WCB [5 days]* **ON – WSIB [3 days]* **QC – CSST [2 days]* **NWT – WSCC [3 days]* Preliminary Report to TSB [5 days] (*Regulatory Affairs*)	Hazardous Occurrence Report to ESDC (*H&S Dept*)	Complete Report, including investigation report, in EnCompass (*Region*) Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*)	Final Submission in OERS to NEB (*Regulatory Affairs*)

Table 3B
People (Occupational Illness/Injury) – Loss of Consciousness/Electric Shock/ Toxic Atmosphere/Oxygen Deficient Atmosphere

- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 Weeks**
Federally - regulated pipelines	**[3B.3] In the Northwest Territories** – incidents that results in unconsciousness	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to immediate supervisor (*injured/ill person*) Verbal to Chief Safety Officer (*Region*) Incident Report to WSCC (*Region*) Complete First Report of Injury (*Region*)	Employers' Report to WSCC [3 days] (H&S Dept)	---	Complete Report, including investigation report, in EnCompass (*Region*)	---

Table 3C
People (Occupational Illness/Injury) – Medical Aid/Modified Work

- *This table pertains to any injury/illness requiring service by a medical practitioner.*
- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 7 Days**	**Within 14 Days**	**Within 30 Business Days**
Federally or Provincially-regulated pipelines	**[3C.1] In all Provinces and Territories** – work-related injury or alleged work related injury to an employee that requires attention by a medical practitioner ***NOTE***: *For additional guidance, see Appendix IV – Commentary (3C.1)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to immediate supervisor (*injured/ill person*) Complete First Report of Injury (*Region*)	Employers' Report to compensation agency* (H&S Dept) **AB – WCB [3 days]* **MB – WCB [5 days]* **SK – WCB [5 days]* **ON – WSIB [3 days]* **QC – CSST [2 days]* **NWT – WSCC [3 days]*	---	---	Complete Report, including investigation report, in EnCompass (*Region*)
Federally or Provincially-regulated pipelines	**[3C.2] In all Provinces and Territories** – work related injury to an employee, attended by a medical practitioner, where modified work must be considered ***NOTE***: *For additional guidance, see Appendix IV – Commentary (3C.2)*	Initiate Investigation Health Care Providers Assessment of Work Abilities and Limitations (HCPAWAL) Form to Regional Management (*injured or ill party*)	Employers' Report to compensation agency* (H&S Dept) **AB – WCB [3 days]* **MB – WCB [5 days]* **SK – WCB [5 days]* **ON – WSIB [3 days]* **QC – CSST [2 days]* **NWT – WSCC [3 days]*	---	---	---
Federally or Provincially-regulated pipelines	**[3C.3] In all Provinces and Territories** – Recording once a worker is off modified work ***NOTE***: *For additional guidance, see Appendix IV – Commentary (3C.3)*	Initiate Investigation Verbal to H&S and Benefits Department (*Region*) Verbal to compensation agency* (*H&S Dept*) **AB – WCB* **MB – WCB* **SK – WCB* **ON – WSIB* **QC – CSST* **NWT – WSCC*	---	---	---	---

Table 3C
People (Occupational Illness/Injury) – Medical Aid/Modified Work

- *This table pertains to any injury/illness requiring service by a medical practitioner.*
- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 2-5 Days**	**Within 7 Days**	**Within 14 Days**	**Within 30 Business Days**
Federally or Provincially-regulated pipelines	**[3C.4] In all Provinces and Territories** – disabling injury to one employee that prevents the employee from reporting for work or from effectively performing all the duties connected with the employee's regular work on any day subsequent to the day on which the injury or disease occurred, whether or not that subsequent day was a working day for that employee	Initiate investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Complete First Report of Injury (*Region*)	Employers' Report to compensation agency* (H&S Dept) **AB – WCB [3 days]* **MB – WCB [5 days]* **SK – WCB [5 days]* **ON – WSIB [3 days]* **QC – CSST [2 days]* **NWT – WSCC [3 days]*	---	Hazardous Occurrence Report to ESDC (*H&S Dept*)	Complete Report, including investigation report, in EnCompass (*Region*)
Federally or Provincially-regulated pipelines	**[3C.5] In Ontario** – requires medical attention because of an accident, explosion fire or incident of workplace violence at a workplace, but no person dies or is critically injured because of that occurrence and requires services by a medical practitioner ***NOTE***: *For additional guidance, see Appendix IV – Commentary (3C.5)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*injured or ill person*) Verbal to TSSA or SAC (*Region*) Complete TSSA online Elevating Devices Incident Form (*Region*) Complete First Report of Injury (*Region*)	Employers' Report to WSIB [3 days] (H&S Dept)	Written Report to TSSA (*Region*)	---	Complete Report, including investigation report, in EnCompass (*Region*)

Table 3D
People (Occupational Illness/Injury) – First Aid

- This table pertains to any injury requiring first aid treatment but requires no medical attention provided by a medical practitioner.
- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines		
		Immediately	**Within 7 Days**	**Within 30 Business Days**
Federally or Provincially-regulated pipelines	**[3D.1] In all Provinces and Territories** – first aid not requiring outside medical attention ***NOTE***: *For additional guidance, see Appendix IV – Commentary (3D.1)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*injured or ill person*) Complete First Report of Injury – First aid rendered by Healthcare professional (*Region*)	---	---
Federally or Provincially-regulated pipelines	**[3D.2] In all Provinces and Territories** Pipeline incidents that result in: – first aid requiring outside medical attention (1 time treatment with no prescription or medical intervention such as a cast) If this injury turns into a medical aid and requires more than one time treatment or prescription, see Table 3C ***NOTE***: *For additional guidance, see Appendix IV – Commentary (3D.2)*	Initiate investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*injured or ill person*) Complete First Report of Injury – First aid rendered by Healthcare professional (*Region*)	---	Complete Report, including investigation report, in EnCompass (*Region*)

Table 3D
People (Occupational Illness/Injury) – First Aid

- This table pertains to any injury requiring first aid treatment but requires no medical attention provided by a medical practitioner.
- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines		
		Immediately	**Within 7 Days**	**Within 30 Business Days**
Federally or Provincially-regulated pipelines	**[3D.3] In Ontario** If an incident occurs that is in connection with an elevating device (as per TSSA), but does not require medical attention ***NOTE***: *For additional guidance, see Appendix IV – Commentary (3D.3)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to TSSA or SAC (*Region*) Complete First Report of Injury – First aid rendered by Healthcare professional (*Region*)	Complete TSSA online Elevating Devices Incident Form, if applicable (*Region*)	Complete Report, including investigation report, in EnCompass (*Region*)

Table 4A
Property Damage – Structural Integrity or Structural Threat to the Pipeline or Operating beyond Design Limits

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 10 Business Days	Within 14 Days	Within 30 Days	Within 12 Weeks
Federally - regulated pipelines	**[4A.1] In all Provinces and Territories** – operation, for any amount of time, beyond the criteria for which the pipeline was designed and/or the operation of the pipeline beyond criteria imposed by the NEB to mitigate a condition of the pipeline. This includes operation of a pipeline: a) >110% of the CSA maximum operating pressure (MOP) b) >110% of self-imposed maximum allowable operating pressure (MAOP) c) > 100% of regulator-imposed restriction ***NOTE**: For additional guidance, see Appendix IV – Commentary (4A.1)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] *(CCO*)* Initial submission in OERS to NEB and TSB [Within 24 hours] (*CCO Engineering**) Notify Regulatory Affairs of OERS submission *(CCO*)* ** CCO, in cooperation with Pipeline Integrity and Facilities Integrity, is responsible for communicating overpressures to Regional Operations*	---	---	Complete Report, including Investigation Report, in EnCompass (*CCO*) Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*)	Final Submission in OERS to NEB (*Regulatory Affairs*)
Federally - regulated pipelines	**[4A.2] In all Provinces and Territories** – any events that fall under the definition of 'operation of pipeline beyond its design limits' include, but are not limited to: a) operation of pipeline at a temperature greater than the design temperature [NOTE: Prior to reporting, consult with Regulatory Affairs for interpretation and guidance] b) slope movements that exceed what was predicted at the design stage or were not predicted in the design stage [NOTE: Prior to reporting, consult with Regulatory Affairs for interpretation and guidance] c) unintended exposures of pipelines including in waterbodies and on land (NOTE: 'waterbodies' is interpreted to include river, creek, stream, lake, canal, reservoir, ocean and all classes of wetlands [i.e., swamp, marsh, bog, fen or other land that is covered by shallow water seasonally or permanently, including land where the water table is located at or close to the surface]) d) the introduction of an inappropriate product into the pipeline (e.g., sour product in a line or facility designed for sweet product; any exceedance of product chemical properties as	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] *(Temperature – CCO*)* *(Slope movement – Region)* *(Exposure – Region)* *(Inappropriate Product – PQ)* **CCO will also inform Thermal Management Group via email notification* Initial submission in OERS to NEB and TSB [24 hours] *(Temperature – Regulatory Affairs)*	---	---	Complete Report, including Investigation Report, in EnCompass *(Temperature - CCO)* *(Slope movement – Region)* *(Exposure – Region)* *(Inappropriate Product – PQ)* Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*)	Final Submission in OERS to NEB (*Regulatory Affairs*)

Table 4A
Property Damage – Structural Integrity or Structural Threat to the Pipeline or Operating beyond Design Limits

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 10 Business Days	Within 14 Days	Within 30 Days	Within 12 Weeks
	defined in the tariff limits) [NOTE: Prior to reporting, consult with Regulatory Affairs for interpretation and guidance] ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4A.2)*	*(Slope movement – Region)* *(Exposure – Region)* *(Inappropriate Product – Regulatory Affairs)* Notify Regulatory Affairs of OERS submission for slope movements and exposures *(Region)*				

Table 4A
Property Damage – Structural Integrity or Structural Threat to the Pipeline or Operating beyond Design Limits

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 10 Business Days	Within 14 Days	Within 30 Days	Within 12 Weeks
Federally regulated pipelines	**[4A.3] In all Provinces and Territories** – unauthorized activities under the NEB Act and the NEB Damage Prevention Regulations-Authorizations, including: a) Ground Disturbance – unauthorized ground disturbance activities in the prescribed area b) Encroachment – unauthorized construction of a facility across, on, along or under a pipeline (including ROW) and includes construction of structures or facilities (e.g., swimming pools, skating rinks, sheds) on a ROW, as well as stockpiling of materials (e.g., sand, soil) c) Vehicle Crossings – unauthorized operation of a vehicle or mobile equipment across or on a ROW outside the travelled portion of a highway or public road (includes operation of heavy equipment or trucks across the ROW) Consult with Damage Prevention and Regulatory Affairs to determine whether or not to report. – All damage to pipe caused or identified during: - construction of a facility across, on, along or under a pipeline - operation, maintenance or removal of a facility - an activity that caused a ground disturbance within the prescribed area; OR - operation of vehicles or mobile equipment across the pipeline *Examples of reportable incidents include impacts that are indicative of contact with the pipe which may include rocks, equipment, piles, shoring, grinders or other such objects that come in contact with the pipe and damage the pipe itself* ***NOTE**: For additional guidance, see Appendix IV – Commentary (4A.3)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Initial submission in OERS to NEB and TSB [24 hours] (*Damage Prevention, Region if in Ontario*) **Reporting to occur following field confirmation and in discussion with Damage Prevention.* Notify Regulatory Affairs of OERS submission (*Damage Prevention*)	---	---	Complete Report, including investigation report, in EnCompass (*Region*) Update initial submission in OERS to satisfy TSB requirements and NEB Damage Prevention Regulations (*Regulatory Affairs*)	Final Submission in OERS to NEB (*Regulatory Affairs*)
Federally regulated pipelines	**[4A.4] In all Provinces and Territories** – unauthorized third party activity within the prescribed area that does not cause property damage or pose a structural threat, but poses a threat to the safe operation of the pipeline including: a) unauthorized ground disturbance or activity within the	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day]	Incident Investigation Form (*Region*)	---	Complete Report, including investigation report, in EnCompass (*Region*)	Final submission in OERS to NEB (*Regulatory Affairs*)

Table 4A
Property Damage – Structural Integrity or Structural Threat to the Pipeline or Operating beyond Design Limits

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 10 Business Days	Within 14 Days	Within 30 Days	Within 12 Weeks
	prescribed area (30 m from each side of the centerline of the pipe) that involves: ▪ soil being disturbed or displaced to a depth of 30 cm or more ▪ any reduction of the earth cover over the pipeline ▪ cultivation to depths of 45 cm or more b) unauthorized construction of a facility on, along or under a pipe, including construction or structures or stockpiling on the ROW c) unauthorized operation of a vehicle or mobile equipment across the ROW, outside the travelled portion of a highway or public road ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4A.4)*	(*Region*) Initial submission in OERS to NEB and TSB [24 hours] (*Damage Prevention*) **Reporting to occur following field confirmation and in discussion with Damage Prevention* Notify Regulatory Affairs of OERS submission *(Region)*			Update initial submission in OERS to satisfy TSB and NEB Damage Prevention Regulation requirements (*Regulatory Affairs*)	
Federally regulated pipelines	**[4A.5] In all Provinces and Territories** – Geotechnical, hydraulic or environmental activity poses a threat to the safe operation of the pipeline. *Examples:* – *Geotechnical activity- landslide, earthquake, blasting, mining, excavation, frac* – *Hydraulic activity – flooding, or high volume of precipitation, reroute of water (dams)* – *Environmental activity – hurricane, tornado, lightning storm, etc.* ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4A.5)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Initial submission in OERS to TSB [24 hours] (*Region*) Notify Regulatory Affairs of OERS submission *(Region)*	---	---	Complete Report, including investigation report, in EnCompass (*Region*) Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*)	---
Federally - regulated pipelines	**[4A.6] In all Provinces and Territories** – Operation of a portion of the pipeline is interrupted as a result of a situation or condition that poses a threat to any person, property or environment	Initiate Investigation Entry and verification of event in EnCompass	---	---	Complete Report, including investigation report, in EnCompass (*Region*)	---

Table 4A
Property Damage – Structural Integrity or Structural Threat to the Pipeline or Operating beyond Design Limits

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 10 Business Days	Within 14 Days	Within 30 Days	Within 12 Weeks
	Examples may include: – *electrical wire cut during construction/maintenance activities, resulting in line shutdown* – *disruption by shipper* ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4A.6)*	(completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Regional On-call (CCO) Initial submission in OERS to TSB [24 hours] (*Region*) Notify Regulatory Affairs of OERS submission *(Region)*			Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*)	
Federally regulated pipelines	**[4A.7] In all Provinces and Territories** – The pipeline restricts the safe operation of any mode of transportation ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4A.7)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Initial submission in OERS to TSB [24 hours] (*Region*) Notify Regulatory Affairs of OERS submission *(Region)*	---	---	Complete Report, including investigation report, in EnCompass (*Region*) Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*)	---
Federally or Provincially-regulated pipelines	**[4A.8] In Ontario** – any activity in the immediate vicinity of the pipeline which poses a threat to the structural integrity of the pipeline	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook,	---	---	Complete Report, including investigation report, in EnCompass (*Region*)	---

Table 4A
Property Damage – Structural Integrity or Structural Threat to the Pipeline or Operating beyond Design Limits

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 10 Business Days	Within 14 Days	Within 30 Days	Within 12 Weeks
	NOTE: *For additional guidance, see Appendix IV – Commentary (4A.8)*	event and impact forms) [by end of next business day] (*Region*) Verbal to TSSA* (*Region*) ** Notify TSSA only if there is a concern with repeat offenders or excavation displaying blatant disregard for the safety of the pipeline facilities*				
Federally or Provincially-regulated pipelines	**[4A.9] In Ontario (…continued)** – pipeline strikes where the strike has caused evacuation, injuries or media attention	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to MOECC (via Spills Action Center) (*Region*)	---	---	Complete Report, including investigation report, in EnCompass (*Region*)	---
Provincially-regulated pipelines	**[4A.10] In Alberta** – contact with a pipeline during any ground disturbance that results in: (i) puncture, crack in the pipeline, (ii) scratch, gouge, flattening or dent on the surface of the pipeline, or (iii) damage to its protective coating that compromises the functionality of the coating, with the exception of minor damages that may occur during final hand excavation and external cleaning ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4A.10)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to AER (*Region*)	Written Report to AER if requested, Incident Investigation Form (*Region*)	---	Complete Report, including investigation report, in EnCompass (*Region*)	---
Provincially-	**[4A.11] In Ontario**	Initiate Investigation	---	Written Report to	Complete Report,	---

Table 4A
Property Damage – Structural Integrity or Structural Threat to the Pipeline or Operating beyond Design Limits

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 10 Business Days	Within 14 Days	Within 30 Days	Within 12 Weeks
regulated pipelines	– all other pipeline strikes that do not meet the above criteria	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*)		TSSA (*Region*)	including investigation report, in EnCompass (*Region*)	

Table 4B
Property Damage – Fire and Explosions

- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual. See Terms & Definitions for definition of "Fire" before reporting.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines					
		Immediately	Within 3-5 Days	Within 7 Days	Within 14 Days	Within 30 Days	Within 12 Weeks
Federally - regulated pipelines	**[4B.1] In all Provinces and Territories** Any unintended fire or explosion that is caused by, or impacts, the construction, operation or abandonment of a pipeline. Events that fall under this definition include, but are not limited to: - battery explosion - fire caused by an arc, or a cable fault, or a breakdown of any component of the uninterruptible power system (UPS) or the back-up generator - wildland or forest fire that damages pipeline infrastructure or impact the construction, operations or abandonment of a pipeline - small welding or housekeeping related fire ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4B.1)*	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to TSB [3 hours] (*Region*) Initial submission in OERS to NEB and TSB [3 hours] (*Region*) Notify Regulatory Affairs of OERS submission (*Region*)	---	---	Hazardous Occurrence Report to ESDC (*H&S*)	Complete Report, including investigation report, in EnCompass (*Region*) Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*)	Final Submission in OERS to NEB (*Regulatory Affairs*)

Table 4B
Property Damage – Fire and Explosions

- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual. See Terms & Definitions for definition of "Fire" before reporting.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines					
		Immediately	Within 3-5 Days	Within 7 Days	Within 14 Days	Within 30 Days	Within 12 Weeks
Federally - regulated pipelines	**[4B.2] In all Provinces and Territories** – unintended fire or explosion has occurred that poses a threat to any person, property or environment – incidents involving unintended fires or explosions and includes but is not limited to: (i) company vehicles and equipment (ii) grass and vegetation on company property or ROW (iii) welding, cutting, grinding or pre-heating (tiger torch) process that unintentionally ignites another material (iv) fires resulting from contact with piping or electrical equipment or conduit	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Initial submission in OERS to NEB and TSB [24 hours] (*Region*) Notify Pipeline Compliance of OERS submission (*Region*)	---	---	---	Complete Report, including investigation report, in EnCompass (*Region*) Update initial submission in OERS to satisfy TSB requirements (*Pipeline Compliance*)	Final Submission in OERS to NEB (*Pipeline Compliance*)
Federally or Provincially-regulated pipelines	**[4B.3] In Ontario** – fire, that may adversely affect the safe operation of the elevating device (as per TSSA)	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to MOECC (via Spills Action Center) (*Region*)	---	TSSA online Elevating Devices Incident Form (*Region*)	---	Complete Report, including investigation report, in EnCompass (*Region*)	---
Federally or Provincially-regulated pipelines	**[4B.4] In Ontario (…continued)** – unexpected explosion and/or fire on a construction project	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day]	---	---	---	Complete Report, including investigation report, in EnCompass (*Region*)	

Table 4B
Property Damage – Fire and Explosions

- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual. See Terms & Definitions for definition of "Fire" before reporting.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines					
		Immediately	**Within 3-5 Days**	**Within 7 Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 Weeks**
		(*Region*) Verbal to Immediate Supervisor (*individual*) Verbal to H&S (*Region*)					
Provincially-regulated pipelines	**[4B.5] In Alberta** – unplanned or uncontrolled explosion, fire or flood that causes a serious injury or that has the potential of causing a serious injury	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to AB Workplace H&S (*Region*)	Employers' Report to WCB [3 days] (*Region*)	---	---	Complete Report, including investigation report, in EnCompass (*Region*)	

Table 4C
Property Damage – Lifting/Elevating Devices and Other Property Damage

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 2 Days	Within 7 Days	Within 14 Days	Within 30 Business Days
Federally - regulated pipelines	**[4C.1] In all Provinces and Territories** – damage to an elevating device that renders it unserviceable or a free fall of an elevating device (in accordance with TSSA)	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to ESDC (*Region*)	---	---	Hazardous Occurrence Report to ESDC (*H&S*)	Complete Report, including investigation report, in EnCompass (*Region*)
Federally - regulated pipelines	**[4C.2] In Ontario** – flood or rush of water, failure of any equipment, machine, device, article or thing, cave-in, subsidence, rock burst or other incident that occurs at a project site	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*individual*)	Notice in Writing to ON OH&S Director (*Region*)	---	---	Complete Report, including investigation report, in EnCompass (*Region*)
Federally - regulated pipelines	**[4C.3] In Ontario (…continued)** – flood, or other significant exposure to water, vandalism, impact or lightning strike that may adversely affect the safe operation of the elevating device (in accordance with TSSA)	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to MOECC (via Spills Action Center) (*Region*)	---	TSSA online Elevating Devices Incident Form (*Region*)	---	Complete Report, including investigation report, in EnCompass (*Region*)
Federally - regulated pipelines	**[4C.4] In Ontario (…continued)** – if a mechanic discovers a condition that constitutes an immediate hazard – if equipment condition constitutes an immediate hazard	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*individual*) Verbal to Director of TSSA (*Region*)	---	Written Report to TSSA (*Region*)	---	---

Table 4C
Property Damage – Lifting/Elevating Devices and Other Property Damage

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 2 Days	Within 7 Days	Within 14 Days	Within 30 Business Days
Federally - regulated pipelines	**[4C.5] In Quebec** – material damage valued at ≥ $50,000	Initiate Investigation Verbal to Immediate Supervisor (*individual*) Incident Report to QC OH&S Commission (*Region*)	---	---	---	Complete Report, including investigation report, in EnCompass (*Region*)
Federally - regulated pipelines	**[4C.6] In the Northwest Territories** – major structural failure or collapse of a building, bridge, tower, crane, structure, scaffold, temporary construction support system or excavation – accidental contact with an energized electrical conductor – premature or accidental detonation of explosives – incident involving heavy equipment	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*individual*) Verbal to Chief Safety Officer (NWT) (*Region*)	---	---	---	Complete Report, including investigation report, in EnCompass (*Region*)
Federally or Provincially-regulated pipelines	**[4C.7] In all Provinces and Territories** – damage to pipeline, tanks, pumps, switchgear motors; oil escape and oil degradation of known cause > $1,000 – damage to buildings, work and office equipment, facilities under construction and other > $1,000 – liability damage to others on third party property through bodily injury, property damage, escape of oil, or hazardous substances – property damage to company aircraft or injury/property damage to others caused by company aircraft/vehicle	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*individual*)	---	---	---	Complete Report, including investigation report, in EnCompass (*Region*)

Table 4C
Property Damage – Lifting/Elevating Devices and Other Property Damage

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 2 Days	Within 7 Days	Within 14 Days	Within 30 Business Days
Provincially-regulated pipelines	**[4C.8] In Alberta** – collapse or upset of a crane, derrick or hoist – failure of a lifting device – collapse or failure of a building component or a structure necessary for its structural integrity	Initiate Investigation Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*individual*) Verbal to AB Workplace H&S Director of Inspection (*Region*)	---	---	---	Complete Report, including investigation report, in EnCompass (*Region*)

Table 4D
Property Damage – Motor Vehicle Incident (MVI) / Damage

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines	
		Immediately	**Within 30 Business Days**
Federally or Provincially-regulated pipelines	**[4D.1] In all Provinces and Territories** – incident involving a company-owned, leased or rented vehicle that results when in operation: - any vehicle damage - any property damage or bodily injury ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4D.1)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*Individual*) Verbal to SGI (Sask) or MPI (MB) (*Region*)	Complete Report, including investigation report, in EnCompass (*Region*)
Federally or Provincially-regulated pipelines	**[4D.2] In all Provinces and Territories** – incident involving a company-owned, leased, or rented vehicle that results when properly parked: - any vehicle damage ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4D.2)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*Individual*) Verbal to SGI (Sask) or MPI (MB) (*Region*)	Complete Report, including investigation report, in EnCompass (*Region*)

Table 4E
Property Damage – Nuclear Densitometer Damage/Explosives Near Densitometer

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines	
		Immediately	Within 21 Days
Federally or Provincially-regulated pipelines	**[4E.1] In all Provinces and Territories** – incident involving a nuclear densitometer that results in: - damage to nuclear densitometer components by physical contact (i.e., hit by equipment, etc.) - fall/collision/crushing of a device - inoperable shutters or device malfunction - unshielded sources - loss or theft of a device - fire or explosion in an area of the nuclear densitometer that may damage any of its components - alteration of the densitometer's physical installation on the pipe in such a way that it is no longer properly mounted on the pipe	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Canadian Nuclear Safety Commission Duty Officer, Verbal to local authorities in event of loss or theft of device, Verbal to Radiation Safety Officer (*Region*)	Nuclear Densitometer Incident Report to Canadian Nuclear Safety Commission (*Radiation Safety Officer*)

Table 4F
Property Damage – Pressure Vessels/Boilers/Heaters/Heat Exchangers

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines	
		Immediately	Within 30 Business Days
Federally - regulated pipelines	**[4F.1] In all Provinces and Territories** – damage to a boiler or pressure vessel that results in a fire or the rupture of the boiler or pressure vessel ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4F.1)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to ESDC (*Region*)	Complete Report, including investigation report, in EnCompass (*Region*)
Federally or Provincially-regulated pipelines	**[4F.2] In Alberta** – accidents involving pressure equipment (i.e., boiler, pressure vessel, pressure piping system, fitting, thermal liquid heating system, etc.) that result in damage to property, or injury/death to a person – accidents not caused by pressure equipment but having some impact on pressure equipment ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4F.2)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to ABSA (*Region*) Complete ABSA Accident Report Form AB-97 (*Region*)	Complete Report, including investigation report, in EnCompass (*Region*)
Federally - regulated pipelines	**[4F.3] In Saskatchewan** - explosion, fire, rupture, overheating of a boiler of pressure vessel that results in damage to property, or injury/death to a person ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4F.3)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to the TSASK Chief Inspector (*Region)*	Complete Report, including investigation report, in EnCompass (*Region*)
Federally - regulated pipelines	**[4F.4] In Manitoba** - explosion in or in connection with a boiler or pressure vessel ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4F.4)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to the Minister (via The Office of the Fire Commissioner) *(Region)* Written report for the Minister within 24hours *(Region)*	Complete Report, including investigation report, in EnCompass *(Region)*
Federally or Provincially-regulated pipelines	**[4F.5] In Ontario** - explosion or rupture of a boiler, pressure vessel, fitting or piping, handling hydrocarbons, that results in injury/death to a person or property damage ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4F.5)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to TSSA (via SAC) *(Region)* Written report for the minister within 48hours *(Region)*	Complete Report, including investigation report, in EnCompass *(Region)*

Table 4F
Property Damage – Pressure Vessels/Boilers/Heaters/Heat Exchangers

- The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.
- Regulatory reporting requirements supersede incident completion timelines in IMS-01.

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines	
		Immediately	Within 30 Business Days
Federally or Provincially-regulated pipelines	**[4F.6] In Quebec** - accident, explosion, break or damage to a pressure vessel or its installation ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4F.6)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to the Quebec Chief Inspector (via Régie du bâtiment du Québec) *(Region)*	Complete report, including investigation Report, in EnCompass *(Region)*
Federally or Provincially-regulated pipelines	**[4F.7] In Northwest Territories** - explosion or rupture of a boiler, pressure vessel or plant; or an accident out of its operation or use that causes injury or death to a person or damage to property ***NOTE***: *For additional guidance, see Appendix IV – Commentary (4F.7)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to the Chief Inspector (via Department of Public Works and Services) *(Region)*	Complete Report, including investigation report, in EnCompass *(Region)*

Table 4G
Property Damage – Alberta Transmission Facilities

- The following reporting requirements apply to the following power transmission facilities located in Alberta, Canada:

- *Leismer Chard Substation - 144 kV equipment up to transformer secondary windings, and associated protection and control and communication devices to the high voltage equipment*
- *Hardisty Clipper Substation - 138 kV equipment up to transformer secondary windings, and associated protection and control and communication devices to the high voltage equipment*
- *Edmonton South Terminal Baseline Substation - 430-TX 2 Transformer*
- *HRT Express 329S Substation - 138 kV equipment up to transformer secondary windings, and associated protection and control and communication devices to the high voltage equipment*
- *Express Youngstown Substation - 69 kV equipment up to transformer secondary windings, and associated protection and control and communication devices to the high voltage equipment*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines	
		Immediately	Within 5 Business Days
Provincially-regulated	**[4G.1] Alberta** Notifiable Circumstance - an unplanned condition or a condition that differs from planned AIES conditions and may include: a) any change or potential change in the status of a substation that could affect the reliability of the AIES, including a change in the status of substation equipment, protection systems, outage duration, remedial action schemes or communication capability b) events or circumstances relating to company facilities that could affect the reliability of the AIES, including adverse weather conditions, fires or bomb threats c) forced outages of substation equipment that could affect the reliability of the AIES	Verbal to Energy Management (*Region*) Verbal to Enterprise Security (*Energy Management*) Verbal to AESO (*Energy Management*)	---
Provincially-regulated	**[4G.2] Alberta (…continued)** Reportable Event - any of the following events (theft that does not result in degradation of normal operation of a company transmission facility is not a Reportable Event): a) damage to, or destruction of, a transmission facility that results in an unexpected sustained outage (i.e., one minute or more) of any combination of 3 or more of the following: - transmission lines energized at greater than 25kV; or - transformers with at least 2 terminals energized at greater than 25kV b) unexpected loss, contrary to design, of any combination caused by a common disturbance (excluding successful automatic reclosing) of 3 or more of the following: - transmission lines energized at greater than 25kV; or - transformers with at least 2 terminals energized at greater than 25 kV c) automatic firm load shedding (via an automatic under-voltage or under-frequency load shedding scheme, or remedial action scheme) that occurs as part of the ISO under-voltage load shed program or under-frequency load shedding program d) failure or mis-operation of a remedial action scheme or protection system on the transmission system that impacts the transmission system, including the failure of a teleprotection communication channel (a) where there is no equivalent backup teleprotection communication channel, and where the failure lasts for more than 10 consecutive minutes or (b) where there is an equivalent backup teleprotection communication channel, and where the failure lasts for more than 24 consecutive hours	Verbal to Energy Management (*Region*) Verbal to Enterprise Security (*Energy Management*)	Complete AESO Event Reporting Form and submit report to AESO (*Energy Management*)

Table 5
Rescue / Near Misses / Suspension of Consent

- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	**Within 10 Business Days**	**Within 14 Days**	**Within 30 Days**	**Within 12 Weeks**
Federally - regulated pipelines	**[5.1] In all Provinces and Territories** – resulted in the rescue of person(s) or implementation of other similar emergency procedure	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*injured/ill person*)	Complete Report, including investigation report, in EnCompass (*Region*) HVLE in EnCompass *(Region)*	Hazardous Occurrence Report to ESDC (*H&S*)	Complete Report, including investigation report, in EnCompass (*Region*)	Final Submission in OERS to NEB *(Regulatory Affairs)*
Federally or Provincially-regulated pipelines	**[5.2] In all Provinces and Territories** – incident that had the potential to result in a serious incident (i.e., property damage, bodily injury).	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor (*injured/ill person*)	Complete Report, including investigation report, in EnCompass (*Region*) HVLE in EnCompass *(Region)*	---	Complete Report, including investigation report, in EnCompass (*Region*)	---
Federally regulated pipelines	**[5.3] In all Provinces and Territories** If the company suspends consent previously given in accordance with the Damage Prevention Regulations Authorizations in regards to third party crossing or proximity agreements, it must notify the NEB. Suspension can be due to: a) the person carrying out the construction of a facility does not comply with the technical details set out in the persons agreement with the company or the instruction of authorized field personnel regarding procedures to be followed while carrying out construction in the vicinity of a pipe; OR b) the person engaging in an activity that causes the ground disturbance does not comply with the technical details set out in the persons agreement with the company; OR c) work practices might impair pipeline safety or security	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Land Services*) Initial submission in OERS to NEB and TSB [24 hours] (*Region*) **Reporting to occur following field confirmation and in discussion with Land Services* Notification to Regulatory Affairs of OERS submission (*Region*)	Incident Investigation Form (*Region*)	---	Complete Report, including investigation report, in EnCompass (*Region*) Update initial submission in OERS to satisfy TSB and NEB Damage Prevention Regulation requirements (*Regulatory Affairs*)	Final submission in OERS to NEB (*Regulatory Affairs*)

Table 5
Rescue / Near Misses / Suspension of Consent

- *The following reporting requirements relate to employees and contract workers deemed by regional management to be an extension of the crew or designate for the company. For contractor personnel reporting requirements, see the LP/MP Safety Manual.*
- *Regulatory reporting requirements supersede incident completion timelines in IMS-01.*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines				
		Immediately	Within 10 Business Days	Within 14 Days	Within 30 Days	Within 12 Weeks
Federally regulated pipelines	**[5.4] In all Provinces and Territories** – Geotechnical, hydraulic or environmental activity poses a threat to the safe operation of the pipeline. **Note**: *"a threat to the safe operation" should be considered as an activity that is being actively monitored or immediately threatening the integrity of the pipeline.* *Examples:* – *Geotechnical activity- landslide, earthquake, blasting, mining, excavation, frac.* – *Hydraulic activity – flooding, or high volume of precipitation, reroute of water (dams)* – *Environmental activity – hurricane, tornado, lightning storm, etc.* ***NOTE***: *For additional guidance, see Appendix IV – Commentary (5.4)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Initial submission in OERS to NEB and TSB [24 hours] (*Region*) Notify Regulatory Affairs of OERS submission (*Region*)	Incident Investigation Form (*Region*)	---	---	---

Table 6
Environment- Adverse Environmental Effects or Environmental Non-Compliance

- In the event of an adverse environmental effect, review Table 6 in its entirety as the effect may result in multi-jurisdictional notifications.
- The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**As Soon as Feasible After Occurrence**	**Within 24 Hours**	**Within 12 Weeks**
Federally - regulated pipelines	**[6.1] In All Provinces and Territories – Significant Adverse Effects on the Environment** – a release of any chemical or physical substance at a concentration or volume sufficient to cause an irreversible, long-term or continuous change to the ambient environment in a manner that causes harm to human life, wildlife or vegetation. *Examples may include:* - *release of a toxic substance (as defined in the OPR) into a sensitive environment (i.e., watercourse, wetland, etc.) or into a designated national/provincial area (i.e., national park, provincial park, wildlife refuge, etc.)* - *'Frac-outs' released directly into a watercourse during horizontal directional drilling operations* - *release of a toxic substance in an area where there is a pathway to a receptor nearby (i.e., groundwater or surface water is used for drinking water, irrigation water, consumed by livestock, etc.)* - *destruction of critical habitat, as that term is defined in the Species at Risk Act*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region/Project*) Verbal to TSB Reporting Hotline [(819) 997-7887] [as soon as possible, no later than 3 hours] (*Region*) Verbal to Env Dept (*Region/Project*) ***Note**: Contact Environment Dept if assistance is required when determining significant adverse effect.* *Certain adverse environmental effects trigger reporting to Provincial or Federal regulatory agencies (see below for criteria). If the adverse effect meets the reporting threshold, Environment must report the event to the applicable regulatory authority.*	Verbal to Regulatory Affairs and Legal (*Env Dept*)	Initial Submission in OERS to NEB (*Regulatory Affairs*)	Final Submission in OERS to NEB (*Regulatory Affairs*)

Table 6
Environment- Adverse Environmental Effects or Environmental Non-Compliance

- *In the event of an adverse environmental effect, review Table 6 in its entirety as the effect may result in multi-jurisdictional notifications.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**As Soon as Feasible After Occurrence**	**Within 24 Hours**	**Within 12 Weeks**
Federally or Provincially-regulated pipelines	**[6.2] In All Provinces and Territories – Adverse Environmental Effects** – situation or activity that may have created, or has the potential to create, an **adverse environmental** effect including but not limited to the following: - unauthorized contaminants in air, soil, or water have crossed outside of Enbridge facility boundaries - any contaminated soil encountered on the ROW (for more information on this reporting, see *Book 8: Environment, 01-02-06 Contaminated Soil Identification, Temporary Storage & Disposal*) - identification of previously unknown contaminated surface water or groundwater - soil erosion into a wetland or water body - fish habitat has been altered, harmed or destroyed - birds, fish, or other animals have been injured or killed (not including Motor Vehicle Incidents) - disturbance or damage to Species at Risk/Endangered Species or their habitat - public complaints relating to an environmental conditions (noise, odor, water, weeds etc.) that is originating from company activities or facilities - degradation or destruction of productive soil	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region/Project*) Verbal to Env Dept (*Region/Project*) ***Note**: Contact Environment Dept if assistance is required when determining adverse effect* ***Note**: Certain adverse environmental effects trigger reporting to Provincial or Federal regulatory agencies. If the adverse effect meets the reporting threshold, Environment must report the event to the applicable regulatory authority.*	Verbal or written report to Agency*, as appropriate (*Env Dept*) ** AB – NEB and AEP (federally-regulated pipelines)* ** AB – AER (provincially-regulated pipelines)* ** SK – SK Ministry of Environment* ** MB – MB Conservation and Water Stewardship* ** ON – MOECC (via Spills Action Center)* ** QC – MDDELCC* ** NWT – NT-NU 24-hr Spill Report Line* **Environment Canada* Verbal to NEB, if applicable (*Regulatory Affairs*)	---	---

Table 6
Environment- Adverse Environmental Effects or Environmental Non-Compliance

- In the event of an adverse environmental effect, review Table 6 in its entirety as the effect may result in multi-jurisdictional notifications.
- The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	As Soon as Feasible After Occurrence	Within 24 Hours	Within 12 Weeks
Federally or Provincially-regulated pipelines	**[6.3] In All Provinces and Territories – Impacts to Fish and Fish Habitat** – incident that either results in: (a) unauthorized serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery; or (b) unauthorized deposit of a deleterious substance in water frequented by fish – there is a serious and imminent danger of the following occurring: (a) unauthorized serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery; or (b) unauthorized deposit of a deleterious substance in water frequented by fish or in any place under any conditions where the deleterious substance may enter any such water	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region/Project*) Verbal to Env Dept (*Region*)	If criteria (a), verbal to Fisheries and Oceans Canada (federally- and provincially-regulated pipelines) and NEB (federally-regulated pipeline only) *(Env Dept)* If criteria (b), verbal to Environment Canada (federally- and provincially-regulated pipelines) and NEB (federally-regulated pipeline only) *(Env Dept)* ***Note:*** *The Fisheries Act requires notification of criteria (a) and (b) "without delay" rather than "as soon as feasible".* Written Report to Fisheries and Oceans Canada or Environment Canada, as soon as feasible (*Env Dept*) Entry and verification of event in EnCompass and send internal notification (*Region/Project*)	---	---

Table 6
Environment- Adverse Environmental Effects or Environmental Non-Compliance

- *In the event of an adverse environmental effect, review Table 6 in its entirety as the effect may result in multi-jurisdictional notifications.*
- *The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers*

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	**As Soon as Feasible After Occurrence**	**Within 24 Hours**	**Within 12 Weeks**
Federally or Provincially-regulated pipelines	**[6.4] In All Provinces and Territories – Environmental Non-Compliance** – situation or activity conducted that is potentially not in compliance with environmental regulations or permits, a project-specific Environmental Protection Plan, and/or environmental commitments communicated to an external stakeholder or regulator. Examples include, but are not limited to: - water withdrawals that exceed approved diversion license quantities - diversion of water for hydrostatic testing without required notifications/licenses - air emissions exceeding permit requirements - operating facility equipment not in accordance with air permits - proceeding with projects or operations without notifying regulatory agencies - adding or modifying facility infrastructure without amending environmental permits or approvals - clearing vegetation outside of permitted areas - conducting operations not in accordance with land use permits - inspections by regulatory agencies with negative findings (oral or written) - unauthorized work within threatened or endangered species habitat	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region/Project*) Verbal to Env Dept (*Region/Project*) ***Note**: Contact the Environment Dept if assistance is required when determining non-compliance. The Environment Dept will notify applicable Federal and Provincial environmental agencies once the situation has been assessed*	Verbal or written report to Agency*, as appropriate (*Env Dept*) ** AB – AEP (federally-regulated pipelines)* ** AB – AER (provincially-regulated pipelines)* ** SK – SK Ministry of Environment* ** MB – MB Conservation and Water Stewardship* ** ON – MOECC (via Spills Action Center)* ** QC – MDDELCC* ** NWT – NT-NU 24-hr Spill Report Line* **Environment Canada*	---	---
Federally-regulated pipelines	**[6.5] In Ontario** – Any discharge (deposit, leak, emission or addition) of any solid, liquid, gas, odour, heat, sound, vibration or radiation, to the air, land or water that has caused or may cause an adverse effect	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to MOECC (via Spills Action Center), (*Region*)	---	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---

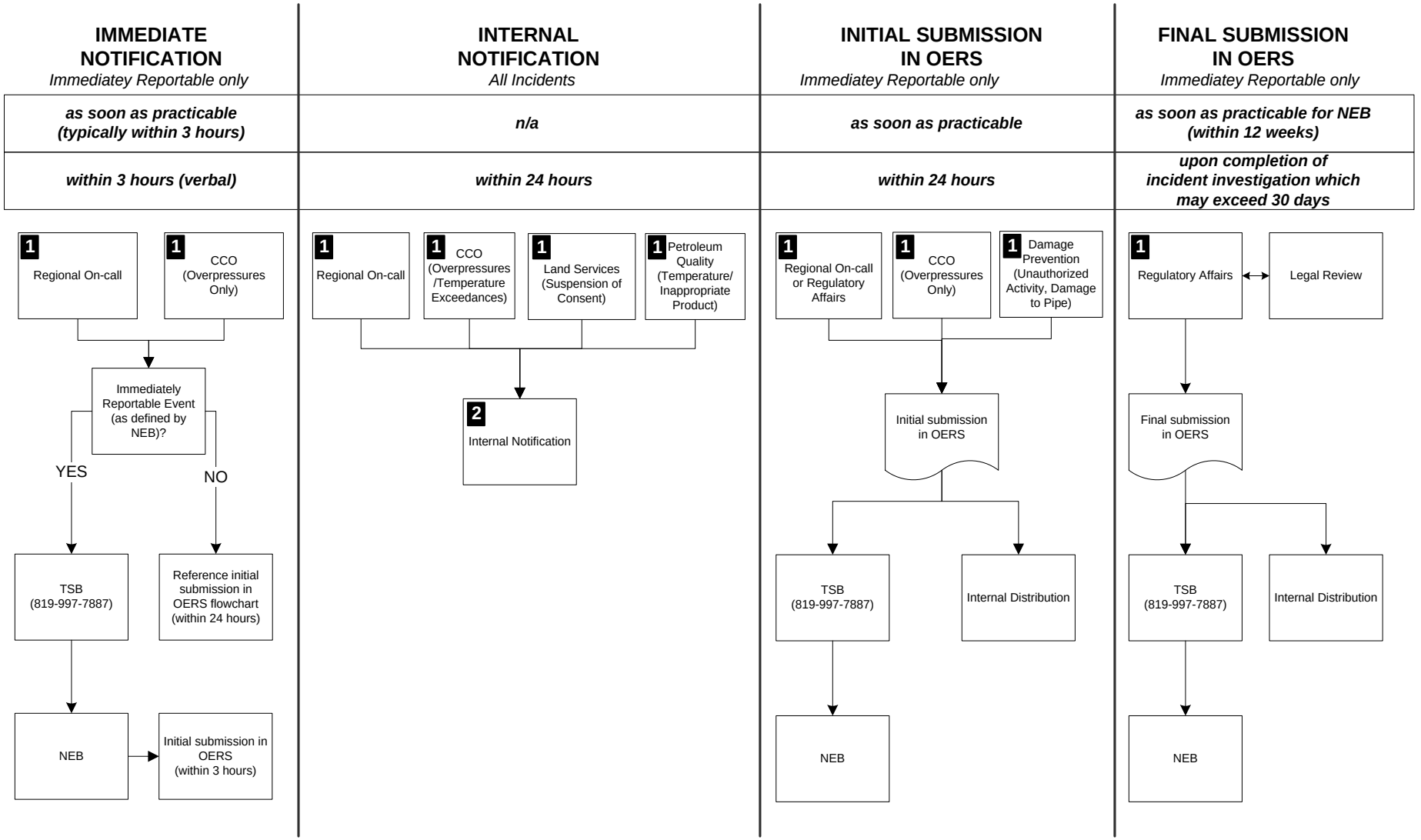
Table 6
Environment- Adverse Environmental Effects or Environmental Non-Compliance

- In the event of an adverse environmental effect, review Table 6 in its entirety as the effect may result in multi-jurisdictional notifications.
- The NEB Online Event Reporting System (OERS) is located at https://apps.neb-one.gc.ca/ers

Jurisdiction	Reporting Criteria	Reporting Requirements & Deadlines			
		Immediately	As Soon as Feasible After Occurrence	Within 24 Hours	Within 12 Weeks
Provincially-regulated pipelines	**[6.6] In Alberta** – release to surface during a pipeline horizontal directional drill ("terrestrial frac out") and **ALL** of the following criteria are met: a) release location is > 50 m from a waterbody b) release volume is < 2 m^3 c) release is contained on the ROW d) released materials – are comprised of bentonite and freshwater and non-toxic additives, products or chemicals – do not contain additives, products, or chemicals that do not have criteria listed in Alberta Tier 1 or Tier 2 Soil and Groundwater Remediation Guidelines or CCME Environmental Quality Guidelines e) release has not caused, nor is there a potential to cause an adverse effect (*Contact Environment Dept if assistance is required when determining adverse effect*) f) all impacted parties (including landowner, grazing lease holder) have been notified – release material completely cleaned-up	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*)	Written Release Report to the AER using the AER Monthly Reporting Form [****By the 5th day of the current month for the previous month's incidents**] *(Env Dept)*	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---
Provincially-regulated pipelines	**[6.7] In Alberta** – Release to surface during a pipeline horizontal directional drill ("terrestrial frac out") and **NOT ALL** of the following criteria are met: a) release location is > 50 m from a waterbody b) release volume is < 2 m^3 c) release is contained on the ROW d) released materials – are comprised of bentonite and freshwater and non-toxic additives, products or chemicals; – do not contain additives, products, or chemicals that do not have criteria listed in Alberta Tier 1 or Tier 2 Soil and Groundwater Remediation Guidelines or CCME Environmental Quality Guidelines; e) release has not caused, nor is there a potential to cause an adverse effect (Contact Environment Dept if assistance is required when determining adverse effect) f) all impacted parties (including landowner, grazing lease holder) have been notified g) release material completely cleaned-up	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to AER *(Region)*	Written Release Report to AER, if requested *(Env Dept)*	Complete Incident Investigation Form and other applicable forms in EnCompass (*Region*)	---

Table 7
Security

Jurisdiction	Reporting Criteria	Reporting Timeline			
		Immediately		Within 3 Business Days	Within 30 Days
Federally or Provincially-regulated pipelines	**[7.1] In all Provinces and Territories** Security incidents, that does not involve shutdown of pipeline operations of a facility, such as: Arson — Protest/interference Break and enter — Sabotage Damage — Suspicious activity Fraud — Theft Harassment — Threat Loss/missing — Trespassing Mischief — Vandalism Policy violation — Violence	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor, Verbal to Enterprise Security Advisor (*Region*)	Verbal to Enterprise Security (*Region*) Verbal to local police (*Region*)	Complete Enterprise Security Incident Report Form *(Region)*	Provide subsequent information to Enterprise Security *(Region)*
Federally or Provincially-regulated pipelines	**[7.2] In all Provinces and Territories** Operation of a portion of the pipeline is interrupted as a result of a situation or condition that poses a threat to any person, property or environment, such as: Security or terrorist threat that results in a pipeline shutdown Arson — Protest/interference Break and enter — Sabotage Damage — Suspicious activity Fraud — Theft Harassment — Threat Loss/missing — Trespassing Mischief — Vandalism Policy violation — Violence	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor, Verbal to Enterprise Security Advisor (*Region*) Initial submission in OERS to TSB [24 hours] (*Region*) Notify Regulatory Affairs of OERS submission (*Region*)	Verbal to Enterprise Security (*Region*) Verbal to local police (*Region*)	Complete Enterprise Security Incident Report Form *(Region)*	Provide subsequent information to Enterprise Security *(Region)* Update initial submission in OERS to satisfy TSB requirements (*Regulatory Affairs*) Complete Incident Investigation Form, AQS Form and other applicable forms, in EnCompass (*Region*)
Provincially-regulated pipelines	**[7.3] In Alberta** – sabotage event involving a transmission asset. ***NOTE***: *For additional guidance, see Appendix IV – Commentary (7.3)*	Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (*Region*) Verbal to Immediate Supervisor, Verbal to Enterprise Security Advisor (*Region*) ***Note****: if applicable to SCADA, also contact IT Security*	Verbal to: - AESO - RCMP (K Division, Tofield, Strathcona, Wood Buffalo) - Local police - Enterprise Security (*Enterprise Security*) ***Note****: see Appendix for agency phone numbers*	Complete Enterprise Security Incident Report Form *(Region)* Complete ISO 304-7 Event Report and submit to AEOS (Enterprise Security)	Provide subsequent information to Enterprise Security *(Region)*



1 **Request Input From Other Departments As Required**
(S&E, P.I., ECC, Crossings, Regulatory Affairs, Law, etc.)

2 **Using the appropriate incident reporting system & notifications**

Figure 2
TSB/NEB Regulatory Incident Reporting

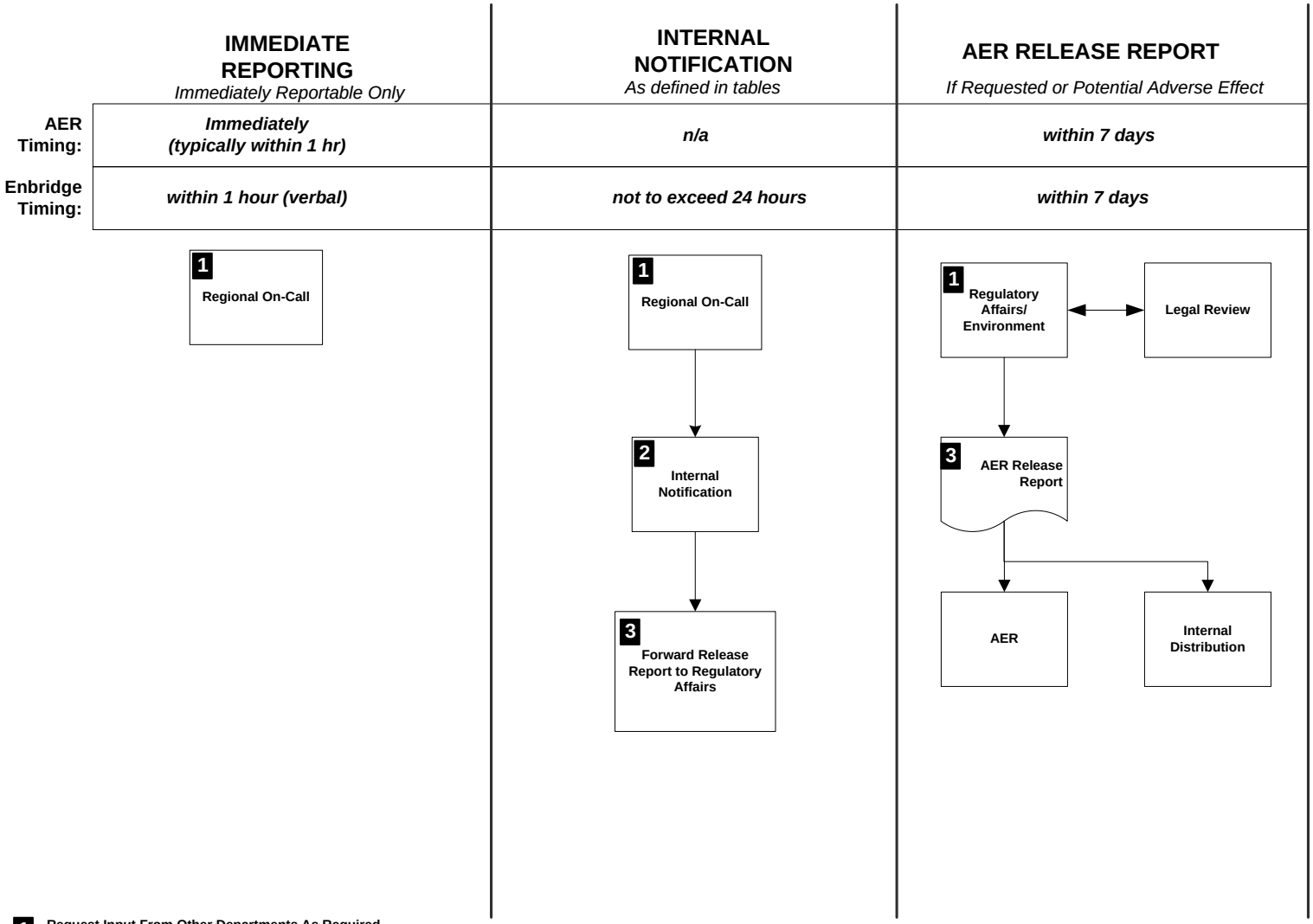


Figure 3
AER Regulatory Incident Reporting

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Appendix I
Agency Contact Phone Numbers

Note: For all emergency phone numbers, see applicable Emergency Response Directory (ERD)

Jurisdiction	Regulatory Agencies	Phone No.
Federal	Canadian Nuclear Safety Commission (CNSC)	(613) 995-0479
	Canadian Wildlife Service	see province
	Environment Canada (National Environmental Emergency Center)	(866) 283-2333
	Environmental Response Fisheries and Oceans Canada	(800) 265-0237
	Economic and Social Development Canada (ESDC)	(800) 641-4049
	Fisheries Protection Program	(855) 852-8320
	1-800 'Oh Canada' General Inquiries	(800) 622-6232
	National Energy Board (NEB) Note: *24/7 Incident Line*	(403) 807-9473
	Transportation of Dangerous Goods (CANUTEC) or see provincial list for local office	(613) 996-6666
	Transportation Safety Board of Canada (TSB) *Note: TSB will report to the NEB.*	(819) 997-7887
	Treasury Board of Canada Secretariat – Occupational Health and Safety	(613) 957-2514
	Workers Compensation	see province
Alberta	Alberta Boilers Safety Association (ABSA)	(780) 437-9100
	Alberta Electric System Operator (AESO)	(403) 233-7476
	Alberta Environment and Parks (AEP) – (24-hour Environmental Hotline)	(800) 222-6514
	Alberta Energy Regulator (AER) (Energy and Environmental Emergency 24-Hour Response Line)	(800) 222-6514
	Alberta Security and Strategic Intelligence Support Team (ASSIST)	(780) 644-2680
	Alberta Workplace Health and Safety (Edmonton)	(780) 415-8690
	Alberta Workplace Health and Safety (outside Edmonton)	(866) 415-8690
	Canadian Wildlife Service - Prairie Northern Region	(780) 951-8600
	CANUTEC	(613) 996-6666
	Environment Canada - (National Environmental Emergency Center)	(866) 283-2333
	Fisheries and Oceans Canada	(800) 265-0237
	RCMP – Alberta 'K' Division	(780) 412-5424
	RCMP – Tofield	(780) 662-3352
	RCMP – Strathcona	(780) 467-7741
	RCMP – Wood Buffalo	(780) 788-4000

Jurisdiction	Regulatory Agencies	Phone No.
	Transportation of Dangerous Goods (Alberta Transportation)	(800) 272-9600
	Workers' Compensation Board (WCB) Toll Free in Alberta	(866) 922-9221
	Workers' Compensation Board (WCB) Toll Free outside Alberta	(800) 661-9608
Saskatchewan	Canadian Wildlife Service	(306) 975-4087
	CANUTEC	(613) 996-6666
	Environmental Response, Fisheries and Oceans Canada	(800) 265-0237
	Environment Canada	(866) 283-2333
	Saskatchewan Government Insurance (SGI)	(800) 667-9868
	Saskatchewan Ministry of Environment	(800) 667-7525
	Saskatchewan Ministry of Economy (Estevan)	(306) 637-4541
	Saskatchewan Ministry of Economy Emergency Support Line	(844) 764-3637
	Saskatchewan Workers' Compensation Board (WCB)	(306) 787-4370
	Transportation of Dangerous Goods (Saskatchewan Ministry of Environment)	(800) 667-7525
	Technical Safety Authority of Saskatchewan (TSASK)	(866) 530-8599
Manitoba	Canadian Wildlife Service - Prairie Northern Region	(780) 951-8600
	CANUTEC	(613) 996-6666
	Environment Canada – National Environmental Emergency Centre	(866) 283-2333
	Environmental Response, Fisheries and Oceans Canada	(800) 265-0237
	Manitoba Sustainable Development	(204) 945-4888
	Manitoba Mineral Resources (Virden)	(204) 748-4260
	Manitoba Mineral Resources (Waskada)	(204) 673-2472
	Manitoba Public Insurance (MPI)	(800) 665-2410
	Manitoba Workplace Safety & Health	(855) 957-7233
	The Office of the Fire Commissioner	(800)-282-8069
	Transportation of Dangerous Goods (Manitoba Conservation)	(204) 945-4888
	Workers' Compensation Board of Manitoba	(855) 954-4321
Ontario	Ontario Ministry of the Environment and Climate Change (MOECC), Spills Action Center (SAC)	(800) 268-6060 (416) 325-3000
	Workplace Safety and Insurance Board (WSIB)	(800) 387-5540
	Ontario Ministry of Labour	(877) 202-0008

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Jurisdiction	Regulatory Agencies	Phone No.
	Transportation of Dangerous Goods	Local Police
	CANUTEC	(613) 996-6666
	Technical Standards & Safety Authority (TSSA)	(877) 682-8772
	Environment Canada – National Environmental Emergency Centre	(866) 283-2333
	Canadian Wildlife Service - Ontario	(416) 739-5830
	Fisheries and Oceans Canada (Burlington)	(905) 336-6240
	Fisheries and Oceans Canada (Peterborough)	(705) 750-0269
	Fisheries and Oceans Canada (Prescott)	(613) 925-2865
	Fisheries and Oceans Canada (London)	(519) 668-2722
Quebec	Environment Canada – National Environmental Emergency Centre	(866) 283-2333
	Canadian Wildlife Service – Quebec	(800) 668-6767
	CANUTEC	(613) 996-6666
	Commission de la sante' et de la securite du travail (CSST)	(866) 302-2778
	Fisheries and Oceans Canada	(418) 648-2239
	Fisheries Protection Program	(877) 722-4828
	Occupational Health and Safety Commission	(866) 302-2778
	Ministère du Dévelopment durable, de l'Environnement, de la Lutte contre les changements climatiques (MDDELCC)	(866) 694-5454
	Quebec Region Environmental Response Program	(800) 363-4735 (418) 648 4557
	Régie du bâtiment du Québec	(800) 268-6060
	Transportation of Dangerous Goods	PQ Local Police
Northwest Territories	Canadian Wildlife Service	(867) 975-4642
	CANUTEC	(613) 996-6666
	Chief Safety Officer	(867) 669-4418
	Department of Public Works and Services	(867) 767-9043
	Environment Canada	(866) 283-2333
	Fisheries and Oceans Canada	(866) 290-3731
	Department of Environment and Natural Resources (ENR) 24 hour Spill Report Line	(867) 920-8130
	Department of Lands (GNWT Lands)	(867) 920-8130
	Mackenzie Valley Land and Water Board (MVLWB)	(867) 669-0506

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Jurisdiction	Regulatory Agencies	Phone No.
	Transportation of Dangerous Goods (Ministry of Environment NWT)	(867) 873-7654
	Workers' Safety and Compensation Commission (WSCC)	(867) 920-3888
For Death or damage to non-migratory birds and other animals, the regulatory agencies are as follows:		
	ASRD Rainbow Lake	(780) 956-3919
	NWT Environment and Natural Resources: Norman Wells to Tulita	(867) 587-2422
	NWT Environment and Natural Resources: Tulita to Wrigley	(867) 588-3441
	NWT Environment and Natural Resources: Wrigley to Alberta Border	(867) 695-6634

Appendix II
Reportable Quantities of Transported Dangerous Goods

Class	Description	Minimum Quantities
1	Explosives	Any quantity
2	Gases	Any quantity that could pose a danger to public safety or any sustained release of 10 min. or more.
3	Flammable Liquids	Any quantity (Packing Group I or II) 30 L or 30 Kg (Packing Group III)
4	Flammable Solids, Substances likely to spontaneously combust, water reactive substances	Any quantity (Packing Group I or II) 30 L or 30 Kg (Packing Group III)
5	Oxidizers/Peroxides	Any quantity (Packing Group I or II) 30 L or 30 Kg (Packing Group III)
6.1	Toxic Substances	Any quantity (Packing Group I or II) 30 L or 30 Kg (Packing Group III)
6.2	Infectious Substances	Any quantity
7	Radioactive Materials	A level of ionizing radiation greater than the level established in Packing and Transport of Nuclear Substances Regulation, Section 39
8	Corrosives	Any quantity (Packing Group I or II) 30 L or 30 Kg (Packing Group III)
9	Miscellaneous Products, Substances or Organisms	30 L or 30 Kg

***NOTE**: The Packing Group indicates the degree of danger of a product or substance:*

- *Packing Group I – great danger (e.g., copper-based pesticide under transport)*
- *Packing Group II – moderate danger (e.g., gasoline under transport)*
- *Packing Group III – minor danger (e.g., diesel under transport)*

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Appendix III
TSB Verbal Notification Guidance Worksheet

This information will be requested by the TSB during verbal notification of an incident. This worksheet can be used to document discussions with the TSB and uploaded into an incident management system (EnCompass).

Prior to calling, ensure the event meets the criteria for a significant event: loss of human life, serious injury, fire or explosion that causes a pipeline or facility to be inoperative, LVP hydrocarbon release in excess of 1.5m^3 (9.4 bbls) that leaves company property or right-of-way, rupture or toxic plume (HVP hydrocarbon release).

DATE: **TIME:** **TSB CONTACT NAME:**

Requested Information	Incident Details
Name of operator:	
Date and time of occurrence:	
The unique identifier of the pipeline or portion of pipeline:	
Specific pipeline components that malfunctioned or failed:	
Location of occurrence (i.e., facility, pipeline kilometer post location):	
Closest city, town or village to the occurrence site:	
Number of persons that were killed or sustained a serious injury:	
Follow-up questions from the TSB:	
Description of any commodity contained in or released from the pipeline and an estimate of volume of commodity released or recovered:	
Follow-up questions from the TSB:	
Description of actual or anticipated duration of any interruption of the operation of the pipeline or a portion of the pipeline:	
Follow-up questions from the TSB:	
Description of the occurrence, the events leading up to it and the extent of any damage including the consequences on public, any other property and the environment:	
Follow-up questions from the TSB:	
Name, address and title of person making the report:	

Appendix IV
Commentary

This appendix provides background information and additional guidance on reporting requirements for the reporting tables.

Figure 1 – Incident Reporting Table Usage Guide, Multiple Incidents	
1.0	It is possible that a single occurrence may result in multiple incident types. If multiple incident types occur as a result of a single occurrence, companies are expected to report those incident types under a single incident report. Examples of situations where this might be the case include, but are not limited to: - a pipeline rupture (occurrence) where there is a release of gas (incident type) and an explosion (incident type) - an industrial accident (occurrence) that causes a death (incident type), a serious injury (incident type) and a fire (incident type) - an operational malfunction (occurrence) that causes an overpressure (incident type) and a release of product (incident type) - an operational malfunction (occurrence) that causes several concurrent or immediately consecutive overpressures (incident types) In cases where an incident has occurred, and a second incident occurs during the response to the initial incident (e.g., a fire occurs during the clean-up of a spill), the second incident is considered distinct and should be reported separately.
Table 1 – Significant Incident Notifications	
1.1	Email notification should include: – Subject Line: LP Significant Incident Notifications – Summary of incident details – Name of designate responsible for performing regular updates For shutdown or leak events, email updates will stop when the line is returned to service or when the source of the release has been repaired and any environmental impact contained. The last email update will read “FINAL UPDATE” to indicate that no more updates will be issued. ** Call-up notification involves verbal notification to the next higher level within the organizational hierarchy. If the next level contact is unavailable and communication cannot be confirmed within 30 minutes, continue attempting to establish contact with the next higher level until an Executive Management Team (EMT) member is reached.
Table 2A – Releases/Leaks/Spills – Commodities	
2A	Record the following commodity releases, regardless of volume, in EnCompass: – crude oil on tank roofs (excludes minor seepage around appurtenances) – crude oil on building floors: if from a source that is not intended to release crude oil – crude oil inside a containment berm or building sump: if from a source that is not intended to release crude oil – valve seal packing: when weeping becomes dripping – pumps seals: if the drain system overflows (i.e., blocked drain, pump seal failure causing flow above system capacity) (excludes dripping into a drain

	system where the system capacity is not exceeded) – flanges/threaded connections: when weeping becomes dripping – mixers: when weeping becomes dripping – small volumes resulting from maintenance activities (i.e., oil spilling out of a tub when removing a pig) Pipeline segment is defined as trap to trap.
2A.2	– Ground does not have to be impacted to trigger an immediately reportable release. – 'Unintended' – not planned or expected – 'Uncontrolled' – not in control of the hydrocarbon being released (i.e., using hand valve to control flow, etc.) – 'Uncontained' – volume loss not anticipated or intended and out of containment Events that do not fall under this definition include, but are not limited to, intended and controlled flaring or venting of natural gas or hydrocarbons including venting through properly functioning pressure relief valves or pressure safety valves. For HVP, supply an estimation of rate of release and total volume released when reporting incidents to OERS. To estimate the HVP release rate use: $Rate\,(kg/\sec) = 132.52 \times \left(\frac{h}{1000}\right)^2 \times \sqrt[2]{D \times P}$ *h = Equivalent hole diameter (mm)* *D = density of gas (kg/m³)* *P = Pressure of gas (bar(a), absolute pressure)* To calculate total HVP mass released for use in estimating volume: *Total Mass (kg) = Rate (kg/sec) x duration of release (sec)* To calculate duration of release, in order: - if the start and end times of the release are known, this is the actual duration of the release - if the start of the release is not known, use the time of the last inspection/surveillance/site visit of that part of the facility/pipeline to the time the release was discovered - if the last inspection/surveillance/site visit time is not known, assume the leak was present for a minimum of 30 days or the date the facility/pipeline was commissioned (whichever is less) NOTE: OERS will automatically determine whether or not the event meets the definition of 'an incident that harms people or the environment'. The company is responsible for specifically indicating whether or not the incident meets the definitions or 'rupture' and 'toxic plume'.
2A.3	Examples of a loss of LVP Hydrocarbons < 1.5 m³ (9.4 bbls) include but are not limited to:

	– crude oil on tank roofs - excludes minor seepage around appurtenances – crude oil on building floors - if from a source that is not intended to release crude oil – crude oil inside a containment berm or building sump - if from a source that is not intended to release crude oil – valve seal packing - when weeping becomes dripping – pump seals - if the drain system overflows (i.e. blocked drain, pump seal failure causing flow above system capacity, etc.). Excludes dripping into a drain system where the system capacity is not exceeded – flanges/threaded connections - when weeping becomes dripping – mixers - when weeping becomes dripping – small volumes resulting from maintenance activities (i.e. oil spilling out of tub when removing a pig, etc.)
2A.4	Line pipe body refers to any wall breach of the transmission pipeline from outside of the stations or terminal fences.
Table 3A – People (Occupational Illness/Injury) – Fatality/Serious Injury	
3A.1	The Onshore Pipeline Regulations does not differentiate between different types of 'persons'. Therefore, companies must report all deaths or serious injuries to any person that occur, relating to pipeline construction, operation or abandonment, regardless of whether that person was directly employed by the company.
Table 3C – People (Occupational Illness/Injury) – Medical Aid/ Modified Work	
3C.1	For more instructions, see WCB Process Manual.
3C.2	Immediately after initial visit to the hospital or clinic.
3C.3	For more instructions, see WCB Process Manual.
3C.5	If the incident is in connection with an elevating device, reporting is required to TSSA.
Table 3D – People (Occupational Illness/Injury) – First Aid	
3D.1 thru 3D.3	Ensure the first aid injury is logged in the first aid logbook and EnCompass.
Table 4A – Property Damage – Structural Integrity/ Structural Threat to the Pipeline/ Operating Beyond Design Limits (i.e., Overpressures)	
4A.1	– The company uses internal control systems and operating procedures to ensure pressure is kept below the maximum allowable operating pressure (MAOP) and that in events where pressure does exceed such limits, an investigation is completed and corrective actions are identified and completed. In the event of a release, the region will be the lead investigator – A self-imposed pressure restriction is one possible mitigation measure to restore the required safety factors (e.g., 1.25 of intended operating pressure) on known defects for which the estimated failure pressure may be lower than design pressure
4A.2	The current interpretation is that the NEB expects that 'operating beyond design limits' incidents be reported on operating pipelines, which includes

	pipelines in a deactivated state, but does not include pipelines in an abandoned or decommissioned state. The NEB definitions are as follows: *Abandon* - permanently cease operation, such that the cessation results in the discontinuance of service (highway analogy – closing both lanes of a two-lane highway such that no one can use the highway to get from point A to point B) *Decommission* - permanently cease operation, such that the cessation does not result in the discontinuance of service (highway analogy – closing one lane of a two-lane highway such that people can still use one lane to get from point A to point B) *Deactivate* - remove temporarily from service (deactivated facilities can be reactivated and returned to service after being granted approval by the NEB)
4A.3	'Ground disturbance' – any activity that involves: – Soil being disturbed or displaced to a depth of ≥ 30 cm – cultivation to a depth of ≥ 45 cm – any reduction of the earth cover over the pipeline 'Prescribed area' is defined as a strip of land measured 30 m perpendicularly on each side from the centerline of a pipe The NEB defines 'damage' as impacts caused by any person to an operational (including deactivated) pipeline where those impacts were: a) discovered during the course of operations or maintenance activities and are indicative of contact with the regulated pipeline; or b) outside the scope of a planned activity and there were no specific procedures in place to mitigate the damage Events that do not fall under this definition include: a) damage to the pipeline during an integrity dig where the scope of the integrity dig was to replace or repair that portion of the pipeline b) damage to the pipeline during slope stability work where potential contact with the pipeline was anticipated and specifically mitigated against
4A.4	For reporting purposes, the TSB Regulations have not yet been updated to use the term 'prescribed area', which is defined as a strip of land measuring 30 m perpendicularly on each side from the centerline of a pipe. To determine whether or not to report, contact Damage Prevention, Regulatory Affairs and Legal.
4A.5	'A threat to the safe operation' should be considered as an activity that is being actively monitored or immediately threating the integrity of the pipeline.
4A.6	Excludes precautionary or emergency shutdown of the pipeline to investigate unknown causes found to be false or nonhazardous (i.e., equipment malfunctions, inadvertent shutdowns, etc.).
4A.7	Incidents that fit this criterion would be any instances where the mainline is impeding the movement of trains, vehicles or watercraft. Pipeline Integrity should be consulted prior to reporting.
4A.8	Includes unauthorized 3rd party activity within 0.3 m (1 ft) of the pipeline, unauthorized activities such as pipeline crossings, use of explosives, mining and drilling activities, and natural activities (i.e., threat of flooding, landslides, etc.), but excludes minor incidents associated with authorized crossings of the ROW.
4A.10	When a leak or break in a pipeline or damage to a pipeline that resulted from a contact described above has been repaired, the NEB may require the

	submission of reports in writing, in accordance with the regulations.
Table 4B – Property Damage – Fires/ Explosions	
4B.1	Events that are not reportable under this section include, but are not limited to, events that are not caused by the construction, operation or abandonment of a pipeline (e.g., grass or wildland fire that is caused by another party and does not impact pipeline facilities or operations).
Table 4D – Property Damage – Motor Vehicle Incident/Damage	
4D.1	For short-term rentals, see the company travel policy. If there is bodily injury, please refer to the People Safety Section.
4D.2	For short-term rentals, see the company travel policy.
Table 4F - Property Damage-Pressure Vessels/Boilers/Heaters/Heat Exchangers	

4F.1 thru 4F.7	All incidents involving a pressure vessel must be reported to the Federal and Provincial/Territory regulator.
	A pressure vessel is a closed vessel designed to contain, store, distribute, transfer, distill, processing, or otherwise handling gas, vapour or liquid and which exceeds the following service and size limits:
	– has an internal volume of 42.5 L (1.5 ft3) or more
	– is designed for internal gauge pressure of 103kPa (15 psig) or more
	– has an internal diameter of:
	  – 152mm (6 in) or more if it is not in water service; or
	  – 610mm (24 in) or more if it is water service

Table 5 – Rescue/Near Misses	
5.3	'A threat to the safe operation' should be considered as an activity that is being actively monitored or immediately threatening the integrity of the pipeline.
Table 7 – Security	
7.3	All sabotage reporting in Alberta must be in accordance with Alberta Reliability Standard – Annual Compliance CIP-001-AB-1 and CIP-AB1-1.

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DOCUMENT CHANGE LOG

Version 20.0	Version 21.0	Justification
Responsibilities Control Center Control Center is responsible for: • initiating incident reporting to applicable regulators in the event of overpressure incidents, as more specifically outlined in the Incident Reporting Tables • contacting regional on-call individual when potential contaminated soil is discovered	**Responsibilities Control Center** Control Center is responsible for: • initiating incident reporting to applicable regulators in the event of overpressure incidents, as more specifically outlined in the Incident Reporting Tables • initiating internal email notifications for temperature threshold exceedances • contacting regional on-call individual when potential contaminated soil is discovered	**OMS-REQR-00888** Reporting responsibilities for temperature and pressure requirements in Table 4A.1 and 4A.2 need to reflect current agreed to process for new requirements in NEB Reporting Guidelines.
N/A	**Responsibilities Land Services** Land Services is responsible for: • initiating internal incident reporting as outlined in the Incident Reporting Table 5.3 • notifying the region when consent of a 3rd party crossing or proximity agreement has been suspended	
N/A	**Responsibilities Petroleum Quality** Petroleum Quality is responsible for: • initiating internal incident reporting as outlined in the Incident Reporting Table 4A.2 • contacting Regulatory Affairs when an inappropriate product is discovered	
Regulatory Affairs, Health & Safety, Environment and Radiation Safety Officer Regulatory Affairs, Health & Safety (H&S), Environment and Radiation Safety Officer are responsible for…	**Regulatory Affairs, Health & Safety, Damage Prevention, Environment and Radiation Safety Officer** Regulatory Affairs, Health & Safety (H&S), Damage Prevention, Environment and Radiation Safety Officer are responsible for…	
4A.2 Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (Temperature – CCO)	**4A.2** Entry and verification of event in EnCompass (completion of logbook, event and impact forms) [by end of next business day] (Temperature – CCO*) (Slope movement – Region)	

DOCUMENT CHANGE LOG

Version 20.0	Version 21.0	Justification
(Slope movement – Region) (Exposure – Region) (Inappropriate Product – PQ) Initial submission in OERS to NEB and TSB [24 hours] (Temperature –CCO) Complete Report, including Investigation Report, in EnCompass (Temperature –PQ)	(Exposure – Region) (Inappropriate Product – PQ) *CCO will also inform Thermal Management Group via email notification Initial submission in OERS to NEB and TSB [24 hours] (Temperature – Regulatory Affairs) Complete Report, including Investigation Report, in EnCompass (Temperature – CCO)	

Annex 3 – Table of Contents Page

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3.0 Sensitive Area General Response Strategies

The High Consequence Areas ("HCAs") and Unusually Sensitive Areas ("USAs") that are detailed and defined for this Plan are an integral part of the Enbridge Central Response Zone for emergency response. Due to the magnitude of the mapping involved the Enbridge Central Region HCA Mapbook has been compressed into electronic media, and is accessible through regional offices.

In the event of an incident, a review of the "Impact Type" column in the *Unusually Sensitive Area Pipe Segments* Tables in *Section 3.11* - would alert responders to the USAs within the area and direct them to High Consequence Area ("HCA") maps and tables and Control Point ("CP") maps in order to protect environmentally and economically sensitive areas.

Regions maintain maps identifying HCAs along the pipeline, including:

- High Population Areas ("HPA")
- Other Population Areas ("OPA")
- Commercially Navigable Waterways ("CNW")
- Environmentally Sensitive Areas ("ESA")
- Drinking Water ("DW")

Regions provide CP Map sets that identify product containment and recovery sites (Control Points) on high risk water-bodies that could be impacted by a pipeline leak. The impact mechanism could be via direct crossing, overland flow or spray.

Below are the specifically identified Unusually Sensitive Areas. This information should be considered when responding to an incident within the Central Response Zone.

3.1 Environmentally Sensitive Areas

Environmentally Sensitive Area ("ESA") HCAs are represented in the Map and Tables - *Unusually Sensitive Area Pipe Segments,* in *Section 3.11* of this Annex.

In the event of an incident the Table- Unusually Sensitive Area Pipe Segments by Stationing- Transport Impact would alert responders to the USAs within the area and direct them to the HCA maps for further site overview.

Further information on ESAs may also be found in regional Environmentally Sensitive Areas maps.

3.2 Public Water Supplies/ Water Intakes

Drinking Water ("DW") HCAs (municipal drinking water wells and municipal water intakes) are represented in the Tables - *Unusually Sensitive Area Pipe Segments.*

3.3 Indigenous Community Lands

There are fifteen Indigenous community lands within three miles of the response area corridor. See the Unusually Sensitive Area Map below.

- Carry the Kettle Nakota
- Cowessess
- Danielson Provincial Park
- Keeseekoose First Nation
- Muskowekwan Urban Reserve
- Nekaneet Cree Nation Indian Reserve
- Oak Lake Provincial Park
- Oak Lake (Canupawakpa Dakota First Nation)
- Ocean Man First Nation
- Ochapowace Indian Reserve (Ochapowace First Nation)
- Piapot Urban Reserve
- Pheasant Rump First Nation
- Sakimay Indian Reserve
- Swan Lake (Swan Lake First Nation)
- White Bear First Nation

3.4 National / Provincial Parks

There is one National Parks/Provincial Parks/Provincial Recreational Areas within three miles of the response zone corridor. Refer to map under *Section 3.11*.

- Oak Lake Provincial park (MB)

3.5 Schools

There are 61 schools within ½ mile of the response zone corridor. These include both urban and rural schools and those within 200m of the right-of-way are included in the Enbridge Public Awareness mailing list.

3.6 Residential Areas

There are a number of residential clusters within the response zone corridor. It is expected that residents would receive notification of pipeline spills over public communications media in these areas. Enbridge Public Information Officer would notify residents within the vicinity of a spill

3.7 Businesses

Because of the various types of businesses and pipelines located in areas along the Central Region pipeline routes, contacts for these businesses are not listed. It is expected that businesses would receive notification of pipeline spills over public communications media in these areas. Under the Incident Command System, the Public Information Officer is responsible for notifying businesses within the vicinity of an incident.

3.8 Water Resources/ Lakes and Streams

Control Point Maps document the water crossings addressed along the Central Region Pipelines. Due to the magnitude of the mapping involved the regional Control Point Mapbook has been compressed into electronic media, which is available through regional offices.

The following table lists the direct water crossings determined by LP Risk Management using the information that was collected by aerial imagery. Each visible water crossing was analyzed to meet the following criteria:

- a watershed size greater than 10km² or evidence of perennial open channel flow;
- an associated latitude/longitude
- a waterbody name

Table 1- Central Pipeline Water Crossings

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
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Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

Water Body Name	Number of Crossings	Lines Impacted	Approx Line KP	Approx Latitude	Approx Longitude
[redacted]					

3.9 Historical/Archaeological Sites

Environmental impact on a Historical/Archaeological site would be a major concern and would impact response activities. Consideration would be made when creating an IAP to address sensitivities around Historical/Archaeological sites. Prior to initiating response activities contact the provincial emergency management office.

3.10 Transportation Areas

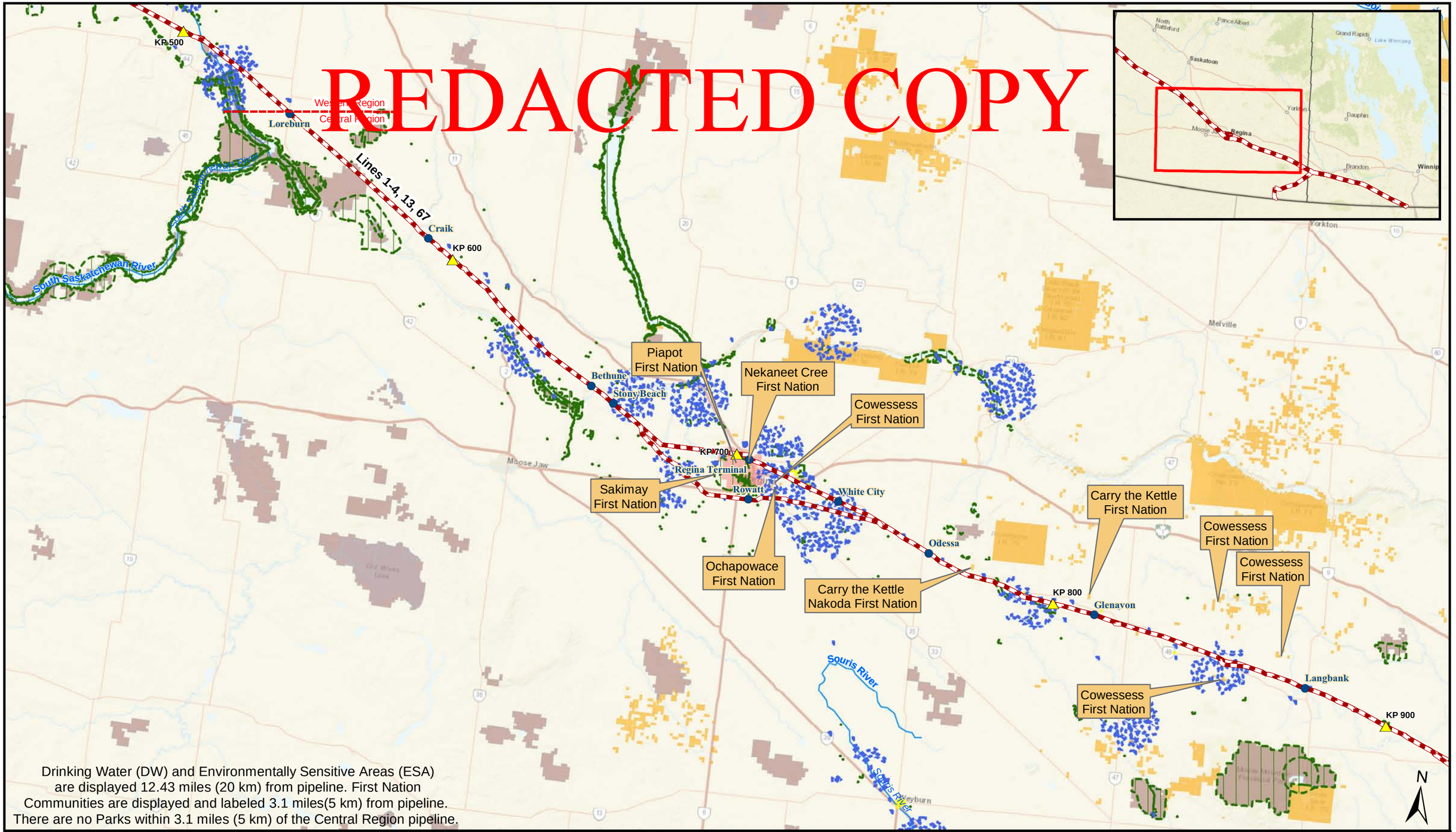
The table below represents the various transportation corridors along the pipeline routes that may be affected during a response.

Federal and Provincial Highway Crossings	
Lines 1-4, 13 & 67	
SASKATCHEWAN	
HWY	KP
18	709
2	126
33	21
35	453,618
361	545
39	591,752
46	697
47	654,814
48	660/681/686/718/726/754/821/841/844/915
6	534,693
600	128/769/928
601	89/96/737/896
603	80
604	48
605	844,685
606	623,784
620	580,741
622	560
624	550
641	504,667
642	484,649
643	430,595
700	60
730	512
733	439,604
739	459,624

Federal and Provincial Highway Crossings	
Lines 1-4, 13 & 67	
SASKATCHEWAN	
HWY	KP
749	381,545
8	113/758/917
9	63/708/868

Federal and Provincial Highway Crossings	
Lines 1-4, 13, 65 & 67	
MANITOBA	
HWY	KP
887/1046	
2	884/908/911/922/1044/1081
201	1052/1212
21	849/1009
23	976/1135
240	1012/1171
242	968/1147
243	1073/1231
244	997/1156
245	954/1112
250	865/1024
254	831/990
255	156/818/977
256	792/952
3	1028/1187
30	1079/1236
306	1061/1220
32	1047/1206
34	973/1132
340	1067
342	951/1110
344	903/1062
348	880/1040
432	1033/1191
434	1030/1189
5	938/1097
530	915/1013
532	958/1117
83	812/972

3.11 CENTRAL UNUSUALLY SENSITIVE AREA MAP



Drinking Water (DW) and Environmentally Sensitive Areas (ESA) are displayed 12.43 miles (20 km) from pipeline. First Nation Communities are displayed and labeled 3.1 miles(5 km) from pipeline. There are no Parks within 3.1 miles (5 km) of the Central Region pipeline.

ENBRIDGE

DW
ESA
Parks
First Nation Community
HPA
OPA
Pipeline
Enbridge Station
Kilometer Post

Regional Unusually Sensitive Area Map

Central Region

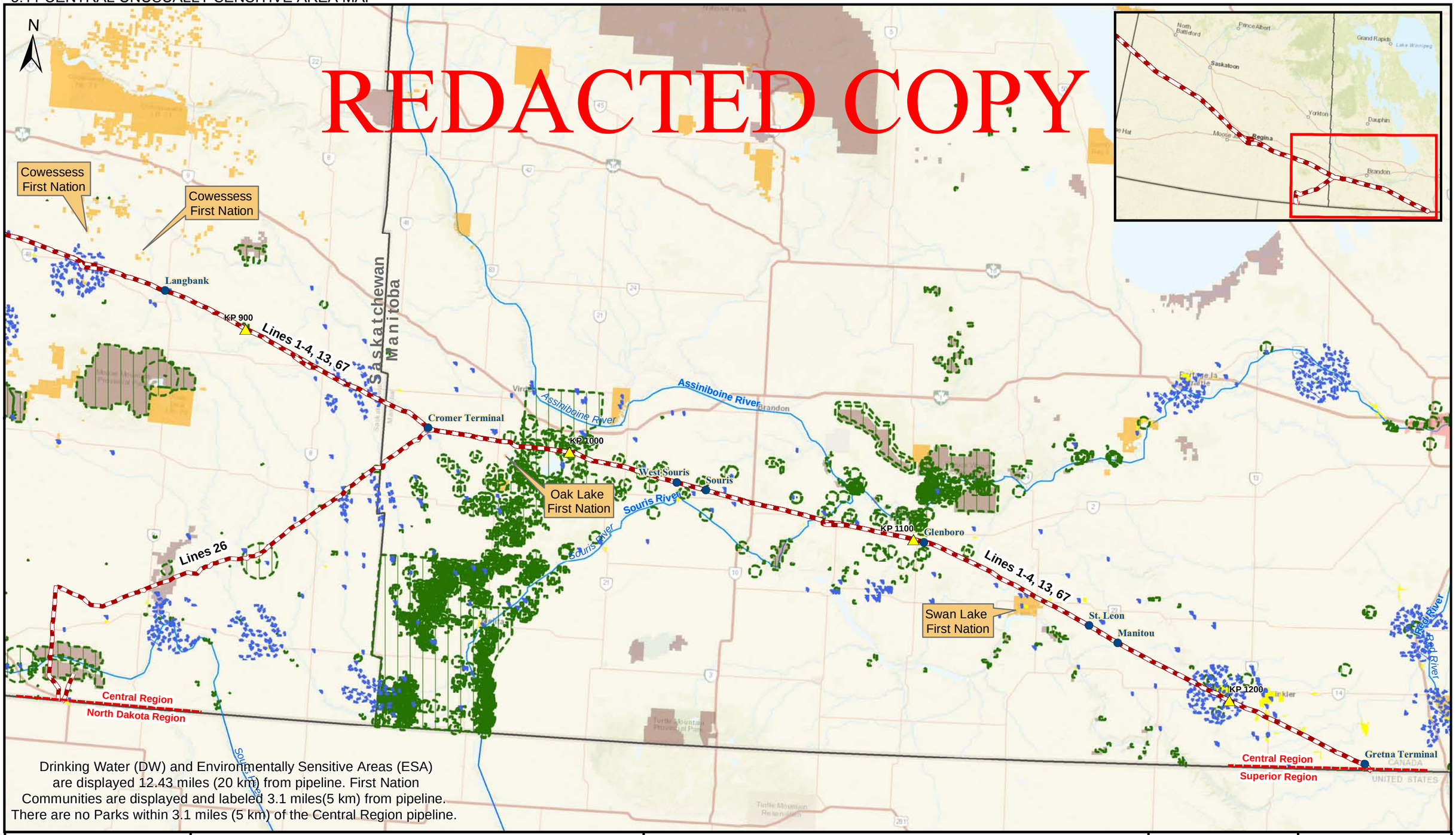
0 12.5 25 50 Miles

0 15 30 60 Kilometers

Date Issued:	02/16/2015
Date Revised:	10/10/2017
Drawn By:	NMS
Scale:	1:1,000,000
Map Series	1 of 2

Natural Resources Engineering Co.
715-395-5680

3.11 CENTRAL UNUSUALLY SENSITIVE AREA MAP



ENBRIDGE

DW
ESA
Parks
First Nation Community
HPA
OPA
Pipeline
Enbridge Station
Kilometer Post

Regional Unusually Sensitive Area Map

Central Region

0 12.5 25 50 Miles

0 15 30 60 Kilometers

Date Issued:	02/16/2015
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Drawn By:	NMS
Scale:	1:1,000,000
Map Series	2 of 2

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Annex 4 – Table of Contents Page

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Federal Legislation

4.1 Transportation Safety Board Regulations, SOR/2014-37

Canadian Transportation Accident Investigation and Safety Board Act SOR/2014-37		
Section	**Brief Description**	**Location in ICP**
4 (1)	The operator of a pipeline must report the following pipeline occurrences to the Board if they result directly from the operation of the pipeline: *(a)* (a person is killed or sustains a serious injury; *(b)* (the safe operation of the pipeline is affected by (i) (i)damage sustained when another object came into contact with it, or (ii) (ii)a fire or explosion or an ignition that is not associated with normal pipeline operations; *(c)* (an event or an operational malfunction results in (i) (i)an unintended or uncontrolled release of gas, (ii) (ii)an unintended or uncontrolled release of HVP hydrocarbons, (iii) (iii)an unintended or uncontained release of LVP hydrocarbons in excess of 1.5 m3, or (iv) (iv)an unintended or uncontrolled release of a commodity other than gas, HVP hydrocarbons or LVP hydrocarbons; *(d)* (there is a release of a commodity from the line pipe body; *(e)* (the pipeline is operated beyond design limits or any operating restrictions imposed by the National Energy Board; *(f)* (the pipeline restricts the safe operation of any mode of transportation; *(g)* (an unauthorized third party activity within the safety zone poses a threat to the safe operation of the pipeline; *(h)* (a geotechnical, hydraulic or environmental activity poses a threat to the safe operation of the pipeline; *(i)* (the operation of a portion of the pipeline is interrupted as a result of a situation or condition that poses a threat to any person, property or the environment; or *(j)* (an unintended fire or explosion has occurred that poses a threat to any person, property or the environment.	Core 2.2 Notification and Communication; Core 2.2.1 Field Notifications; Core 2.2.2 Control Center; Core 2.2.3 Classification of the Incident; Annex 2.0 Notifications Overview; Annex 2.1 Emergency Responsibilities; Annex 2.2.3 Enbridge Incident Reporting Standard

4.2 Transportation Of Dangerous Good Regulation

Part 8 Accidental Release and Imminent Accidental Release Report SOR/2017-137		
Section	**Brief Description**	**Location in ICP**
8.1	**Application and Interpretation** This Part applies in respect of: **(a)** the release or anticipated release of dangerous goods that are being offered for transport, handled or transported by road vehicle, railway vehicle or ship; **(b)** the release or anticipated release of dangerous goods that are being offered for transport, handled or transported by aircraft; **(c)** undeclared and misdeclared dangerous goods that are being offered for transport, handled or transported by aircraft; **(d)** the loss or theft of dangerous goods; and **(e)** unlawful interference with dangerous goods.	Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification
8.2	**Emergency Report — Road, Rail or Marine** A person who is required by subsection 18(1) of the Act to report a release or anticipated release of dangerous goods that are being offered for transport, handled or transported by road vehicle, railway vehicle or ship must, as soon as possible after a release or anticipated release, make an emergency report to any local authority that is responsible for responding to emergencies at the geographic location of the release or anticipated release if the dangerous goods are, or could be, in excess of the quantity set out in the table on the next page.	Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification

Part 8 Accidental Release and Imminent Accidental Release Report SOR/2017-137		
Section	**Brief Description**	**Location in ICP**
8.2 Cont.	<table><tr><th>Class¤</th><th>Packing·Group·or·Category¤</th><th>Quantity¤</th></tr><tr><td>1¤</td><td>II¤</td><td>Any·quantity¤</td></tr><tr><td>2¤</td><td>Not·applicable¤</td><td>Any·quantity¤</td></tr><tr><td>3,·4,·5,·6.1·or·8¤</td><td>I·or·II¤</td><td>Any·quantity¤</td></tr><tr><td>3,·4,·5,·6.1·or·8¤</td><td>III¤</td><td>30·L·or·30·kg¤</td></tr><tr><td>6.2¤</td><td>A·or·B¤</td><td>Any·quantity¤</td></tr><tr><td>7¤</td><td>Not·applicable¤</td><td>A·level·of·ionizing·radiation·greater·than·the·level·established·in·section·39·of·the·"Packaging·and·Transport·of·Nuclear·Substances·Regulations,·2015"¤</td></tr><tr><td>9¤</td><td>II·or·III,·or·without·packing·group¤</td><td>30·L·or·30¤</td></tr></table>	Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification
8.3	**Information to be Included in an Emergency Report — Road, Rail or Marine** An emergency report referred to in section 8.2 must include the following information: (a) the name and contact information of the person making the report; (b) in the case of a release of dangerous goods, the date, time and geographic location of the release; (c) in the case of an anticipated release of dangerous goods, the date, time and geographic location of the incident that led to the anticipated release; (d) the mode of transport used; (e) the shipping name or UN number of the dangerous goods; (f) the quantity of dangerous goods that was in the means of containment before the release or anticipated release; (g) in the case of a release of dangerous goods, the quantity of dangerous goods estimated to have been released; and (h) if applicable, the type of incident leading to the release or anticipated release, including a collision, roll-over, derailment, overfill, fire, explosion or load-shift.	Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification

Part 8 Accidental Release and Imminent Accidental Release Report SOR/2017-137		
Section	**Brief Description**	**Location in ICP**
8.4(1)	**Release or Anticipated Release Report — Road, Rail or Marine** (1) Subject to subsection (2), a person who has made an emergency report referred to in section 8.2 must, as soon as possible after making it, make a report to the persons listed in subsection (	Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification
8.4(2)	(2) Subject to subsection (3), the person is not required to make a report referred to in subsection (1) if the release or anticipated release did not result in: (a) the death of a person; (b) a person sustaining injuries that required immediate medical treatment by a health care provider; (c) an evacuation of people or their shelter in place; or (d) the closure of **(i)** a facility used in the loading and unloading of dangerous goods, or a road, a main railway line or a main waterway.	Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification
8.4(3)	(3) The person is required to make a report referred to in subsection (1) if: (a) a means of containment has been damaged to the extent that its integrity is compromised; or the centre sill or stub sill of a tank car is broken or there is a crack in the metal equal to or greater than 15 cm (6 in.).	
8.4(4)	(4) For the purposes of subsection (1), the persons to whom a report must be made are (a) CANUTEC, at 1-888-CANUTEC (1-888-226-8832) or 613-996-6666; (b) the consignor of the dangerous goods; (c) in the case of dangerous goods included in Class 7, Radioactive Materials, the Canadian Nuclear Safety Commission; and in the case of a ship, a Vessel Traffic Services Centre or a Canadian Coast Guard radio station.	

Part 8 Accidental Release and Imminent Accidental Release Report SOR/2017-137		
Section	**Brief Description**	**Location in ICP**
8.5	**Information to be Included in a Release or Anticipated Release Report — Road, Rail or Marine** A release or anticipated release report referred to in section 8.4 must include the following information: (a) the name and contact information of the person making the report; (b) in the case of a release of dangerous goods, the date, time and geographic location of the release; (c) in the case of an anticipated release of dangerous goods, the date, time and geographic location of the incident that led to the anticipated release; (d) the mode of transport used; (e) the shipping name or UN number of the dangerous goods; (f) the quantity of dangerous goods that was in the means of containment before the release or anticipated release; (g) in the case of a release of dangerous goods, the quantity of dangerous goods estimated to have been released; (h) if applicable, the type of incident leading to the release or anticipated release, including a collision, rollover, derailment, overfill, fire, explosion or load-shift; (i) if applicable, the name and geographic location of any road, main railway line or main waterway that was closed; (j) a description of the means of containment containing the dangerous goods; (k) if applicable, an estimate of the number of people evacuated or sheltered in place; and (l) if applicable, the number of deaths and the number of persons who sustained injuries that required immediate medical treatment by a health care provider.	Core 2 Notification Annex 2 Notification Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification
8.6	**30-Day Follow-up Report** A person who has made a report referred to in section 8.4, or the person's employer, must make a follow-up report in writing to the Director General within 30 days after the day on which the report was made.	Annex 2.2.3 Enbridge Incident Reporting Standard

Part 8 Accidental Release and Imminent Accidental Release Report SOR/2017-137		
Section	**Brief Description**	**Location in ICP**
8.7	**Information to be Included in a 30-Day Follow-up Report** A follow-up report referred to in section 8.6 must include the following information: (a) the name and contact information of the person making the report; (b) the names and contact information of the consignor, consignee and carrier; (c) in the case of a release of dangerous goods, the date, time and geographic location of the release; (d) in the case of an anticipated release of dangerous goods, the date, time and geographic location of the incident that led to the anticipated release; (e) the mode of transport used; (f) the classification of the dangerous goods; (g) the quantity of dangerous goods that was in the means of containment before the release or anticipated release; (h) in the case of a release of dangerous goods, the quantity of dangerous goods estimated to have been released; (i) a description of the means of containment containing the dangerous goods; (j) if applicable, a description of any failure of or damage to the means of containment; (k) information about the events leading to the release or anticipated release of dangerous goods; (l) information as to whether there was an explosion or fire; (m) the name and geographic location of any facility used in the loading or unloading of the dangerous goods that was closed, and the duration of the closure; (n) the name and geographic location of any road, main railway line or main waterway that was closed, and the duration of the closure; (o) if applicable, an estimate of the number of people evacuated or sheltered in place and the duration of the evacuation or shelter in place; (p) if applicable, the number of deaths and the number of persons who sustained injuries that required immediate medical treatment by a health care provider; (q) if applicable, the ERAP reference number; (r) the date on which the report referred to in section 8.4 was made; and (s) an estimate of any financial loss incurred as a result of the release or anticipated release, and any emergency response cost or remediation costs related to it.	Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification

Part 8 Accidental Release and Imminent Accidental Release Report SOR/2017-137		
Section	**Brief Description**	**Location in ICP**
8.8	**30-Day Follow-up Report — Notice and Retention of Report** (1) A person who has made a follow-up report referred to in section 8.6 must, as soon as possible, notify the Director General of any change to the information referred to in paragraph 8.7(f), (i), (j), (k), (l), (p) or (s) that occurs within one year after the day on which the follow-up report was made. (2) The person must keep a copy of the report for two years after the day on which it is made. (3) The person must make the report available to an inspector within 15 days after the day on which the person receives a written request from the inspector.	Core 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification

4.3 NEB Onshore Pipeline Regulation SOR/99-294

SOR 99_294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
Management System 6.1: A company shall establish, implement and maintain a management system that (a) is systematic, explicit, comprehensive and proactive; (b) integrates the company's operational activities and technical systems with its management of human and financial resources to enable the company to meet its obligations under section 6; (c) applies to all the company's activities involving the design, construction, operation or abandonment of a pipeline and to the programs referred to in section 55; (d) ensures coordination between the programs referred to in section 55; and (e) corresponds to the size of the company, to the scope, nature and complexity of its activities and to the hazards and risks associated with those activities.	IMS 07 Emergency and Security Management System IMS 01 Governing Policies and Process IMS 04 Occupational Health and Safety Management System

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
6.2: (1) The company shall appoint an officer as accountable officer to ensure on its behalf that its management system and the programs referred to in section 55 are established, implemented and maintained in accordance with section 6.1, this section and sections 6.3 to 6.6 and that its obligations under section 6 are met.	IMS 01 Governing Policies and Process
6.2: (2) Within 30 days after the appointment of its accountable officer, the company shall notify the Board in writing of the name of the person appointed and ensure that the accountable officer submits to the Board a signed statement accepting the responsibilities of their position.	
6.2: Management System cont. (3) The company shall ensure that the accountable officer has authority over the human and financial resources required to (a) establish, implement and maintain the management system and the programs referred to in section 55; and ensure that the company's activities are carried out in a manner that enables it to meet its obligations under section 6.	IMS 01 Governing Policies and Process
6.3: (1) The company shall establish documented policies and goals for meeting its obligations (a) a policy for the internal reporting of hazards, potential hazards, incidents and near-misses that includes the conditions under which a person who makes a report will be granted immunity from disciplinary action; (b) goals for the prevention of ruptures, liquid and gas releases, fatalities and injuries and for the response to incidents and emergency situations.	Elements of the EMP are being executed across several Management Systems in Enbridge but there is no central framework to tie it all together. There is no single program document defining what the LP EMP is, its purpose and scope, or accountabilities within Enbridge. The EMP does not have a defined set of goals, objectives and targets that are documented.

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
6.3: (2) The company shall base its management system, as well as the programs referred to in section 55, on those policies and goals.	/
6.3: (3) The accountable officer shall prepare a policy statement that sets out the company's commitment to those policies and goals and shall communicate it to the company's employees.	Elements of the EMP are being executed across several Management Systems in Enbridge but there is no central framework to tie it all together.
6.4: The company must have a documented organizational structure that enables it to (a) meet the requirements of the management system and meet its obligations under section 6; (b) determine and communicate the roles, responsibilities and authority of the officers and employees at all levels of the company; and (c) demonstrate, based on an annual documented evaluation of need, that the human resources allocated to establishing, implementing and maintaining the management system are sufficient to meet the requirements of the management system and to meet the company's obligations under section 6.	IMS 07 Emergency and Security Management System Integrated Contingency Plan IMS 07 Emergency Incident Response Overview Incident Management Handbook IMS 01 Governing Policies and Process
Emergency Management Program 32: (1) A company shall develop, implement and maintain an emergency management program that anticipates, prevents, manages and mitigates conditions during an emergency that could adversely affect property, the environment or the safety of workers or the public. (1.1) The company shall develop an emergency procedures manual, review it regularly and update it as required.	IMS 07 Emergency and Security Management System IMS 01 Governing Policies and Process IMS 04 Occupational Health & Safety Integrated Contingency Plans (Core 1.4 & Core 2.0.1, Core 3.0, Annex 2.2, Annex 5.1.), Tactical Response Plans, Tactical Response Guide, Guide Exercise

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
(2) A company shall submit the emergency procedures manual and any updates that are made to it to the Board.	Design Guide, Course Syllabus, Pre-fire Plans for Athabasca, Central, Eastern, and Western Regions.
33: A company shall establish and maintain liaison with the agencies that may be involved in an emergency response on the pipeline and shall consult with them in developing and updating the emergency procedures manual.	Mutual Aid Agreement Development Process, CEPA MEAA Providing Assistance Workbook, CEPA MEAA Receiving Assistance Workbook, CANADA - Public Awareness Program for First Response & Municipal Organizations Record. Emergency Response Education Program Training Records, 911 Dispatch Module training records
Emergency Management Program 34: A company shall take all reasonable steps to inform all persons who may be associated with an emergency response activity on the pipeline of the practices and procedures to be followed and make available to them the relevant information that is consistent with that which is specified in the emergency procedures manual.	IMS 07 Emergency and Security Management System IMS 01 Governing Policies and Process IMS 04 Occupational Health & Safety Top Risk Areas Volume Out Dispersion Analysis Results High Consequence Areas Implementation Docs: Book 1 Incident Reporting, Integrated

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
Emergency Management Program 35: A company shall develop a continuing education program for the police, fire departments, medical facilities, other appropriate organizations and agencies and the public residing adjacent to the pipeline to inform them of the location of the pipeline, potential emergency situations involving the pipeline and the safety procedures to be followed in the case of an emergency.	Contingency Plans (Core 1.4 & Core 2.0.1, Core 3.0, Annex 2.2, Annex 5.1.), Tactical Response Plans, Tactical Response Guide, Guide Exercise Design Guide, Course Syllabus, Pre-fire Plans for Athabasca, Central, Eastern, and Western Regions. Mutual Aid Agreement, IMS 07 Mutual Aid Agreement Development Process, CEPA MEAA Providing Assistance Workbook, CEPA MEAA Receiving Assistance Workbook, CANADA - Public Awareness Program for First Response & Municipal Organizations Record. Emergency Response Education Program Training Records, 911 Dispatch Module training records
General Operation Requirements 36: A company shall (a) maintain communication facilities for the safe and efficient operation of the pipeline and for emergency situations;	Information Production Unit written and visual communication materials Media alerts and advisories New Releases (including advance notices or external website notices) Messaging, Statements Social Media Messages Dark Website Emergency Response Advisory Team (ERAT) records ICP Core 2.0, core 2.4.1.5, core 2.4.1.6
Surveillance and Monitoring 39 A company shall develop a surveillance and monitoring program for the protection of the pipeline, the public and the environment	Currently being developed

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
Training Program 46: (1) A company shall develop and implement a training program for any employee of the company who is directly involved in the operation of the pipeline.	ICP core 3, Training Syllabi, Training Records, Regional Training Matrices, Training Program
Training Program 46: (2) The training program shall instruct the employee on (a) the safety regulations and procedures applicable to the day-to-day operation of the pipeline; (a.1) the security processes, procedures and measures applicable to the day-to-day operation of the pipeline; (b) responsible environmental practices and procedures in the day-to-day operations of the pipeline; (c) the procedures for the proper operation of the equipment that the employee could reasonably be expected to use; and (d) the emergency procedures set out in the manual developed under section 32 and the procedures for the operation of all emergency equipment that the	ICP core 3, Training Syllabi, Training Records, Regional Training Matrices, Training Program
Training Program 46: (3) The company shall use reasonable efforts to ensure that any employee who attends a training program has a working knowledge of the subject-matter of the program at the end of the program.	

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
Safety Management Program 47: A company shall develop, implement and maintain a safety management program that anticipates, prevents, manages and mitigates potentially dangerous conditions and exposure to those conditions during all activities relating to construction, operation, maintenance, abandonment and emergency situations.	IMS 01 Governing Policies and Process IMS 04 Occupational Health & Safety
Security Management Program 47.1: A company shall develop, implement and maintain a security management program that anticipates, prevents, manages and mitigates conditions that could adversely affect people, property or the environment.	IMS-07 Emergency & Security Security Vulnerability Assessments (SVAs) SVA tracking sheet Assessments stemming from IMS-04 or initiated by LP Security LP Security Incident Reporting Form Internal/external security audits
Damage Prevention Program 47.2: A company shall develop, implement and maintain a damage prevention program that anticipates, prevents, manages and mitigates damage to its pipeline and meets the requirements set out in section 16 of the National *Energy Board Pipeline Damage Prevention Regulations — Obligations of Pipeline Companies*.	On the Enbridge agenda to be developed
Incident Report 52: (1) A company shall immediately notify the Board of any incident relating to the construction, operation or abandonment of its pipeline and shall submit a preliminary and detailed incident report to the Board as soon as is practicable.	ICP and Enbridge Incident Reporting Standard IMS 01 Governing Policies and Process ICP and Book 1 IMS 01 Governing Policies and Process

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
(2) After notification of an incident, an inspection officer may partially or completely relieve a company from the requirement to submit a preliminary and detailed incident report.	ICP and Enbridge Incident Reporting Standard IMS 01 Governing Policies and Process ICP and Book 1 IMS 01 Governing Policies and Process
Audits and Inspections General Compliance 53: (1) A company shall conduct inspections on a regular basis and audits, with a maximum interval of three years, to ensure that its pipeline is designed, constructed, operated and abandoned in compliance with (a) Part III of the Act; (b) Part V of the Act, as it relates to the protection of property and the environment and the safety and security of the public and of the company's employees; (c) these Regulations; and (d) the terms and conditions of any certificate or order issued by the Board, as they relate to the protection of property and the environment and the safety of the public and of the company's employees.	IMS 01 Governing Policies and Process
53 (2) The audit shall document (a) all non-compliance noted; and any corrective action taken or planned to be taken.	

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
Program Audits 55: (1) A company shall conduct audits, with a maximum interval of three years, of the following programs: (a) the emergency management program referred to in section 32; (b) the integrity management program referred to in section 40, including the pipeline control system referred to in section 37; (c) the safety management program referred to in section 47; (d) the security management program referred to in section 47.1; (e) the environmental protection program referred to in section 48; and (f) the damage prevention program referred to in section 47.2.	IMS 01 Governing Policies and Process
(2) The documents prepared following the audit shall include (a) any deficiencies noted; and any corrective action taken or planned to be taken.	IMS 01 Governing Policies and Process

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
56: A company shall, in addition to complying with the record retention requirements set out in the CSA standards referred to in section 4, retain (a) until at least one month after the date on which they were recorded, the records made under paragraphs 36(c) and 37(b) except for leak detection data, which shall be retained for six months; (b) an annual report on the training program developed under section 46 that compares the actual training received by employees to the planned training; (c) for at least one year after a pipeline or part of one is placed into service, any information with respect to the quality assurance program developed under section 15; (d) for the most recent five years of operation or for the period covered by the two most recent complete audits, whichever period is longer, the records for the audits and inspections required by sections 53 to 55; (e) for as long as the installations referred to in section 38 remain on the pipeline, detailed records of those installations, (e) for as long as the installations referred to in section 38 remain on the pipeline, detailed records of those installations, including (i) IMS 01 Governing Policies and Process (ii) IMS 06 Environmental (iii) Retention and Disposition of Transitory Material Guide (iv) Records System Identification Standard (v) Records Retention Schedule (vi) Information Classification Standard (vii) Records Management Policy accurate records of the location of all buried facilities, until they are removed;	IMS 01 Governing Policies and Process IMS 06 Environmental Retention and Disposition of Transitory Material Guide Records System Identification Standard Records Retention Schedule Information Classification Standard Records Management Policy

SOR/99-294 Onshore Pipeline Regulation	
Program Element (Oct 2016)	**EM Control**
56 (f) for at least two years after the operation of a pipeline or part of one has been duly abandoned in accordance with all applicable requirements (i) all records available to the company in respect of the procedures used in each stage of the construction of the pipeline or part, (ii) the production reports and mill certificates, (iii) the specifications and name-plate data, if any, of the pumps, compressors, drivers, storage tanks and other major equipment of the pipeline, (iv) the performance curves of all main line pumps and compressors of the pipeline, (v) the reports of all surveillance and monitoring programs developed under section 39, (vi) the documentation referred to in section 41 in respect of pipeline defects, and the documentation on all incidents reported under section 52.	IMS 01 Governing Policies and Process IMS 06 Environmental Retention and Disposition of Transitory Material Guide Records System Identification Standard Records Retention Schedule Information Classification Standard Records Management Policy

4.4 NEB Emergency Procedures Manual Requirements

National Energy Board Act Reporting - Board Letter to all companies, dated 26 March 2015		
Section	**Brief Description**	**Location in ICP**
	Reporting Guidelines – File # OFSurv-CompMan 01 Board Letter to all companies, dated 26 March 2015	Annex 2.2 Incident Reporting
Annex A - 2	The contents of the Emergency Procedure Manual, should include, but are not limited, to the following: • Manual Distribution List (or on separate file)	Annex 5.0 Distribution List (List for region is on separate file)
	• Manual updating procedures and schedule (or on a separate file);	Update Notice and Revision Record Table; Annex 5.0 Distribution List (List for region is on separate file); Annex 5.1 Revision Process
	• Description of initial actions when someone reports an incident;	Core 2.1 Discovery and Detection; Core 2.2 Notification and Communication; Annex 2.0.1 Emergency Notification/Activation
	• Definitions and levels of emergencies;	Core 2.2.3 Classification of the Incident
	• Corporate and operational chains of command (e.g., organization structures);	Core 1.3 Purpose and Scope of the Plan; Core 1.4.1 Enbridge Emergency Response and Support Team Hierarchy; Core 2.4.1.2 Incident Command Structure;

National Energy Board Act Reporting Board Letter to all companies, dated 26 March 2015		
Section	**Brief Description**	**Location in ICP**
Annex A – 2, Continued	• management of threat information;	Core 2.2.2 Control Center; Core 2.2.3 Classification of the Incident; Core 2.3.4.2 Community Evacuation; Core 2.4.3 Hazard-Specific Field Response Team Guides; Core 4, ICP 002 First Responder Checklist; Core 4, ICP 005 Threat Checklist
	• incident management system (e.g., Incident Command System);	Core 2.4.1 Enbridge's Response Management System; Annex 2.2.2 Incident Management Team
	• spill control procedures and locations of spill control points (if applicable);	Core 2.1.1.2 Discharge Mitigation; Core 2.2.1 Field Notifications; Core 2.4.4.2 Field Response Team – Pipeline Release; Core 2.4.4.5 Spill Volume Estimation; Core 2.4.6.1 Spills to Groundwater; Core 2.4.9.1 Inland Spill Response Tactics Guide; Annex 1.6 Local Spill Response Equipment; Annex 2.2.3 External Agencies and Support Resources; Annex 3, Unusually Sensitive Area Information; SPILL CONTROL POINT LOCATIONS (CP Map Sets) (separate file due to size of documents)

National Energy Board Act Reporting Board Letter to all companies, dated 26 March 2015		
Section	**Brief Description**	**Location in ICP**
Annex A – 2, Continued	• debriefing procedure;	Core 2.4.1.5 ICS Roles and Responsibilities (Incident Commander to determine other attendees); Core 2.5.2.1 Debriefing the Incident; Core 2.5.2 After Action Review; Core 2.5.2.2 Post-Incident Analysis
	• internal and external communications;	Core 1.2.2 Joint Information Center (JIC) definition Core 1.5.3 Leak Detection Systems; Core 1.5.3 Third Party Reporting System; Core 1.5.5 Public Awareness & Education; Core 2.0.1 #9 Guiding Objectives and Strategies Core 2.0.2 Documentation; Core 2.2 Notification and Communication Core 2.2.4 Third-Party Notifications; Core 2.2.5 External Communication; Core 2.3.3 Evacuation; Core 2.4.1.5 ICS Roles and Responsibilities, (Command Staff – Incident Commander, Public Information Officer, Liaison Officer) Core 4 Forms ICS 205, Communications Plan; Core 4 Forms ICS 202, General Response Objectives; Annex 1.7 Evacuation

National Energy Board Act Reporting / Board Letter to all companies, dated 26 March 2015		
Section	**Brief Description**	**Location in ICP**
Annex A – 2, Continued	• roles and responsibilities for internal positions involved in a response (including contractors);	Core 2.4.1.3 ICS 207 Organizational Chart; Core 2.4.1.5 Roles and Responsibilities; Annex 1.6 Local Spill Response Equipment; Annex 1.7 Evacuation
	• roles and responsibilities for agencies that would likely be involved in a response;	Core 2.4.1.3 ICS 207 Organizational Chart; Core 2.4.1.5 ICS Roles and Responsibilities; Core 2.4.1.7 Expanding Incidents / Unified Command; Annex 2.2.3 External Agencies and Support Resources
	• environmental or other areas requiring special consideration or protection;	Core 2.4.6 Environmental Response; Core 2.4.7 Waste and Disposal; Core 2.4.9 Protection, Containment and Recovery; Annex 3, Unusually Sensitive Area Information
	• detailed product information;	Annex 1.5 Response Zone Description; Annex 1.10 Safety Data Sheets
	• internal and external reporting requirements;	Core 1.5.3 Leak Detection System, Core 2.2 Notification and Communication; Core 2.4.4.7 Fire or Explosion First Responder Guide; Core 2.4.6.6 Environmental Documentation; Annex 2.2.3 Enbridge Incident Reporting Standard
	• up-to-date internal and external contact lists;	Annex 2.2.3 External Agencies and Support Resources

National Energy Board Act Reporting Board Letter to all companies, dated 26 March 2015		
Section	**Brief Description**	**Location in ICP**
Annex A – 2, Continued	• lists of persons in the Emergency Planning Zones (or on a separate file);	Annex 3 identifies First Nation community Lands, Schools, Residential Areas, and Businesses. Specific lists are kept on a separate file with the Public Awareness Program
	• description and location of response equipment, including information on how to access the response equipment on a 24-hour basis;	Annex 1.6 Local Spill Response Equipment; For full inventory listing refer to http://www.ecrc.ca/en/about_ecrc/equipment.asp.
	• up-to-date area maps;	Core 1.7 Canada Pipeline System Map; Core 1.8 US Pipeline System Map; Annex 1.8 Emergency Response Time Maps; Annex 1.6 Local Spill Response Equipment;
	• mutual aid agreements (or on a separate file) or a reference to mutual aid agreements in the emergency procedures manual; and	Annex 2.2.3 External Agencies and Support Resources; Annex 1.8.4 Emergency Response Time Maps for Mutual Aid agreements; CEPA mutual Aid Agreement available at: http://myteamsites.cnpl.enbridge.com/sites/EmergencySM/Mutual%20Aid/default.aspx
	• forms and records.	Core 2.0.2 Documentation; Core 2.4.1.5 Roles and Responsibilities; Core 4, Forms

4.5 Fisheries Act, R.S.C., 1985, c. F-14

R.S.C., 1985, c. F-14 Fisheries Act		
Section	**Brief Description**	**Location in ICP**
38 (4)	Every person shall without delay notify an inspector, a fishery officer or an authority prescribed by the regulations of an occurrence that results in serious harm to fish that are part of a commercial, recreational or Aboriginal fishery, or to fish that support such a fishery, that is not authorized under this Act, or of a serious and imminent danger of such an occurrence, if the person at any material time (*a*) owns or has the charge, management or control of the work, undertaking or activity that resulted in the occurrence or the danger of the occurrence; or (*b*) causes or contributes to the occurrence or the danger of the occurrence.	Core 2.2 Notification and Communication; Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2.2.3 External Agencies and Support Resources
38 (5)	If there occurs a deposit of a deleterious substance in water frequented by fish that is not authorized under this Act, or if there is a serious and imminent danger of such an occurrence, and detriment to fish habitat or fish or to the use by humans of fish results or may reasonably be expected to result from the occurrence, then every person shall without delay notify an inspector, a fishery officer or an authority prescribed by the regulations if the person at any material time (*a*) owns or has the charge, management or control of (i) the deleterious substance, or (ii) the work, undertaking or activity that resulted in the deposit or the danger of the deposit; or (*b*) causes or contributes to the occurrence or the danger of the occurrence.	
38 (6)	Any person described in paragraph (4)(*a*) or (*b*) or (5)(*a*) or (*b*) shall, as soon as feasible, take all reasonable measures consistent with public safety and with the conservation and protection of fish and fish habitat to prevent the occurrence or to counteract, mitigate or remedy any adverse effects that result from the occurrence or might reasonably be expected to result from it.	Core 2, Core Plan Elements
38 (7)	As soon as feasible after the occurrence or after learning of the danger of the occurrence, the person shall provide an inspector, fishery officer or an authority prescribed by the regulations with a written report on the occurrence or danger of the occurrence.	Annex 2.2.3 External Agencies and Support Resources

4.6 Paragraph 35(2)(b) of the Fisheries Regulations SOR/2013-191

Applications for Authorization under Paragraph 35(2)(b) of the Fisheries Regulations SOR/2013-191		
Section	**Brief Description**	**Location in ICP**
4 (1)	**Required information — emergency circumstances** Only the information listed in Schedule 2 must be submitted to the Minister in support of an application in respect of a work, undertaking or activity that needs to be carried on without delay in response to (a) a matter of national security; (b) a national emergency for which special temporary measures are taken under the Emergencies Act; or (c) an emergency that poses a risk to public health or safety or to the environment or property.	Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2 Notification

4.7 Canadian Environmental Protection Act, S.C. 1999, c. 33

Canadian Environmental Protection Act (CEPA 1999) S.C. 1999, c. 33		
Section	**Brief Description**	**Location in ICP**
95 (1)	Where there occurs or is a likelihood of a release into the environment of a substance specified on the List of Toxic Substances in Schedule 1 in contravention of a regulation made under section 92.1 or 93 or an order made under section 94, any person described in subsection (2) shall, as soon as possible in the circumstances, (a) subject to subsection (4) and any regulations made under paragraph 97(b), notify an enforcement officer or any other person designated pursuant to the regulations and provide a written report on the matter to the enforcement officer or other person; (b) take all reasonable measures consistent with the protection of the environment and public safety to prevent the release or, if it cannot be prevented, to remedy any dangerous condition or reduce or mitigate any danger to the environment or to human life or health that results from the release of the substance or may reasonably be expected to result if the substance is released; and (c) make a reasonable effort to notify any member of the public who may be adversely affected by the release or likely release.	Core 2.2 Notification and Communication; Core 2.4.1.5 ICS Roles and Responsibilities, (Command Staff – Incident Commander, Liaison Officer, Public Information Officer); Core 2.4.6 Environmental Response; Annex 2.2.3 Enbridge Incident Reporting Standard

Canadian Environmental Protection Act (CEPA) 1999 S.C. 1999, c. 33		
Section	**Brief Description**	**Location in ICP**
169 (1)	Where there occurs or there is a likelihood of a release into the air of a substance in contravention of a regulation made under section 167, any person described in subsection (2) shall, as soon as possible in the circumstances, (a) subject to subsection (4) and the regulations, notify an enforcement officer or any other person designated pursuant to the regulations and provide a written report on the matter to the enforcement officer or other person; (b) take all reasonable measures consistent with the protection of the environment and public safety to prevent the release or, if it cannot be prevented, to remedy any dangerous condition or reduce or mitigate any danger to the environment or to human life or health that results from the release of the substance or may reasonably be expected to result if the substance is released; and (c) make a reasonable effort to notify any member of the public who may be adversely affected by the release or likely release.	Core 2.2 Notification and Communication; Core 2.4.1.5 ICS (Command Staff – Incident Commander, Liaison Officer, Public Information Officer); Core 2.4.6 Environmental Response; Core 2.4.9 Protection, Containment and Recovery; Annex 2.2.3 Enbridge Incident Reporting Standard Annex 2.2.3 External Agencies and Support Resources

Canadian Environmental Protection Act (CEPA) 1999 S.C. 1999, c. 33		
Section	**Brief Description**	**Location in ICP**
179 (1)	Where there occurs or there is a likelihood of a release into waters of a substance in contravention of a regulation made under section 177, any person described in subsection (2) shall, as soon as possible in the circumstances (a) subject to subsection (4) and the regulations, notify an enforcement officer or any other person designated pursuant to the regulations and provide a written report on the matter to the enforcement officer or other person; (b) take all reasonable measures consistent with the protection of the environment and public safety to prevent the release or, if it cannot be prevented, to remedy any dangerous condition or reduce or mitigate any danger to the environment or to human life or health that results from the release of the substance or may reasonably be expected to result if the substance is released; and (c) make a reasonable effort to notify any member of the public	Core 2.2 Notification and Communication; Core 2.4.1.5 ICS Roles and Responsibilities, *(Command Staff – Incident Commander, Liaison Officer, Public Information Officer, Operations Section, Planning Section);* Core 2.4.6 Environmental Response; Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard

Canadian Environmental Protection Act (CEPA) 1999 S.C. 1999, c. 33		
Section	**Brief Description**	**Location in ICP**
201 (1)	Subject to any regulations made under subsection 200(1) or any interim orders made under section 200.1, if there occurs an environmental emergency in respect of a substance on a list established under the regulations or interim orders, any person described in subsection (2) shall, as soon as possible in the circumstances, (a) notify an enforcement officer or any other person designated by regulation or interim order and provide a written report on the environmental emergency to the enforcement officer or other person; (b) take all reasonable emergency measures consistent with the protection of the environment and public safety (i) to prevent the environmental emergency, or (ii) to repair, reduce or mitigate any negative effects on the environment or human life or health that result from the environmental emergency or that may reasonably be expected to result from it; and (c) make a reasonable effort to notify any member of the public who may be adversely affected by the environmental emergency.	Core 2.2 Notification and Communication; Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard
212 (1)	If a substance is released into the environment in contravention of a regulation, or if there is a likelihood of such a release, a person described in subsection (2) shall, as soon as possible in the circumstances, (a) subject to the regulations, notify an enforcement officer or any other person designated pursuant to the regulations and provide a written report on the matter to the enforcement officer or other person; (b) take all reasonable measures consistent with the protection of the environment and public safety to prevent or eliminate any dangerous condition or minimize any danger to the environment or to human life or health that results from the release or may reasonably be expected to result if the substance is released; and (c) make a reasonable effort to notify any members of the public who may be adversely affected by the release or likely release.	Core 2.2 Notification and Communication; Core 2.4.6 Environmental Response; Core 2.2.5 External Communications; Annex 2.2.3 External Agencies and Support Resources Annex 2.2.3 Enbridge Incident Reporting Standard

4.8 CEPA 1999 - Federal Halocarbon Regulations 2003

Canadian Environmental Protection Act, 1999 Federal Halocarbon Regulations 2003 (SOR//2003-289)		
Section	**Brief Description**	**Location in ICP**
32(1)	In the event of a release of 100 kg or more of a halocarbon from a system, or from a container or equipment used in the reuse, recycling, reclamation or storage of a halocarbon, the owner of the system, container or equipment shall submit the following reports to the Minister, within the periods indicated: (a) within 24 hours after the release is detected, a verbal or written report, or a report in an electronic format compatible with that used by the Minister, that indicates the name of the owner, the type of halocarbon released and the type of system, container or equipment from which it was released; and (b) within 14 days after the release is detected, a written report, or a report in an electronic format compatible with that used by the Minister, containing the information set out in column 3 of item 8 of Schedule 2.	Annex 2 Notification Annex 2.2.3 Enbridge Incident Reporting Standard
33(1)	In the event of a release of more than 10 kg but less than 100 kg of a halocarbon from a system, or from a container or equipment used in the reuse, recycling, reclamation or storage of a halocarbon, the owner of the system, container or equipment shall submit to the Minister a report in written format, or in an electronic format compatible with that used by the Minister, that contains the information set out in column 3 of item 8 of Schedule 2.	
33(2)	The owner shall submit the release report required by subsection (1) twice annually, not later than 30 days after January 1 and July 1.	

4.9 Environmental Emergency Regulations SOR/2003-307

Environmental Emergency Regulations SOR/2003-307		
Section	**Brief Description**	**Location in ICP**
9(1)	**Environmental Emergencies** If a substance set out in column 1 of Schedule 1, the person who is designated, for the purpose of paragraph 201(1)(a) of the Act, to be provided with a written report is the Regional Director of the Environmental Enforcement Division of the Enforcement Branch of the Department of the Environment in the region where the environmental emergency occurs.	Core 2.2 Notification and Communication; Core 2.2.1 Field Notifications; Core 2.2.2 Control Center; Core 2.2.3 Classification of the Incident; Annex 2.0 Notifications Overview; Annex 2.1 Emergency Responsibilities; Annex 2.2.3 Enbridge Incident Reporting Stand
9(2)	The report must include the following information: (c) the name, civic address and telephone number of the person who owns or has the charge, management or control of the substance released; (d) the date, time and location of the release; (e) the name and CAS registry number of the substance released; (f) the quantity of the substance released or, if the quantity cannot be determined, an estimate of it; (g) the identification of the container from which the substance was released and a description of its condition; (h) the location of the release and a description of potential negative effects on the environment or on human life or health; (i) a description of the circumstances and of the cause of the release, if known, and of the measures taken to mitigate any negative effects on the environment or on human life or health; (j) the identification of all persons and agencies that were notified as a result of the release; and all measures taken or planned to be taken to prevent similar releases.	

4.10 Nuclear Substances & Radiation Devices Reg. 2000-207

Nuclear Substances and Radiation Devices Regulations SOR/2000-207		
Section	**Brief Description**	**Location in ICP**
38(1)	**Environmental Emergencies** Every licensee who possesses or uses a nuclear substance or a radiation device and becomes aware of any of the following situations shall notify the Commission immediately of the location and circumstances of the situation and of any action that the licensee has taken or proposes to take with respect to it: (a) the nuclear substance or the radiation device is lost or stolen; (b) the radiation device is damaged to an extent that could impair its normal use; (c) the sealed source is separated from the radiation device when the latter is not being serviced; (d) the sealed source fails to return to the shielded position inside the radiation device; and (e) there is a spill of (i) an unsealed radioactive nuclear substance that is set out in column 1 of Schedule 1, that has produced in excess of 100 times the activity set out in column 3, and (ii) an unsealed radioactive nuclear substance that is not set out in column 1.	Core 2.2 Notification and Communication; Core 2.2.1 Field Notifications; Core 2.2.2 Control Center; Core 2.2.3 Classification of the Incident; Annex 2.0 Notifications Overview; Annex 2.1 Emergency Responsibilities; Annex 2.2.3 Enbridge Incident Reporting Stand

Nuclear Substances and Radiation Devices Regulations SOR/2000-207		
Section	**Brief Description**	**Location in ICP**
38(2)	Every licensee referred to in subsection (1) or subsection 30(2) who becomes aware of a situation referred to in one of those subsections shall file a full report of the situation with the Commission within 21 days after the day on which the licensee becomes aware of it or within the period specified in the licence, and the report shall contain the following information: (a) a description of the situation, the circumstances and the problem, if any, with the radiation device; (b) the probable cause of the situation; (c) the nuclear substance, and if applicable, the brand name, model number and serial number of the radiation device involved; (d) the date, time and location where the situation occurred or, if unknown, the approximate date, time and location, and the date and time of becoming aware of the situation; (e) the actions that the licensee has taken to re-establish normal operations; (f) the actions that the licensee has taken or proposes to take to prevent a recurrence of the situation; (g) if the situation involved an exposure device, the qualifications of the workers, including any trainee, who were involved; (h) the effective dose and equivalent dose — as those terms are defined in subsection 1(1) of the Radiation Protection Regulations — received by any person as a result of the situation; and the effects on the environment, the health and safe- ty of persons and the maintenance of security that have resulted or may result from the situation.	Annex 2.2.3 Enbridge Incident Reporting Standard

SASKATCHEWAN

4.11 Environmental Management & Protection Act Chapter E-10.22

Statutes of Saskatchewan, 2010 Chapter E-10.22		
Section	**Brief Description**	**Location in ICP**
9(1)	9(1) Every person who, in contravention of section 8, discharges or allows the discharge of a substance into the environment that may cause or is causing an adverse effect shall report the discharge in accordance with any prescribed requirements or any requirements set out in the code. (2) Every person who owns or occupies land on which a substance is discovered that may cause or is causing an adverse effect shall report the discovery in accordance with any prescribed requirements or any requirements set out in the code. (3) Every person who, while conducting work, discovers a substance that may cause or is causing an adverse effect shall report the discovery in accordance with any prescribed requirements or any requirements set out in the code.	Core 2.1 Discovery and Detection; Core 2.2 Notification and Communication; Annex 2.2 Incident Reporting
10	Duty to take immediate action 10 A person mentioned in subsection 9(1) and any person who owns or occupies land respecting which a report is filed in accordance with subsections 9(2) to (4) shall, as soon as possible, take all reasonable emergency measures consistent with public safety: (a) to repair or remedy any undue risk; or (b) to reduce or mitigate danger to life, health, property or the environment that results or that may reasonably be expected to result from the discharge of the substance.	Core 2.1 Discovery/Detection; Core 2.3 Initial Response; Core 2.3.4.2 Community Evacuation; Core 2.4.1.5 ICS Roles and Responsibilities (Safety Officer, Public Safety Leader); Core 2.4.6 Environmental Response; Core 2.4.7 Waste and Disposal; Core 2.4.9 Protection, Containment and Recovery

4.12 Environmental Code, Discharge and Reporting Standard 2016

Discharge and Discovery Reporting Standard, 2016		
Section	**Brief Description**	**Location in ICP**
A	There is no obligation to report a discovery in instances where a site assessment identifies a substance of potential concern above the level set out in Table 2 of the Discharge and Discovery Reporting Standard at a site for which a report had been previously provided to the minister. If the discovery is unrelated to the original report (e.g., as a result of a discharge that occurred after the original assessment/report) then a new report as set out in 1-6 of the Discharge and Discovery Reporting Chapter is required. There is no obligation to report the intentional, lawful and prudent use of a substance that is generally recognized as accepted, ordinary and normal. This includes fugitive emissions resulting from commissioning, operating, or decommissioning a works. Delineation of substances of potential concern are limited to those anthropogenic substances identified, known to be present, or that may be reasonably expected to be present in soil, ground water or surface water based on past or present land use at the site. There is no obligation to report a discovery in instances where it can be clearly demonstrated by the person responsible that an exceedance of the Table 2 level is due to naturally elevated (i.e. non-anthropogenic) background levels for the substance of potential concern. Where there is insufficient, or no, evidence of naturally elevated background levels for a substance of potential concern, a report as set out in 1-6 of the Discharge and Discovery Reporting Chapter is required.	Core 2.2 Notification and Communication; Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard

Discharge and Discovery Reporting Standard, 2016		
Section	**Brief Description**	**Location in ICP**
B	**B REPORT** (1) For the purpose of complying with the Discharge and Discovery Reporting Chapter of the Saskatchewan Environment Code, a report shall be made in accordance with the requirements of the Act and as set out in the Discharge and Discovery Reporting Chapter. Refer to Table 1 Discharge Reporting Quantities (on and off site) and Table 2 Reportable Concentrations in the *Discharge and Discovery Reporting Standard).* − flammable liquid: - release > 500 L onsite - release > 200 L offsite - any amount subsurface − glycols (antifreeze): - release > 100 L onsite - release > 50 L offsite − lubricating oils/hydraulic fluids: - release > 500 L onsite - release > 200 L offsite	Core 2.2 Notification and Communication; Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources Annex 2.2.3 Enbridge Incident Reporting Standard

4.13 Dangerous Goods Transportation Act Chapter D-1.2

The Dangerous Goods Transportation Act Chapter D-1.2		
Section	**Brief Description**	**Location in ICP**
8.0	**Emergency plans** 8(1) The minister may require any person who engages in the handling, offering for transport or transportation of dangerous goods to prepare, in the prescribed manner and circumstances, emergency plans for implementation in the event of any discharge, emission or escape of dangerous goods from any container, packaging or means of transport. (2) The minister may require any person who engages in the handling, offering for transport or transportation of dangerous goods to prepare emergency plans for implementation in the event of any terrorist activity or threat of terrorist activity.	Core 2.2 Notification and Communication; Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard
9.0	**Duty to report discharge, etc**. 9 Where any discharge, emission or escape of dangerous goods from any container, packaging or means of transport occurs, the person who, at that time, has the charge, management or control of the dangerous goods shall, in the prescribed manner and circumstances, report the discharge, emission or escape.	

4.14 Chapter E.1.1 Halocarbon Control

Chapter E.1.1 Halocarbon Control		
Section	**Brief Description**	**Location in ICP**
E.1.1	• Reporting of accidental releases of halocarbons greater than 100 kg is required in accordance with the Discharge Discovery and Reporting Chapter. • Discharges between 10-100 kg require retaining records of the release	Core 2.2 Notification and Communication; Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard

4.15 The Boiler and Pressure Vessel Act, 1999

Saskatchewan, The Boiler and Pressure Vessel Act, 1999		
Section	**Brief Description**	**Location in ICP**
37(1)	In this section, "accident" means: (a) an explosion, serious fire, rupture or serious overheating of a boiler, pressure vessel, plant or pressure piping system; or (b) an accident that causes death or serious injury to a person and arises out of the operation of a boiler, pressure vessel, plant or pressure piping system.	Core 2.2 Notification and Communication; Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard
37(2)	(2) Where an accident occurs, the owner or a person acting on behalf of the owner must immediately notify the chief inspector by telephone or any other direct means stating: (a) the precise location of the accident; (b) the time at which the accident occurred; (c) the number of persons killed or injured, if any; and (d) the nature and extent of the accident.	
37(3)	(3) Subject to The Coroners Act, the chief inspector may investigate or inquire, or cause an investigation or inquiry to be made, into the cause and circumstances of an accident.	
37(4)	Subject to The Coroners Act and The Fire Safety Act, where an accident involving the explosion or rupture of a boiler, pressure vessel, plant or pressure piping system occurs: (a) no part of the boiler, pressure vessel, plant or pressure piping system is to be removed nor is its position to be altered by any person, except for the purposes of rescuing persons injured, removing the bodies of persons killed or preventing further injuries or deaths, without the permission of an inspector; (b) an inspector may remove from the scene of the accident any object that the inspector has reasonable grounds to believe may have caused or contributed to the accident.	
37(5)	No person shall operate or cause to be operated a boiler, pressure vessel, plant or pressure piping system that has been involved in an accident until the person has obtained the permission of an inspector	

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4.16 Dangerous Goods Handling & Transportation Act C.C.S.M. C. D12 -

The Dangerous Goods Handling and Transportation Act C.C.S.M. C. D12 -		
Section	**Brief Description**	**Location in ICP**
3	**Handling of dangerous goods in accordance with Act** No person shall handle or dispose of dangerous goods or cause dangerous goods to be handled or disposed of except in compliance with this Act and the regulations.	Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard
28	**Reporting of environmental accident** Every person responsible for and every person having the custody and control of, any contaminant involved in an environmental accident shall immediately after the occurrence of the environmental accident report the accident and the details thereof in accordance with the regulations and shall follow the instructions of an environment officer with respect to the accident.	

4.17 Environmental Accident Reporting Regulation 439/87

Environmental Accident Reporting Regulation Regulation 439/87		
Section	**Brief Description**	**Location in ICP**
3(1)	Reporting of environmental accidents 3(1) A person who is responsible for or who has custody and control of a contaminant involved in an environmental accident shall immediately after the occurrence of the environmental accident report the accident by calling (a) the Manitoba Department of Environment and Workplace Safety and Health in Winnipeg at (204) 944-4888; or (b) the local police or fire department, as appropriate.	Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard
3(2)	The report referred to in subsection (1) shall include the following information where it is either known or is readily available: (a) the location and time of the accident; (b) the name and telephone number of the person reporting the accident; (c) a brief description of the circumstances of the accident and its status at the time of the report;	

4.18 Environment Act C.C.S.M. c. E125

Environment Act C.C.S.M. c. E125		
Section	**Brief Description**	**Location in ICP**
30.1 (1)	No person shall release or allow the release of a pollutant in an amount or concentration, or at a level or rate of release, that causes or may cause a significant adverse effect, unless expressly authorized or permitted to do so	Annex 2.2 Incident Reporting; Annex 2.2.3 External Agencies and Support Resources; Annex 2.2.3 Enbridge Incident Reporting Standard
30.1 (3)	A person who releases or causes or allows the release of a pollutant that may cause, is causing or has caused an adverse effect must report the release, in accordance with the regulations, to (a) the director; (b) the person responsible for the pollutant, if the person reporting is not the person responsible for the pollutant but he or she knows or is readily able to determine the identity of that person; and (c) any other person who the person reporting knows or ought to know may be directly affected by the release	
30.1 (4)	A person responsible for a pollutant that is released into the environment that may cause, is causing or has caused an adverse effect must report the release, in accordance with the regulations, to the persons referred to in subsection (3), unless he or she has reasonable grounds to believe that those persons are already aware of the release	

4.19 Ozone Depleting Substances & Halocarbon Regulation 103/94

Ozone Depleting Substances and Other Halocarbons Regulation Regulation 103/94		
Section	**Brief Description**	**Location in ICP**
24	Reporting a release of a Class 1, 2 or 3 substance 24 A person who owns, operates, services, installs, repairs or does any other work on equipment from which there has been a release, whether accidental or not, of more than 10 kilograms of a Class 1, 2 or 3 substance into the environment shall immediately after the release report it to an environment officer, and shall provide an environment officer with all information regarding the release that is requested by an environment officer.	Annex 2.2 Incident Reporting; Annex 2.2.3a Emergency Contact Information; Annex 2.2.3 Enbridge Incident Reporting Standard

4.20 Steam and Pressure Plants Act C.C.S.M. c. S210

The Steam and Pressure Plants Act C.C.S.M. c. S210		
Section	**Brief Description**	**Location in ICP**
16 (1)	Where an explosion occurs in or in connection with a plant, boiler, or pressure vessel, the owner thereof shall immediately report it to the minister by telephone or telegraph; and he shall, within 24 hours after its occurrence, send a report thereon by mail to the minister, stating the exact place at which the explosion occurred, the number of persons, if any, killed or injured thereby, and any other information required by the regulations.	Annex 2.2 Incident Reporting; Annex 2.2.3 Enbridge Incident Reporting Standard

Annex 5 – Table of Contents Page

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5.0 Distribution List

An updated Distribution List for this Plan is maintained on the Emergency Management SharePoint site. The plan is available to all staff on the Governance Document Library at https://esites.enbridge.com/sites/GDL/SitePages/Home.aspx

In addition to the Company Corporate Office, the entire Plan with appropriate Geographical Annexes will be kept at each regional office, with Qualified Individual / Incident Commander and with spill response trailers where appropriate. Additionally, the Field Emergency Response Plan is a concise truncated version of this plan, will be kept by designated response personnel.

5.1 Revision Process

The maintenance process for all Integrated Contingency Plans follows the IMS 07 Emergency Response Plans Development and Maintenance Process. The purpose of this process is to ensure that plans and other essential emergency response documents are developed, maintained and updated when required. The establishment and implementation of an Emergency Response Planning process is a requirement of the NEB.

The ICP will be reviewed annually or when an operating condition change occurs. Examples may include:

- Construction of a new terminal; Construction of new pipeline;
- The Qualified Individual / Incident Commander or designee as identified in *Annex 1* will be updated if needed to reflect accurate accountability in the Region;
- New response Procedure that would significantly alter how Enbridge manages a response.

The annual review process of the ICP Annexes will ensure that the most accurate drawings and references are integrated into the Plan. The annual revision process will also include consultation with agencies that may be involved in an emergency response on the pipeline on the development and update of the ICP.

In the event of a revision requirement before the annual review, a revision request to update the Core Plan and/or a Regional Annex may be submitted for consideration by completing and sending an ESM Management of Change Form, Part A (see next page) to the Document Owner of this Plan or to ESM@enbridge.com.

The Emergency Management Department is the ICP Administrator. All revision requests shall be forwarded to this Department. The revision request will be examined, prioritized and when the revision is integrated into the ICP electronic version, electronic notifications will be sent to the Region(s) and updates will be mailed out to hard copy plan holders.

5.2 Record of Revisions

A simplified record of revisions can be found at the beginning of this document. A full detailed record of revisions for all Integrated Contingency Plans is kept with the Emergency Management Department.

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For internal use only ID:

Management of Change
PART A: Change Request Form

Change Requestor:	**Date:**
Department:	
Change Title:	**Published Version:**

PRIORITY

Priority:

☐ Non-Critical OR (Critical (Select one):

- ☐ Emergency & Security Management Department finding/mandated change
- ☐ Significant change in process, function and/or authority*
- ☐ Regulatory requirement / recommendation

DOCUMENT SECTION/ANNEX (if applicable)

Document Name:

Section Part/Annex Part Name & Number:

Page Number(s) or Major Document Revision:

REVISION REQUEST

Current Wording of process or document if known (or attached markup if available):

Proposed Wording (or attached markup)/Proposed Change:

Reason for Change (Please be specific):

For internal use only ID:

Management of Change – PART A
Change Request Form

Suggested Stakeholders:
Impact of Change:
Risk of not doing change:

Submit PART A to esm@enbridge.com