# Field Emergency Response Plan

**Central Region** 

2017/2018



# **Emergency Reporting**

Edmonton Control Center Enbridge Media Line 1-877-420-8800 1-888-992-0997

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FIELD EMERGENCY RESPONSE PLAN

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# 1.0 ACRONYMS / GLOSSARY

#### 1.1 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
СМТ	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
EPA	U.S. Environmental Protection Agency
ERD	Emergency Response Directory

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Acronym	Description
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
IC	Incident Commander
ICP	Integrated Contingency Plan
ICS	Incident Command System
ІМН	Incident Management Handbook

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Acronym	Description
ІМТ	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
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

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Acronym	Description	
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	
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	
ттх	Table Top Exercise	

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Acronym	Description	
UC	Unified Command	
UEL	Upper Exposure Limit	
USA	Unusually Sensitive Areas	
USC	U.S. Code	
USCG	U.S. Coast Gaurd	
WCD	Worst-Case Discharge	



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#### 1.2 Glossary

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

Term	Definition
Α	
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.
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.
В	
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 <i>spill</i> .
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.
С	
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.

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Term	Definition
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.
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	<ol> <li>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;</li> <li>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;</li> <li>Active membership in a local or regional oil spill removal organization that has identified specific personnel and equipment described under this plan are owned, and equipment 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.</li> </ol>
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.

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Term	Definition
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.
Critical Facility	<ul> <li>A facility that meets one or more of the following criteria:</li> <li>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</li> <li>If damaged or destroyed, would significantly impair other modes of transportation or other critical infrastructures (e.g., electrical power generation, telecommunications, public utility)</li> </ul>
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.

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Term	Definition
Discharge	Any spilling, leaking, pumping, pouring, emitting, emptying, or dumping.
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.

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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.	
Н		
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.

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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	at least one study conducted in accordance with established scientific principles that acute or chronic health effects may occur in exposed persons.				
1					
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.				
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.				

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Term	Definition				
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.				
7					
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.				
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.				

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Term	Definition				
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.				
Ν					
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.				
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	<ul> <li>Refers to a petroleum-based oil that, at the time of shipment, consists of hydrocarbon fractions</li> <li>a) At least 50% of which by volume, distill at a temperature of 340° C (645° F); and</li> <li>b) At least 95% of which by volume distill at a temperature of 370° C (700° F).</li> </ul>				
Non-Petroleum Oil	Oil of any kind that is not petroleum-based. It includes, but is not limited to, animal and vegetable oils.				

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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)	perativeMulti-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.ponse ("OSRO")An entity that provides oil spill response resources, and includes any 					
Oil Spill Response Organization ("OSRO")						
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.					
Р						
P Persistent Oil	<ul> <li>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:</li> <li>Group II – specific gravity less than .85;</li> <li>Group III – specific gravity between .85 and less than .95;</li> <li>Group IV – specific gravity .95 to and including 1.0.; and</li> <li>Group V – specific gravity greater than 1.0.</li> </ul>					
P Persistent Oil Physical Security	<ul> <li>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:</li> <li>Group II – specific gravity less than .85;</li> <li>Group III – specific gravity between .85 and less than .95;</li> <li>Group IV – specific gravity .95 to and including 1.0.; and</li> <li>Group V – specific gravity greater than 1.0.</li> <li>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).</li> </ul>					
Persistent Oil Physical Security Post-Emergency Response	<ul> <li>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:</li> <li>Group II – specific gravity less than .85;</li> <li>Group III – specific gravity between .85 and less than .95;</li> <li>Group IV – specific gravity .95 to and including 1.0.; and</li> <li>Group V – specific gravity greater than 1.0.</li> <li>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).</li> <li>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.</li> </ul>					
Persistent Oil Physical Security Post-Emergency Response PREP	<ul> <li>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:</li> <li>Group II – specific gravity less than .85;</li> <li>Group III – specific gravity between .85 and less than .95;</li> <li>Group IV – specific gravity .95 to and including 1.0.; and</li> <li>Group V – specific gravity greater than 1.0.</li> <li>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).</li> <li>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.</li> <li>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.</li> </ul>					

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Υ Υ	
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.
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.

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Term		Definition		
S				
Safety-Related Condition (Gas Only)	Any c any b or is v paved • A c • C • C • C • C • C • C • C • C • C • C	<ul> <li>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: <ul> <li>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,</li> <li>A leak in a pipeline that is characterized by the need for immediate corrective action to protect the public or property,</li> <li>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,</li> <li>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</li> <li>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.</li> </ul> </li> </ul>		
Site Conditions	Detail typica	s of the area surrounding the facility, including shoreline descriptions, I weather conditions, socioeconomic breakdowns, etc.		
Site Emergency	Mean critica	s an incident has occurred and the entire terminal, with the exception of I 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 and p opera	that must be taken to provide safeguards needed to protect personnel property, as well as the general public, to ensure an efficient clean-up tion.		
Site Supervisor	A gen Pipeli super	neric term that refers to the employee responsible for the location (i.e., ne Maintenance ("PLM") coordinator/supervisor, technician, terminal visor), or designate.		
Skimmers	Mech There oleop deper	anical devices used to skim the surface of water and recover floating oil. e are four basic categories of skimmers; suction heads, floating weirs, hilic surface units, and hydrodynamic devices. These vary in efficiency anding on the type of oil and size of spill.		

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Term

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Definition



	Materials ranging from natural products to synthetic polymeric foams placed in					
Sorbents	confined areas to soak up small quantities of oil. Sorbents are very effective in					
Consonts	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.					
	The number of organizational elements that may be directly managed by one					
Span of Control	person. Span of Control may vary from three to seven, and a ratio of one to					
	five reporting elements is recommended.					
	The first Company individual who discovers an oil spill. This individual must					
Spill Observer	function as the responsible person-in-charge until relieved by an authorized					
	supervisor.					
	All actions taken in responding to spills of oil and nazardous materials					
	(HAZIMAT), i.e., receiving and making nouncations, information gathering and					
Spill Response	etechnical advisory phone calls, preparation for and travel to and from spill					
	sites, direction of clean-up activities, damage assessments, report whiling,					
	development					
	Federal Provincial/State Local agency and industry personnel responsible for					
Spill Response	narticipating in or otherwise involved in spill response. All spill response					
Personnel	personnel will be preapproved on a list maintained in each Company region					
	Location established where resources can be placed while awaiting a tactical					
Staging Area	assignment The Operations Section manages Staging Areas					
	Any person, group, or organization affected by, and having a vested interest in.					
Stakeholders	the incident and/or the response operation.					
State Emergency	A group of officials in the U.S. appointed by the Governor to implement the					
Response	provisions of Title III of the Federal Superfund Amendments and					
Commission	Reauthorization Act of 1986 ("SARA"). The SERC approves the State Oil and					
("SERC")	Hazardous Substance Discharge Prevention and Contingency Plan and Local					
	ERPs.					
Strategy	The general plan or direction selected to accomplish incident objectives.					
Submerged Oil	Oil suspended beneath the surface or that sinks to the bottom of a body of water					
	Any incident or condition involving a facility that may create a risk of discharge					
Substantial	of Crude Oil and Oil. Such incidents include, but are not limited to storage tank					
Threat of a	or piping failures, above ground or underground leaks, fires, explosions,					
Discharge	flooding, spills contained within the facility, or other similar occurrences.					
Т						
	Directions given by the Operations Section Chief including: the tactics					
Tactical	appropriate for the selected strategy: the selection and assignment of					
Direction	resources; tactics implementation; and performance monitoring for each					
	operational period.					
Testics	Deploying and directing resources during an incident to accomplish the desired					
Tactics	objective.					
Technical	Personnel with special skills or technical expertise who can be used anywhere					
Specialists	within the ICS organization.					

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Term	Definition
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.



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# 2.0 INITIAL RESPONSE CHECKLIST

Purpo	se: 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).
EXPL	<b>DRE-</b> 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.
	<ul> <li>Determine the wind direction and approach cautiously from upwind.</li> </ul>
	<ul> <li>Explore the suspected release area only when wearing appropriate PPE using the buddy system if possible.</li> </ul>
	Ensure safety of personnel in the area.     Eliminate areabut official national institution sources in the immediate area
	<ul> <li>Eliminate of shut on all potential ignition sources in the infinediate area.</li> <li>Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).</li> </ul>
	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
	<ul> <li>Coordinates of leading and trailing edge of oil slick</li> </ul>
	Sensitivities endangered
	<ul> <li>Areas of population that are threatened</li> </ul>
	<ul> <li>If radio contact cannot be made; the line flyer will land report to Company management by telephone</li> </ul>
	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person.
APPR	оасн
	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 breatning nazards evident?     Fines exercise an inside a subscription
	<ul> <li>Fires, sparks or ignition sources visible?</li> <li>Heles, saverse, deep ditches, feet water or eliffe nearby?</li> </ul>
	<ul> <li>Holes, caverins, deep ditches, rast water of chins field by?</li> <li>Is local traffic a potential problem?</li> </ul>
	Ground conditions (select one)     Dry     Wet     Icy
CONF	
	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
	tollowed. Confirm identification of spilled material and check the SDS sheets. Consider the following:
	<ul> <li>Assess the spin threat, site safety, and parameters such as spin volume, extent and direction of movement</li> </ul>
	Has pipeline(s) been shut down?
	Has wind direction been confirmed and windsock erected?
	<ul> <li>Has the public been protected or evacuation considered if necessary?</li> </ul>
	Have all ignition sources been identified and eliminated?
	<ul> <li>Have personal protection and safety requirements been established and communicated?</li> </ul>
	<ul> <li>Is adequate fire protection equipment available and in place?</li> </ul>
	<ul> <li>Are tank and VAC-truck electrical equipment properly grounded?</li> </ul>
	Have decontamination sites and procedures been established?
	Are activities and events being logged/ documented?
	<ul> <li>Eliminate sources of vapor cloud ignition, consider the ignition of NGL. Shut down all engines and motors.</li> <li>Establish Evolution zone and Safe Work Areas (Lat Works and Cald)</li> </ul>
	<ul> <li>Establish Exclusion zone and Sale work Areas (Hot, Warm, and Cold).</li> </ul>



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If on water         • Re         cr         cr         e Re         Communication         Communication	er, consult Control Point and HCA maps for appropriate response strategies for incoming resources. leview pipeline alignment sheets to become familiar with the location of mainline valves and elevation haracteristics. leview ESA maps for the location of any sensitive area that may be impacted (Annex 3). port has arrived conduct transfer of command and start preparing for tactical and planning meetings. DN/NOTIFICATIONS
	port has arrived conduct transfer of command and start preparing for tactical and planning meetings.
	DN/NOTIFICATIONS
	DN/NOTIFICATIONS
COMMONICATIO	
Initiate ac Control Ce Control Ce Er Er Ha No P No Ac	tions to notify government agencies including local authorities of area affected or at risk areas via the entre, Regional Management or designate. omplete notifications for emergency call-out, including regulatory agencies. This will be done by Regional Management or designate. excavating, has One-Call agency been notified? nsure notifications have been captured as a radio channel been established for communication between the site and other personnel in field? otify External Emergency Services as appropriate. Work with local law enforcement to make sure all bersonnel/citizens are a safe distance away from the hazard area. otify the appropriate Company management. dvise neighboring property owners and operators of any threat to their property or personnel.
• No	otify appropriate federal, state and local government agencies, including local utilities.
INCIDENT COMM	MAND
Once it ha	as 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 eam once they arrive on site to establish a workable Incident Command Post and Communications Center. Direct initial response actions. Bedin development of an initial incident action plan (ICS 201 Forms).
EMERGENCY SH	HUT DOWN PROCEDURES
The follow release of the pipelin • S • N • N • N • N • N • N • N • N • Once a lea • H • A • A • A • A • A • A • V • II • V • II • A • V • II • A • A • A • A • A • A • A • A • A • A	Ving emergency shutdown procedures should be initiated if company personnel are threatened by the f product from a pipeline to the environment or when coordinating activities for prompt and safe repair of ne 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 hight, manpower might be used to walk the line. ak 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.



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# 3.0 **RESPONSE ZONE DESCRIPTION (INFORMATION SUMMARY)**

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.

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### **Central Region Pipelines Beginning and Ending Stationing**

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	51.1	-106.5	538.03	49.0	-97.5	1245.18
Line 2 (24") CO** & Synthetic Products	Loreburn Station to CA/US Border at Gretna, MB	51.1	-106.5	538.05	49.0	-97.5	1245.20
Line 3 (34") CO	Loreburn Station to CA/US Border at Gretna, MB	51.1	-106.5	538.03	49.0	-97.5	1245.18
Line 4 (36"/48") CO	Loreburn Station to CA/US Border at Gretna, MB	51.1	-106.5	537.35	49.0	-97.5	1245.18
Line 13 (16"/1820"") Diluent	Loreburn Station to CA/US Border at Gretna, MB	51.1	-106.5	538.04	49.0	-97.5	1245.18
Line 26 (12"-CO)	US/CA Border at Portal, SK to Steelman Bakken Pump Station	48.9	-102.5	no MP at this time	49.2	-102.6	85.07 MP
Line 26 (16"-CO)	Steelman Bakken Pump Station to Cromer Terminal	49.2	-102.6	85.07 MP	49.7	-101.2	162.31 MP
Line 65 (20") CO	Cromer Terminal to CA/US Border at Gretna, MB	49.7	-101.2	0.00	49.0	-97.5	287.84
Line 67 (36") CO	Loreburn Station to CA/US Border at Gretna, MB	51.1	-106.5	364.81	49.0	-97.5	1080.89

\*NGL- Natural Gas Liquid

\*\*CO- Crude Oil

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Tank No.         Location         Build Date         Total V           300-TK-64         Stoney Beach TO (SB)         1992         30,           300-TK-65         (SB)         1993         36,           301-TK-71         1951         56,           301-TK-72         1951         56,           301-TK-73         1951         140           301-TK-74         1952         80,           301-TK-77         1955         56,           301-TK-78         1955         56,	Volume         Total Barrel Capacity           ,000         66,250           ,000         66,250           ,000         ,000           ,000         ,000           ,000         ,000           ,000         ,792,050           ,000         ,000           ,000         ,000           ,000         ,000           ,000         ,000           ,000         ,000           ,000         ,000           ,000         ,000           ,000         ,000
300-TK-64         Stoney Beach TO (SB)         1992         30, 1993         36, 36, 1993         36, 36, 1951         36, 36, 1951         36, 56, 1951         1951         56, 1951         1951         56, 140         1951         56, 140         1951         56, 1951         140         1952         80, 1955         1955         56, 56, 1955         1955         56, 1955         1955         56, 1955         1904         150	,000 ,250 ,000 ,000 ,000 ,000 ,000 ,000
300-TK-65         (SB)         1993         36,           301-TK-71         1951         56,           301-TK-72         1951         56,           301-TK-73         1951         56,           301-TK-74         1951         56,           301-TK-77         1951         56,           301-TK-78         1955         56,           301-TK-78         1955         56,	,250 ,000 ,000 ,000 ,000 ,000 ,000 ,000
301-TK-71         1951         56,           301-TK-72         1951         56,           301-TK-73         1951         56,           301-TK-73         1951         140           301-TK-74         1952         80,           301-TK-77         1955         56,           301-TK-78         1955         56,           201 TK 70         1904         150	,000 ,000 ),000 ,000 ,000 ,000 ),000 ),000 ),050 ),200
301-TK-72         1951         56,           301-TK-73         1951         140           301-TK-74         1952         80,           301-TK-77         1955         56,           301-TK-78         1955         56,           201 TK 70         1955         56,	,000 ,000 ,000 ,000 ,000 ,000 ,000 ,000 ,000 ,000 ,000 ,000 ,000 ,000
301-TK-73         1951         140           301-TK-74         1952         80,           301-TK-77         1955         56,           301-TK-78         1955         56,           201 TK 70         1004         150	0,000 ,000 ,000 ,000 0,000
301-TK-74         Regina (QU)         1952         80,           301-TK-77         1955         56,           301-TK-78         1955         56,           201 TK 70         1004         150	,000 ,000 ,000 ,000 ,000 ,050 ,200
301-TK-77         Regina (QU)         1955         56,           301-TK-78         1955         56,           201 TK 70         1004         150	,000 ,000 ),000 ),000 ),050 ),200
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301-TK-80 2015 198	),200
302-TK-87 2015 199	Contraction of the second s
302-TK-88 2015 199	,200
301-TK-89 1986 100	0,000
301-TK-90 1986 100	0,000
301-TK-91 1986 100	0,000
301-TK-92 1986 100	0,000
301-TK-93 1986 100	0,000
303-TK-94 1974 120	0,000
302-TK-95 1963 150	0,000
303-TK-96 1956 56.	.000
303-TK-97 Cromer (CM) 1956 56.	.000 2.487.700
303-TK-98 1956 96.	.000
302-TK-99 1956 56.	.000
301-TK-100 1988 150	0.000
301-TK-101 1992 150	0.000
301-TK-102 1994 174	1.300
303-TK-103 1996 150	0.000
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 Arial 56	.000
300-TK-112 Arial 56	.000
300-TK-113 Arial Out of	Service
300-TK-114 Gretna (GF) Arial 56	.000 280,000
300-TK-115 Arial 56	000
300-TK-116 Arial 56	000
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### 4.0 DISCOVERY/DETECTION

#### 4.1 Observation & 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.
- Automated discharge detection by the SCADA system at the Control Center which monitors flow and pressure on most lines as well as breakout tank oil levels.

#### 4.2 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 Section 5.5-Notification Procedures).

#### 4.3 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.

For all Spill Detection and Mitigation Procedures refer to Core Section 1 of the Integrated Contingency Plan ("ICP").

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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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# 5.0 NOTIFICATION PROCEDURES

## 5.1 Required Notifications

The information provided herein focuses primarily on general notifications and reporting. Relevant internal and external notifications will be found in the geographic specific Integrated Contingency Plan ("ICP") Geographical Annex 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.

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## 5.3 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 13 - 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 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 the Incident Management Team as required.
- Notification Procedures for required regulatory Notifications
- Call response agencies/oil spill removal agencies

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## 5.4 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
- Stakeholders

## 5.5 Emergency Contact Information

In Case of Emergency – 24 hr. Contacts			
Edmonton Control Center	1-877-420-8800		
Enbridge Media Hotline	888-992-0997		

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**Federal Regulator Canada Federal Regulator Canada Federal Regulator Canada				
Transportation Safety Board (TSB) Reporting Hotline	819-997-7887			
National Energy Board (NEB) Incident Line	403-807-9473			
CANUTEC	613-996-6666			
Environment Canada	800-222-6514			

\*\*Refer to Section 5.6f in this document for a detailed listing of Federal Agencies

**Saskatchewan Regulators	
Saskatchewan Ministry of Environment	(800) 667-7525

\*\*Refer to Section 5.6f in this document for a detailed listing of Provincial Agencies

**Manitoba Regulators	the second s
Manitoba Sustainable Development	(204) 945-4888

\*\*Refer to Section 5.6f in this document for a detailed listing of Provincial Agencies

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# 5.6 Emergency Contact Information

## 5.6a Emergency Contacts

	CONTROL CENTER		
Central Region	877-420-	8800	
	ENBRIDGE MEDIA HOTLINE		
Canada		888-992-	0997
	ENBRIDGE QUALIFIED INDIVIDUALS		
Job Title	Name	Office #	Cell #
Director Central Region Ops		306-791-8191	
Manager, RS & D		306-791-8176	
Manager, PLM		306-791-8177	
	Central Response Units (Manned/Unmann	ned)	
	INTERNAL		
Enbridge Central Region Re	sponse Units (Manned)		
Regina Unit	Regina, SK, S4P 2B2 Coordinates (X: 50.4 Y:104.5	306-791-7165	
Cromer Unit	Cromer, MB, R0M 0J0 Coordinate (X: 49.7	204-556-2309	
Gretna Unit	Gretna, MB. R0G 0V0 Coordinates (X: 49.0 , Y: -97.5	204-327-5348	
	EXTERNAL		
Environmental Protection Un Winnipeg CPA EPU	nitEuroway Industrial Services Co. Ltd.	204-661-	0500
Area U Co-op Zone 2 Spill Response Trailer Bromby Welding (Hardisty)		780-888- Cell:	0005
Area 6 Emergency Response Dispatch Call-Out	e Co-Operative	306-791-	5058
Area 2 Spill Co-operative S Tervita TRD Facility	pill Response Trailer	(24hr) 306-8	46-2088

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WATE	ER SYSTEMS
PORTA	GE LA PRAIRIE
The Wate	r Treatment Plant
City of Portage la Prairie	Telephone: (204) 239-8374
Portage la Prairie MB R1N 0L8	E-mail:
ST.	EUSTACHE
Cartier Reg	gional Water Plant
Cartier Regional Water Cooperative Inc.	Telephone: (204) 353-4055
	Fax: (204) 353-4068
St. Eustache MB R0H 1H0	E-mail:

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# 5.6b Incident Management Team List

ICS Position	Normal Job Title	Name	Office Number	Alt. Number
Summer of the second	1	Command S	Staff	
Incident Commander (IC)	Manager, Regional Services & Dev.		306-791-8176	
Alternate IC	Manager, PLM		306-391-8177	
ICS Advisor	Emergency Response Corrdinator		306-337- 5156	
Liaison Officer (LNO)	Sr. Compliance Advisor		306-791-3335	
Alternate LNO	ROW Agent		204-327-5041	
Alternate LNO	Director, Central Region		306-791-8191	
Public Information Officer (PIO)	Community Relations Advisor		306-790-0522	
Alternate PIO	Se	e PIO On-Call Lis	st	
Safety Officer (SOFR)	Sr. Safety Advisor		306-791-8175	
Alternate SOFR	Safety Advisor		204-556-1215	
Alternate SOFR	PLM Supervisor (Gretna)		204-327-5589	
		Operations Se	ection	
Operations Section Chief (OSC)	Manager, Regional Services & Dev.		306-791-8176	
Alternate OSC	PLM Supervisor (Cromer)		204-556-2309	
Alternate OSC	Manager, PLM		306-791-8177	
Staging Area Manager (STAM)	Supervisor, Maintenance Services		306-790-0525	
Alternate STAM	Project Integration Engineer		306-790-0523	
Alternate STAM	Operations Engineer		306-790-0527	
		Planning Sec	ction	
Planning Section Chief (PSC)	Supervisor, Regional Services & Dev.		306-790-0524	
Alternate PSC	Supervisor, Maintenance Services		306-790-0525	
Alternate PSC	Operations Engineer		306-790-0527	
Situation Unit Leader (SITL)	Training Coordinator		306-791-8194	
Alternate SITL	Maintenance Planner		306-790-0529	
Alternate SITL	Operations Engineer		306-790-0526	
Environmental Unit Leader (ENVL)	Supervisor, Regional Support		780-412-6415	

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ICS Position	Normal Job Title	Name	Office Number	Alt. Number
Alternate ENVL	Supervisor, Regional Services & Dev.		306-790-0524	
Alternate ENVL	Maintenance Planner		306-790-0529	
Documentation Unit Leader (DOCL)	Maintenance Planner		306-790-0529	
Alternate DOCL	Training Coordinator		306-791-8194	
Alternate DOCL	Sr. Compliance Coordinator		306-791-3335	
Resource Unit Leader (RESL)	Coordinator Maintenance Services		306-790-0529	
Alternate RESL	Operations Engineer		306-790-0527	
Alternate RESL	Supervisor, Maintenance Services		306-790-0525	
		Logistics Section	and the second second	
Logistics Section Chief (LSC)	PLM Supervisor (Cromer)		204-556-2309	
Alternate LSC	Training Coordinator		306-791-8194	
Alternate LSC	Maintenance Planner		306-790-0529	
		Finance Section		
Finance Section Chief (FSC)	Sr. Operations Financial Analyst		306-791-8172	
Alternate FSC	Project Controls Admin Assistant		306-790-0520	
Alternate FSC	Maintenance Planner		306-790-0529	

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# 5.6c Emergency Services and EMO Directory

Saskatchewan		Mile 171 -	Mile 587 Regina	a, Saskatchewan	306-780-6607
Location	Police	Fire	Ambulance	Hospital	EMO
Enbridge	Pipelines Inc Sas	katchewan			
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:
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: 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) 567-2801 Davidson	RM of Craik W: (306) 734-2242 C: RM of Huron C:
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:
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: RM of Sherwood W: (306) 525-5237 C
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:
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: RM of Edenwold C:

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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: RM of Edenwold C: MR of South Qu'Appelle C:
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: RM of Francis W: (306) 245-3256 C: RM of Montmartre / Village of Montmartre C:
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: RM of Kingsley / Town of Kipling W: (306) 736-2272 C:
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: RM of Wawken (306) 575-9601 RM of Walpole (306) 306-435- 7224
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:	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:

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Manitoba

Winnipeg, Manitoba 204-983-5462

Location	Police	Fire	Ambulance	Hospital	EMO		
Enbridge	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	<b>911 or</b> (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:		
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:		
MP 631.8 - 670 West Souris 641.0 East Souris 646.2	911 or Souris Emerg: (204) 483- 2123	<b>911 or</b> (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:		
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/Wawane sa RM of South Cypress (204) 827-2308		
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: RM of Pembina C:		

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Location	Police	Fire	Ambulance	Hospital	EMO	
Enbridge	Enbridge Pipelines Inc Manitoba					
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: 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:	
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: Municipality of Emerson- FRanklin C:	



## 5.6d Area 6 Call-Out Chart



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## 5.6e 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.



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## 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

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# 5.6f Government Agencies

GOVERNMENT AGENCIES				
FEDERAL AGENCIES				
Transportation Safety Board (TSB) Incident Line	(819) 997-7887			
Fax	(819) 953-7876			
E-mail address PipelineNotifications@tsb.gc.ca				
National Energy Board (NEB) Incident Line	(403) 807-9473			
NEB Online Event Reporting System (OERS) (https://apps.neb-one.gc.ca/ers/hom	e/index)			
In the event that OERS is unavailable, companies are directed to report events to the TSB Reporting Hotline	(819) 997-7887			
Canadian Nuclear Safety Commission (CNSC)	(613) 995-0479			
	(800) 668-6767			
Canadian wildlife Service/Environment & Climate Change	(204) 944-4888			
Ducks Unlimited	(403) 362-4827			
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			
National Environmental Emergencies Centre	(866) 283-2333			
Transportation of Dangerous Goods (CANUTEC)	(010) 000 0000			
or see provincial list for local office	(013) 990-0000			
Transport Canada Navigation Protection Program & Receiver of Wreck	(780) 495-8215			

PROVINCIAL AGENCIES	PROVINCIAL AGENCIES				
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 Sustainable Development	(204) 945-4888				
Manitoba Growth, Enterprise and Trade (Virden)	(204) 748-4260				
Manitoba Growth, Enterprise and Trade (Waskada)	(204) 673-2472				

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PROVINCIAL AGENCIES			
Manitoba Public Insurance (MPI)	(800) 665-2410		
Manitoba Workplace Safety & Health	(866) 888-8186		
Workers' Compensation Board of Manitoba	(855) 954-4321		

# 5.6e Other Pipelines

OTHER PIPELINES	
OIL AND GAS	200 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -
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

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## 5.7 External Communications (Media Releases)

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 888-992-0997 in Canada.
- 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.

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# 6.0 **PROTECTIVE ZONES**

## 6.1 Isolation Distance

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.



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## 6.1 Isolation Distance, continued

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)

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\* 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



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## 6.2 Setting Up 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.

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# 7.0 EVACUATION

## 7.1 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: walk,	Evacuation should be carried out in an orderly manner. Personnel should NOT run or panic.

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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.

## 7.2 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.



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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.

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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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# 8.0 OPERATIONS

## 8.1 Enbridge Response Management System

## Incident Command System

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 and 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 5.0 Notification Procedures*.

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## 8.2 ICS Activation

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 I/C 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.



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## 8.3 ICS 207 Organization Chart



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

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## 8.4 Operations Sections Organization Chart




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# 8.5 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.



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# 8.6 ICS Common Responsibilities

	Common Responsibilities Checklist
Afte	er 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.
<ul> <li>Image: A start of the start of</li></ul>	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.
<ul> <li>Image: A start of the start of</li></ul>	Review Incident Management Handbook (IMH) and role specific requirements.
<	Take advantage of available travel to rest prior to arrival.
~	<ul> <li>Upon arrival at the incident, check-in at the designated check-in location. Check-in may be found at any of the following locations:</li> <li>Incident Command Post, Base/Camps, Staging Areas, and Heli-bases.</li> <li>If you are instructed to report directly to a line assignment, check-in with the Division/Group Supervisor.</li> </ul>
✓	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 Conduct.
<	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.

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	Common Responsibilities Checklist (Cont'd)				
✓	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 your 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 unsafe acts.				
✓	Maintain Individual/Activity Log (ICS 214a).				



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# 8.7 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.

# 8.7.1 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 safety 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

# 8.7.2 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).

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# 8.7.3 Notifications

• Follow Notification Procedures (Section 5.0)

# 8.7.4 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

# 8.7.5 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



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# 8.8 Hazard Specific Response Actions

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

# 8.8.1 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



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# 8.8.2 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

### 8.8.3 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.

# 8.8.4 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

# **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 1 inch = 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-jobaid.html



#### Notes:

# 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.

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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**

(					Visu	al Color					
	Sheen (Silver Grey)	Rainbow	Metallic	Transitional	Dark (or True) Color		Sheen (Silver Grey)	Rainbow	Metallic	Transitional	Dark (or True) Color
1	Sheen (Silver/Grey)	Rainbow	Metallic	Transitional	Dark (or True)		Sheen (Silver/Grey)	Rainbow	Metallic	Transiti ona I	Dark (or True) Col- or
Approximate Thickness	0_04 to 0.3 um	03 to 5.0 um	5.0 to 50 um	50 to 200 um	>200 um	Approximate Thickness	1.6 x10 <sup>-5</sup> to 1.2 x 10 <sup>-5</sup> inches	$1.2 \times 10^{-5}$ to $2.0 \times 10^{-5}$ inches	$2.0 \times 10^{-4}$ to 2.0 x 10 <sup>-3</sup> inches	$2.0 \times 10^{-5}$ to 1.2 x 10^{-5} inches	$8 \times 10^{-3}$ inches
Area			Volume (liters)		<u>^</u>	Area			Volume (gallon	s)	2
100 m2	0.004 to 0.03	0.03 to 0.5	0.5 to 5	5 to 20	>20	100 yd <sup>2</sup>	0.003 to 0.007	0.007 to 0.11	0.11to 1.1	1.1to 4.4	>4.4
500 m2	0.02 to 0.15	0.15 to2.5	2.5 to 25	25 to100	>100	500 yd <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	0.052 to 0.14	0.14t 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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 <sup>2</sup>	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 controlléd
- 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 unignited 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 gualified 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 das 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.

# REDA (rom t und Effections Mar alse NA) or Reference - PUBLIC Ignifilig ar RGY Plume

#### 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. Air movers are also an effective method of providing air circulation in confined areas or in buildings. Ensure they are safe (intrinsically safe) to use in that 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

# 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.





# 8.8.7 Enbridge Field Response Team Guide Fire and Explosion IC COPY

\*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



# **DIESEL STORAGE TANK FIRES**

If possible and safe to do so, isolate diesel tank by closing remote or

Keep other installations in the vicinity cool with water spray if possi-

# TANK FIRES

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

# VEHICLE FIRES

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

# 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 effec-

Do not extinguish fire unless flow can be stopped and it is safe to do so Use water in flooding quantities as fog. Solid streams of water may spread

Cool all affected containers with flooding quantities of water. If fire becomes uncontrollable or container is exposed to direct flame - consider



8.8.7 Explosion 20 Fire п Team Response Field

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# 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**

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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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# 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

# Additional Notifications

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

# 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 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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# 8.8.10 Enbridge Field Response Team Glie Afie BarguBMITTAL-PUBLIC COPY

# **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

Actions to Consider After a Flood:

- of cover survey
- pipelines and the risks posed by reduced cover

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

# Personnel Protective Actions

 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

 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

# Site Control & Safety



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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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# 8.8.12 Bomb and Security Threats

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Bomb Explosion, Confirmed or Credible Threat cont.

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

Contact Supervisor immediatelyHandle note as minimally as possible.

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

Contact Supervisor immediately

• Do not delete the message.

# 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.

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Threats

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# 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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# 8.8.13 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.



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# 8.9 Control Points

Tactical Control Point Planning (TCPPs) is the development and maintenance of plans containing detailed tactics that are identified for strategic locations (Tactical Control Points) along the Company's system. These plans provide fast and effective site-specific response tactics to ensure that sensitive resources are protected. The tactics should be flexible to varying conditions where possible. Tactical Control Point Plans complement this Integrated Contingency Plan. During a response, the interpretation of Tactical Control Point Plans should be flexible; resources and tactics may need to be adjusted (or discontinued) depending on the nature and complexity of the incident or surrounding environmental conditions. Tactical Control Point Plans are not intended as a replacement to communicating with Environmental representatives to ensure resources at risk are adequately identified and protected, nor should they negate any tactical or control point location change recommendations from the field responders.

During an Incident:

- ✓ Refer to Tactical Control Point Plans for guidance on protection, containment and recovery locations and strategies
- Contact an Environmental representative for detailed screening of the site during a response
- ✓ If required, assess site for hazards
- ✓ Prepare site prior to beginning tactics (grading/clearing)
- ✓ Seek permission if not already secured for any of the following:
  - Highways and secondary roads
  - Bridges
  - Campgrounds
  - Public boat launches
  - Private access points
  - Cut lines or remote access trails

# CENTRAL REGION

FIELD EMERGENCY RESPONSE PLAN

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# 9.0 RESPONSE EQUIPMENT

# 9.1 Spill Response Organizations – Internal & External Locations

Equipment Locations	Emergency Phone Number	Address	Coordinates	
Central Region Respons	e Units			
Cromer Terminal	204-556-2309	Cromer, MB, R0M 0J0	49.7	-101.2
Gretna Terminal	204-327-5348	Gretna, MB, R0G 0V0	49.0	-97.5
Regina Terminal	306-791-7165	North, Regina, SK, S4P 2B2	50.4	-104.5
External Response Agen	cies			
Husky Pipeline Yard	780-871-6621	Lloydminster, AB	53.2	-110.0
Dick's Welding & Contracting	780-983-3416	Acheson, AB T7X 5A7	53.5	-113.7
Encana Corporation Coop	403-823-1049	Drumheller, Alberta T0J 0Y0	51.4	-112.6
Bromby Welding Ltd.	780-888-1095	Hardisty	52.6	-111.3
Saskatchewan Oil Spill Cooperative	306-861-2320	Weyburn, SK	49.1	-102.9
Manitoba Oil Spill Cooperative	204 748-4261	Virden Station	49.8	-101.9
Cenovus Parking Lot	780-573-7375	La Corey AB	54.4	-110.7
CEPA Mutual Emergency Assistance Agreement**	Primary: Emergency Ph Emergency Ph Secondary: Emergency Ph Chose the "Mutual Aid" contact information for t	ir. Central Region Ops one Number: 306-536-5167 , Manager, PLM one Number 306-530-5909 tab on the following SharePoin he CEPA Mutual Emergency A	t site that disp ssistance Agr	lays the external eement:

\*\* 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.



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# 9.2 Local Response Equipment

It is the responsibility of each Area Supervisor/ Maintenance Team Leader 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.

## **CENTRAL REGION**

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Central Region		
Cromer		
CM-630-OUT-0823 - Cromer vard		-
	the second second second second	
Resource Name	SPECIALIZED EQUIPMENT	Total
		10
Trailer,Command/40021417		1 Each
Cromer		
CM-630-STRM-0817 - Cromer Cold Storage buil	ding	
		1
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, CENTRIFUGAL, 6IN, GORMAN-RUPP, CUMMI	NS DIESEL/40021063	1 Each
PUMP, CENTRIFUGAL, 4IN, GORMAN-RUPP, CUMMI	NS 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	201005	1 Each
GENERATOR, PORTABLE, 7.5KW, ONAN, DIESEL/40	021065	1 Each
GENERATOR, HONDA, EM 2500 (gas Powered)/40020	356	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, D. LBS/40013640	2488, V3600T 85 H.P. Turbo Diesel, 5,700.0	1 Each
Cromer		
CM-862-TRLR-0822 - Cromer Summer Respons	e Trailer	
Resource Name	BOOM	Total
	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

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Gretna

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GF-862-CCN-0814 - Gretna PLM Oil Spill co	ntainment CCAN #6/ Water Recovery equipmen	t
Posoureo Nomo		Total
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, HYDRAULIC, ELASTEC/AMERICANMARI	NE, 3IN/40020395	1 Each
Resource Name	SKIMMER	Total
SKIMMER, MECHANICAL, C/W HEATER, PUMP / MARINE, HYDRAULIC/40013722	AND HOSES, OSKIMUN350G, ELASTEC/AMERICAN	1 Each
Resource Name	SPECIALIZED EQUIPMENT	Total
Tank, Pillow, 5000 U.S. Gallons, Elastec, with 3IN I Alum. Camlock./40013597	Flange, Valve/Camlock, Close nipple, Brass gate valve,	1 Each
GF-862-TRLR-0815 - Gretna PLM Emergen	cy Response Trailer #1	
Resource Name	BOOM	Total
Resource Name	BOOM	TOLAI
BOOM, OSCAR RIVER, 8IN X 50FT/40021060		650 Each
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP YANMAR 2N DIESEL (40020928		1 Each
Resource Name	SKIMMER	Total
	200 400/40004050	4 Fach
SKIMMER, MECHANICAL DISC, AQUAGUARD, F		Total
Acource Mame	SI EGIALIZED EGOII MENT	Total
Tank, Fast, 2000 (Full Kit),Includes Roof Cover, Ground Mat, Tank Liner, Valve Outlet, Pipe Saddle, Tapst and & Handpump/40013599		
REGINA	Puilding	
QU-050-51 KM-0001 - Regina Colu Stolage	Building	
Resource Name	BOAT & RESPONSE VEHICLE	Total
BOAT, WORK BOAT, LANDING CRAFT, 22 FT, OUTLAW EAGLE , INBOARD TWIN 330 HP 5.7L.		
BOAT,LANDING CRAFT, EAGLE/OUTLAW MARINE. 18FT. 200 HP MERCURY. Jet/40015621		
BOAT, WORK BOAT, LANDING CRAFT, 20FT, INBOARD, 5.7L 330HP, JET, OUTLAW EAGLE MANUFACTURING/40021027		

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REGINA		
QU-630-STRM-0804 - Regina PLM Shop		1.1
		1
Resource Name	SPECIALIZED EQUIPMENT	Total
GENERATOR HONDA ELI6500/40020857		1 Each
GENERATOR, HONDA, E00300/4002003/		I Lacii
ARGO, Diesel, AMPHIBIOUS, PERSONNEL, ALLWHL	DRIVE, 950DT/40013663	1 Each
VEHICLE, OFF HIGHWAY, Gasoline, SIDE BY SIDE, 4	WHL DRIVE/40015239	1 Each
REGINA		
QU-862-TRLR-0805 - Regina Summer Response	e Trailer	
Resource Name	BOOM	Total
		10111
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
		1
SKIMMER, MECHANICAL, MORRIS, MI-11/24, 24 DISC PACK/40020822	CS, 11IN, C/W DIESEL HYDRAULIC POWER	1 Each
SKIMMER, WEIR, PEDCO, 2FT WIDE/40020397		1 Each
Resource Name	SPECIALIZED EQUIPMENT	Total
TANK, PORT-A-TANK, C/W BLADDERS, 1500 GAL/400	020355	2 Each
REGINA	the second s	
QU-862-TRLR-0806 - Regina Winter Response 1	Trailer	
		1
Resource Name	SPECIALIZED EQUIPMENT	Total
GENERATOR, HONDA 3500 WATTS/40020791		1 Each

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REGINA		
QU-862-TRLR-0809 - Regina Summer Respo	onse Semi	_
Resource Name	SHALLOW WATER EQUIPMENT	Total
PUMP, ELASTEC/AMERICANMARINE, 4IN/400210	054	1 Each
PUMP, TRASH, 2IN/40013876		1 Each
Resource Name	SKIMMER	Total
SKIMMER, MECHANICAL, GROOVED DRUM, TDS136, ELASTEC/AMERICAN MARINE/40021053		
SKIMMER, VACUUM, Shovel Head, Vacuum system MARINE,/40013600	m w/Hydraulic Motor, ELASTEC/AMERICAN	1 Each
SKIMMER, WEIR, ES400 helical screw pump, OSYS ELASTEC/AMERICAN MARINE, Self Adjusting/400	STSK440S, 520.0 GPM, Sea Skater Weir, 13609	1 Each



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# 9.3 Emergency Response Time Maps

Drive Times depicted in the Regional Emergency Response Time Maps were generated using ESRI's (Environmental Systems Research Institute) ArcGIS Online Created Drive Time Areas tool. Drive Times calculated with this tool took into account typical traffic conditions for Monday at 7am but actual time is subject to changes based on local road, traffic and weather conditions. ESRI's road network was last updated June 19, 2017 and Drive Times reflect this update.

These response time maps are considered a conservative timeframe for travel to site and additional time up to two hours is required for notification and deployment. In the event of an incident, reference to individual maps will be necessary.

Manned facility travel times are calculated every hour up to six hours. This will show **only** the travel time required from the manned facilities, after notification, **to the company trailers or to areas along the pipeline.** 

Enbridge Emergency Response Trailer location travel times are calculated every hour up to six hours depicting the travel time for the trailer to locations along the pipelines. Each trailer location has its own map with color changes representing one-two hour time changes.

OSRO Emergency Response Trailer location travel times are represented by calculating every hour up to six hours based on the above criteria. The color changes represent hourly travel time changes. Response times may vary with the locations of OSRO personnel at the time of an event. This is representative of travel time for the trailers only.


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### 10.0 GENERAL GUIDANCE

The purpose of this Emergency Response Action Plan is to provide quick access to key types of information that are often required in the initial stage of an emergency incident. The information provided in this Emergency Response Action Plan is presented in greater detail in other sections of the Integrated Contingency Plan.

The Emergency Response Action Plan will be updated and redistributed annually. Coordinating updates and reviews of the Emergency Response Action Plan shall be the responsibility of the Emergency & Security Management Department.

#### 10.1 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)

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#### **11.0 PROTECTION, CONTAINMENT AND RECOVERY**

#### 11.1 Isolation Protection Technique Selection

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 f	following considerations should be taken into account when planning or ementing 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
~	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.

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.

#### CENTRAL REGION FIELD EMERGENCY RESPONSE PLAN

Isolation Protection	on Technique Selection			
Technique	Description	Logistical Requirement Examples	Use Limitations <sup>1</sup>	Potential Environmental Effects
Techniques on Land		San Trading of Street, St		
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.	<u>Typical Equipment</u> Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting	<ul> <li>Steep Slopes</li> <li>Porous substrate</li> </ul>	<ul> <li>Disturbance to environmental sensitivities, surface soils and vegetation</li> <li>Increased oil penetration</li> </ul>
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.	<u>Typical Equipment*</u> Backhoe or set of hand, tools, misc. plastic sheeting	<ul> <li>Slope</li> <li>Depth to near- surface flow</li> </ul>	<ul> <li>Increased oil penetration</li> <li>Disturbance to environmental sensitivities, surface soils and vegetation</li> <li>Potential to impact groundwater</li> </ul>
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.	<u>Typical Equipment*</u> Backhoe, bulldozer, front- end loader, or set of hand tools, plastic sheeting	<ul> <li>Steep Slopes</li> <li>Porous</li> <li>substrate</li> </ul>	<ul> <li>Increased oil penetration</li> <li>Disturbance to environmental sensitivities, surface soils and vegetation</li> <li>Potential to impact groundwater</li> </ul>
Techniques on Small	Watercourses	The second s	1	
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.	<u>Typical Equipment*</u> 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	<ul> <li>Increased oil penetration</li> <li>May increase suspended sediment</li> <li>Downstream water flow may be restricted</li> </ul>

#### CENTRAL REGION FIELD EMERGENCY RESPONSE PLAN

Technique	Description	Logistical Requirement Examples	Use Limitations <sup>1</sup>	Potential Environmenta Effects
E. Culvert Block (3.2.3 in Tactics Guide)	Block culvert opening with plywood, sediments, sandbags, etc. to prevent oil from entering culvert	<u>Typical Equipment*</u> Misc. hand tools, misc. plywood, sandbags, etc.	Upstream     storage capacity	<ul> <li>Increased oil penetration</li> <li>Downstream water flow may be restricted</li> </ul>
F. Filter Fence Debris Exclusion (3.2.4 in Tactics Guide)	Install fence barrier upstream of containment site to exclude debris/ice	<u>Typical Equipment*</u> Misc. hand tool, fence posts, fence, fasteners, chicken wire, support lines, bales, sorbent materials etc.	Soft substrate	<ul> <li>Minor substrate disturbance at post an anchor points</li> </ul>
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.	<u>Typical Equipment*</u> Misc. hand tools, boats, fence posts, wire mesh, sorbents, misc. fasteners, support lines, stakes, etc.	Soft substrate	<ul> <li>Minor substrate disturbance at post and shoreline anchor points</li> <li>High substrate disturbance if boat is not used</li> </ul>

#### CENTRAL REGION FIELD EMERGENCY RESPONSE PLAN

Isolation Protection Technique Selection						
Description	Logistical Requirement Examples	Use Limitations <sup>1</sup>	Potential Environmental Effects			
Watercourses	de la constance	10 10 10 10 10 10 10 10 10 10 10 10 10 1				
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.	<ul> <li>Sensitive shorelines</li> </ul>	<ul> <li>Minor substrate disturbance at anchor points</li> <li>Heavy oiling at shoreline anchor point</li> </ul>			
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.	<ul> <li>Sensitive shorelines</li> </ul>	<ul> <li>Minor substrate disturbance at anchor points</li> <li>Heavy shoreline oiling at downstream anchor point</li> </ul>			
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 Selection         Description         Watercourses         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.         Boom is deployed across entire river channel at an angle to contain floating oil passing through channel.         Boom is deployed across or around sensitive areas and anchored in place. Approaching oil is excluded from area.	Technique SelectionDescriptionLogistical Requirement ExamplesWatercoursesBoom 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.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.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.	Technique Selection         Logistical Requirement Examples       Use Limitations <sup>1</sup> Watercourses         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         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         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.       • Sensitive shorelines			



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Technique	Description	Logistical Requirement Examples	Use Limitations <sup>1</sup>	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.	<u>Typical Equipment*</u> Hard boom, ground tackle, rope, shoreline anchors, boats, winches.	Onshore winds	<ul> <li>Minor substrate disturbance at anchor points</li> <li>Oil is not contained and may contact other shorelines</li> </ul>
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.	<u>Typical Equipment*</u> Hard boom, BoomVane(s), control line, mooring line,boom/shore anchor line, tow bridles, shore anchor pins.	<ul> <li>Requires access to multiple shoreline locations (if mooring line is to be used)</li> <li>Requires a current (not for still water use)</li> </ul>	<ul> <li>Minor disturbance of trees if using as an anchor point.</li> </ul>



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#### 11.2 Imperial/Metric Conversion Table

Eng	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 <sup>2</sup> )	929 square centimetres (cm <sup>2</sup> )	1 cm <sup>2</sup>	0.0129 ft <sup>2</sup>	
1 square foot (ft <sup>2</sup> )	0.0929 square metres (m <sup>2</sup> )	1 m <sup>2</sup>	10.76 ft <sup>2</sup>	
1 acre (ac)	4.047 square metres (m <sup>2</sup> )	1 000 m <sup>2</sup>	0.247 ac	
1 square mile (mi <sup>2</sup> )	2.59 square kilometres (km <sup>2</sup> )	1 km <sup>2</sup>	0.386 mi <sup>2</sup>	
Volume				
1 US Gallon (US gal)	3.785 litres (I)	11	0.264 U.S. gal	
1 Imperial Gallon (Imp gal)	4.546 litres (I)	11	0.220 imp gal	
1 Barrel	0.16 cubic metres (m <sup>3</sup> )	1m³	6.29 bbl	
1 Barrel (bbl)	159 litres (I)	11	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				
°F = (°C (9) ÷5) + 32				
_				
Pressure				
1 pound per square inch (psi)	0.0689 bar	1 bar	14.504 psi	
<u>1 pound per square inch (psi)</u>	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 <sup>2</sup>	1 kg/cm <sup>2</sup>	0.968 atm	
1 atmosphere (atm)	760 mm mercury (mm Hg)	1 mm Hg	0.00132 atm	
Flow	<b>3 1 1 1 1</b>	. 30		
1 gallon per minute (gpm)	0.227 metre per hour (m /hr)	1 m <sup>×</sup> /h	4.403 gpm	
1 cubic foot per minute (cfm)	1.699 cubic meters per hour (m <sup>°</sup> /hr)	1 m /h	0.5886 cfm	
1 barrel per day (bph)	0.1104 litres per minute (lpm)	1 lpm	9.057 bpd	
<b>D</b>				
Power			4.0441	
1 norsepower (hp)	U.746 kilowatt (kw)	1 kw	1.341 hp	

### **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., 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.

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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 60°C (140°F).
- 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:
- general disinfection
- used
- if Viral Hemorrhagic Septicemia (VHS) is targeted a 20% chlorine bleach solution should be used.

- 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 ®).

decontamination stations.

materials and solutions.

- vessels
- 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.

- 2% bleach solution (200 mL and water added to make 10 liters ) for
- if targeting whirling disease specifically, a 10% solution should be
- Bleach can be corrosive to aluminum and hot water can delaminate Gore-Tex® fabric and other sensitive clothing or fabrics.
- 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
- The following is recommended for disinfecting heavy equipment and vehicles. These should be used in addition to the previously listed
- Pressure washer with at least 250 psi strength.
- Pumps for collecting wash solutions and emptying boats and other
- Brooms and brushes for cleaning operator areas inside vehicles and



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 plausible 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 nonporous 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 guaternary 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 nonabsorbent 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 60°C (140°F) and soaked for at least 20 minutes in hot water kept above 45°C (113°F).
- 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**

saturation.

- At least 30 minutes in hot water kept above 45°C containing a 5% dishwashing detergent solution For SCUBA gear, the following solution and soak times may also be
- used:
- water

### DISPOSAL

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Absorbent items (e.g. felt-soled waders and diving suits) will require longer soaking times than non-absorbent items, to allow thorough

Soak absorbent items in the following solutions:

At least 40 minutes in hot water kept above 45°C

· Submerge and wash the suit and equipment (including inside of buoyancy compensator with hot water that is at least 40°C (or 104°F); • 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

 Materials and solutions used in the disinfection process will be contained, and managed as outlined in the site-specific Waste Management Plan.

CENTRAL REGION

FIELD EMERGENCY RESPONSE PLAN

Effective 2017/2018



### 12.0 SAFETY DATA SHEETS ("SDS")

#### **Table of Contents**

- Light Synthetic
- Condensate
- Sweet
- Sour
- Heavy
- Dilbit
- Synbit
- Other (High Sweet Clearbrook)

	REDACTED SUBN	<b>IITTAL-PUBLIC</b>	COPY
CENTRAL REGION			SENBRIDGE

FIELD EMERGENCY RESPONSE PLAN

Effective 2017/2018

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# **CENBRIDGE** REDACTED SUBMITTAL-PUBLIC COPY Safety Data Sheet

Section 1:	Identification		
PRODUCT IDENTIFIER	Petroleum Crude Oil—Light S	ynthetic	
OTHER MEANS OF	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

SkinIrritation	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

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#### Signal Word REDACTED

	Hazard Pictograms	
	Hazard Statements	<ul> <li>Causes skin irritation.</li> <li>Causes serious eye irritation.</li> <li>May cause genetic defects.</li> <li>May cause cancer.</li> <li>Suspected of damaging fertility or the unborn child.</li> <li>May cause respiratory irritation.</li> <li>Causes damage to organs through prolonged or repeated exposure.</li> <li>May be fatal if swallowed and enters airways.</li> <li>Extremely flammable liquid and vapor.</li> <li>May cause drowsiness or dizziness.</li> </ul>
PRECAUTIONARY STATEMENTS	Prevention	<ul> <li>Wash face, hands and any exposed skin thoroughly after handling.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection.</li> <li>Obtain special instructions before use.</li> <li>Do not handle until all safety precautions have been read and understood.</li> <li>Use personal protective equipment as required.</li> <li>Do not breathe dust/fume/gas/mist/vapors/spray.</li> <li>Use only outdoors or in a well-ventilated area.</li> <li>Do not eat, drink or smoke when using this product.</li> <li>Keep away from heat/sparks/open flames/hot surfaces.</li> <li>Keep container tightly closed.</li> <li>No smoking.</li> <li>Ground/bond container and receiving equipment.</li> <li>Use only non-sparking tools.</li> <li>Take precautionary measures against static discharge.</li> <li>In case of inadequate ventilation wear respiratory protection.</li> </ul>
	Response Storage/Disposal	<ul> <li>IF EXPOSED or concerned: Get medical advice/attention.</li> <li>IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.</li> <li>Call a POISON CENTER or doctor/physician if you feel unwell.</li> <li>IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.</li> <li>Do NOT induce vomiting.</li> <li>IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.</li> <li>In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction.</li> <li>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</li> <li>If SKIN irritation occurs: Get medical advice/attention.</li> <li>If EYE irritation persists: Get medical advice/attention.</li> <li>Store locked up and keep cool.</li> <li>Store in a well-ventilated place. Keep container tightly closed</li> </ul>
		<ul> <li>Store in a well-ventilated place. Keep container tightly closed.</li> <li>Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.</li> </ul>
OTHER INFORMATION	<ul> <li>Under United States Reg considered hazardous.</li> <li>Very toxic to aquatic life w</li> </ul>	ulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is rith long lasting effects.

### Section 3:

### **REDACTED SUBMITTAL-PUBLIC COPY Composition/Information on Ingredients**

COMPONENT NAME	CASNUMBER	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.

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### REDACTED SUBMITTAL-PUBLIC COPY First Aid Measures

DESCRIPTION OF NECESSARY	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.	
MEASURES	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	<ul> <li>Do NOT induce vomiting. Call a physician or poison control center.</li> <li>Aspiration hazard if swallowed—can enter lungs and cause damage.</li> </ul>	
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	<ul> <li>Aspiration hazard. Symptoms may be delayed.</li> <li>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.</li> <li>Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.</li> </ul>	

### Section 5: Fire Fighting Measures

EXTINGUISHING	Suitable Extinguishing       • SMALL FIRES: Dry chemical, CO <sub>2</sub> , water spray or regular foam.         Media       • LABGE FIRE: Water spray fog or regular foam.			
	Unsuitable Extinguishing Media	<ul><li>CAUTION: Use of water spray when fighting fire may be inefficient.</li><li>Do not use straight streams.</li></ul>		
FIREFIGHTING PROCEDURES	<ul> <li>FIRE INVOLVING TANKS OF devices or discoloration of ta</li> <li>FIRE INVOLVING TANKS OF burn itself out.</li> <li>Stay upwind.</li> <li>Ventilate closed spaces befor</li> <li>Fire fighters should wear corrighter of the should wear corrig</li></ul>	R CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety unk. R CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to pre entering. nplete protective clothing including self-contained breathing apparatus. ruck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial (1 mile) in all directions. of this material is involved in a major fire, consider an initial evacuation distance of 300 meters ea if you can do it without risk.		

	· LARGE FIRERED AGTED SUBMITSTALIGHEUBLIC COPY				
	<ul> <li>LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn</li> <li>LARGE FIRES: Flood fire area with large quantities of water. while knocking down vapors with water fog</li> </ul>				
SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE	<ul> <li>Vapors may travel to source of ignition and flash back.</li> <li>Air/vapor mixtures may explode when ignited.</li> <li>Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).</li> </ul>				
	Runoff to sewer may create fire or explosion hazard.				
	<ul> <li>Vapor explosion hazard indoors, outdoors or in sewers.</li> <li>MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.</li> <li>May create vapor/air explosion hazard indoors, outdoors or in sewers.</li> </ul>				
	<ul> <li>Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).</li> </ul>				
EXPLOSION DATA	Hazardous Combustion Products• Carbon monoxide. Carbon dioxide (CO2). Nitrogen oxides (NOx). Oxides of sulfur. • Aldehydes, aromatic and other hydrocarbons.				
	Sensitivity to  • None. Mechanical Impact				
	Sensitivity to Static  • Yes. Discharge				
PROTECTIVE EQUIPMENT AND	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.				
PRECAUTIONS FOR FIREFIGHTERS	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 bollover.				
	For lifes beyond the incipient stage, emergency responders in the immediate nazard area should wear bunker gear.				

### Section 6:

### **Accidental Release Measures**

PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES	Personal Precautions	<ul> <li>Evacuate personnel to safe areas.</li> <li>Remove all sources of ignition.</li> <li>Deny entry to unauthorized and unprotected personnel.</li> <li>Use personal protective equipment.</li> <li>Avoid contact with skin, eyes and clothing.</li> <li>Stop leak if you can do it without risk.</li> <li>Keep people away from and upwind of spill/leak.</li> <li>Do not touch damaged containers or spilled material unless wearing appropriate</li> </ul>
	Protective Equipment	<ul> <li>ventilate enclosed areas.</li> <li>Do not walk through spilled material.</li> <li>Wear appropriate breathing apparatus (if applicable) and protective clothing.</li> </ul>

	Emergency FREEDAS T	<ul> <li>DESUIDEM LIGTADE SUGE LIGTOR OF PAGES, sparks or flames in immediate area)</li> <li>Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.</li> <li>Report spills to local or federal authorities as appropriate or required.</li> </ul>		
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	<ul> <li>Stop leak if you can do it without risk.</li> <li>Contain and recover liquid when possible.</li> <li>A vapor suppressing foam may be used to reduce vapors.</li> <li>Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.</li> <li>Use water spray to reduce vapors or divert vapor cloud drift.</li> <li>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.</li> </ul>		
	Methods for Cleaning Up	<ul> <li>Clean up spill immediately.</li> <li>LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.</li> <li>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.</li> <li>Use appropriate Personal Protective Equipment (PPE).</li> <li>Use clean non-sparking tools to collect absorbed material.</li> <li>Vacuum spilled material.</li> <li>Try to work upwind of spill.</li> <li>All equipment used when handling the product must be grounded.</li> <li>Recover and return free product to proper containers</li> <li>Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.</li> <li>Do not place spilled materials back in the original container.</li> </ul>		

• Do not flush to sewer or allow to enter waterways.

### Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	landling	<ul> <li>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.</li> <li>The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).</li> <li>The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.</li> <li>Take precautionary measures against static discharges.</li> </ul>
		Do not cut drill, grind or weld on empty containers since they may contain explosive residues.     Stay upwind and yeart open batches before upleading
		<ul> <li>Avoid contact with skin, eyes and clothing.</li> </ul>
		• Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

	Handling REDAC	TED SUBMITTAL: PUBLIC COPY
	-	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	Storage	Ventilate enclosed areas.
SAFE STORAGE,		Store in a well-ventilated place.
INCLUDING ANY		Keep container tightly closed.
INCOMPATIBILITIES		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.
		<ul> <li>Do not enter confined spaces such as tanks or pits without following proper entry procedures.</li> </ul>
		<ul> <li>Store in properly closed containers that are appropriately labeled and in a cool well- ventilated area.</li> </ul>
		<ul> <li>Harmful concentrations of hydrogen sulfide (H<sub>2</sub>S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.</li> </ul>
		Keep away from open flames, hot surfaces and sources of ignition.
		<ul> <li>Keep product and empty container away from heat and sources of ignition.</li> </ul>
		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

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	_	_	TWA 25 ppm TWA 125 mg/m³
Benzene	TLV 0.5 ppm	PEL1ppm	TWA 0.1 ppm
	TLV 1.6 mg/m <sup>3</sup>	STEL5ppm	STEL1ppm
	STEL 2.5 ppm		IDLH 500 ppm
	STEL 8 mg/m <sup>3</sup>		
Butane	STEL 1000 ppm	_	TWA 800 ppm
			TWA 1900 mg/m <sup>3</sup>
Cyclohexane	TLV 100 ppm	PEL 300 ppm	TWA 300 ppm
	TLV 334 mg/m <sup>3</sup>	PEL 1050 mg/m <sup>3</sup>	TWA 1050 mg/m <sup>3</sup>
			IDLH 1300 ppm
	CHEMICAL NAME 1,2,4-Trimethylbenzene Benzene Butane Cyclohexane	CHEMICAL NAMEACGIH1,2,4-Trimethylbenzene-BenzeneTLV 0.5 ppm TLV 1.6 mg/m³ STEL 2.5 ppm STEL 8 mg/m³ButaneSTEL 1000 ppmCyclohexaneTLV 100 ppm 	CHEMICAL NAMEACGIHOSHA1,2,4-TrimethylbenzeneBenzeneTLV 0.5 ppm TLV 1.6 mg/m³ STEL 2.5 ppm STEL 2.5 ppm STEL 2.5 ppm STEL 8 mg/m³PEL 1 ppm STEL 5 ppmButaneSTEL 1000 ppm TLV 100 ppm TLV 334 mg/m³-CyclohexaneTLV 100 ppm TLV 334 mg/m³PEL 300 ppm PEL 1050 mg/m³

Ethylbenzen <b>e≺ヒDAC</b>	TLV 87 mg/m <sup>3</sup>	PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 125 ppm STEL 545 mg/m <sup>3</sup> IDLH 800 ppm
Fuels, diesel, No. 2	TLV 100 mg/m <sup>3</sup>	-	-
Heptane	TLV 400 ppm TLV 1640 mg/m <sup>3</sup> STEL 500 ppm STEL 2000 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m³	TWA 85 ppm TWA 350 mg/m <sup>3</sup> Ceiling 440 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m³	PEL 500 ppm PEL 1800 mg/m³	TWA 50 ppm TWA 180 mg/m³ IDLH 1100 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
Octane	TLV 300 ppm TLV 1401 mg/m³	PEL 500 ppm PEL 2350 mg/m³	TWA 75 ppm TWA 350 mg/m <sup>3</sup> Ceiling 385 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1000 ppm
o-Xylene	TLV 100 ppm STEL 150 ppm	_	TLV 100 ppm STEL 150 ppm
Petroleum distillate (naptha)	-	_	TWA 350 mg/m <sup>3</sup> Ceiling 1800 mg/m <sup>3</sup>
Toluene	TLV 20 ppm TLV 75 mg/m <sup>3</sup>	PEL 200 ppm STEL 300 mg/m <sup>3</sup>	TWA 100 ppm TWA 375 mg/m <sup>3</sup> STEL 150 ppm STEL 560 mg/m <sup>3</sup> IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m <sup>3</sup> STEL 150 ppm STEL 651 mg/m <sup>3</sup>	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 150 ppm STEL 655 mg/m <sup>3</sup> IDLH 900 ppm

electrical equipment.

APPROPRIATE ENGINEERING

CONTROLS

	Eye and FaceREDACTED			
MEASURES	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	<ul> <li>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.</li> </ul>		
	General Hygiene Measures	Handle in accordance with good industrial hygiene and safety practice.		

### Section 9:

### **Physical and Chemical Properties**

MATERIAL	Physical State	Liquid	Odor	Petroleum like odor
DESCRIPTION	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

CHEMICAL STABILITY

Chlorine Dioxide

Stable at 70 °F, 760 mm Hg pressure

#### POSSIBILITY OF HAZARDOUS REACTIOREDACTED SUBMITTALS RUBLIC COPY

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.     Causes skin irritation.					
	Skin Contact						
	Ingestion	<ul> <li>Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.</li> <li>Potential for aspiration if swallowed.</li> <li>Aspiration may cause pulmonary edema and pneumonitis.</li> </ul>					
TOXICOLOGICAL DATA	CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION			
	1,2,4-Trimethylbenzene	5 g/kg (Rat)	-	18000 mg/m <sup>3</sup> (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/m³ (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/m³ (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	=>6g/kg (Rat)	_	= 8500 mg/m³ (Rat)			
	Octane	_	_	= 118 g/m³ (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	REDACTED SUBVATAL-PUBLIC OR RAYoit)       = 29.08 mg/L (Rat) 4 h         > 1700 mg/kg (Rabbit)       = 5000 ppm (Rat) 4 h
SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS	Benzene	<ul> <li>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.</li> </ul>
	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	<ul> <li>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.</li> </ul>

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

**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

**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

**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

**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

**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

subchronically exposed to high concentrations of xylenes.

solvent abusers who directly inhale toluene during pregnancy.

has been listed as a possible human carcinogen by IARC.

listed as a carcinogen by IARC.

loss and visual disturbances.

Safety Data Sheet: Petroleum Crude Oil—Light Synthetic	
Revision date: 5/13/2015	

Toluene

Ethylbenzene

and noise in workers.

DELAYED AND	SensitizationREDACTEDinStol BM MaTaTaAL-PUBLIC COPY							
AND ALSO CHRONIC	Mutagenic Effects	May cause genetic defects						
SHORT- AND LONG- TERM EXPOSURE	Carcinogenicity	May cause cancer						
CARCINOGENIC INFORMATION	CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA		
	Benzene	A1	Х	Group1	Known	Х		
	Fuels, diesel, No. 2	A3	Х	_	_	_		
	Ethylbenzene	A3	-	Group 2B	Evidence	Х		
	Hexane	_	Х	_	_	-		
	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 orga	ans through proloi	nged or repeated expos	sure.				
ASPIRATION HAZARD	May be fatal if swallowed	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)

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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

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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	ICITY REDACTED SUBMITTAL-PUBLIC COPY			
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	CHEMICAL	LOGPOW		
POTENTIAL	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 MOBILIT	Y	
	1,2,4-Trimethylbenzene	Low		
	Benzene	High		
	Butane	Low		
	Cyclohexane	Moderate		
	Decane	Immobile		
	Ethylbenzene	Low		
	Heptane	Moderate		
	Hexane	High		

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Octane	REDACTE	
o-Xylene		Very High to Moderate
Petroleum	distillate (naptha)	High
Toluene		High to Moderate
Yulono		Very High to Moderate

**OTHER ADVERSE EFFECTS** 

#### Section 13: **Disposal Considerations**

Product Waste	<ul> <li>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.</li> <li>This product could also contain benzene at &gt;0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).</li> <li>This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).</li> <li>It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.</li> </ul>
Packaging Waste	<ul> <li>Container contents should be completely used and containers should be emptied prior to discard.</li> <li>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.</li> <li>Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner.</li> <li>To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.</li> </ul>
	Product Waste Packaging Waste

### 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		Emergency response guide number: 128
	TDG	UN1268	Petroleum Distillate, N.O.S.	3	I	_
	IMO/IMDG	UN1268	Petroleum Distillate, N.O.S.	3	I	EmSNo.F-E,S-E
	IATA/ICAO	UN1268	Petroleum Distillate, N.O.S.	3	1	ERG Code 3L
SPECIAL RECAUTIONS	• None					

#### SPECIAL RECAUTIONS FORUSER

### Section 15:

### REDACTED SUBMITTAL-PUBLIC COPY 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

#### COMPONENREDACTEDAS⊌BMITTAL-PUBLICOOPY

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
COMPONENT	CAS#	LISTED
1,2,4-Trimethylbenzene	95-63-6	Not Listed
Benzene	71-43-2	X
Butane	106-97-8	NotListed
Cyclohexane	110-82-7	Х
Decane	124-18-5	Not Listed
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed

Ethylbenzen	TED₀S€JBMITTAL-F	PUBLIC COPY
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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	Х	
Petroleum distillate (naphtha)	8002-05-9	Not Listed	
Toluene	108-88-3	Х	
Xylene	1330-20-7	Х	
X= The component is listed			
COMPONENT	CAS#	LISTED	
1,2,4-Trimethylbenzene	95-63-6	Not Listed	
Benzene	71-43-2	Х	
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	Х	
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	

#### U.S.-CWA (CLEAN WATER ACT)-PRIORITY POLLUTANTS

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### Naphtha (petREDACTED4SUBMITTAL-PUBL4CisCOPY hydrotreated light

hydrotreated light		
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	Х
Xylene	1330-20-7	Not Listed
X= The component is listed		
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

#### CANADA-WHMIS— CLASSIFICATIONS OF SUBSTANCES

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(naphtha)			
Toluene	108-88-3	B2, D2A, D2B	
Xylene	1330-20-7	B2, D2A, D2B	
X= The component is listed			
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	
COMPONENT	CAS#	AMOUNT	
Ethylbenzene	100-41-4	25 µg/L	
Toluene	108-88-3	215 µg/L	
Benzene	71-43-2	110 µg/L	
COMPONENT	CAS#	LISTED	
1,2,4-Trimethylbenzene	95-63-6	Not Listed	
Benzene	71-43-2	Х	
Butane	106-97-8	Х	
Cyclohexane	110-82-7	Х	
Decane	124-18-5	Not Listed	
Distillates (petroleum), hydrotreated middle	64742-46-7	Not Listed	
Ethylbenzene	100-41-4	Х	
Fuels, diesel, No. 2	68476-34-6	Not Listed	
Gas Oils, Petroleum, Hydrodesulfurized	64742-79-6	Not Listed	

Not Listed

Not Listed

Not Listed

Not Listed

CANADA – COUNCIL OF MINISTERS OF THE ENVIRONMENT – WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT— WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

CANADA— ENVIRONMENTAL EMERGENCIES

Hexane

Methylcyclohexane

Naphtha (petroleum),

Naphtha, (petroleum),

heavy, hydrotreated

hydrotreated light

110-54-3

108-87-2

64742-49-0

64742-48-9

#### Octane REDACTED SUBMITTAL-PUBLIC COPY

o-Xylene	95-47-6	NotListed	
Petroleum distillate (naphtha)	8002-05-9	Not Listed	
Toluene	108-88-3	Х	
Xylene	1330-20-7	Х	

X= The component is listed

### Section 16:

### Other Information

NFPA	2 0	4 0			
	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 presen Sheet (SDS). However, or representation, expre nor is any authorization be assumed by vendor	ted herein is based on data cons SDSs may not be used as a com ess or implied, is made as to the a given or implied to practice any p for any damage or injury resultin	idered to be accurate as of the mercial specification sheet of n accuracy or completeness of th patented invention without a lice g from abnormal use, from any f	date of preparation of this Safety Data nanufacturer or seller, and no warranty e foregoing data and safety information, ense. In addition, no responsibility can failure to adhere to recommended	

practices or from any hazards inherent in the nature of the product.

### **ENBRIDGE REDACTED SUBMITTAL-PUBLIC COPY Safety Data Sheet**

Section 1:	<b>Identification</b>			
PRODUCT IDENTIFIER	Petroleum Crude Oil - Conder	nsate		
OTHER MEANS OF	UN-Number	UN1268		
DENTRICATION	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			
RECOMMENDEDUSE	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	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

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

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#### Signal Word REDACTED

	Hazard Pictograms	
	Hazard Statements	<ul> <li>Causes skin irritation.</li> <li>Causes serious eye irritation.</li> <li>May cause genetic defects.</li> <li>May cause cancer.</li> <li>Suspected of damaging fertility or the unborn child.</li> <li>May cause respiratory irritation.</li> <li>Causes damage to organs through prolonged or repeated exposure.</li> <li>May be fatal if swallowed and enters airways.</li> <li>Extremely flammable liquid and vapor</li> </ul>
		May cause drowsiness or dizziness.
PRECAUTIONARY STATEMENTS	Prevention	<ul> <li>Wash face, hands and any exposed skin thoroughly after handling.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection.</li> <li>Obtain special instructions before use.</li> <li>Do not handle until all safety precautions have been read and understood.</li> <li>Use personal protective equipment as required.</li> <li>Do not breathe dust/fume/gas/mist/vapors/spray.</li> <li>Use only outdoors or in a well-ventilated area.</li> <li>Do not eat, drink or smoke when using this product.</li> <li>Keep away from heat/sparks/open flames/hot surfaces.</li> <li>Keep container tightly closed.</li> <li>No smoking.</li> <li>Ground/bond container and receiving equipment.</li> <li>Use only non-sparking tools.</li> <li>Take precautionary measures against static discharge.</li> <li>In case of inadequate ventilation wear respiratory protection.</li> </ul>
	Response	<ul> <li>IF EXPOSED or concerned: Get medical advice/attention.</li> <li>IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.</li> <li>Call a POISON CENTER or doctor/physician if you feel unwell.</li> <li>IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.</li> <li>Do NOT induce vomiting.</li> <li>IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.</li> <li>In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction.</li> <li>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</li> <li>If SKIN irritation occurs: Get medical advice/attention.</li> <li>If EYE irritation persists: Get medical advice/attention.</li> </ul>
	Storage/Disposal	<ul> <li>Store locked up and keep cool.</li> <li>Store in a well-ventilated place. Keep container tightly closed.</li> <li>Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.</li> </ul>
OTHER INFORMATION	<ul> <li>Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.</li> <li>Very toxic to aquatic life with long lasting effects.</li> </ul>	

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## Section 3:

## **REDACTED SUBMITTAL-PUBLIC COPY 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.

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### REDACTED SUBMITTAL-PUBLIC COPY First Aid Measures

DESCRIPTION	Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for	
OF NECESSARY MEASURES		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.	
	Еуе	• 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	<ul> <li>Do NOT induce vomiting. Call a physician or poison control center.</li> <li>Aspiration hazard if swallowed—can enter lungs and cause damage.</li> </ul>	
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	<ul> <li>Aspiration hazard. Symptoms may be delayed.</li> <li>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.</li> <li>Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and provent epreed of contamination.</li> </ul>	

# Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA FIREFIGHTING PROCEDURES	Suitable Extinguishing Media	<ul> <li>SMALL FIRES: Dry chemical, CO<sub>2</sub>, water spray or regular foam.</li> <li>LARGE FIRE: Water spray, fog or regular foam.</li> </ul>
	Unsuitable Extinguishing Media	<ul> <li>CAUTION: Use of water spray when fighting fire may be inefficient.</li> <li>Do not use straight streams.</li> </ul>
	<ul> <li>FIRE INVOLVING TANKS devices or discoloration of FIRE INVOLVING TANKS burn itself out.</li> <li>Stay upwind.</li> <li>Ventilate closed spaces be</li> <li>Fire fighters should wear of FIRE: If tank, rail car or tank evacuation for 1600 meter</li> <li>FIRE: When a large quantiti (1000 feet) in all directions</li> <li>Move containers from fire</li> </ul>	OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety f tank. OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to efore entering. complete protective clothing including self-contained breathing apparatus. < truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial rs (1 mile) in all directions. ty of this material is involved in a major fire, consider an initial evacuation distance of 300 meters area if you can do it without risk.

	LARGE FIRE: E:DAGET, E:DO:SUBMITSTAdict P:UBLIC COPY     LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire k			
	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	<ul> <li>Vapors may travel to source of ignition and flash back.</li> <li>Air/vapor mixtures may explode when ignited.</li> <li>Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).</li> <li>Will be easily ignited by heat, sparks or flames.</li> <li>Runoff to sewer may create fire or explosion hazard.</li> <li>Vapor explosion hazard indoors, outdoors or in sewers.</li> <li>MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.</li> <li>May create vapor/air explosion hazard indoors, outdoors or in sewers.</li> <li>Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).</li> </ul>			
EXPLOSION DATA	Hazardous• Carbon monoxide. Carbon dioxide (CO2). Nitrogen oxides (NOx). Oxides of sulfur.Combustion Products• Aldehydes, aromatic and other hydrocarbons.			
	Sensitivity to     • None.       Mechanical Impact     • None.			
	Sensitivity to • Yes. Static Discharge			
PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS	<ul> <li>As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent protective gear.</li> <li>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.</li> <li>Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.</li> <li>Water spray may be useful in minimizing or dispersing vapors.</li> <li>Long-duration fires involving diluent stored in tanks may result in a boilover.</li> <li>For fires beyond the incipient stage, emergency responders in the immediate hazard area should wear bunker gear</li> </ul>			

## Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS, PROTECTIVE	Personal Precautions	<ul><li>Evacuate personnel to safe areas.</li><li>Remove all sources of ignition.</li></ul>
		Deny entry to unauthorized and unprotected personnel.
		Use personal protective equipment.
		<ul> <li>Avoid contact with skin, eyes and clothing.</li> </ul>
PROCEDURES		Stop leak if you can do it without risk.
		Keep people away from and upwind of spill/leak.
		<ul> <li>Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> </ul>
		Ventilate enclosed areas.
		Do not walk through spilled material.
	Protective Equipment	Wear appropriate breathing apparatus (if applicable) and protective clothing.

		<ul> <li>DESUIDEM LTIGTAde SPUCE Labor Grapha es, sparks or flames in immediate area)</li> <li>Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.</li> <li>Report spills to local or federal authorities as appropriate or required.</li> </ul>		
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	<ul> <li>Stop leak if you can do it without risk.</li> <li>Contain and recover liquid when possible.</li> <li>A vapor suppressing foam may be used to reduce vapors.</li> <li>Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.</li> <li>Use water spray to reduce vapors or divert vapor cloud drift.</li> <li>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.</li> </ul>		
	Methods for Cleaning Up	<ul> <li>Clean up spill immediately.</li> <li>LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.</li> <li>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.</li> <li>Use appropriate Personal Protective Equipment (PPE).</li> <li>Use clean non-sparking tools to collect absorbed material.</li> <li>Vacuum spilled material.</li> <li>Try to work upwind of spill.</li> <li>All equipment used when handling the product must be grounded.</li> <li>Recover and return free product to proper containers</li> <li>Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.</li> <li>Do not place spilled materials back in the original container.</li> <li>Do not flush to sower or allow to onter waterways</li> </ul>		

# Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	Handling	<ul> <li>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.</li> </ul>
		<ul> <li>The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).</li> </ul>
		<ul> <li>The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.</li> </ul>
		Take precautionary measures against static discharges.

	Handling REDAC	TEDDSUBMilitgTirAbr-RUBErtGy CGDReys 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.
		<ul> <li>Remove and wash contaminated clothing before re-use.</li> </ul>
		• 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	Storage	Ventilate enclosed areas.
SAFE STORAGE,		Store in a well-ventilated place.
INCLUDING ANY		Keep container tightly closed.
INCOMPATIBILITIES		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.
		<ul> <li>Do not enter confined spaces such as tanks or pits without following proper entry procedures.</li> </ul>
		<ul> <li>Store in properly closed containers that are appropriately labeled and in a cool well- ventilated area.</li> </ul>
		<ul> <li>Harmful concentrations of hydrogen sulfide (H<sub>2</sub>S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.</li> </ul>
		Keep away from open flames, hot surfaces and sources of ignition.
		<ul> <li>Keep product and empty container away from heat and sources of ignition.</li> </ul>
		<ul> <li>Storage containers should be grounded and bonded.</li> </ul>
		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:	CHEMICAL NAME	ACGIH	OSHA	NIOSH
EXPOSURE GUIDELINES	1,2,4-Trimethylbenzene	_	_	TWA 25 ppm TWA 125 mg/m³
	2-Methylbutane (In Liquid form)	TLV 1000 ppm	_	_
	Benzene	TLV 0.5 ppm	PEL1ppm	TWA 0.1 ppm
		TLV 1.6 mg/m <sup>3</sup>	STEL 5 ppm	STEL1ppm
		STEL 2.5 ppm		IDLH 500 ppm
		STEL 8 mg/m <sup>3</sup>		
	Benzene, trimethyl-	TLV 25 ppm	_	_

Butane REDAC	TEDISUBMITTAL-I	TWA 800 ppm TWA 1900 mg/m³	
Cyclohexane	TLV 100 ppm TLV 334 mg/m <sup>3</sup>	PEL 300 ppm PEL 1050 mg/m <sup>3</sup>	TWA 300 ppm TWA 1050 mg/m <sup>3</sup> IDLH 1300 ppm
Cyclopentane	TLV 600 ppm	_	TWA 600 ppm TWA 1720 mg/m³
Ethane	TLV 1000 ppm	_	_
Ethylbenzene	TLV 20 ppm TLV 87 mg/m³	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 125 ppm STEL 545 mg/m <sup>3</sup> IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m <sup>3</sup> STEL 500 ppm STEL 2000 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m <sup>3</sup>	TWA 85 ppm TWA 350 mg/m <sup>3</sup> Ceiling 440 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m³	PEL 500 ppm PEL 1800 mg/m³	TWA 50 ppm TWA 180 mg/m³ IDLH 1100 ppm
Hydrogen sulfide	TLV1ppm TLV1.4 mg/m <sup>3</sup> STEL 5 ppm STEL 7 mg/m <sup>3</sup>	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m <sup>3</sup> IDLH 100 ppm
Isobutane	TWA 1000 ppm		
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m <sup>3</sup>	TWA 400 ppm TWA 1600 mg/m³ IDLH 1200 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m <sup>3</sup>	_	TWA 200 ppm TWA 1050 mg/m³
Octane	TLV 300 ppm TLV 1401 mg/m <sup>3</sup>	PEL 500 ppm PEL 2350 mg/m <sup>3</sup>	TWA 75 ppm TWA 350 mg/m <sup>3</sup> Ceiling 385 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m <sup>3</sup>	PEL 1000 ppm PEL 2950 mg/m <sup>3</sup>	TWA 120 ppm TWA 350 mg/m <sup>3</sup> Ceiling 610 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1500 ppm

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	Propane REDACTI	ED. SUBANITISTA LoopU Aliphatic hydrocarbon gases: Alkane C1-4)	BLAC 1000 PY TWA 1800 mg/m <sup>3</sup>	TWA 1000 ppm TWA 1800 mg/m³	
	Toluene	TLV 20 ppm TLV 75 mg/m³	PEL 200 ppm STEL 300 mg/m³	TWA 100 ppm TWA 375 mg/m <sup>3</sup> STEL 150 ppm STEL 560 mg/m <sup>3</sup> IDLH 500 ppm	
	Xylenes	TLV 100 ppm TLV 434 mg/m <sup>3</sup> STEL 150 ppm STEL 651 mg/m <sup>3</sup>	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 150 ppm STEL 655 mg/m <sup>3</sup> IDLH 900 ppm	
APPROPRIATE ENGINEERING CONTROLS	Adequate ventilation system limit values. Prevent vapor bu electrical equipment.	Adequate ventilation systems as needed to control concentrations of airborne contaminants below applicable threshold imit values. Prevent vapor build up by providing adequate ventilation during and after use. Use only appropriately classified electrical equipment.			
	Eye and Face	Wear face shield and eye pro	tection.		
MEASURES	Skin and Body	<ul> <li>The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.</li> </ul>			
	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 get	ood industrial hygiene and s	afety practice.	

# Section 9: Physical and Chemical Properties

MATERIAL	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 REDACT	<b>ED450BMITTAL</b> - >-40°F	PUBWHGr COURING	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 Stable at 70 °F, 760 mm Hg pressure		
CHEMICAL STABILITY			
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	<ul> <li>Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.</li> <li>Potential for aspiration if swallowed.</li> <li>Aspiration may cause pulmonary edema and pneumonitis.</li> </ul>		

#### TOXICOLOGICAL DATA

#### CHEMICAL NR MEDACTEDOSE/BMITTAL-PUBL/GEOOPY

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)2h	
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/m <sup>3</sup> (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/m <sup>3</sup> (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 <sup>3</sup> (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)	<ul> <li>&gt; 4350 mg/kg (Rabbit) = 29.08 mg/L (Rat) 4 h</li> <li>&gt; 1700 mg/kg (Rabbit) = 5000 ppm (Rat) 4 h</li> </ul>		
Benzene	Repeated or prolonged exposure to benzene at concentrations in excess of the TLV may     cause serious injury to blood forming organs. Significant obrasis even us to benzene uses			

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS • 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.

Ethylbenzen REDAC	TER is be Bill Rate And Red Blacked COP, 260, 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.
	<b>Target Organs:</b> 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 <sub>2</sub> S)	• 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	<b>Carcinogenicity:</b> 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 LABC.
	<ul> <li>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.</li> <li>Reproductive Toxicity: Exposure to toluene during pregnancy has demonstrated limited evidence of developmental toxicity in laboratory animals. Decreased fetal body weight and</li> </ul>
	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	<ul> <li>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.</li> </ul>

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DELAYED AND							
AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG- TERM EXPOSURE	Mutagenic Effects       • May cause genetic defects         Carcinogenicity       • May cause cancer						
							CARCINOGENIC
	Benzene	A1	Х	Group1	Known	Х	
	Ethylbenzene	A3	_	Group 2B	Evidence	Х	
	Hexane	_	Х	_	_	_	
	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 a	nd enters airways F	Risk of serious damage	to the lungs (by a	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	REDACTED SUBMITTAL-PUBLIC COPY				
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)	-	

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ECOTOXICITY

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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	REDACTED SUBMITTAL-PUBLIC COPY				
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	LOGPOW			
	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			
	Xvlene	2.77-3.15			

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#### **MOBILITY IN SOIL**

## CHEMICAL REDACTEDX Std BM STILADER UBLIC COPY

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:

## REDACTED SUBMITTAL-PUBLIC COPY Disposal Considerations

Product Waste	<ul> <li>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.</li> <li>This product could also contain benzene at &gt;0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).</li> <li>This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).</li> <li>It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.</li> </ul>
Packaging Waste	<ul> <li>Container contents should be completely used and containers should be emptied prior to discard.</li> <li>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.</li> <li>Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner.</li> <li>To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.</li> </ul>
	Product Waste Packaging Waste

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		_
	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:

# REDACTED SUBMITTAL-PUBLIC COPY Regulatory Information

#### U.S.-CERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE **QUANTITIES**

COMPONENT	CAS#	AMOUNT
1,2,4-Trimethylbenzene	95-63-6	NotListed
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	NotListed
Natural gas condensate	68919-39-1	NotListed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Nonane	111-84-2	NotListed
Octane	111-65-9	NotListed
Pentane	109-66-0	Not Listed
Propane	74-98-6	NotListed
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

### COMPONENREDACTEDAS⊌BMITTAL-PUBLICOUDOPY

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.SCWA	COMPONENREDACTEDASUBMITTAL-PUBLICOUDOPY				
(CLEAN WATER ACT)— RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE	Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC		
U.SCWA	COMPONENT	CAS #	AMOUNT		
RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE	HydrogenSulfide	7783-06-4	2.0 µg/L CCC		
U.SCWA	COMPONENT	CAS #	LISTED		
HAZARDOUS	1,2,4-Trimethylbenzene	95-63-6	NotListed		
SUBSTANCES	2-Methylbutane (In Liquid form)	78-78-4	Not Listed		
	Benzene	71-43-2	Х		
	Benzene, trimethyl-	25551-13-7	Not Listed		
	Butane	106-97-8	Not Listed		
	Cyclohexane	110-82-7	Х		
	Cyclopentane	287-92-3	Not Listed		
	Decane	124-18-5	Not Listed		
	Ethane	74-84-0	Not Listed		
	Ethylbenzene	100-41-4	Х		
	Heptane	142-82-5	Not Listed		
	Hexane	110-54-3	Not Listed		
	Hydrogen Sulfide	7783-06-4	Х		
	Isobutane	75-28-5	Not Listed		
	Methylcyclohexane	108-87-2	Not Listed		
	Methylcyclopentane	96-37-7	Not Listed		
	Natural gas condensate	68919-39-1	NotListed		
	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		

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	Propane REDACT			
	Toluene	108-88-3	X	
	Xylene	1330-20-7	Х	
	X= The component is listed			
U.SCWA	COMPONENT	CAS#	LISTED	
(CLEAN WATER ACT) – PRIORITY POLLUTANTS	1,2,4-Trimethylbenzene	95-63-6	Not Listed	
	2-Methylbutane (In Liquid form)	78-78-4	Not Listed	
	Benzene	71-43-2	Х	
	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	Х	
	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	Х	
	Xylene	1330-20-7	Not Listed	

X= The component is listed

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#### CANADA-WHMIS— CLASSIFICATIONS OF SUBSTANCES

#### COMPONENREDACTEDAS⊌BMITTAL-PUBLIQSSDORMON

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	NotListed
Natural gas condensate	68919-39-1	NotListed
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	COMPONENREDACTEDAS⊌BMITTAL-PUBLMOU®OPY				
THE ENVIRONMENT—	Ethylbenzene	100-41-4	90 µg/L		
GUIDELINES FOR	Toluene	108-88-3	2.0 µg/L		
AQUATIC LIFE	Benzene	71-43-2	370 µg/L		
CANADA-COUNCIL	COMPONENT	CAS#	AMOUNT		
THE ENVIRONMENT—	Ethylbenzene	100-41-4	25 µg/L		
GUIDELINES FOR	Toluene	108-88-3	215 µg/L		
	Benzene	71-43-2	110 µg/L		
CANADA— ENVIRONMENTAL	COMPONENT	CAS#	LISTED		
EMERGENCIES	1,2,4-Trimethylbenzene	95-63-6	Not Listed		
	2-Methylbutane (In Liquid form)	78-78-4	Х		
	Benzene	71-43-2	Х		
	Benzene, trimethyl-	25551-13-7	Not Listed		
	Butane	106-97-8	Х		
	Cyclohexane	110-82-7	Х		
	Cyclopentane	287-92-3	Not Listed		
	Decane	124-18-5	Not Listed		
	Ethane	74-84-0	Х		
	Ethylbenzene	100-41-4	Х		
	Heptane	142-82-5	Not Listed		
	Hexane	110-54-3	Not Listed		
	Hydrogen Sulfide	7783-06-4	Х		
	Isobutane	75-28-5	Х		
	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		

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Pentane	REDACTEDSUBMITTA	REDACTED®S&BMITTAL-PUBLIC COPY	
Propane	74-98-6	Х	
Toluene	108-88-3	Х	
Xylene	1330-20-7	Х	

Section 16:

## **Other Information**

NFPA	3 0			
	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	<ul> <li>The information presension Sheet (SDS). However, so representation, expresion or representation.</li> </ul>	ted herein is based on data cons SDSs may not be used as a com ass or implied, is made as to the a given or implied to practice any p	idered to be accurate as of the mercial specification sheet of n occuracy or completeness of th patented invention without a lice	date of preparation of this Safety Data nanufacturer or seller, and no warranty e foregoing data and safety information ense. In addition, no responsibility can

practices or from any hazards inherent in the nature of the product.

be assumed by vendor for any damage or injury resulting from abnormal use, from any failure to adhere to recommended

# **CENBRIDGE** REDACTED SUBMITTAL-PUBLIC COPY Safety Data Sheet

Section 1:	Identification	
PRODUCT IDENTIFIER	Petroleum Crude Oil—Sweet	
OTHER MEANS OF	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
RECOMMENDEDUSE	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	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

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### Signal Word REDACTED

	Hazard Pictograms			
	Hazard Statements	Causes skin irritation.		
		May cause genetic defects.     May cause cancer.		
		<ul><li>Suspected of damaging fertility or the unborn child.</li><li>May cause respiratory irritation.</li></ul>		
		<ul> <li>Causes damage to organs through prolonged or repeated exposure.</li> <li>May be fatal if swallowed and enters airways.</li> <li>Extremely flammable liquid and vapor.</li> </ul>		
		May cause drowsiness or dizziness.		
PRECAUTIONARY STATEMENTS	Prevention	<ul> <li>Wash face, hands and any exposed skin thoroughly after handling.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection.</li> <li>Obtain special instructions before use.</li> <li>Do not handle until all safety precautions have been read and understood.</li> </ul>		
		<ul> <li>Use personal protective equipment as required.</li> <li>Do not breathe dust/fume/gas/mist/vapors/spray.</li> <li>Use only outdoors or in a well-ventilated area.</li> </ul>		
		<ul> <li>Do not eat, drink or smoke when using this product.</li> <li>Keep away from heat/sparks/open flames/hot surfaces.</li> <li>Keep container tightly closed.</li> </ul>		
		<ul> <li>No smoking.</li> <li>Ground/bond container and receiving equipment.</li> <li>Use explosion-proof electrical/wentileting/lighting/equipment.</li> </ul>		
		<ul> <li>Use explosion-proof electrical/ventilating/righting/equipment.</li> <li>Use only non-sparking tools.</li> <li>Take precautionary measures against static discharge.</li> </ul>		
		In case of inadequate ventilation wear respiratory protection.		
	Response	<ul> <li>IF EXPOSED or concerned: Get medical advice/attention.</li> <li>IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.</li> <li>Call a POISON CENTER or doctor/physician if you feel unwell.</li> </ul>		
		<ul> <li>IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.</li> <li>Do NOT induce vomiting.</li> <li>IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin</li> </ul>		
		<ul> <li>with water/shower and soap.</li> <li>In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction.</li> <li>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses.</li> </ul>		
		<ul> <li>if present and easy to do. Continue rinsing.</li> <li>If SKIN irritation occurs: Get medical advice/attention.</li> <li>If EXE irritation percents. Cot medical advice/attention.</li> </ul>		
	Storage/Disposal	<ul> <li>Store locked up and keep cool.</li> <li>Store in a well-ventilated place. Keep container tightly closed.</li> <li>Dispose of content and/or container in accordance with local, regional, national, and/or</li> </ul>		
		International regulations.		
OTHER INFORMATION	<ul> <li>Under United States Reg considered hazardous.</li> <li>Very toxic to aquatic life w</li> </ul>	ulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is vith long lasting effects.		

## Section 3:

## **REDACTED SUBMITTAL-PUBLIC COPY Composition/Information on Ingredients**

COMPONENT NAME	CASNUMBER	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	O-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.

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## REDACTED SUBMITTAL-PUBLIC COPY First Aid Measures

DESCRIPTION OF NECESSARY	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.		
MEASURES	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	<ul> <li>Do NOT induce vomiting. Call a physician or poison control center.</li> <li>Aspiration hazard if swallowed—can enter lungs and cause damage.</li> </ul>		
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	<ul> <li>Aspiration hazard. Symptoms may be delayed.</li> <li>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.</li> <li>Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.</li> </ul>		

# 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	<ul> <li>CAUTION: Use of water spray when fighting fire may be inefficient.</li> <li>Do not use straight streams.</li> </ul>	
FIREFIGHTING PROCEDURES	<ul> <li>FIRE INVOLVING TANKS OF devices or discoloration of ta</li> <li>FIRE INVOLVING TANKS OF burn itself out.</li> <li>Stay upwind.</li> <li>Ventilate closed spaces befor</li> <li>Fire fighters should wear conditions.</li> <li>FIRE: If tank, rail car or tank tr evacuation for 1600 meters ( 1000 feet) in all directions.</li> <li>Move containers from fire are</li> </ul>	R CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety nk. R CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to are entering. Inplete protective clothing including self-contained breathing apparatus. uck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial 1 mile) in all directions. of this material is involved in a major fire, consider an initial evacuation distance of 300 meters ea if you can do it without risk.	

	• LARGE FIRE EDAG	SED SUBMITSTAdic Pubble COPY			
	• 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	Vapors may travel to sourc	Vapors may travel to source of ignition and flash back.			
ARISING FROM THE	<ul> <li>Air/vapor mixtures may explanation</li> </ul>	plode when ignited.			
SUBSTANCE OR	Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).				
MIXTURE	<ul> <li>Will be easily ignited by heat</li> </ul>	it, sparks or flames.			
	Runoff to sewer may create	e fire or explosion hazard.			
	Vapor explosion hazard inc	doors, outdoors or in sewers.			
	MAY EXPLODE AND THR	OW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.			
	<ul> <li>May create vapor/air explo</li> </ul>	sion hazard indoors, outdoors or in sewers.			
	<ul> <li>Most vapors are heavier th basements, tanks).</li> </ul>	an air. They will spread along ground and collect in low or confined areas (sewers,			
EXPLOSION DATA	Hazardous Combustion Products	<ul> <li>Carbon monoxide. Carbon dioxide (CO<sub>2</sub>). Nitrogen oxides (NOx). Oxides of sulfur.</li> <li>Aldehydes, aromatic and other hydrocarbons.</li> </ul>			
	Sensitivity to Mechanical Impact	• None.			
	Sensitivity to Static Discharge	• Yes.			
PROTECTIVE EQUIPMENT AND	As in any fire, wear self-cor protective gear.	tained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full			
PRECAUTIONS FOR	Water spray is recommend	led to cool or protect exposed materials or structures. Water may be ineffective for			
FIREFIGHTERS	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.			
	<ul> <li>Long-duration fires involvir</li> </ul>	ng diluent stored in tanks may result in a boilover.			
	<ul> <li>For fires beyond the incipie</li> </ul>	nt stage, emergency responders in the immediate hazard area should wear bunker gear.			

## Section 6: Accidental Release Measures

PERSONAL PRECAUTIONS,	Personal Precautions	<ul> <li>Evacuate personnel to safe areas.</li> <li>Remove all sources of ignition.</li> </ul>
PROTECTIVE		Deny entry to unauthorized and unprotected personnel.
		Use personal protective equipment.
PROCEDURES		<ul> <li>Avoid contact with skin, eyes and clothing.</li> </ul>
THOOLDONES		<ul> <li>Stop leak if you can do it without risk.</li> </ul>
		<ul> <li>Keep people away from and upwind of spill/leak.</li> </ul>
		<ul> <li>Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> </ul>
		Ventilate enclosed areas.
		Do not walk through spilled material.
	Protective Equipment	Wear appropriate breathing apparatus (if applicable) and protective clothing.

		<ul> <li>DESUIDEM LTIGTAde SPUCE Later Coupling es, sparks or flames in immediate area)</li> <li>Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.</li> <li>Report spills to local or federal authorities as appropriate or required.</li> </ul>
ENVIRONMENTAL PRECAUTIONS	Avoid run off to waterways ar confined areas. Runoff from f	nd sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or ire control may cause pollution.
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	Methods for Containment	<ul> <li>Stop leak if you can do it without risk.</li> <li>Contain and recover liquid when possible.</li> <li>A vapor suppressing foam may be used to reduce vapors.</li> <li>Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.</li> <li>Use water spray to reduce vapors or divert vapor cloud drift.</li> <li>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.</li> </ul>
	Methods for Cleaning Up	<ul> <li>Clean up spill immediately.</li> <li>LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.</li> <li>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.</li> <li>Use appropriate Personal Protective Equipment (PPE).</li> <li>Use clean non-sparking tools to collect absorbed material.</li> <li>Vacuum spilled material.</li> <li>Try to work upwind of spill.</li> <li>All equipment used when handling the product must be grounded.</li> <li>Recover and return free product to proper containers</li> <li>Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.</li> <li>Do not place spilled materials back in the original container.</li> <li>Do not flush to sower or allow to onter waterways</li> </ul>

# Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	Handling	<ul> <li>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</li> </ul>
		<ul> <li>surfaces.</li> <li>The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).</li> </ul>
		• The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
		Take precautionary measures against static discharges.

	Handling REDAC	TEDDSUBMilitgTirAbr-RUBErtGy CGDReys 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.
		<ul> <li>Remove and wash contaminated clothing before re-use.</li> </ul>
		• 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	Storage	Ventilate enclosed areas.
SAFE STORAGE,		Store in a well-ventilated place.
INCLUDING ANY		Keep container tightly closed.
INCOMPATIBILITIES		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.
		<ul> <li>Do not enter confined spaces such as tanks or pits without following proper entry procedures.</li> </ul>
		<ul> <li>Store in properly closed containers that are appropriately labeled and in a cool well- ventilated area.</li> </ul>
		<ul> <li>Harmful concentrations of hydrogen sulfide (H<sub>2</sub>S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.</li> </ul>
		Keep away from open flames, hot surfaces and sources of ignition.
		<ul> <li>Keep product and empty container away from heat and sources of ignition.</li> </ul>
		<ul> <li>Storage containers should be grounded and bonded.</li> </ul>
		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:	CHEMICAL NAME	ACGIH	OSHA	NIOSH
EXPOSURE GUIDELINES	1,2,4-Trimethylbenzene	TWA 25 ppm	_	TWA 25 ppm TWA 125 mg/m³
	2-Methylbutane (In Liquid form)	TWA 600 ppm	-	-
	Benzene	TLV 0.5 ppm	PEL1ppm	TWA 0.1 ppm
		TLV 1.6 mg/m <sup>3</sup>	STEL 5 ppm	STEL1ppm
		STEL 2.5 ppm		IDLH 500 ppm
		STEL 8 mg/m <sup>3</sup>		
	Benzene, trimethyl-	TLV 25 ppm	_	_

Butane REDAC	TED SUBMITTAL-PU	TWA 800 ppm TWA 1900 mg/m³		
Cyclohexane	TLV 100 ppm TLV 334 mg/m <sup>3</sup>	PEL 300 ppm PEL 1050 mg/m <sup>3</sup>	TWA 300 ppm TWA 1050 mg/m <sup>3</sup> IDLH 1300 ppm	
Cyclopentane	TLV 600 ppm	-	TWA 600 ppm TWA 1720 mg/m³	
Ethane	TLV 1000 ppm (listed under Aliphatic hydrocarbon gases: Alkane C1-4)	_	_	
Ethylbenzene	TLV 20 ppm TLV 87 mg/m <sup>3</sup>	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 125 ppm STEL 545 mg/m <sup>3</sup> IDLH 800 ppm	
Heptane	TLV 400 ppm TLV 1640 mg/m <sup>3</sup> STEL 500 ppm STEL 2000 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m³	TWA 85 ppm TWA 350 mg/m <sup>3</sup> Ceiling 440 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 750 ppm	
Hexane	TLV 50 ppm TLV 176 mg/m <sup>3</sup>	PEL 500 ppm PEL 1800 mg/m³	TWA 50 ppm TWA 180 mg/m³ IDLH 1100 ppm	
Hydrogen sulfide	TLV 1ppm TLV 1.4 mg/m <sup>3</sup> STEL 5 ppm STEL 7 mg/m <sup>3</sup>	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m <sup>3</sup> IDLH 100 ppm	
Isobutane	TWA 1000 ppm			
MethylCyclohexane	TLV 400 ppm TLV 1610 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m³	TWA 400 ppm TWA 1600 mg/m³ IDLH 1200 ppm	
Nonane	TLV 200 ppm TLV 1050 mg/m <sup>3</sup>	_	TWA 200 ppm TWA 1050 mg/m³	
Octane	TLV 300 ppm TLV 1401 mg/m <sup>3</sup>	PEL 500 ppm PEL 2350 mg/m³	TWA 75 ppm TWA 350 mg/m <sup>3</sup> Ceiling 385 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1000 ppm	
Pentane	TLV 600 ppm TLV 1770 mg/m <sup>3</sup>	PEL 1000 ppm PEL 2950 mg/m³	TWA 120 ppm TWA 350 mg/m <sup>3</sup> Ceiling 610 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1500 ppm	

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	Propane REDACTI	ED. SUBANITISTA LoopU Aliphatic hydrocarbon gases: Alkane C1-4)	BLAC 1000 PY TWA 1800 mg/m <sup>3</sup>	TWA 1000 ppm TWA 1800 mg/m³	
	Toluene	TLV 20 ppm TLV 75 mg/m³	PEL 200 ppm STEL 300 mg/m³	TWA 100 ppm TWA 375 mg/m <sup>3</sup> STEL 150 ppm STEL 560 mg/m <sup>3</sup> IDLH 500 ppm	
	Xylenes	TLV 100 ppm TLV 434 mg/m <sup>3</sup> STEL 150 ppm STEL 651 mg/m <sup>3</sup>	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 150 ppm STEL 655 mg/m <sup>3</sup> 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.				
	Eye and Face	Wear face shield and eye pro	tection.		
MEASURES	Skin and Body	<ul> <li>The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.</li> </ul>			
	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 get	ood industrial hygiene and s	afety practice.	

# Section 9: Physical and Chemical Properties

MATERIAL	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 REDACT	-40 to 212 °F	PUBWHGr COUPRity	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	Inhalation	May cause irritation of respiratory tract. May cause drowsiness and dizziness.		
THE LIKELY ROUTES OF EXPOSURE	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 NR MEDACTEDOSE/BMITTAL-PUBL/GEOOPY

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)2h		
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/m <sup>3</sup> (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/m <sup>3</sup> (Rat) 4 h		
Hexane	=25g/kg (Rat)	= 3000 mg/kg ( Rabbit )	= 48000 ppm ( Rat ) 4 h		
Hydrogen sulfide	_	_	= 444 ppm ( Rat )		
Isobutane	_	_	=658,000 mg/m <sup>3</sup> (Rat)4 h		
MethylCyclohexane	>3200 mg/kg (Rat)	_	_		
Natural gas condensates (petroleum)	_	_	= 600 mg/m <sup>3</sup> (Rat )		
Nonane	_	_	= 3200 ppm (Rat) 4 h		
Octane	-	_	= 118 g/m³ ( Rat ) 4 h = 25260 ppm ( Rat ) 4 h		
Pentane	>2000 mg/kg(Rat)	_	364g/cu(Rat)4h		
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 REDAC	<b>TED SUBMOD CALEXPLUED CORP</b> Constrained 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	<b>Carcinogenicity:</b> 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.			
		<b>Target Organs:</b> 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 <sub>2</sub> S)	• 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	<b>Carcinogenicity:</b> 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.			
		<b>Target Organs:</b> 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.			
		<b>Reproductive Toxicity:</b> 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.			

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	Xylenes       REDACTED SUBMITTALE PUBLING GORM 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	Sensitization	No informat	tion available				
AND ALSO CHRONIC	Mutagenic Effects	May cause	genetic defects				
SHORT- AND LONG- TERM EXPOSURE	Carcinogenicity  • May cause cancer						
	CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA	
INFORMATION	Benzene	A1	Х	Group 1	Known	Х	
	Ethylbenzene	A3	_	Group 2B	Evidence	Х	
	Hexane	_	Х	_	_	_	
	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).						

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### Section 12:

### REDACTED SUBMITTAL-PUBLIC COPY 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)

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ECOTOXICITY

### REDACTED SUBMITTAL-PUBLIC COPY

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	REDACTED SUBMITTAL-PUBLIC COPY				
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	LOGPOW			
	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			
	Xvlene	2.77-3.15			

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#### **MOBILITY IN SOIL**

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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:

# REDACTED SUBMITTAL-PUBLIC COPY Disposal Considerations

WASTE TREATMENT METHODS	Product Waste	<ul> <li>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.</li> <li>This product could also contain benzene at &gt;0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).</li> <li>This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).</li> <li>It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.</li> </ul>
	Packaging Waste	<ul> <li>Container contents should be completely used and containers should be emptied prior to discard.</li> <li>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.</li> <li>Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner.</li> <li>To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.</li> </ul>

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		ERG Code 3L
SPECIAL RECAUTIONS	None					

**SPECIAL RECAUTIONS FOR USER** 

## Section 15:

# REDACTED SUBMITTAL-PUBLIC COPY 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

#### COMPONENREDACTEDAS⊌BMITTAL-PUBLICOUDOPY

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)—		EDAS#JBMITTA		
RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE	Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC	
U.S.—CWA (CLEAN WATER ACT)—	COMPONENT	CAS#	AMOUNT	
RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE	HydrogenSulfide	7783-06-4	2.0 µg/L CCC	
U.SCWA (CLEAN WATER ACT)-	COMPONENT	CAS #	LISTED	
HAZARDOUS	1,2,4-Trimethylbenzene	95-63-6	Not Listed	
	2-Methylbutane (In Liquid form)	78-78-4	Not Listed	
	Benzene	71-43-2	Х	
	Butane	106-97-8	Not Listed	
	Cyclohexane	110-82-7	Х	
	Cyclopentane	287-92-3	Not Listed	
	Decane	124-18-5	Not Listed	
	Ethane	74-84-0	Not Listed	
	Ethylbenzene	100-41-4	Х	
	Heptane	142-82-5	Not Listed	
	Hexane	110-54-3	Not Listed	
	Hydrogen Sulfide	7783-06-4	Х	
	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	NotListed	
	Octane	111-65-9	NotListed	
	Pentane	109-66-0	NotListed	
	Petroleum	8002-05-9	NotListed	

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	Propane REDACT	ED-SUBMITTAL-P			
	Toluene	108-88-3	Х		
	Xylene	1330-20-7	Х		
	X= The component is listed				
U.SCWA	COMPONENT	CAS#	LISTED		
PRIORITY POLLUTANTS	1,2,4-Trimethylbenzene	95-63-6	Not Listed		
	2-Methylbutane (In Liquid form)	78-78-4	Not Listed		
	Benzene	71-43-2	Х		
	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	Х		
	Heptane	142-82-5	Not Listed		
	Hexane	110-54-3	Not Listed		
	Hydrogen Sulfide	7783-06-4	Not Listed		
	Isobutane	75-28-5	NotListed		
	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	NotListed		
	Nonane	111-84-2	Not Listed		
	Octane	111-65-9	Not Listed		
	Pentane	109-66-0	Not Listed		
	Petroleum	8002-05-9	NotListed		
	Propane	74-98-6	NotListed		
	Toluene	108-88-3	Х		
	Xylene	1330-20-7	Not Listed		

X= The component is listed

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#### CANADA-WHMIS— CLASSIFICATIONS OF SUBSTANCES

#### COMPONENREDACTEDAS⊌BMITTAL-PUBLIQSSDORMON

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	should this row be left in the layout?
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	COMPONENREDACTEDAS⊌BMITTAL-PUBLMOUNOPY				
THE ENVIRONMENT—	Ethylbenzene	100-41-4	90 µg/L		
GUIDELINES FOR	Toluene	108-88-3	2.0 µg/L		
AQUATIC LIFE	Benzene	71-43-2	370 µg/L		
CANADA-COUNCIL	COMPONENT	CAS #	AMOUNT		
THE ENVIRONMENT-	Ethylbenzene	100-41-4	25 µg/L		
GUIDELINES FOR	Toluene	108-88-3	215 µg/L		
	Benzene	71-43-2	110 µg/L		
CANADA— ENVIRONMENTAI	COMPONENT	CAS#	LISTED		
EMERGENCIES	1,2,4-Trimethylbenzene	95-63-6	Not Listed		
	2-Methylbutane (In Liquid form)	78-78-4	X		
	Benzene	71-43-2	Х		
	Butane	106-97-8	Х		
	Cyclohexane	110-82-7	Х		
	Cyclopentane	287-92-3	Not Listed		
	Decane	124-18-5	Not Listed		
	Ethane	74-84-0	Х		
	Ethylbenzene	100-41-4	Х		
	Heptane	142-82-5	Not Listed		
	Hexane	110-54-3	Not Listed		
	Hydrogen Sulfide	7783-06-4	Х		
	Isobutane	75-28-5	Х		
	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		

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Propane	74-98-6	Х		
Toluene	108-88-3	Х		
Xylene	1330-20-7	Х		

Section 16:

# **Other Information**

NFPA					
	Health Hazard: 2	Flammability: 4	Instability: 0	Physical and Chemical Hazards: X	
HMIS	Health Hazard: 2	Flammability: 4	Instability: O	Personal Protection: X	
ISSUING DATE	5/6/15				
REVISION DATE	5/6/15				
DISCLAIMER	The information presen Sheet (SDS). However, or representation, expre	ted herein is based on data cons SDSs may not be used as a com ess or implied, is made as to the a	idered to be accurate as of the mercial specification sheet of r accuracy or completeness of th	date of preparation of this Safety Data nanufacturer or seller, and no warranty e foregoing data and safety information	

practices or from any hazards inherent in the nature of the product.

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

# **CENBRIDGE** REDACTED SUBMITTAL-PUBLIC COPY Safety Data Sheet

Section 1:	Identification	
PRODUCT IDENTIFIER	Petroleum Crude Oil—Sour	
OTHER MEANS OF	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
RECOMMENDEDUSE	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	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

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#### Signal Word REDACTED

	Hazard Pictograms			
	Hazard Statements	<ul> <li>Causes skin irritation.</li> <li>Causes serious eye irritation.</li> <li>May cause genetic defects.</li> <li>May cause cancer.</li> <li>Suspected of damaging fertility or the unborn child.</li> <li>May cause respiratory irritation.</li> <li>Causes damage to organs through prolonged or repeated exposure.</li> <li>May be fatal if swallowed and enters airways.</li> <li>Extremely flammable liquid and vapor.</li> <li>May cause drowsiness or dizziness.</li> </ul>		
PRECAUTIONARY STATEMENTS	Prevention	<ul> <li>Wash face, hands and any exposed skin thoroughly after handling.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection.</li> <li>Obtain special instructions before use.</li> <li>Do not handle until all safety precautions have been read and understood.</li> <li>Use personal protective equipment as required.</li> <li>Do not breathe dust/fume/gas/mist/vapors/spray.</li> <li>Use only outdoors or in a well-ventilated area.</li> <li>Do not eat, drink or smoke when using this product.</li> <li>Keep away from heat/sparks/open flames/hot surfaces.</li> <li>Keep container tightly closed.</li> <li>No smoking.</li> <li>Ground/bond container and receiving equipment.</li> <li>Use only non-sparking tools.</li> <li>Take precautionary measures against static discharge.</li> <li>In case of inadequate ventilation wear respiratory protection.</li> </ul>		
	Response	<ul> <li>IF EXPOSED or concerned: Get medical advice/attention.</li> <li>IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.</li> <li>Call a POISON CENTER or doctor/physician if you feel unwell.</li> <li>IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.</li> <li>Do NOT induce vomiting.</li> <li>IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.</li> <li>In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction.</li> <li>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</li> <li>If SKIN irritation occurs: Get medical advice/attention.</li> <li>If EYE irritation persists: Get medical advice/attention.</li> </ul>		
	Storage/Disposal	<ul> <li>Store locked up and keep cool.</li> <li>Store in a well-ventilated place. Keep container tightly closed.</li> <li>Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.</li> </ul>		
OTHER INFORMATION	<ul> <li>Under United States Reg considered hazardous.</li> <li>Very toxic to aquatic life w</li> </ul>	ulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is vith long lasting effects.		

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## Section 3:

### **REDACTED SUBMITTAL-PUBLIC COPY** Composition/Information on Ingredients

CAS NUMBER	PERCENTAGE (%)*	NOTES
78-78-4	0-4	
71-43-2	0-5	
106-97-8	0-5	
110-82-7	0-5	
100-41-4	0-2	
142-82-5	0-10	
110-54-3	0-8	
7783-06-4	0-5	
75-28-5	0-5	
108-87-2	0-3	
96-37-7	0-3	
91-20-3	0-1	
64741-47-5	0-25	
111-65-9	0-10	
109-66-0	0-3	
8002-05-9	0-100	
108-88-3	0-5	
1330-20-7	0-3	
	CAS NUMBER         78-78-4         71-43-2         106-97-8         110-82-7         100-41-4         142-82-5         110-54-3         7783-06-4         75-28-5         108-87-2         96-37-7         91-20-3         64741-47-5         111-65-9         109-66-0         8002-05-9         108-88-3         1330-20-7	CAS NUMBER         PERCENTAGE (%)*           78-78-4         0-4           71-43-2         0-5           106-97-8         0-5           100-97-8         0-5           100-41-4         0-2           142-82-5         0-10           110-54-3         0-8           7783-06-4         0-5           108-87-2         0-3           96-37-7         0-3           91-20-3         0-1           110-55-9         0-10           110-65-9         0-10           109-66-0         0-3           8002-05-9         0-100           108-88-3         0-5           1330-20-7         0-3

\*Values do not reflect absolute minimums and maximums; those values may vary from time to time.

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#### REDACTED SUBMITTAL-PUBLIC COPY First Aid Measures

DESCRIPTION	Inhalation	• IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for
OF NECESSARY MEASURES		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.
	Еуе	• 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	<ul> <li>Do NOT induce vomiting. Call a physician or poison control center.</li> <li>Aspiration hazard if swallowed—can enter lungs and cause damage.</li> </ul>
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	<ul> <li>Aspiration hazard. Symptoms may be delayed.</li> <li>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.</li> <li>Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and provent epreed of contamination.</li> </ul>

# Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	Suitable Extinguishing Media	<ul> <li>SMALL FIRES: Dry chemical, CO<sub>2</sub>, water spray or regular foam.</li> <li>LARGE FIRE: Water spray, fog or regular foam.</li> </ul>
	Unsuitable Extinguishing Media	<ul> <li>CAUTION: Use of water spray when fighting fire may be inefficient.</li> <li>Do not use straight streams.</li> </ul>
FIREFIGHTING PROCEDURES	<ul> <li>FIRE INVOLVING TANKS devices or discoloration of FIRE INVOLVING TANKS burn itself out.</li> <li>Stay upwind.</li> <li>Ventilate closed spaces be</li> <li>Fire fighters should wear of FIRE: If tank, rail car or tank evacuation for 1600 meter</li> <li>FIRE: When a large quantiti (1000 feet) in all directions</li> <li>Move containers from fire</li> </ul>	OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety f tank. OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to efore entering. complete protective clothing including self-contained breathing apparatus. < truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial rs (1 mile) in all directions. ty of this material is involved in a major fire, consider an initial evacuation distance of 300 meters area if you can do it without risk.

	<ul> <li>LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.</li> <li>LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.</li> </ul>			
SPECIAL HAZARDS	Vapors may travel to source of ignition and flash back.			
ARISING FROM THE	<ul> <li>Air/vapor mixtures may exp</li> </ul>	plode when ignited.		
SUBSTANCE OR	<ul> <li>Vapors may accumulate in</li> </ul>	confined areas (basement, tanks, hopper/tank cars etc.).		
MIXIUKE	<ul> <li>Will be easily ignited by heat</li> </ul>	t, sparks or flames.		
	<ul> <li>Runoff to sewer may create</li> </ul>	fire or explosion hazard.		
	<ul> <li>Vapor explosion hazard inc</li> </ul>	loors, outdoors or in sewers.		
	<ul> <li>MAY EXPLODE AND THR</li> </ul>	OW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.		
	<ul> <li>May create vapor/air explo</li> </ul>	sion hazard indoors, outdoors or in sewers.		
	<ul> <li>Most vapors are heavier the basements, tanks).</li> </ul>	an air. They will spread along ground and collect in low or confined areas (sewers,		
EXPLOSION DATA	Hazardous	• Carbon monoxide. Carbon dioxide (CO,). Nitrogen oxides (NOx). Oxides of sulfur.		
	<b>Combustion Products</b>	Aldehydes, aromatic and other hydrocarbons.		
	Sensitivity to Mechanical Impact	• None.		
	Sensitivity to Static Discharge	• Yes.		
PROTECTIVE EQUIPMENT AND	As in any fire, wear self-con protective gear.	tained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full		
PRECAUTIONS FOR FIREFIGHTERS	<ul> <li>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.</li> </ul>			
	Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.			
	Water spray may be useful	in minimizing or dispersing vapors.		
	<ul> <li>Long-duration fires involvin</li> </ul>	g diluent stored in tanks may result in a boilover.		
	For fires beyond the incinient stage emergency responders in the immediate bazard area should wear bunker gear			

# Section 6: Accidental Release Measures

<b>Personal Precautions</b>	<ul> <li>Evacuate personnel to safe areas.</li> </ul>
	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.
	<ul> <li>Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> </ul>
	Ventilate enclosed areas.
	Do not walk through spilled material.
<b>Protective Equipment</b>	Wear appropriate breathing apparatus (if applicable) and protective clothing.
	Personal Precautions

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	Emergency REDACT	<ul> <li>E DESUID M LTIGTADESPUTE In Kencic Prayes, sparks or flames in immediate area)</li> <li>Keep unauthorized personnel away. Evacuate area. Keep out of low areas. Stop leak if you can do it without risk.</li> <li>Report spills to local or federal authorities as appropriate or required.</li> </ul>		
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	<ul> <li>Stop leak if you can do it without risk.</li> <li>Contain and recover liquid when possible.</li> <li>A vapor suppressing foam may be used to reduce vapors.</li> <li>Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.</li> <li>Use water spray to reduce vapors or divert vapor cloud drift.</li> <li>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.</li> </ul>		
	Methods for Cleaning Up	<ul> <li>Clean up spill immediately.</li> <li>LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.</li> <li>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.</li> <li>Use appropriate Personal Protective Equipment (PPE).</li> <li>Use clean non-sparking tools to collect absorbed material.</li> <li>Vacuum spilled material.</li> <li>Try to work upwind of spill.</li> <li>All equipment used when handling the product must be grounded.</li> <li>Recover and return free product to proper containers</li> <li>Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.</li> <li>Do not place spilled materials back in the original container.</li> <li>Do not flueb to sewer or allow to enter waterways</li> </ul>		

# Section 7: Handling and Storage

PRECAUTIONS FOR SAFE HANDLING	Handling	<ul> <li>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.</li> </ul>
		<ul> <li>The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).</li> </ul>
		The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.
		Take precautionary measures against static discharges.

	Handling RED	ACTEDDS COBM HIT TIM broke Color Commerce Since they may contain explosive residues.
		Stay upwind and vent open hatches before uploading.
		<ul> <li>Avoid contact with skin, eyes and clothing.</li> </ul>
		<ul> <li>Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.</li> </ul>
		Wear personal protective equipment.
		<ul> <li>Remove and wash contaminated clothing before re-use.</li> </ul>
		<ul> <li>Do not eat, drink or smoke when using this product.</li> </ul>
		Do not take internally.
		Wash thoroughly after handling.
		• Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR	Storage	Ventilate enclosed areas.
SAFE STORAGE,		Store in a well-ventilated place.
INCLUDING ANY		Keep container tightly closed.
INCOMPATIBILITIES		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.
		<ul> <li>Do not enter confined spaces such as tanks or pits without following proper entry procedures.</li> </ul>
		<ul> <li>Store in properly closed containers that are appropriately labeled and in a cool well- ventilated area.</li> </ul>
		<ul> <li>Harmful concentrations of hydrogen sulfide (H<sub>2</sub>S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.</li> </ul>
		Keep away from open flames, hot surfaces and sources of ignition.
		<ul> <li>Keep product and empty container away from heat and sources of ignition.</li> </ul>
		<ul> <li>Storage containers should be grounded and bonded.</li> </ul>
		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 Produ	• 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	PEL1ppm	TWA 0.1ppm
		TLV 1.6 mg/m <sup>3</sup>	STEL 5 ppm	STEL1ppm
		STEL 2.5 ppm		IDLH 500 ppm
		STEL 8 mg/m <sup>3</sup>		
	Butane	STEL 1000 ppm	_	TWA 800 ppm
				TWA 1900 mg/m <sup>3</sup>

	TED SUBMITTAL-I	PUBERCICOPY	TWA 300 ppm
	TLV 334 mg/m <sup>3</sup>	PEL 1050 mg/m <sup>3</sup>	TWA 1050 mg/m <sup>3</sup> IDLH 1300 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m <sup>3</sup>	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 125 ppm STEL 545 mg/m <sup>3</sup> IDLH 800 ppm
Heptane	TLV 400 ppm TLV 1640 mg/m <sup>3</sup> STEL 500 ppm STEL 2000 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m <sup>3</sup>	TWA 85 ppm TWA 350 mg/m <sup>3</sup> Ceiling 440 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 750 ppm
Hexane	TLV 50 ppm TLV 176 mg/m³	PEL 500 ppm PEL 1800 mg/m³	TWA 50 ppm TWA 180 mg/m³ IDLH 1100 ppm
Hydrogen sulfide	TLV1ppm TLV1.4 mg/m <sup>3</sup> STEL5 ppm STEL7 mg/m <sup>3</sup>	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m <sup>3</sup> IDLH 100 ppm
Isobutane	TWA 1000 ppm	_	_
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m³	TWA 400 ppm TWA 1600 mg/m³ IDLH 1200 ppm
Naphthalene	TLV 10 ppm STEL 15 ppm	PEL 10 ppm PEL 50 mg/m <sup>3</sup>	TWA 10 ppm TWA 50 mg/m <sup>3</sup> STEL 15 ppm STEL 75 mg/m <sup>3</sup>
Octane	TLV 300 ppm TLV 1401 mg/m <sup>3</sup>	PEL 500 ppm PEL 2350 mg/m <sup>3</sup>	TWA 75 ppm TWA 350 mg/m <sup>3</sup> Ceiling 385 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1000 ppm
Pentane	TLV 600 ppm TLV 1770 mg/m³	PEL 1000 ppm PEL 2950 mg/m³	TWA 120 ppm TWA 350 mg/m <sup>3</sup> Ceiling 610 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1500 ppm
Toluene	TLV 20 ppm TLV 75 mg/m <sup>3</sup>	PEL 200 ppm STEL 300 mg/m <sup>3</sup>	TWA 100 ppm TWA 375 mg/m <sup>3</sup> STEL 150 ppm STEL 560 mg/m <sup>3</sup> IDLH 500 ppm

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	Xylenes REDACT	ED_SWBMITTAL-PUBEICOCOPY	TWA 100 ppm			
		TLV 434 mg/m <sup>3</sup> PEL 435 mg/m <sup>3</sup>	TWA 435 mg/m <sup>3</sup>			
		STEL 150 ppm	STEL 150 ppm			
		STEL 651 mg/m <sup>3</sup>	STEL 655 mg/m <sup>3</sup>			
			IDLH 900 ppm			
APPROPRIATE ENGINEERING CONTROLS	Adequate ventilation system limit values. Prevent vapor b electrical equipment.	ns as needed to control concentrations of airborne contami build up by providing adequate ventilation during and after us	nants below applicable threshold e. Use only appropriately classified			
INDIVIDUAL PROTECTION	Eye and Face	Wear face shield and eye protection.				
MEASURES	Skin and Body	<ul> <li>The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation.</li> </ul>				
		Wear protective gloves/protective clothing/eye protective sleeves and/or protective coveralls.	tion/face protection. Wear long			
	Respiratory	<ul> <li>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.</li> </ul>				
	General Hygiene Measure	• Handle in accordance with good industrial hygiene and	d safety practice.			

# Section 9: Physical and Chemical Properties

MATERIAL	Physical State	Liquid	Odor	Petroleum like odor	
DESCRIPTION	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	

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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 BOUTES	Inhalation	May cause irritation of respiratory tract. May cause drowsiness and dizziness.					
OF EXPOSURE	Eye Contact	Causes serious eye irritation.     Causes skin irritation.					
	Skin Contact						
	Ingestion	<ul> <li>Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.</li> <li>Potential for aspiration if swallowed.</li> <li>Aspiration may cause pulmonary edema and pneumonitis.</li> </ul>					
TOXICOLOGICAL DATA	CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION			
	2-Methylbutane (In Liquid form)	_	_	= 150,000 mg/m <sup>3</sup> (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/m³ (Rat) 4 h			
	Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h			

	Hydrogen su Re DAC	TED SUBMITTAL	-PUBLIC COPY	= 444 ppm (Rat)		
	Isobutane	_	_	= 658,000 mg/m <sup>3</sup> (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/m³ (Rat)		
	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		
	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 <sub>2</sub> S)	<ul> <li>Toxic by inhalation. Prolonged breathing of 50-100 ppm H<sub>2</sub>S 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 &gt;1000 ppm will cause immediate unconsciousness and death through respiratory paralysis. Rats and mice exposed to 80 ppm H<sub>2</sub>S, 6 hrs/day, 5 days/ week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H<sub>2</sub>S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H<sub>2</sub>S, respectively. Over the years a number of acute cases of H<sub>2</sub>S 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.</li> </ul>				
	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.				

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	Xylenes REDA	CTED SUBMITTALE PUBLING GOPTY 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.
		<b>Target Organs:</b> 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.
		<b>Reproductive Toxicity:</b> 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	<b>Carcinogenicity:</b> 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.
		<b>Target Organs:</b> 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	Sensitization	No information available
AND ALSO CHRONIC	Mutagenic Effects	May cause genetic defects
SHORT- AND LONG- TERM EXPOSURE	Carcinogenicity	May cause cancer

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	Benzene	A1	Х	Group1	Known	Х	
	Ethylbenzene	A3	_	Group 2B	Evidence	Х	
	Hexane	_	Х	_	_	_	
	Naphthalene	A4	Х	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 or	Causes damage to organs through prolonged or repeated exposure.					
ASPIRATION HAZARD	May be fatal if swallowe	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)	_

ΕCOTOXICITY

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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

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		TOXICITY TO FISH		OTHER TOXICITY
	TONOTITIOAEGAE		(WATER FLEA)	
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/I 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	CHEMICAL	LOGPOW		
FUTENTIAL	2-Methylbutane (In Liquid form)	2.72		
	Benzene	1.83		
	Butane	2.89		

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#### CyclohexaneREDACTE224SUBMITTAL-PUBLIC COPY

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
CHEMICAL	EXPECTED SOIL MOBILITY
2-Methylbutane (In Liquid form)	Low
Benzene	High
Butane	Low
Cyclohexane	Moderate
Ethylbenzene	Low
Heptane	Moderate
Hexane	High
Isobutane	VeryHigh
Methylcyclopentane	Low
Naphthalene	High to None
Octane	Immobile
Pentane	High
Toluene	High to Moderate
Xylene	Very High to Moderate

#### **MOBILITY IN SOIL**

OTHER ADVERSE
EFFECTS

No information available

### Section 13:

### REDACTED SUBMITTAL-PUBLIC COPY Disposal Considerations

WASTE TREATMENT METHODS	Product Waste	<ul> <li>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.</li> <li>This product could also contain benzene at &gt;0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).</li> <li>This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).</li> <li>It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.</li> </ul>
	Packaging Waste	<ul> <li>Container contents should be completely used and containers should be emptied prior to discard.</li> <li>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.</li> <li>Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner.</li> <li>To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.</li> </ul>

Section 14:

# **Transport Information**

**CHART NAME**		UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
	DOT	UN1267	Petroleum Crude Oil	3	1	Emergency response guide number: 128
	TDG	UN1267	Petroleum Crude Oil	3		Marine Pullutant
	IMO/IMDG	UN1267	Petroleum Crude Oil	3		Marine Pullutant
	IATA/ICAO	UN1267	Petroleum Crude Oil	3	I	ERG Code 3L
SPECIAL RECAUTIONS	• None					

FORUSER

# Section 15:

### REDACTED SUBMITTAL-PUBLIC COPY 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	NotListed
Methylcyclohexane	108-87-2	NotListed
Methylcyclopentane	96-37-7	NotListed
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	NotListed
Pentane	109-66-0	NotListed
Petroleum	8002-05-9	NotListed
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

#### COMPONENREDACTEDAS⊌BMITTAL-PUBLICOOPY

Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC	
COMPONENT	CAS#	AMOUNT	
nyalogon ounide		2.0 μg/ 2 000	
Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC	
COMPONENT	CAS#	AMOUNT	
Xylene	1330-20-7	100 lb RQ	
Toluene	108-88-3	1000 lb RQ	
Petroleum	8002-05-9	Not Listed	
Pentane	109-66-0	Not Listed	
Octane	111-65-9	Not Listed	
Natural gas condensates (petroleum)	64741-47-5	Not Listed	
Naphthalene	91-20-3	100 lb RQ	
Methylcyclopentane	96-37-7	Not Listed	
Methylcyclohexane	108-87-2	Not Listed	
Isobutane	75-28-5	Not Listed	
Hydrogen Sulfide	7783-06-4	100 lb RQ	
Hexane	110-54-3	Not Listed	
Heptane	142-82-5	Not Listed	
Ethylbenzene	100-41-4	1000 lb RQ	
Cyclohexane	110-82-7	1000 lb RQ	
Butane	106-97-8	Not Listed	
Benzene	71-43-2	10 lb RQ	
(In Liquid form)	10-10-4	NOLLISIEU	
0 Mathudhutana	70 70 4	Natlistad	

(CLEAN WATER ACT)— RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE

U.S.-CWA

Revision date: 5/7/2015

#### U.S.-CWA (CLEAN WATER ACT)-HAZARDOUS SUBSTANCES

#### COMPONENREDACTEDAS⊌BMITTAL-PUBLkccOPY

2-Methylbutane (In Liquid form)	78-78-4	NotListed
Benzene	71-43-2	Х
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	Х
Ethylbenzene	100-41-4	Х
Heptane	142-82-5	NotListed
Hexane	110-54-3	Not Listed
Hydrogen Sulfide	7783-06-4	Х
Isobutane	75-28-5	NotListed
Methylcyclohexane	108-87-2	NotListed
Methylcyclopentane	96-37-7	NotListed
Naphthalene	91-20-3	Х
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Octane	111-65-9	NotListed
Pentane	109-66-0	NotListed
Petroleum	8002-05-9	NotListed
Toluene	108-88-3	Х
Xylene	1330-20-7	Х
X= The component is listed		
COMPONENT	CAS#	LISTED
2-Methylbutane (In Liquid form)	78-78-4	Not Listed
Benzene	71-43-2	Х
Butane	106-97-8	Not Listed
Cyclohexane	110-82-7	NotListed
Ethylbenzene	100-41-4	Х
Heptane	142-82-5	NotListed
Hexane	110-54-3	NotListed
Hydrogen Sulfide	7783-06-4	NotListed
Hydrogen Sulfide Isobutane	7783-06-4 75-28-5	Not Listed

U.S.-CWA

(CLEAN WATER ACT) – PRIORITY POLLUTANTS

#### Methylcyclop

Naphthalene	91-20-3	Х
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	NotListed
Toluene	108-88-3	Х
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	COMPONENREDACTEDASUBMITTAL-PUBLICUDOPY				
THE ENVIRONMENT-	Ethylbenzene	100-41-4	90 µg/L		
GUIDELINES FOR FRESHWATER AQUATIC LIFE	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	COMPONENT	CAS#	AMOUNT		
THE ENVIRONMENT— WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE	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	Х		
	Benzene	71-43-2	Х		
	Butane	106-97-8	Х		
	Cyclohexane	110-82-7	Х		
	Ethylbenzene	100-41-4	Х		
	Heptane	142-82-5	Not Listed		
	Hexane	110-54-3	Not Listed		
	Hydrogen Sulfide	7783-06-4	Х		
	Isobutane	75-28-5	Х		
	Methylcyclohexane	108-87-2	Not Listed		
	Methylcyclopentane	96-37-7	Not Listed		
	Naphthalene	91-20-3	Х		
	Natural gas condensates (petroleum)	64741-47-5	Not Listed		
	Octane	111-65-9	Not Listed		
	Pentane	109-66-0	Х		
	Petroleum	8002-05-9	Not Listed		
	Toluene	108-88-3	X		
	Xylene	1330-20-7	Х		

X= The component is listed

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### Section 16:

# REDACTED SUBMITTAL-PUBLIC COPY Other Information

NFPA	3 0					
	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	<ul> <li>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</li> </ul>					

practices or from any hazards inherent in the nature of the product.

# **CENBRIDGE** REDACTED SUBMITTAL-PUBLIC COPY Safety Data Sheet

Section 1:	Identification		
PRODUCT IDENTIFIER	Petroleum Crude Oil—Heavy		
OTHER MEANS OF	UN-Number	UN1267	
	Synonyms	Premium Conventional Heavy (PCH), Conventional Heavy (CHV)	
	Chemical Category	Crude oils—extremely flammable	
RECOMMENDEDUSE	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			
	_	_		170
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			/ I I I N	

### Signal Word REDACTED

	Hazard Pictograms					
	Hazard Statements	<ul> <li>Causes skin irritation.</li> <li>Causes serious eye irritation.</li> <li>May cause genetic defects.</li> <li>May cause cancer.</li> </ul>				
		<ul> <li>Suspected of damaging fertility or the unborn child.</li> <li>May cause respiratory irritation.</li> <li>Causes damage to organs through prolonged or repeated exposure.</li> <li>May be fatal if swallowed and enters airways.</li> <li>Extremely flammable liquid and vapor.</li> <li>May cause drowsiness or dizziness.</li> </ul>				
PRECAUTIONARY STATEMENTS	Prevention	<ul> <li>Wash face, hands and any exposed skin thoroughly after handling.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection.</li> <li>Obtain special instructions before use.</li> <li>Do not handle until all safety precautions have been read and understood.</li> <li>Use personal protective equipment as required.</li> <li>Do not breathe dust/fume/gas/mist/vapors/spray.</li> <li>Use only outdoors or in a well-ventilated area.</li> <li>Do not eat, drink or smoke when using this product.</li> <li>Keep away from heat/sparks/open flames/hot surfaces.</li> <li>Keep container tightly closed.</li> <li>No smoking.</li> <li>Ground/bond container and receiving equipment.</li> <li>Use only non-sparking tools.</li> <li>Take precautionary measures against static discharge.</li> <li>In case of inadequate ventilation wear respiratory protection.</li> </ul>				
	Response	<ul> <li>IF EXPOSED or concerned: Get medical advice/attention.</li> <li>IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.</li> <li>Call a POISON CENTER or doctor/physician if you feel unwell.</li> <li>IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.</li> <li>Do NOT induce vomiting.</li> <li>IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.</li> <li>In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction.</li> <li>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</li> <li>If SKIN irritation occurs: Get medical advice/attention.</li> <li>If EYE irritation persists: Get medical advice/attention.</li> </ul>				
	Storage/Disposal	<ul> <li>Store locked up and keep cool.</li> <li>Store in a well-ventilated place. Keep container tightly closed.</li> <li>Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.</li> </ul>				
OTHER INFORMATION	<ul> <li>Under United States Reg considered hazardous.</li> <li>Very toxic to aquatic life w</li> </ul>	ulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is vith long lasting effects.				

## Section 3:

### **REDACTED SUBMITTAL-PUBLIC COPY Composition/Information on Ingredients**

<b>CAS NUMBER</b>	PERCENTAGE (%)*	NOTES
		NOTES
8002-05-9	60-100	
64741-47-5	60-100	
8052-42-4	50-90	
106-97-8	0-10	
109-66-0	0-7	
111-65-9	0-5	
111-84-2	0-5	
142-82-5	0-5	
78-78-4	0-5	
75-28-5	0-5	
110-54-3	0-5	
124-18-5	0-5	
71-43-2	0-2	
1330-20-7	0-1	
108-88-3	0-1	
100-41-4	0-1	
95-63-6	0-1	
7783-06-4	0-1	
	8002-05-9         64741-47-5         8052-42-4         106-97-8         109-66-0         111-65-9         111-84-2         142-82-5         78-78-4         75-28-5         110-54-3         124-18-5         71-43-2         1330-20-7         108-88-3         100-41-4         95-63-6         7783-06-4	8002-05-9         60-100           64741-47-5         60-100           8052-42-4         50-90           106-97-8         0-10           109-66-0         0-7           111-65-9         0-5           111-84-2         0-5           142-82-5         0-5           78-78-4         0-5           75-28-5         0-5           110-54-3         0-5           124-18-5         0-5           130-20-7         0-1           108-88-3         0-1           100-41-4         0-1           95-63-6         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	<ul> <li>IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. If irritation persists: Get medical advice/attention.</li> </ul>
	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 REDAC	TEDESUBMETSEALITEU BIL VacCOPY al minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical advice/ attention.		
	Ingestion	<ul> <li>Do NOT induce vomiting. Call a physician or poison control center.</li> <li>Aspiration hazard if swallowed—can enter lungs and cause damage.</li> </ul>		
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	<ul> <li>Aspiration hazard. Symptoms may be delayed.</li> <li>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.</li> <li>Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.</li> </ul>		

## Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	Suitable Extinguishing Media	<ul> <li>SMALL FIRES: Dry chemical, CO<sub>2</sub>, water spray or regular foam.</li> <li>LARGE FIRE: Water spray, fog or regular foam.</li> </ul>		
	Unsuitable Extinguishing Media	<ul><li>CAUTION: Use of water spray when fighting fire may be inefficient.</li><li>Do not use straight streams.</li></ul>		
FIREFIGHTING PROCEDURES	<ul> <li>FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.</li> <li>FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.</li> <li>Stay unwind</li> </ul>			
	<ul> <li>Ventilate closed spaces before entering.</li> <li>Fire fighters should wear complete protective clothing including self-contained breathing apparatus.</li> <li>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.</li> <li>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.</li> <li>Move containers from fire area if you can do it without risk.</li> </ul>			
	<ul> <li>LARGE FIRES: Use water spray or fog; do not use straight streams.</li> <li>LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.</li> <li>LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.</li> </ul>			

SPECIAL HAZARDS	Vapors may REDAGC				
<b>ARISING FROM THE</b>	Air/vapor mixtures may explode when ignited.				
SUBSTANCE OR	<ul> <li>Vapors may accumulate in</li> </ul>	confined areas (basement, tanks, hopper/tank cars etc.).			
MIXTURE	<ul> <li>Will be easily ignited by heat</li> </ul>	t, sparks or flames.			
	Runoff to sewer may create	fire or explosion hazard.			
	Vapor explosion hazard inc	loors, outdoors or in sewers.			
	MAY EXPLODE AND THR	OW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.			
	<ul> <li>May create vapor/air explosition</li> </ul>	sion hazard indoors, outdoors or in sewers.			
	Most vapors are beavier the	an air They will spread along ground and collect in low or confined areas (sewers			
	basements, tanks).				
<b>EXPLOSION DATA</b>	Hazardous	• Carbon monoxide. Carbon dioxide (CO <sub>2</sub> ). Nitrogen oxides (NOx). Oxides of sulfur.			
	<b>Combustion Products</b>	Aldehydes, aromatic and other hydrocarbons.			
	Sensitivity to	• None.			
	Mechanical Impact				
	Sensitivity to	• Yes.			
	Static Discharge				
PROTECTIVE EQUIPMENT AND	As in any fire, wear self-con protective gear.	tained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full			
<b>PRECAUTIONS FOR</b>	Water spray is recommended to cool or protect exposed materials or structures. Water may be ineffective for				
FIREFIGHTERS	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	Personal Precautions	<ul> <li>Evacuate personnel to safe areas.</li> <li>Remove all sources of ignition.</li> <li>Deny entry to unauthorized and unprotected personnel.</li> <li>Use personal protective equipment.</li> </ul>
PROCEDURES		Avoid contact with skin, eyes and clothing.     Step look if you can do it without risk
		<ul> <li>Stop leaking ou can do it with out lisk.</li> <li>Keep people away from and upwind of spill/leak.</li> </ul>
		<ul> <li>Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> </ul>
		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 R COAQSE confined areas. Runoff from f	Avoid run off REDACEE BWDT TAL RUBLEG. COR Antry 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	<ul> <li>Stop leak if you can do it without risk.</li> <li>Contain and recover liquid when possible.</li> <li>A vapor suppressing foam may be used to reduce vapors.</li> <li>Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.</li> <li>Use water spray to reduce vapors or divert vapor cloud drift.</li> <li>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.</li> </ul>		
	Methods for Cleaning Up	<ul> <li>Clean up spill immediately.</li> <li>LARGE SPILLS: DO NOT CLEAN-UP OR DISPOSE OF, EXCEPT UNDER SUPERVISION OF A SPECIALIST.</li> <li>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.</li> <li>Use appropriate Personal Protective Equipment (PPE).</li> <li>Use clean non-sparking tools to collect absorbed material.</li> <li>Vacuum spilled material.</li> <li>Try to work upwind of spill.</li> <li>All equipment used when handling the product must be grounded.</li> <li>Recover and return free product to proper containers</li> <li>Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.</li> <li>Do not place spilled materials back in the original container.</li> <li>Do not flush to sewer or allow to enter waterways.</li> </ul>		

## 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.
		<ul> <li>The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).</li> </ul>
		<ul> <li>The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.</li> </ul>
		<ul> <li>Take precautionary measures against static discharges.</li> </ul>

	Handling RED/	ACTEDDS CBM III gTirA br-R CB Enforty COPPers since they may contain explosive residues.
		Stay upwind and vent open hatches before uploading.
		<ul> <li>Avoid contact with skin, eyes and clothing.</li> </ul>
		<ul> <li>Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.</li> </ul>
		Wear personal protective equipment.
		<ul> <li>Remove and wash contaminated clothing before re-use.</li> </ul>
		<ul> <li>Do not eat, drink or smoke when using this product.</li> </ul>
		Do not take internally.
		Wash thoroughly after handling.
		Empty containers pose a potential fire and explosion hazard.
CONDITIONS FOR	Storage	Ventilate enclosed areas.
SAFE STORAGE,		Store in a well-ventilated place.
INCLUDING ANY		<ul> <li>Keep container tightly closed.</li> </ul>
INCOMPATIBILITIES		Store locked up.
		<ul> <li>Avoid shock, impact, friction, and rough handling. Do not use sparking tools.</li> </ul>
		Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources.
		Keep away from sources of ignition.
		No Smoking.
		<ul> <li>Do not enter confined spaces such as tanks or pits without following proper entry procedures.</li> </ul>
		<ul> <li>Store in properly closed containers that are appropriately labeled and in a cool well- ventilated area.</li> </ul>
		• 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 Produc	• 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 <sup>3</sup> IDLH 1100 ppm Ceiling 1800 mg/m <sup>3</sup>
	Asphalt	TLV 0.5 mg/m <sup>3</sup>		Ceiling 5 mg/m <sup>3</sup>
	Butane	STEL 1000 ppm	_	TWA 800 ppm TWA 1900 mg/m³

Pentane REDA	CTED SUBMITTAL-	PUBERCOCORY	TWA 120 ppm
	TLV 1770 mg/m <sup>3</sup>	PEL 2950 mg/m <sup>3</sup>	TWA 350 mg/m <sup>3</sup> Ceiling 610 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1500 ppm
Octane	TLV 300 ppm TLV 1401 mg/m <sup>3</sup>	PEL 500 ppm PEL 2350 mg/m <sup>3</sup>	TWA 75 ppm TWA 350 mg/m <sup>3</sup> Ceiling 385 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1000 ppm
Nonane	TLV 200 ppm TLV 1050 mg/m³	-	TWA 200 ppm TWA 1050 mg/m³
Heptane	TLV 400 ppm TLV 1640 mg/m <sup>3</sup> STEL 500 ppm STEL 2000 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m³	TWA 85 ppm TWA 350 mg/m <sup>3</sup> Ceiling 440 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 750 ppm
2-Methylbutane	TWA 600 ppm	_	_
Isobutane	TWA 1000 ppm	_	_
Hexane	TLV 50 ppm TLV 176 mg/m³	PEL 500 ppm PEL 1800 mg/m³	TWA 50 ppm TWA 180 mg/m <sup>3</sup> IDLH 1100 ppm
Decane	_	_	_
Benzene	TLV 0.5 ppm TLV 1.6 mg/m <sup>3</sup> STEL 2.5 ppm STEL 8 mg/m <sup>3</sup>	PEL1ppm STEL5ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Xylenes	TLV 100 ppm TLV 434 mg/m <sup>3</sup> STEL 150 ppm STEL 651 mg/m <sup>3</sup>	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 150 ppm STEL 655 mg/m <sup>3</sup> IDLH 900 ppm
Toluene	TLV 20 ppm TLV 75 mg/m <sup>3</sup>	PEL 200 ppm STEL 300 mg/m <sup>3</sup>	TWA 100 ppm TWA 375 mg/m <sup>3</sup> STEL 150 ppm STEL 560 mg/m <sup>3</sup> IDLH 500 ppm
Ethylbenzene	TLV 20 ppm TLV 87 mg/m <sup>3</sup>	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 125 ppm STEL 545 mg/m <sup>3</sup> IDLH 800 ppm

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	1,2,4-Trimeth RepACT	EDASUBMITTAL	TWA 25 ppm TWA 125 mg/m <sup>3</sup>			
	Hydrogen sulfide	TLV1ppm TLV1.4 mg/m <sup>3</sup> STEL 5 ppm STEL 7 mg/m <sup>3</sup>	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m³ IDLH 100 ppm		
APPROPRIATE ENGINEERING CONTROLS	Adequate ventilation system limit values. Prevent vapor b electrical equipment.	ns as needed to control con uild up by providing adequ	ncentrations of airborne contamina ate ventilation during and after use	ants below applicable threshold . Use only appropriately classified		
INDIVIDUAL PROTECTION MEASURES	Eye and Face	Wear face shield and eye protection.				
	Skin and Body	<ul> <li>The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible irritation.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection. Wear long sleeves and/or protective coveralls.</li> </ul>				
	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	<b>res</b> • Handle in accordance with good industrial hygiene and safety practice.				

## Section 9: Physical and Chemical Properties

MATERIAL	Physical State	Liquid	Odor	Petroleum like odor
DESCRIPTION	Substance Type	Mixture	Odor Threshold	No data available
	Appearance	Brown		
PROPERTIES	рН	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 FlammRtHip ANGTED Std BMIDETAL-PUB LOG RIV

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 dastrointestinal irritation nausea yomiting and diarrhea	
OF EXPOSURE       Eye Contact       • Causes serious eye irritation.         Skin Contact       • Causes skin irritation.         Ingestion       • Ingestion may cause gastrointestinal irritation nausea yomiting and diarrhea	
Skin Contact       • Causes skin irritation.         Ingestion       • Ingestion may cause gastrointestinal irritation nausea yomiting and diarrhea	
Indestion     Indestion may cause dastrointestinal irritation nausea yomiting and diarrhea	
<ul> <li>Potential for aspiration if swallowed.</li> </ul>	
Aspiration may cause pulmonary edema and pneumonitis.	
TOXICOLOGICAL DATA     CHEMICAL NAME     LD50 ORAL     LD50 DERMAL     LC50 INHAL	ATION
Asphalt         >5000 mg/kg (Rat)         -         >94.4 mg/m³ (	Rat)
<b>Butane</b> – – 658 mg/L (Ra	t) 4 h
Pentane         >2000 mg/kg (Rat)         -         364 g/cu (Rat)	14h
<b>Octane</b> – – = 118 g/m <sup>3</sup> (Ra	t) 4 h
= 25260 ppm	(Rat) 4 h
<b>Nonane</b> – – = 3200 ppm (F	Rat) 4 h
<b>Heptane</b> $-$ = 3000 mg/kg (Rabbit) = 103 g/m <sup>3</sup> (Ra	at) 4 h
<b>2-Methylbutane</b> – – = 150,000 mg	/m³ (Rat) 2 h

Isobutane REDAC	TED SUBMITTAL	-PUBLIC COPY	= 658,000 mg/m <sup>3</sup> (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	1800 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/m³ (Rat) 4h		
Hydrogen sulfide	-	_	= 444 ppm (Rat)		
Benzene	<ul> <li>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.</li> </ul>				
Hydrogen Sulfide Gas (H <sub>2</sub> S)	• 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 set to cause lung, liver, kidney Laboratory animals expo- kidneys, lungs, spleen, he gestation to significant co toxicity (skeletal retardation These types of fetotoxic e inhalation of high xylene co (behavioral tests) in animal subchronically exposed to	evere poisoning incidents in human theart and brain damage as well a sed to high dose of xylenes showe art and adrenals, Exposure of pre- ncentrations of xylenes produced on, cleft palate, and wavy ribs) gen effects have been associated with concentrations has shown impairm als and man. Xylenes produced a r o high concentrations of xylenes.	ns to xylenes has been reported as neurologic disturbances. ed evidence of effects in the liver, gnant rats, mice and rabbits during I maternal, fetal and developmental erally at maternally toxic doses. maternal toxicity. Repeated nent of performance abilities nild frequency hearing loss in rats		

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS

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	1200 ppm for listed as a care	two years did not demo cinogen by IARC.	onstrate evidence	of carcinogenicity. T	oluene has not been		
	Target Organ toluene may of produced kidr laboratory ani has been show loss and visua Beproductiv	<ul> <li>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.</li> <li>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.</li> <li>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.</li> </ul>					
	evidence of de increased ske maternally tox Decreased sp fertility. Toluer solvent abuse						
Ethylbenzene	<b>Carcinogeni</b> inhalation stud has been liste	<b>city:</b> Rats and mice exp dy demonstrated limited d as a possible human	oosed to 0, 75, 250 d evidence of kidr carcinogen by IAF	D, or 750 ppm ethyl be ney, liver, and lung car RC.	enzene in a two year ncer. Ethyl benzene		
	inhalation stud foci, hypertrop (hyperplasia) affects the aud observed afte ethyl benzene and noise in w	dy there was mild dama oby, necrosis), lung (alve and pituitary (hyperplas ditory function mainly in er combined exposure t e-induced hearing losse rorkers.	ge to the kidney ( colar epithelium m sia). In animal moo the cochlear mic o noise and ethyl as or ototoxicity w	tubular hyperplasia), hetaplasia), thyroid (h dels (particularly rats) I-frequency range an benzene. There is no ith combined exposu	liver (eosinophilio yperplasia), thyroid , ethyl benzene d ototoxicity was evidence of either ure to ethyl benzene		
Sensitization	No informati	onavailable					
Mutagonic Effecto	May cause g	genetic defects	etic defects				
wuldyenic Ellects	Carcinogenicity • May cause cancer						
Carcinogenicity	May cause c	cancer					
Carcinogenicity CHEMICAL NAME	• May cause c	cancer ACGIH SKIN*	IARC	NTP	OSHA		
Carcinogenicity CHEMICAL NAME Petroleum distillate (naphtha)	• May cause of <b>ACGIH</b> A2	ACGIH SKIN*	IARC Group 3	NTP	OSHA -		
Carcinogenicity CHEMICAL NAME Petroleum distillate (naphtha) Asphalt	May cause c     ACGIH     A2     A4	ACGIH SKIN*	IARC Group 3 Group 2B	<b>NTP</b> Reasonably Anticipated	OSHA - -		
Carcinogenicity CHEMICAL NAME Petroleum distillate (naphtha) Asphalt Hexane	• May cause of ACGIH A2 A4	ACGIH SKIN*  - X	IARC Group 3 Group 2B	NTP Reasonably Anticipated	<b>OSHA</b>		
Carcinogenicity CHEMICAL NAME Petroleum distillate (naphtha) Asphalt Hexane Benzene	May cause c     ACGIH     A2     A4     -     A1	ancer ACGIH SKIN*  - X X X	IARC Group 3 Group 2B – Group 1	NTP Reasonably Anticipated – Known	<b>OSHA</b> X		
Carcinogenicity CHEMICAL NAME Petroleum distillate (naphtha) Asphalt Hexane Benzene Xylenes	May cause c     ACGIH     A2     A4     -     A1     A4	Cancer ACGIH SKIN*	IARC Group 3 Group 2B - Group 1 Group 3	NTP         Reasonably         Anticipated         -         Known         Evidence	<b>OSHA</b> X		
Carcinogenicity CHEMICAL NAME Petroleum distillate (naphtha) Asphalt Hexane Benzene Xylenes Toluene	May cause of ACGIH     A2     A4     -     A1     A4     A4     A4	Cancer ACGIH SKIN*	IARC Group 3 Group 2B - Group 1 Group 3 Group 3	NTP         Reasonably         Anticipated         -         Known         Evidence         Evidence	OSHA 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.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE

CARCINOGENIC INFORMATION

REPRODUCTIVE TOXICITY	
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

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CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA	OTHER TOXICITY
			(WATER FLEA)	
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)	-

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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 $\mu$ g/L static (Pimephales promelas) LC50 96 h: 70000 - 142000 $\mu$ g/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 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)

#### **REDACTED SUBMITTAL-PUBLIC COPY ECOTOXICITY TOXICITY TO ALGAE OTHER TOXICITY CHEMICAL NAME TOXICITY TO FISH DAPHNIA MAGNA** (WATER FLEA) Ethylbenzene EC5072h:=4.6mg/L LC50 96 h: 11.0 - 18.0 mg/L static EC50 48 h: 1.8 - 2.4 mg/L $EC50 = 9.68 \, mg/L \, 30 \, min$ (Pseudokirchneriella (Oncorhynchus mykiss) (Daphnia magna) EC50 = 96mg/L 24 h (Microorganisms) subcapitata) LC50 96 h: = 4.2 mg/L semi-EC50 96 h: > 438 mg/L static (Oncorhynchus mykiss) (Pseudokirchneriella LC50 96 h: 7.55 - 11 mg/L flowsubcapitata) through (Pimephales promelas) EC5072h:2.6-11.3mg/L LC50 96 h: = 32 mg/L static static (Pseudokirchneriella (Lepomis macrochirus) subcapitata) LC50 96 h: 9.1 - 15.6 mg/L static EC50 96 h: 1.7 - 7.6 mg/L (Pimephales promelas) static (Pseudokirchneriella LC50 96 h: = 9.6 mg/L static subcapitata) (Poecilia reticulata) EC5072h = 11 mg/L(Pseudokirchneriella subcapitata) LC5096h:7.72mg/L EC50 48h: 30 mmol/cu LC50 24h: 100 mmol/cu 1,2,4-Trimethylbenzene (Daphnia magna) Artemia salina (Brine Shrimp) (Pimephales promelas) LC50 96h: 49 µg/l EC50 48h: 62 µg/l Hydrogen sulfide Oncorhynchus mykiss Gammarus pseudolimnaeus (Rainbow Trout) eggs (Scud) LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow) **PERSISTENCE AND** No information available DEGRADABILITY BIOACCUMULATIVE **CHEMICAL** LOG POW POTENTIAL Asphalt 6.006 **Butane** 2.89 Pentane 3.39 Octane 5.18 Heptane 4.66 2-Methylbutane 2.72 Isobutane 2.76 3.90 Hexane Decane 5.1 Benzene 1.83 **Xylene** 2.77-3.15 Toluene 2.65 Ethylbenzene 3.118

### 1,2,4-Trimeth REDACTED7SUBMITTAL-PUBLIC COPY

	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.
		<ul> <li>This product could also contain benzene at &gt;0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).</li> <li>This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).</li> </ul>
		• It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.

### Packaging WREDACTEDCStdiBMintenAtheRUBbrie Corectand 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		Marine Pullutant
	IATA/ICAO	UN1267	Petroleum Crude Oil	3		ERG Code 3L
SPECIAL RECAUTIONS	• None					

FORUSER

## Section 15: Regulatory Information

U.SCERCLA/SARA HAZARDOUS SUBSTANCES AND THEIR REPORTABLE QUANTITIESCOMPONENTCAS #AMOUNTPetroleum distillate (naphtha)8002-05-9Not ListedNatural gas condensates (petroleum)64741-47-5Not ListedAsphalt8052-42-4Not ListedButane106-97-8Not ListedPentane109-66-0Not ListedOctane111-65-9Not ListedNonane111-84-2Not ListedHeptane142-82-5Not Listed2-Methylbutane78-78-4Not Listed				
SUBSTANCES AND THEIR REPORTABLE QUANTITIESPetroleum distillate (naphtha)8002-05-9Not ListedNatural gas condensates (petroleum)64741-47-5Not ListedAsphalt8052-42-4Not ListedAsphalt8052-42-4Not ListedButane106-97-8Not ListedPentane109-66-0Not ListedOctane111-65-9Not ListedNonane111-84-2Not ListedHeptane142-82-5Not Listed2-Methylbutane78-78-4Not Listed	U.S.—CERCLA/SARA HAZARDOUS	COMPONENT	CAS#	AMOUNT
Natural gas condensates (petroleum)64741-47-5Not ListedAsphalt8052-42-4Not ListedButane106-97-8Not ListedPentane109-66-0Not ListedOctane111-65-9Not ListedNonane111-84-2Not ListedHeptane142-82-5Not Listed2-Methylbutane78-78-4Not Listed	SUBSTANCES AND THEIR REPORTABLE QUANTITIES	Petroleum distillate (naphtha)	8002-05-9	Not Listed
Asphalt8052-42-4Not ListedButane106-97-8Not ListedPentane109-66-0Not ListedOctane111-65-9Not ListedNonane111-84-2Not ListedHeptane142-82-5Not Listed2-Methylbutane78-78-4Not Listed		Natural gas condensates (petroleum)	64741-47-5	Not Listed
Butane106-97-8Not ListedPentane109-66-0Not ListedOctane111-65-9Not ListedNonane111-84-2Not ListedHeptane142-82-5Not Listed2-Methylbutane78-78-4Not Listed		Asphalt	8052-42-4	Not Listed
Pentane109-66-0Not ListedOctane111-65-9Not ListedNonane111-84-2Not ListedHeptane142-82-5Not Listed2-Methylbutane78-78-4Not Listed		Butane	106-97-8	Not Listed
Octane111-65-9Not ListedNonane111-84-2Not ListedHeptane142-82-5Not Listed2-Methylbutane78-78-4Not Listed		Pentane	109-66-0	Not Listed
Nonane         111-84-2         Not Listed           Heptane         142-82-5         Not Listed           2-Methylbutane         78-78-4         Not Listed		Octane	111-65-9	Not Listed
Heptane         142-82-5         Not Listed           2-Methylbutane         78-78-4         Not Listed		Nonane	111-84-2	Not Listed
2-Methylbutane 78-78-4 Not Listed		Heptane	142-82-5	Not Listed
		2-Methylbutane	78-78-4	Not Listed

### Isobutane REDACTED SUBMITTAL-PUBLIC COPY

Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ
Decane	124-18-5	NotListed
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	NotListed
Hydrogen Sulfide	7783-06-4	100 lb final RQ; 45.4 kg final RQ
COMPONENT	CAS#	AMOUNT
Petroleum distillate (naphtha)	8002-05-9	Not Listed
Natural gas condensates (petroleum)	64741-47-5	Not Listed
Asphalt	8052-42-4	NotListed
Butane	106-97-8	NotListed
Pentane	109-66-0	NotListed
Octane	111-65-9	NotListed
Nonane	111-84-2	NotListed
Heptane	142-82-5	NotListed
2-Methylbutane	78-78-4	NotListed
Isobutane	75-28-5	NotListed
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)-REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES

U.SCWA	COMPONENREDACTEDAS⊌BMITTAL-PUBLMOUDOPY			
RECOMMENDED WATER QUALITY CRITERIA—CCC FOR FRESHWATER LIFE	Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC	
U.SCWA	COMPONENT	CAS#	AMOUNT	
RECOMMENDED WATER QUALITY CRITERIA—CCC FOR SALTWATER LIFE	HydrogenSulfide	7783-06-4	2.0 µg/L CCC	
U.SCWA	COMPONENT	CAS#	LISTED	
HAZARDOUS SUBSTANCES	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	NotListed	
	Decane	124-18-5	NotListed	
	Benzene	71-43-2	Х	
	Xylene	1330-20-7	Х	
	Toluene	108-88-3	Х	
	Ethylbenzene	100-41-4	Х	
	1,2,4-Trimethylbenzene	95-63-6	Not Listed	
	Hydrogen Sulfide	7783-06-4	Х	

X= The component is listed

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### U.S.-CWA (CLEAN WATER ACT)-PRIORITY POLLUTANTS

### COMPONENREDACTEDAS€BMITTAL-PUBLI€CECOPY

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	Х
Xylene	1330-20-7	Not Listed
Toluene	108-88-3	Х
Ethylbenzene	100-41-4	Х
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 REDACTED SUBMITTAL-PUBBLO2COPY

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		
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
COMPONENT	CAS#	AMOUNT
Ethylbenzene	100-41-4	25 µg/L
Toluene	108-88-3	215 µg/L
Benzene	71-43-2	110 µg/L
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	Х
Pentane	109-66-0	Х

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT— WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT— WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

CANADA— ENVIRONMENTAL EMERGENCIES

### Octane REDACTED SUBMITTAL-PUBLIC COPY

Nonane	111-84-2	Not Listed	
Heptane	142-82-5	Not Listed	
2-Methylbutane	78-78-4	Х	
Isobutane	75-28-5	Х	
Hexane	110-54-3	NotListed	
Decane	124-18-5	NotListed	
Benzene	71-43-2	Х	
Xylene	1330-20-7	Х	
Toluene	108-88-3	Х	
Ethylbenzene	100-41-4	Х	
1,2,4-Trimethylbenzene	95-63-6	Not Listed	
Hydrogen Sulfide	7783-06-4	Х	

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	<ul> <li>The information presen Sheet (SDS). However, or representation, expresentation.</li> </ul>	ted herein is based on data cons SDSs may not be used as a com ess or implied, is made as to the a	idered to be accurate as of the mercial specification sheet of n accuracy or completeness of th	date of preparation of this Safety Data nanufacturer or seller, and no warranty e foregoing data and safety information,	

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.

# **CENBRIDGE** REDACTED SUBMITTAL-PUBLIC COPY Safety Data Sheet

Section 1:	Identification	
PRODUCT IDENTIFIER	Petroleum Crude Oil—Dilbit	
OTHER MEANS OF	UN-Number	UN1993
DENTIFICATION	Synonyms	Dilbit Kearl, Diluted Kearl Bitumen, Kearl Blend, Kearl Dilbit, Kearl Lake Dilbit (KDB)
	Chemical Category	Crude oils—extremely flammable Bitumen Products
RECOMMENDEDUSE	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

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

CLASSIFICATION

			ITC
	_		
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### Signal Word REDACTED

	-	
	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.
		Gauses damage to organs through prolonged or repeated exposure.
		May be fatal if swallowed and enters alrways.
		• Extremely hammable liquid and vapor.
PRECAUTIONARY	Prevention	Wash face, hands and any exposed skin thoroughly after handling.
STATEMENTS		Wear protective gloves/protective clothing/eye protection/face protection.
		Obtain special instructions before use.
		<ul> <li>Do not handle until all safety precautions have been read and understood.</li> </ul>
		<ul> <li>Use personal protective equipment as required.</li> </ul>
		<ul> <li>Do not breathe dust/fume/gas/mist/vapors/spray.</li> </ul>
		Use only outdoors or in a well-ventilated area.
		<ul> <li>Do not eat, drink or smoke when using this product.</li> </ul>
		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.
		Iake precautionary measures against static discharge.
		<ul> <li>In case of inadequate ventilation wear respiratory protection.</li> </ul>
	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.
		<ul> <li>IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.</li> </ul>
		• 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.
		<ul> <li>Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.</li> </ul>
OTHER INFORMATION	Under United States Regr considered hazardous.	ulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is
	<ul> <li>Very toxic to aquatic life w</li> </ul>	ith long lasting effects.

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## **REDACTED SUBMITTAL-PUBLIC COPY** Composition/Information on Ingredients

COMPONENT NAME	CASNUMBER	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	<ul> <li>Do NOT induce vomiting. Call a physician or poison control center.</li> <li>Aspiration hazard if swallowed—can enter lungs and cause damage.</li> </ul>
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	<ul> <li>Aspiration hazard. Symptoms may be delayed.</li> <li>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.</li> <li>Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.</li> </ul>

Section 5:	Fire Fighting N	ED SUBMITTAL-PUBLIC COPY <b>Jeasures</b>			
EXTINGUISHING MEDIA	Suitable Extinguishing Media	<ul> <li>SMALL FIRES: Dry chemical, CO<sub>2</sub>, water spray or regular foam.</li> <li>LARGE FIRE: Water spray, fog or regular foam.</li> </ul>			
	Unsuitable Extinguishing Media	<ul><li>CAUTION: Use of water spray when fighting fire may be inefficient.</li><li>Do not use straight streams.</li></ul>			
FIREFIGHTING PROCEDURES	FIRE INVOLVING TANKS O     devices or discoloration of ta	R CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety ank.			
	<ul> <li>FIRE INVOLVING TANKS OR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to burn itself out.</li> <li>Stay upwind.</li> </ul>				
	Ventilate closed spaces before	pre entering.			
	Fire fighters should wear cor	nplete protective clothing including self-contained breathing apparatus.			
	<ul> <li>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.</li> </ul>				
	• FIRE: When a large quantity (1000 feet) in all directions.	of this material is involved in a major fire, consider an initial evacuation distance of 300 meters			
	Move containers from fire area if you can do it without risk.				
	<ul> <li>LARGE FIRES: Use water spray or fog; do not use straight streams.</li> <li>LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.</li> <li>LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.</li> </ul>				
SPECIAL HAZARDS	Vapors may travel to source	of ignition and flash back			
ARISING FROM THE	ING FROM THE • Air/vapor mixtures may explode when ignited				
SUBSTANCE OR	<ul> <li>Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).</li> </ul>				
MIXTURE	• 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 explosi	ion hazard indoors, outdoors or in sewers.			
	<ul> <li>Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).</li> </ul>				
EXPLOSION DATA	Hazardous Combustion	Carbon monoxide, Carbon dioxide (CO2), Nitrogen oxides (NOx), Oxides of sulfur,			
	Products	<ul> <li>Aldehydes, aromatic and other hydrocarbons.</li> </ul>			
	Sensitivity to Mechanical Impact	• None.			
	Sensitivity to Static Discharge	• Yes.			

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### PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, REDACTLED: State Mbbarakerester Bld GacOPX/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	<ul> <li>Evacuate personnel to safe areas.</li> <li>Remove all sources of ignition.</li> <li>Deny entry to unauthorized and unprotected personnel.</li> <li>Use personal protective equipment.</li> <li>Avoid contact with skin, eyes and clothing.</li> <li>Stop leak if you can do it without risk.</li> <li>Keep people away from and upwind of spill/leak.</li> <li>Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> <li>Ventilate enclosed areas.</li> <li>Do not walk through spilled material.</li> </ul>	
	Protective Equipment	Wear appropriate breathing apparatus (if applicable) and protective clothing.	
	Emergency Procedures	<ul> <li>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.</li> <li>Report spills to local or federal authorities as appropriate or required.</li> </ul>	
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	<ul> <li>Stop leak if you can do it without risk.</li> <li>Contain and recover liquid when possible.</li> <li>A vapor suppressing foam may be used to reduce vapors.</li> <li>Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.</li> <li>Use water spray to reduce vapors or divert vapor cloud drift.</li> <li>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.</li> </ul>	

### Methods for Rearing AUGTED SUBMITTE Adate UBLIC COPY

- 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	<ul> <li>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.</li> <li>Hydrogen sulfide (H<sub>2</sub>S) may be given off when this material is heated.</li> <li>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.</li> <li>The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).</li> <li>The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.</li> <li>Take precautionary measures against static discharges.</li> </ul>
	Handling	<ul> <li>Do not cut drill, grind or weld on empty containers since they may contain explosive residues.</li> <li>Stay upwind and vent open hatches before uploading.</li> <li>Avoid contact with skin, eyes and clothing.</li> <li>Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.</li> <li>Wear personal protective equipment.</li> <li>Remove and wash contaminated clothing before re-use.</li> <li>Do not eat, drink or smoke when using this product.</li> <li>Do not take internally.</li> <li>Wash thoroughly after handling.</li> <li>Empty containers pose a potential fire and explosion hazard.</li> </ul>

CONDITIONS FOR SAFE STORAGE, INCLUDING ANY	Storage	• Store in a well-ventilated place.	
INCOMPATIBILITIES		Store locked up	
		Avoid shock, impact, friction, and rough handling. Do not use sparking tools.	
		<ul> <li>Store in a cool/low-temperature, well-ventilated place away from heat and igr</li> </ul>	nition sources.
		<ul> <li>Keep away from sources of ignition.</li> </ul>	
		No Smoking.	
		<ul> <li>Do not enter confined spaces such as tanks or pits without following proper e procedures.</li> </ul>	ntry
		<ul> <li>Store in properly closed containers that are appropriately labeled and in a coor ventilated area.</li> </ul>	ol well-
		<ul> <li>Harmful concentrations of hydrogen sulfide (H<sub>2</sub>S) gas can accumulate in exca low-lying areas as well as the vapor space of storage and bulk transport comp</li> </ul>	avations and partments.
		Keep away from open flames, hot surfaces and sources of ignition.	
		Keep product and empty container away from heat and sources of ignition.	
		<ul> <li>Storage containers should be grounded and bonded.</li> </ul>	
		<ul> <li>Fixed storage containers, transfer containers and associated equipment sho grounded and bonded to prevent accumulation of static charge.</li> </ul>	uldbe
		Store away from incompatible materials.	
	Incompatil	• Strong oxidizers such as nitrates, chlorates, peroxides, chlorine.	

## Section 8: Exposure Controls/Personal Protection

	CHEMICAL NAME	ACGIH	OSHA	NIOSH	
EXPOSURE	Benzene	TLV 0.5 ppm	PEL1ppm	TWA 0.1 ppm	
GUIDELINES		TLV 1.6 mg/m <sup>3</sup>	STEL5ppm	STEL1ppm	
		STEL 2.5 ppm		IDLH 500 ppm	
		STEL 8 mg/m <sup>3</sup>			
	Bitumen	TLV 0.5 mg/m <sup>3</sup>	_	Ceiling 5 mg/m <sup>3</sup>	
	Hexane	TLV 50 ppm	PEL 500 ppm	TWA 50 ppm	
		TLV 176 mg/m <sup>3</sup>	PEL 1800 mg/m <sup>3</sup>	TWA 180 mg/m <sup>3</sup>	
				IDLH 1100 ppm	
APPROPRIATE ENGINEERING CONTROLS	Adequate ventilation sys limit values. Prevent vapo electrical equipment.	tems as needed to control con or build up by providing adequa	centrations of airborne contamina te ventilation during and after use.	ants below applicable threshold Use only appropriately classified	
INDIVIDUAL PROTECTION	Eye and Face	Wear face shield and e	ye protection.		
MEASURES	Skin and Body	The use of gloves (nitrile or neoprene) is advised to prevent skin contact and possible     irritation			
		Wear protective gloves sleeves and/or protection	s/protective clothing/eye protection ive coveralls.	on/face protection. Wear long	

**Respiratory REDACTED**FSUBMISTINAL pir RUBULE ON DRIV29 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/solvent like odor
	Substance Type	Mixture	Odor Threshold	No data available
	Appearance	Black		
PROPERTIES	рН	No data available Vapor pressure		12 to 21 kPa @ 24 °C (75.2 °F)
	Melting Point/ Freezing Point	No data available	Vapor density	No data available
	Boiling Point/ Boiling Range	68 to 1049 °F 20 to 565°C	Density	900 to 1200 kg/m³ @ 15.5 °C (59.9 °F
	Flash Point	<-0.4 to 60.8 °F <-18 to 16 °C (Closed Cup)	Water Solubility	No data available
	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	0.94
	Viscosity	52 to 96 Centistoke (cSt, cS) or mm²/sec @ 38 °C (100.4 °F)		

# Section 10: **REDACTED SUBMITTAL-PUBLIC COPY**

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	Inhalation	May cause irritation of respiratory tract. May cause drowsiness and dizziness.					
OFEXPOSURE	Eye Contact	Causes serious eye irritation.					
	Skin Contact	Causes skin irritation.					
	Ingestion	<ul> <li>Ingestion may cause ga</li> <li>Potential for aspiration if</li> <li>Aspiration may cause presented and the second seco</li></ul>	iting and diarrhea.				
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/m³ (Rat)			
	Hexane	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h			
	Sulfur	_	_	1660 mg/m³ (Mammal)			
SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS	Benzene	<ul> <li>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.</li> </ul>					

	Hexane REDAC	produced syst at hexane cond concentrations system damag	Ity of the factor of the facto	spleen and lungs ced maternal to: hown to cause t	Studies in laborator s. Fetotoxicity has b xicity. Long term ex resticular effects an	y animals have been observed posure to high d nervous	
	Hydrogen Sulfide Gas (H <sub>2</sub> S)	• Toxic by inhala respiratory trac produce heada pneumonia. Co through respira week for 10 we not affect repro concentrations cases of H <sub>2</sub> S p However, if the of oxygen to th are possible.	tion. Prolonged breath et irritation. Higher cond ache, dizziness, nervou oncentrations of >1000 atory paralysis. Rats an eks, did not produce a oduction and developn s of 75-80 ppm or 150 p oisoning have been rep exposure was sufficien e brain), neurologic effe	ing of 50-100 p centration (250- usness, nausea ) ppm will cause ad mice exposed ny toxicity excep- nent (birth defec- opm H <sub>2</sub> S, respe- ported. Comple ntly intense and ects such as am	om H <sub>2</sub> S vapors can -600 ppm) for 15-30 and pulmonary ede immediate uncons d to 80 ppm H <sub>2</sub> S, 6 l pt for irritation of na- cts or neurotoxicity) ctively. Over the yea te and rapid recove sustained causing inesia, intention trer	produce eye and O minutes can ema or bronchial sciousness and death nrs/day, 5 days/ sal passages. H <sub>2</sub> S did in rats exposed to ars a number of acute ery is the general rule. cerebral hypoxia (lack mors or brain damage	
DELAYED AND	Sensitization	• No information available					
AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG- TERM EXPOSURE	Mutagenic Effects	• May cause genetic defects					
	Carcinogenicity	Carcinogenicity  • May cause cancer					
	CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA	
INFORMATION	Benzene	A1	Х	Group1	Known	Х	
	Bitumen	A4	_	_	_	_	
	Hexane	_	Х	-	_	_	
	*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 f	Suspected of damaging fertility or the unborn child.					
STOT—SINGLE EXPOSURE	May cause drowsiness ar	nd dizziness.					
STOT—REPEATED EXPOSURE	Causes damage to organ	Causes damage to organs through prolonged or repeated exposure.					
ASPIRATION HAZARD	May be fatal if swallowed an	nd enters airways F	lisk of serious damage	to the lungs (by	aspiration).		

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## Section 12:

### REDACTED SUBMITTAL-PUBLIC COPY 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)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna) EC50 48 h: = 10 mg/L (Daphnia magna)	-		
		LC50 96 h: 70000 - 142000 µg/L static (Lepomis macrochirus)				
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	<ul> <li>Low molecular wt. component—Expected to be inherently biodegradable</li> <li>High molecular wt. component—Expected to be persistent.</li> </ul>					
BIOACCUMULATIVE	CHEMICAL	LOGPOW				
POTENTIAL	Benzene	1.83				
	Hexane	3.90				
MOBILITY IN SOIL	CHEMICAL	EXPECTED SOIL MOBILITY	ſ			
	Benzene	High				
	Hexane	High				
OTHER ADVERSE	• VOC (EPA Method 24): 2.	353 lbs/gal				

## Section 13:

## REDACTED SUBMITTAL-PUBLIC COPY Disposal Considerations

WASTE TREATMENT METHODS	Product Waste	<ul> <li>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.</li> <li>This product could also contain benzene at &gt;0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).</li> <li>This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s).</li> </ul>		
		determine appropriate disposal options.		
	Packaging Waste	<ul> <li>Container contents should be completely used and containers should be emptied prior to discard.</li> <li>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.</li> <li>Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner.</li> <li>To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.</li> </ul>		

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		Special Provision: 16
	IMO/IMDG	UN1993	FLAMMABLE LIQUIDS, N.O.S.	3		EMS No. F-E, S-E
	IATA/ICAO	UN1993	FORBIDDEN	_	_	_

SPECIAL RECAUTIONS FOR USER None specified

Section 15:

## **Regulatory Information**

U.SCERCLA/SARA	COMPONENT	CAS#	AMOUNT
SUBSTANCES AND	Benzene	71-43-2	10 lb final RQ; 4.54 kg final RQ
QUANTITIES	Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ

		E <mark>DaS</mark> ⊎BMITTA	COMPONENREDACTEDASUBMITTAL-PUBLICOUDPY			
REPORTABLE QUANTITIES OF DESIGNATED HAZARDOUS SUBSTANCES	Benzene	71-43-2	10 lb RQ			
U.SCWA	COMPONENT	CAS#	LISTED			
HAZARDOUS	Benzene	71-43-2	Х			
SOBSTANCES	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)—	COMPONENT	CAS#	LISTED			
PRIORITY POLLUTANTS	Benzene	71-43-2	Х			
	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					

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CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT— WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE	COMPONENREDACTEDASUBMITTAL-PUBLICOOPY					
	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	Х			
	Bitumen	8052-42-4	Not Listed			
	Hexane	110-54-3	Not Listed			
	Natural gas condensates (petroleum)	68919-39-1	NotListed			
	Sulfur	7704-34-9	NotListed			

X= The component is listed

Section 16:

## Other Information

NFPA	2 3 0			
	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	<ul> <li>The information present Sheet (SDS). However, S or representation, expre- nor is any authorization be assumed by vendor f practices or from any ha</li> </ul>	ed herein is based on data cons SDSs may not be used as a com ss or implied, is made as to the a given or implied to practice any p or any damage or injury resulting zards inherent in the nature of th	idered to be accurate as of the mercial specification sheet of m ccuracy or completeness of th atented invention without a lice g from abnormal use, from any f ie product.	date of preparation of this Safety Data nanufacturer or seller, and no warranty e foregoing data and safety information, nse. In addition, no responsibility can ailure to adhere to recommended

# **CENBRIDGE** REDACTED SUBMITTAL-PUBLIC COPY Safety Data Sheet

Section 1:	<b>Identification</b>	
PRODUCT IDENTIFIER	Petroleum Crude Oil—Synbit	
OTHER MEANS OF	UN-Number	UN1267
	Synonyms	Statoil Cheecham Synbit (SCS), Surmont Heavy Blend (SHB), Christina SynBit (CSB), MacKay River Heavy (MKH), Long Lake Heavy Synbit Blend (PSH)
	Chemical Category	Crude oils—extremely flammable
RECOMMENDEDUSE	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

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

CLASSIFICATION
	_	_		170
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### Signal Word REDACTED

	Hazard Pictograms			
	Hazard Statements	<ul> <li>Causes skin irritation.</li> <li>Causes serious eye irritation.</li> <li>May cause genetic defects.</li> <li>May cause cancer.</li> </ul>		
		<ul> <li>Suspected of damaging fertility or the unborn child.</li> <li>May cause respiratory irritation.</li> <li>Causes damage to organs through prolonged or repeated exposure.</li> <li>May be fatal if swallowed and enters airways.</li> <li>Extremely flammable liquid and vapor.</li> <li>May cause drowsiness or dizziness.</li> </ul>		
PRECAUTIONARY STATEMENTS	Prevention	<ul> <li>Way cause drows hess of dizzhess.</li> <li>Wash face, hands and any exposed skin thoroughly after handling.</li> <li>Wear protective gloves/protective clothing/eye protection/face protection.</li> <li>Obtain special instructions before use.</li> <li>Do not handle until all safety precautions have been read and understood.</li> <li>Use personal protective equipment as required.</li> <li>Do not breathe dust/fume/gas/mist/vapors/spray.</li> <li>Use only outdoors or in a well-ventilated area.</li> <li>Do not eat, drink or smoke when using this product.</li> <li>Keep away from heat/sparks/open flames/hot surfaces.</li> <li>Keep container tightly closed.</li> <li>No smoking.</li> <li>Ground/bond container and receiving equipment.</li> <li>Use only non-sparking tools.</li> <li>Take precautionary measures against static discharge.</li> <li>In case of inadequate ventilation wear respiratory protection.</li> <li>IF EXPOSED or concerned: Get medical advice/attention.</li> <li>IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.</li> </ul>		
	Response	<ul> <li>IF EXPOSED or concerned: Get medical advice/attention.</li> <li>IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.</li> <li>Call a POISON CENTER or doctor/physician if you feel unwell.</li> <li>IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.</li> <li>Do NOT induce vomiting.</li> <li>IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.</li> <li>In case of fire: Use CO<sub>2</sub>, dry chemical, or foam for extinction.</li> <li>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</li> <li>If SKIN irritation occurs: Get medical advice/attention.</li> <li>If EYE irritation persists: Get medical advice/attention.</li> </ul>		
	Storage/Disposal	<ul> <li>Store locked up and keep cool.</li> <li>Store in a well-ventilated place. Keep container tightly closed.</li> <li>Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.</li> </ul>		
OTHER INFORMATION	<ul> <li>Under United States Reg considered hazardous.</li> <li>Very toxic to aquatic life w</li> </ul>	ulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is vith long lasting effects.		

# Section 3:

### **REDACTED SUBMITTAL-PUBLIC COPY Composition/Information on Ingredients**

COMPONENT NAME	CASNUMBER	PERCENTAGE (%)*	NOTES
1,2,4-Trimethylbenzene	95-63-6	0-1	
1-Propanethiol	107-03-9	0-1	
2-Butanethiol	513-53-1	0-1	
2-Propanethiol	75-33-2	0-1	
Benzene	71-43-2	0-1	
Bitumen	8052-42-4	0-80	
Butane	106-97-8	0-1.2	
Cyclohexane	110-82-7	0-1	
Distillates, petroleum, petroleum residues vacuum	68955-27-1	0-30	
Ethanethiol	75-08-1	0-1	
Ethylbenzene	100-41-4	0-5	
Fuels, diesel, No. 2	68476-34-6	0-15	
Gas oil, blend	64741-44-2	0-15	
Heavy straight-run (petroluem) naphtha	64741-41-9	0-5	
Heptane	142-82-5	0-2.5	
Hexane	110-54-3	0-5	
Hydrogen Sulfide	7783-06-4	0-0.1	
Methanethiol	74-93-1	0-1	
Methylcyclohexane	108-87-2	0-1	
Methylcyclopentane	96-37-7	0-1	
Naphtha (petroleum), hydrotreated light	64742-49-0	0-30	
Naphthalene	91-20-3	0-5	
Natural Gas Condensates (petroleum)	64741-47-5	0-30	
n-Butanethiol	109-79-5	0-1	
Octane	111-65-9	0-2.5	
Pentane	109-66-0	0-1.5	

COMPONENT NAME RE		-PUBERCENDRY (%)* NOTES	
Petroleum	8002-05-9	0-60	
p-Xylene	106-42-3	0-1	
Residues (petroleum), vacuum	64741-56-6	0-50	
Sulfur	7704-34-9	0-3.5	
Toluene	108-88-3	0-1	
Xylene	1330-20-7	0-1	
Hydrocarbon Diluent	_	0-50	
Bitumen	128683-24-9	0-80	
Naphtha (oil sand), hydrotreated	128683-33-0	0-15	

\*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	<ul> <li>Do NOT induce vomiting. Call a physician or poison control center.</li> <li>Aspiration hazard if swallowed—can enter lungs and cause damage.</li> </ul>
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	<ul> <li>Aspiration hazard. Symptoms may be delayed.</li> <li>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.</li> <li>Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.</li> </ul>

Section 5:	Fire Fighting I	ED SUBMITTAL-PUBLIC COPY Measures		
EXTINGUISHING MEDIA	Suitable Extinguishing Media	<ul> <li>SMALL FIRES: Dry chemical, CO<sub>2</sub>, water spray or regular foam.</li> <li>LARGE FIRE: Water spray, fog or regular foam.</li> </ul>		
	Unsuitable Extinguishing Media	<ul><li>CAUTION: Use of water spray when fighting fire may be inefficient.</li><li>Do not use straight streams.</li></ul>		
FIREFIGHTING PROCEDURES	<ul> <li>FIRE INVOLVING TANKS C devices or discoloration of t</li> <li>FIRE INVOLVING TANKS C burn itself out.</li> <li>Stay upwind.</li> <li>Ventilate closed spaces bef</li> <li>Fire fighters should wear co</li> <li>FIRE: If tank, rail car or tank t evacuation for 1600 meters</li> <li>FIRE: When a large quantity (1000 feet) in all directions.</li> <li>Move containers from fire and</li> <li>LARGE FIRES: Use water s</li> </ul>	DR CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety ank. DR CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to fore entering. Implete protective clothing including self-contained breathing apparatus. truck is involved in a fire, ISOLATE for 1600 meters (1 mile) in all directions; also, consider initial (1 mile) in all directions. If this material is involved in a major fire, consider an initial evacuation distance of 300 meters rea if you can do it without risk. pray or fog; do not use straight streams.		
	<ul> <li>LARGE FIRES: If insufficient water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.</li> <li>LARGE FIRES: Flood fire area with large quantities of water, while knocking down vapors with water fog.</li> </ul>			
SPECIAL HAZARDS ARISING FROM THE SUBSTANCE OR MIXTURE	<ul> <li>Vapors may travel to source of ignition and flash back.</li> <li>Air/vapor mixtures may explode when ignited.</li> <li>Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars etc.).</li> <li>Will be easily ignited by heat, sparks or flames.</li> <li>Runoff to sewer may create fire or explosion hazard.</li> <li>Vapor explosion hazard indoors, outdoors or in sewers.</li> <li>MAY EXPLODE AND THROW FRAGMENTS 1600 meters (1 MILE) OR MORE IF FIRE REACHES CARGO.</li> <li>May create vapor/air explosion hazard indoors, outdoors or in sewers.</li> <li>Most vapors are heavier than air. They will spread along ground and collect in low or confined areas (sewers, basements, tanks).</li> </ul>			
EXPLOSION DATA	Hazardous Combustion Products	<ul> <li>Carbon monoxide. Carbon dioxide (CO<sub>2</sub>). Nitrogen oxides (NOx). Oxides of sulfur.</li> <li>Aldehydes, aromatic and other hydrocarbons.</li> </ul>		
	Sensitivity to Mechanical Impact	• None.		
	Sensitivity to Static Discharge	• Yes.		

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#### PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIREFIGHTERS

- As in any fire, REDACTLED: Sale Mbbarakeres/BldGaCOPX/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	<ul> <li>Evacuate personnel to safe areas.</li> <li>Remove all sources of ignition.</li> <li>Deny entry to unauthorized and unprotected personnel.</li> <li>Use personal protective equipment.</li> <li>Avoid contact with skin, eyes and clothing.</li> <li>Stop leak if you can do it without risk.</li> <li>Keep people away from and upwind of spill/leak.</li> <li>Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> <li>Ventilate enclosed areas.</li> <li>Do not walk through spilled material.</li> </ul>			
	Protective Equipment	Wear appropriate breathing apparatus (if applicable) and protective clothing.			
	Emergency Procedures	<ul> <li>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.</li> <li>Beport spills to local or federal authorities as appropriate or required.</li> </ul>			
ENVIRONMENTAL PRECAUTIONS	Avoid run off to waterways are confined areas. Runoff from f	nd sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or ire control may cause pollution.			
METHODS AND MATERIAL FOR CONTAINMENT AND CLEANING UP	Methods for Containment	<ul> <li>Stop leak if you can do it without risk.</li> <li>Contain and recover liquid when possible.</li> <li>A vapor suppressing foam may be used to reduce vapors.</li> <li>Dike far ahead of spill; use dry sand to contain the flow of material; contain water spills by booming.</li> <li>Use water spray to reduce vapors or divert vapor cloud drift.</li> <li>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.</li> </ul>			

### Methods for RETINACTED SUBMITTER ALERBUBLIC COPY

- 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	<ul> <li>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.</li> <li>The use of explosion-proof equipment is recommended and may be required (see appropriate fire codes).</li> <li>The use of appropriate respiratory protection is advised when concentrations exceed any established exposure limits.</li> <li>Take precautionary measures against static discharges.</li> </ul>
	Handling	<ul> <li>Do not cut drill, grind or weld on empty containers since they may contain explosive residues.</li> <li>Stay upwind and vent open hatches before uploading.</li> <li>Avoid contact with skin, eyes and clothing.</li> <li>Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.</li> <li>Wear personal protective equipment.</li> <li>Remove and wash contaminated clothing before re-use.</li> <li>Do not eat, drink or smoke when using this product.</li> <li>Do not take internally.</li> <li>Wash thoroughly after handling.</li> <li>Empty containers pose a potential fire and explosion hazard.</li> </ul>

CONDITIONS FOR	Storage	<b>REDAC1</b>	ED/SUBMITSTALesPUBLIC COPY
SAFE STORAGE,			Store in a well-ventilated place.
INCLUDING ANY			Keep container tightly closed.
INCOMPATIBILITIES			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.
			<ul> <li>Do not enter confined spaces such as tanks or pits without following proper entry procedures.</li> </ul>
			<ul> <li>Store in properly closed containers that are appropriately labeled and in a cool well- ventilated area.</li> </ul>
			<ul> <li>Harmful concentrations of hydrogen sulfide (H<sub>2</sub>S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.</li> </ul>
			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.
			<ul> <li>Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.</li> </ul>
			Store away from incompatible materials.
	Incompati	ble Products	Strong oxidizers such as nitrates, chlorates, peroxides.

Section 8:

### CONTROL PARAMETERS: EXPOSURE

**GUIDELINES** 

# **Exposure Controls/Personal Protection**

CHEMICAL NAME	ACGIH	OSHA	NIOSH
1,2,4-Trimethylbenzene	_	_	TWA 25 ppm TWA 125 mg/m <sup>3</sup>
1-Propanethiol	_	_	Ceiling 0.5 ppm Ceiling 1.6 mg/m <sup>3</sup>
2-Butanethiol	TLV 0.5 mg/m <sup>3</sup>	PEL 10 ppm PEL 35 mg/m <sup>3</sup>	Ceiling 0.5 ppm Ceiling 1.8 mg/m <sup>3</sup>
Benzene	TLV 0.5 ppm TLV 1.6 mg/m <sup>3</sup> STEL 2.5 ppm STEL 8 mg/m <sup>3</sup>	PEL1ppm STEL5ppm	TWA 0.1 ppm STEL 1 ppm IDLH 500 ppm
Bitumen	TLV 0.5 mg/m <sup>3</sup>	-	Ceiling 5 mg/m <sup>3</sup>
Butane	TLV 1000 ppm	_	TWA 800 ppm TWA 1900 mg/m <sup>3</sup>
Cyclohexane	TLV 100 ppm TLV 334 mg/m <sup>3</sup>	PEL 300 ppm PEL 1050 mg/m³	TWA 300 ppm TWA 1050 mg/m <sup>3</sup> IDLH 1300 ppm

Ethanethiol REDACTED SUBMITTAL-PUBLing@ORY Ceiling 0.5 ppm				
		Ceiling 25 mg/m <sup>3</sup>	Ceiling 1.3 mg/m <sup>3</sup>	
Ethylbenzene	TLV 20 ppm TLV 87 mg/m³	PEL 100 ppm PEL 435 mg/m <sup>3</sup>	TWA 100 ppm TWA 435 mg/m <sup>3</sup> STEL 125 ppm STEL 545 mg/m <sup>3</sup> IDLH 800 ppm	
Fuels, diesel, No. 2	TLV 100 mg/m <sup>3</sup>	_	_	
Heptane	TLV 400 ppm TLV 1640 mg/m <sup>3</sup> STEL 500 ppm STEL 2000 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m³	TWA 85 ppm TWA 350 mg/m <sup>3</sup> Ceiling 440 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 750 ppm	
Hexane	TLV 50 ppm TLV 176 mg/m³	PEL 500 ppm PEL 1800 mg/m <sup>3</sup>	TWA 50 ppm TWA 180 mg/m³ IDLH 1100 ppm	
Hydrogen sulfide	TLV1ppm TLV1.4 mg/m <sup>3</sup> STEL5ppm STEL7 mg/m <sup>3</sup>	Ceiling 20 ppm	Ceiling 10 ppm Ceiling 15 mg/m <sup>3</sup> IDLH 100 ppm	
Methanethiol	TLV 0.5 ppm	Ceiling 10 ppm Ceiling 20 mg/m <sup>3</sup>	Ceiling 0.5 ppm Ceiling 1 mg/m <sup>3</sup>	
Methylcyclohexane	TLV 400 ppm TLV 1610 mg/m <sup>3</sup>	PEL 500 ppm PEL 2000 mg/m³	TWA 400 ppm TWA 1600 mg/m³ IDLH 1200 ppm	
Naphthalene	TLV 10 ppm STEL 15 ppm	PEL 10 ppm PEL 50 mg/m <sup>3</sup>	TWA 10 ppm TWA 50 mg/m <sup>3</sup> STEL 15 ppm STEL 75 mg/m <sup>3</sup>	
Octane	TLV 300 ppm TLV 1401 mg/m <sup>3</sup>	PEL 500 ppm PEL 2350 mg/m <sup>3</sup>	TWA 75 ppm TWA 350 mg/m <sup>3</sup> Ceiling 385 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1000 ppm	
Pentane	TLV 600 ppm TLV 1770 mg/m <sup>3</sup>	PEL 1000 ppm PEL 2950 mg/m <sup>3</sup>	TWA 120 ppm TWA 350 mg/m <sup>3</sup> Ceiling 610 ppm Ceiling 1800 mg/m <sup>3</sup> IDLH 1500 ppm	
Petroleum	_	_	TWA 350 mg/m <sup>3</sup> Ceiling 1800 mg/m <sup>3</sup>	

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	p-Xylene REDAC	CTED_SUBMITTAL	DSUBMITTAL-PUBERCOCOPY TWA 100 ppm			
		TLV 434 mg/m <sup>3</sup>	PEL 435 mg/m <sup>3</sup>	TWA 435 mg/m <sup>3</sup>		
		STEL 150 ppm		STEL 150 ppm		
		STEL 651 mg/m <sup>3</sup>		STEL 655 mg/m <sup>3</sup>		
				IDLH 900 ppm		
	Toluene	TLV 20 ppm	PEL 200 ppm	TWA 100 ppm		
		TLV 75 mg/m <sup>3</sup>	STEL 300 mg/m <sup>3</sup>	TWA 375 mg/m <sup>3</sup>		
				STEL 150 ppm		
				STEL 560 mg/m <sup>3</sup>		
				IDLH 500 ppm		
	Xylenes	TLV 100 ppm	PEL 100 ppm	TWA 100 ppm		
		TLV 434 mg/m <sup>3</sup>	PEL 435 mg/m <sup>3</sup>	TWA 435 mg/m <sup>3</sup>		
		STEL 150 ppm		STEL 150 ppm		
		STEL 651 mg/m <sup>3</sup>		STEL 655 mg/m <sup>3</sup>		
				IDLH 900 ppm		
APPROPRIATE ENGINEERING CONTROLS	Adequate ventilation sys limit values. Prevent vapo electrical equipment.	tems as needed to control con or build up by providing adequa	centrations of airborne contamina te ventilation during and after use.	ants below applicable threshold Use only appropriately classified		
	Eye and Face	Wear face shield and e	ye protection.			
MEASURES	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	<ul> <li>Follow the OSHA resp EN 149. Use a NIOSH/ exposure limits are exc</li> </ul>	irator regulations found in 29 CFR MSHA or European Standard EN reeded or symptoms are experier	1910.134 or European Standard 149 approved respirator if nced.		
	General Hygiene Measu	es • 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	Bark black/brown		
PROPERTIES	рН	No data available	Vapor pressure	5 to 76 kPa @ 37.8 C (100.04 F)
	Melting Point/ Freezing Point	No data available	Vapor density	1.0 to 5.0 Air=1

Boiling Point <b>REDACT</b> Boiling Range	ED: 510/B1/11TTAL-F -12 to 565°C	PUBE4@ive@Rity	No data available
Flash Point	-45.4 to 338 °F -43 to 170 °C	Water Solubility	Negligible
Evaporation Rate	No data available	Partition coefficient: n-octanol/water	No data available
Flammability (solid, gas)	No data available	Autoignition temperature	>482°F >250°C
Upper Flammability Limit	No data available	Decomposition temperature	No data available
Lower Flammability Limit	No data available	Specific Gravity	0.9026-0.9400
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 NAMEDACTEDOSEABMITTAL-PUBLICEOCAPY

LC50 INHALATION

1,2,4-Trimethylbenzene	5 g/kg (Rat)	_	18000 mg/m³ (Rat) 4h
1-Propanethiol	= 1790 mg/kg (Rat)	-	_
2-Propanethiol	_	_	130 g/m <sup>3</sup> (Mouse) 1h
Benzene	=1800 mg/kg (Rat)	-	13050 - 14380 ppm (Rat) 4 h
Bitumen	>5000 mg/kg (Rat)	-	>94.4 mg/m³ (Rat)
Butane	-	_	658 mg/L (Rat) 4 h
Cyclohexane	> 5000 mg/kg (Rat)	> 2000 mg/kg (Rabbit)	= 13.9 mg/L (Rat) 4 h
Ethanethiol	= 682 mg/kg (Rat)	500 mg (Rabbit) 24h	4420 ppm (Rat) 4h
Ethylbenzene	= 3500 mg/kg (Rat)	= 15400 mg/kg (Rabbit)	= 17.2 mg/L (Rat) 4 h
Gas oil, blend	_	= 500 mg (Rabbit)	= 1700 mg/m <sup>3</sup> (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)
Methylcyclohexane	> 3200 mg/kg (Rat)	_	-
Naphthalene	490 mg/kg (Rat)	0.05 ml (Rabbit) 24 h	-
Natural gas condensates (petroleum)	_	_	= 600 mg/m³ (Rat)
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)	500 mg (Rabbit) 24 h	-
p-Xylene	= 3910 mg/kg (Rat)	-	4550 ppm (Rat) 4h
Sulfur	-	_	1660 mg/m³ (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 REDAC	<b>TED</b> : <b>SLIB</b> : <b>Mit Tot Alex PUBL</b> : <b>Let 200</b> : A contractions 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 <sub>2</sub> S)	• Toxic by inhalation. Prolonged breathing of 50-100 ppm H <sub>2</sub> S 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 <sub>2</sub> S, 6 hrs/day, 5 days/ week for 10 weeks, did not produce any toxicity except for irritation of nasal passages. H <sub>2</sub> S did not affect reproduction and development (birth defects or neurotoxicity) in rats exposed to concentrations of 75-80 ppm or 150 ppm H <sub>2</sub> S, respectively. Over the years a number of acute cases of H <sub>2</sub> S 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	<ul> <li>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.</li> </ul>
	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.

Toluene REDA	CTERisber	AM:EXpAdurePitchBd		ne at concentrations	ranging from 120-		
	1200 ppm for listed as a car	two years did not demo cinogen by IARC.	onstrate evidence	e of carcinogenicity.	Toluene has not been		
	Target Orga toluene may o produced kid laboratory an has been sho loss and visua Beproducti	<b>Target Organs:</b> 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.					
	evidence of d increased ske maternally to Decreased s fertility. Tolue	levelopmental toxicity ir eletal variations in both i xic. No fetal toxicity was perm counts have been ne has been reported to	n laboratory anim nhalation and ora seen at doses th observed in male o cause mental or	als. Decreased feta al studies, but only at at were not materna e rats in the absence growth retardation	I body weight and doses that were ally toxic. e of a reduction in in the children of		
Ethylbenzene	Carcinogeni inhalation stu has been liste Target Orga inhalation stu foci, hypertro (hyperplasia) affects the au observed afte ethyl benzene and noise in v	<ul> <li>Solvent abusers who directly inhale toluene during pregnancy.</li> <li>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.</li> <li>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</li> </ul>					
Sensitization	No informat	tion available					
Mutagenic Effects	May cause	genetic defects					
Carcinogenicity	May cause	cancer					
CHEMICAL NAME	ACGIH	ACGIH SKIN*	IARC	NTP	OSHA		
Benzene	A1	Х	Group1	Known	Х		
Bitumen	A4	_	_	_	_		
Ethylbenzene	A3	_	Group 2B	Evidence	Х		
Fuels, diesel, No. 2	A3	Х	_	-	_		
Hexane	_	Х	_	_	_		
Naphthalene	A4	Х					
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.

DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM

SHORT- AND LONG-TERM EXPOSURE

CARCINOGENIC INFORMATION

REPRODUCTIVE TOXICITY					
STOT-SINGLE     • May cause drowsiness and dizziness.       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

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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)	
1-Propanethiol	_	-	LC 48h: 60 ug/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)	
Ethanethiol		_	EC50 48 h: >90-280 mg/L (Daphnia magna)	-	

#### ECOTOXICITY

### REDACTED SUBMITTAL-PUBLIC COPY

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)	
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)	_	
Methanethiol		-	_	LC50: 0.55-0.9 mg/L (Salmonides)	
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)	_	
n-Butanethiol	EC50 96 h: = 1068.3-5478.24 mg/l (Scenedesmus subspicatus)	LC50 96 h: = 1100-3600 mg/L (lctalurus punctatus)	_	_	
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)	
p-Xylene	EC50 3h: 430 mmol/cu (Chlamydomonas angulosa)	LC50 96h: 2600 ug/l (Oncorhynchus mykiss)	-	-	

#### ECOTOXICITY

### REDACTED SUBMITTAL-PUBLIC COPY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
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 REDACTEDOSEDEMITTAL-PUBLIC COPY

1,2,4-Trimethylbenzene	3.78
1-Propanethiol	1.81
2-butanethiol	2.18
2-Propanethiol	1.7
Benzene	1.83
Butane	2.89
Cyclohexane	3.44
Ethanethiol	1.27
Ethylbenzene	3.118
Gas oil, blend	3.3-7.06
Heptane	4.66
Hexane	3.90
Methanethiol	0.78
Methylcyclohexane	3.61
Methylcyclopentane	3.37
Naphthalene	3.30
n-Butanethiol	2.28
Octane	5.18
Pentane	3.39
p-Xylene	3.15
Toluene	2.65
Xylene	2.77-3.15
CHEMICAL	EXPECTED SOIL MOBILITY
1,2,4-Trimethylbenzene	Low
1-Propanethiol	Moderate
2-butanethiol	High
2-Propanethiol	Very High
Benzene	High
Butane	Low
Cyclohexane	Moderate
Ethanethiol	VeryHigh

**MOBILITY IN SOIL** 

### Ethylbenzen& REDACTED & SUBMITTAL-PUBLIC COPY

Gas oil, blend	Low
Heptane	Moderate
Hexane	High
Methanethiol	Very High
Methylcyclopentane	Low
Naphthalene	High to None
n-Butanethiol	Moderate
Octane	Immobile
Pentane	High
p-Xylene	Moderate to Low
Toluene	High to Moderate
Xylene	Very high to Moderate
No information available	

#### **OTHER ADVERSE EFFECTS**

#### 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.
		<ul> <li>This product could also contain benzene at &gt;0.5 ppm and could exhibit the characteristic of "toxicity" (D018) as determined by the toxicity characteristic leaching procedure (TCLP).</li> </ul>
		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	<ul> <li>Container contents should be completely used and containers should be emptied prior to discard.</li> </ul>
		<ul> <li>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.</li> </ul>
		<ul> <li>Larger empty containers, such as drums, should be returned to the distributor or to a drum re-conditioner.</li> </ul>
		<ul> <li>To assure proper disposal of smaller empty containers, consult with state and local regulations and disposal authorities.</li> </ul>

## Section 14:

### REDACTED SUBMITTAL-PUBLIC COPY Transport Information

#### \*\*CHART NAME\*\*

UN NUMBER	PROPER SHIPPING NAME	TRANSPORT HAZARD CLASS	PACKING GROUP	ENVIRONMENTAL HAZARD
UN1267	Petroleum Crude Oil	3		Emergency response guide number: 128
UN1267	Petroleum Crude Oil	3		_
UN1267	Petroleum Crude Oil	3	I	EmSNo.F-E,S-E
UN1267	Petroleum Crude Oil	3	I	3L
	UN NUMBER UN1267 UN1267 UN1267 UN1267	UN NUMBERPROPER SHIPPING NAMEUN1267Petroleum Crude OilUN1267Petroleum Crude OilUN1267Petroleum Crude OilUN1267Petroleum Crude Oil	UN NUMBERPROPER SHIPPING NAMETRANSPORT HAZARD CLASSUN1267Petroleum Crude Oil3UN1267Petroleum Crude Oil3UN1267Petroleum Crude Oil3UN1267Petroleum Crude Oil3UN1267Petroleum Crude Oil3	UN NUMBERPROPER SHIPPING NAMETRANSPORT HAZARD CLASSPACKING GROUPUN1267Petroleum Crude Oil3IUN1267Petroleum Crude Oil3IUN1267Petroleum Crude Oil3IUN1267Petroleum Crude Oil3IUN1267Petroleum Crude Oil3I

SPECIAL RECAUTIONS FOR USER

None

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
Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
Ethylbenzene	100-41-4	1000 lb final RQ; 454 kg final RQ
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
Methanethiol	74-93-1	100 lb final RQ; 45.4 kg final RQ
Naphthalene	91-20-3	100 lb final RQ; 45.4 kg final RQ
p-Xylene	106-42-3	100 lb final RQ; 45.4 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

U.SCWA	COMPONENREDACTEDAS#BMITTAL-PUBŁWOWOOPY			
REPORTABLE	Benzene	71-43-2	10 lb RQ	
DESIGNATED	Cyclohexane	110-82-7	1000 lb RQ	
SUBSTANCES	Ethylbenzene	100-41-4	1000 lb RQ	
	Hydrogen Sulfide	7783-06-4	100 lb RQ	
	Methanethiol	74-93-1	100 lb RQ	
	Naphthalene	91-20-3	100 lb RQ	
	Toluene	108-88-3	1000 lb RQ	
	Xylene	1330-20-7	100 lb RQ	
U.SCWA	COMPONENT	CAS#	AMOUNT	
(CLEAN WATER ACT)- RECOMMENDED	Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC	
CRITERIA—CCCFOR				
FRESHWATER LIFE				
U.S.—CWA (CLEAN WATER ACT)—	COMPONENT	CAS#	AMOUNT	
(CLEAN WATER ACT) – RECOMMENDED WATER QUALITY CRITERIA – CCC FOR SALTWATER LIFE	HydrogenSulfide	7783-06-4	2.0 µg/L CCC	
U.SCWA	COMPONENT	CAS#	LISTED	
(CLEAN WATER ACT)— HAZARDOUS	1,2,4-Trimethylbenzene	95-63-6	Not Listed	
SUBSTANCES	1-Propanethiol	107-03-9	Not Listed	
	2-Butanethiol	513-53-1	Not Listed	
	2-Propanethiol	75-33-2	Not Listed	
	Benzene	71-43-2	Х	
	Bitumen	8052-42-4	Not Listed	
	Butane	106-97-8	Not Listed	
	Cyclohexane	110-82-7	Х	
	Distillates, petroleum, petroleum residues vacuum	68955-27-1	Not Listed	
	Ethanethiol	75-08-1	Not Listed	

Ethylbenzene

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100-41-4

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Fuels, diesel, REDACT	ED:SUBMITTA	L-PUBNAC COPY	
Gas oil, blend	64741-44-2	Not Listed	
Heavy straight-run (petroluem) naphtha	64741-41-9	Not Listed	
Heptane	142-82-5	Not Listed	
Hexane	110-54-3	Not Listed	
Hydrogen Sulfide	7783-06-4	Х	
Methanethiol	74-93-1	Х	
Methylcyclohexane	108-87-2	NotListed	
Methylcyclopentane	96-37-7	NotListed	
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed	
Naphthalene	91-20-3	Х	
Natural gas condensates (petroleum)	64741-47-5	Not Listed	
n-Butanethiol	109-79-5	NotListed	
Octane	111-65-9	Not Listed	
Pentane	109-66-0	NotListed	
Petroleum	8002-05-9	Not Listed	
p-Xylene	106-42-3	Х	
Residues (petroleum), vacuum	64741-56-6	Not Listed	
Sulfur	7704-34-9	NotListed	
Toluene	108-88-3	Х	
Xylene	1330-20-7	Х	
X= The component is listed			
COMPONENT	CAS#	LISTED	
1,2,4-Trimethylbenzene	95-63-6	NotListed	
1-Propanethiol	107-03-9	Not Listed	
2-Butanethiol	513-53-1	Not Listed	
2-Propanethiol	75-33-2	NotListed	

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Not Listed

### Safety Data Sheet: Petroleum Crude Oil—Synbit

Benzene

Bitumen

U.S.-CWA

(CLEAN WATER ACT) – PRIORITY POLLUTANTS

71-43-2

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8052-42-4

Butane	REDACTED STUBMITTAL-PUBLIC COPY	
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Cyclohexane	110-82-7	Not Listed
Distillates, petroleum, petroleum residues vacuum	68955-27-1	Not Listed
Ethanethiol	75-08-1	Not Listed
Ethylbenzene	100-41-4	Х
Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas oil, blend	64741-44-2	Not Listed
Heavy straight-run (petroluem) naphtha	64741-41-9	Not Listed
Heptane	142-82-5	Not Listed
Hexane	110-54-3	NotListed
Hydrogen Sulfide	7783-06-4	Not Listed
Methanethiol	74-93-1	Not Listed
Methylcyclohexane	108-87-2	Not Listed
Methylcyclopentane	96-37-7	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphthalene	91-20-3	Х
Natural gas condensates (petroleum)	64741-47-5	Not Listed
n-Butanethiol	109-79-5	Not Listed
Octane	111-65-9	Not Listed
Pentane	109-66-0	Not Listed
Petroleum	8002-05-9	Not Listed
p-Xylene	106-42-3	Not Listed
Residues (petroleum), vacuum	64741-56-6	Not Listed
Sulfur	7704-34-9	Not Listed
Toluene	108-88-3	Х
Xylene	1330-20-7	Not Listed

X= The component is listed

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#### CANADA-WHMIS— CLASSIFICATIONS OF SUBSTANCES

### COMPONENREDACTEDAS BMITTAL-PUBLICS COURTYON

1,2,4-Trimethylbenzene	95-63-6	B3
1-Propanethiol	107-03-9	Not Listed
2-Butanethiol	513-53-1	NotListed
2-Propanethiol	75-33-2	NotListed
Benzene	71-43-2	B2, D2A, D2B
Bitumen	8052-42-4	NotListed
Butane	106-97-8	A, B1
Cyclohexane	110-82-7	B2, D2B
Distillates, petroleum, petroleum residues vacuum	68955-27-1	Not Listed
Ethanethiol	75-08-1	B2
Ethylbenzene	100-41-4	B2, D2A, D2B
Fuels, diesel, No. 2	68476-34-6	NotListed
Gas oil, blend	64741-44-2	Not Listed
Heavy straight-run (petroluem) naphtha	64741-41-9	Not Listed
Heptane	142-82-5	B2, D2B
Hexane	110-54-3	B2, D2A, D2B
Hydrogen Sulfide	7783-06-4	A, B1, D1A, D2B
Methanethiol	74-93-1	A, B1, D1A
Methylcyclohexane	108-87-2	B2
Methylcyclopentane	96-37-7	Not Listed
Naphtha (petroleum), hydrotreated light	64742-49-0	Not Listed
Naphthalene	91-20-3	B4, D2A
Natural gas condensates (petroleum)	64741-47-5	Not Listed
n-Butanethiol	109-79-5	B2, D1B
Octane	111-65-9	B2, D2B
Pentane	109-66-0	B2
Petroleum	8002-05-9	B2

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### p-Xylene REDACTED SUBMITTAL-PUBLAC COPY

Residues (petroleum), vacuum	64741-56-6	NotListed
Sulfur	7704-34-9	B4
Toluene	108-88-3	B2, D2A, D2B
Xylene	1330-20-7	B2, D2A, D2B
X= The component is listed		
COMPONENT	CAS #	AMOUNT
Naphthalene	91-20-3	1.1µg/L
Ethylbenzene	100-41-4	90 µg/L
Toluene	108-88-3	2.0 µg/L
Benzene	71-43-2	370 µg/L
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
COMPONENT	CAS #	LISTED
1,2,4-Trimethylbenzene	95-63-6	NotListed
1-Propanethiol	107-03-9	NotListed
2-Butanethiol	513-53-1	Not Listed
2-Propanethiol	75-33-2	NotListed
Benzene	71-43-2	Х
Bitumen	8052-42-4	NotListed
Butane	106-97-8	Х
Cyclohexane	110-82-7	Х
Distillates, petroleum, petroleum residues vacuum	68955-27-1	Not Listed
Ethanethiol	75-08-1	Х

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT— WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

CANADA—COUNCIL OF MINISTERS OF THE ENVIRONMENT— WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

CANADA— ENVIRONMENTAL EMERGENCIES

### Ethylbenzen& EDACTED Stul BMITTAL-PUBLIC COPY

Fuels, diesel, No. 2	68476-34-6	Not Listed
Gas oil, blend	64741-44-2	NotListed
Heavy straight-run (petroluem) naphtha	64741-41-9	Not Listed
Heptane	142-82-5	NotListed
Hexane	110-54-3	NotListed
Hydrogen Sulfide	7783-06-4	Х
Methanethiol	74-93-1	Х
Methylcyclohexane	108-87-2	NotListed
Methylcyclopentane	96-37-7	NotListed
Naphtha (petroleum), hydrotreated light	64742-49-0	NotListed
Naphthalene	91-20-3	Х
Natural gas condensates (petroleum)	64741-47-5	Not Listed
n-Butanethiol	109-79-5	NotListed
Octane	111-65-9	NotListed
Pentane	109-66-0	Х
Petroleum	8002-05-9	NotListed
p-Xylene	106-42-3	NotListed
Residues (petroleum), vacuum	64741-56-6	Not Listed
Sulfur	7704-34-9	NotListed
Toluene	108-88-3	Х
Xylene	1330-20-7	Х

X= The component is listed

### Section 16:

# REDACTED SUBMITTAL-PUBLIC COPY Other Information

N

NFPA	2 0				
	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	4/10/15				
REVISION DATE	4/10/15				
DISCLAIMER	The information presen Sheet (SDS). However, or representation, expre nor is any authorization be assumed by vendor	ted herein is based on data cons SDSs may not be used as a com ess or implied, is made as to the a given or implied to practice any p for any damage or injury resultin	idered to be accurate as of the mercial specification sheet of n accuracy or completeness of th patented invention without a lice g from abnormal use, from any t	date of preparation of this Safety Data nanufacturer or seller, and no warranty e foregoing data and safety information, ense. In addition, no responsibility can failure to adhere to recommended	

practices or from any hazards inherent in the nature of the product.

# **CENBRIDGE** REDACTED SUBMITTAL-PUBLIC COPY Safety Data Sheet

Section 1:	Identification	1	
PRODUCT IDENTIFIER	High Sweet Clearbrook		
OTHER MEANS OF	UN-Number	UN1267	
IDENTIFICATION	Synonyms	Bakken Crude Oil; High Swee Sweet (NSW)	et Clearbrook (UHC); Hydrocarbons of Petroleum; North Dakota
RECOMMENDEDUSE	No information available		
RESTRICTIONS OF USE	No information available		
SUPPLIER INFORMATION	Enbridge Pipelines Inc. 1020	1 Jasper Avenue Edmonton, Albe	rta T5J 3N7 Canada TEL: 1-780-420-5210
EMERGENCY CONTACT	CHEMTREC	1-800-424-9300 for US 703-527-3887 outside US	
	CANUTEC (Canadian Transportation)	613-996-6666	
Section 2.	Hazards Iden	tification	
COOLOTIZ.			
CLASSIFICATION			Category 2
CLASSIFICATION	Skin Corrosion/Irritation Eye Irritation	-	Category 2 Category 2
CLASSIFICATION	Skin Corrosion/Irritation Eye Irritation Germ Cell Mutagenicity		Category 2 Category 2 Category 1B
CLASSIFICATION	Skin Corrosion/Irritation Eye Irritation Germ Cell Mutagenicity Carcinogenicity		Category 2 Category 2 Category 1B Category 1A
CLASSIFICATION	Skin Corrosion/Irritation Eye Irritation Germ Cell Mutagenicity Carcinogenicity Reproductive Toxicity		Category 2 Category 2 Category 1B Category 1A Category 2
CLASSIFICATION	Skin Corrosion/Irritation Eye Irritation Germ Cell Mutagenicity Carcinogenicity Reproductive Toxicity Specific Target Organ Syste	emic Toxicity (Single Exposure)	Category 2 Category 2 Category 1B Category 1A Category 2 Category 3
CLASSIFICATION	Skin Corrosion/Irritation Eye Irritation Germ Cell Mutagenicity Carcinogenicity Reproductive Toxicity Specific Target Organ Syste Specific Target Organ Toxic	emic Toxicity (Single Exposure) ity (Repeated Exposure)	Category 2 Category 2 Category 1B Category 1A Category 2 Category 3 Category 1
CLASSIFICATION	Skin Corrosion/Irritation Eye Irritation Germ Cell Mutagenicity Carcinogenicity Reproductive Toxicity Specific Target Organ Syste Specific Target Organ Toxic Aspiration Toxicity	emic Toxicity (Single Exposure) ity (Repeated Exposure)	Category 2 Category 2 Category 1B Category 1A Category 2 Category 3 Category 1 Category 1

**Hazard Pictograms** 



	Hazard State Rep A	CTED:SLIBMITTETAL-PUBLIC COPY
		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	Prevention	Wash face, hands and any exposed skin thoroughly after handling.
STATEMENTS		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.
		<ul> <li>IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.</li> </ul>
		In case of fire: Use CO2, dry chemical, or foam for extinction.
		<ul> <li>IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.</li> </ul>
		Do NOT induce vomiting.
	Storage/Disposal	Store locked up.
		<ul> <li>Store in a well-ventilated place. Keep container tightly closed.</li> </ul>
		• Keep cool.
		<ul> <li>Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.</li> </ul>
OTHER	Under United States Reg	gulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered

• Very toxic to aquatic life with long lasting effects.

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# Section 3:

### **REDACTED SUBMITTAL-PUBLIC COPY** 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.

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### REDACTED SUBMITTAL-PUBLIC COPY First Aid Measures

DESCRIPTION OF NECESSARY	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	Note to the Physician	Aspiration hazard. Symptoms may be delayed.
IMMEDIATE MEDICAL ATTENTION AND SPECIAL TREATMENT NEEDED, IF NECESSARY		• 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.
		<ul> <li>Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.</li> </ul>

# Section 5: Fire Fighting Measures

EXTINGUISHING MEDIA	Suitable Extinguishing Media	<ul> <li>SMALL FIRES: Dry chemical, CO2, water spray or regular foam.</li> <li>LARGE FIRE: Water spray, fog or regular foam.</li> </ul>	
	Unsuitable Extinguishing Media	<ul> <li>CAUTION: Use of water spray when fighting fire may be inefficient.</li> <li>Do not use straight streams.</li> </ul>	
FIREFIGHTING PROCEDURES	<ul> <li>FIRE INVOLVING TANKS OF devices or discoloration of tal</li> <li>FIRE INVOLVING TANKS OF burn itself out.</li> </ul>	R CAR/TRAILER LOADS: Withdraw immediately in case of rising sound from venting safety ank. R CAR/TRAILER LOADS: If impossible to extinguish, protect surroundings and allow fire to	
	<ul><li>Stay upwind.</li><li>Ventilate closed spaces before</li></ul>	pre entering.	
	<ul> <li>Fire fighters should wear complete protective clothing including self-contained breathing apparatus.</li> <li>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.</li> </ul>		

	• FIRE: When <b>REDAC</b> it, E DS <b>StUBNINTOVALIDER AND INTOVALIDER CONSUMPLY</b> in the evacuation distance of 300 meters (1000 feet) in all directions.				
	Move containers from fire a	Move containers from fire area if you can do it without risk.			
	LARGE FIRES: Use water s	pray or fog; do not use straight streams.			
	LARGE FIRES: If insufficien	t water supply: knock down vapors only. If this is impossible, withdraw from area and let fire burn.			
	LARGE FIRES: Flood fire an	ea with large quantities of water, while knocking down vapors with water fog.			
SPECIAL HAZARDS	Vapors may travel to source	e of ignition and flash back.			
ARISING FROM THE	<ul> <li>Air/vapor mixtures may exp</li> </ul>	lode when ignited.			
SUBSTANCE OR	Vapors may accumulate in a	confined areas (basement, tanks, hopper/tank cars etc.).			
MIXTORE	<ul> <li>Will be easily ignited by heat</li> </ul>	t, 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.				
	<ul> <li>Most vapors are heavier that tanks).</li> </ul>	an air. They will spread along ground and collect in low or confined areas (sewers, basements,			
EXPLOSION DATA	Hazardous Combustion	Carbon monoxide. Carbon dioxide (CO2). Nitrogen oxides (NOx). Oxides of sulfur.			
	Products	Aldehydes, aromatic and other hydrocarbons.			
	Sensitivity to Mechanical Impact	• None.			
	Sensitivity to Static Discharge	• Yes.			
PROTECTIVE EQUIPMENT AND	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.				
PRECAUTIONS FOR FIREFIGHTERS	<ul> <li>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.</li> </ul>				
	Carbon dioxide can displace oxygen. Use caution when applying carbon dioxide in confined spaces.				
	<ul> <li>Water spray may be useful in</li> </ul>	n 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	Personal Precautions	Evacuate personnel to safe areas.
		Remove all sources of ignition.
		Deny entry to unauthorized and unprotected personnel.
		Use personal protective equipment.
PROCEDURES		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.
		<ul> <li>Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.</li> </ul>

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• 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 ar confined areas. Runoff from f	nd sewers. Do NOT wash away into sewer. Prevent entry into waterways, sewers, basements or ire control may cause pollution.
METHODS AND	Methods for Containment	Stop leak if you can do it without risk.
MATERIAL FOR		Contain and recover liquid when possible.
CONTAINMENT AND		A vapor suppressing foam may be used to reduce vapors.
CLEANING OF		• 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
		<ul> <li>Use suitable absorbent materials such as vermiculite, sands, soil, or clay to clean up residual liquids.</li> </ul>
		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).

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<ul> <li>Take procautionary measures against static discharges.</li> <li>Handling</li> <li>Do not cut drill, grind or weld on empty containers since they may contain explosive residues.</li> <li>Stay upwind and vent open hatches before uploading.</li> <li>Avoid contact with skin, eyes and clothing.</li> <li>Exercise good personal hygiene including removal of solled clothing and prompt washing with scap and water.</li> <li>Waar personal protective equipment.</li> <li>Remove and wash contaminated clothing before re-use.</li> <li>Do not take internally.</li> <li>Wash throroughly after handling.</li> <li>Empty containers pose a potential fire and explosion hazard.</li> </ul> Some Storage Storage <ul> <li>Ventilate enclosed areas.</li> <li>Store locked up.</li> <li>Avoid shock, impact, friction, and rough handling. Do not use sparking tools.</li> <li>Store locked up.</li> <li>Avoid shock, impact, friction, and rough handling. Do not use sparking tools.</li> <li>Store locked up.</li> <li>Avoid shock, impact, friction, and rough handling. Do not use sparking tools.</li> <li>Store locked up.</li> <li>No Smoking.</li> <li>Do not entite confined spaces such as tanks or pils without following proper entry procedures.</li> <li>Store in property closed containers that are appropriately labeled and in a cool well-vertilated containers that are appropriately labeled and in a cool well-vertilated containers should be grounded and bounded.</li> <li>Fixed storage containers should be grounded and sources of ignition.</li> <li>Keep rowal rom open flames, hot surfaces and sources of ignition.</li> <li>Store in properly closed containers and associated equipment should be grounded and borded.</li> <li>Fixed storage containers should be grounded and bounded.</li> <li>Store avay from heat and sources of ignition.</li> <li>Store age containers should be grounded and bounded.</li> <li>Fixed storage container</li></ul>			established exposure limits.
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<ul> <li>Keep container tightly closed.</li> <li>Store locked up.</li> <li>Avoid shock, impact, friction, and rough handling. Do not use sparking tools.</li> <li>Store in a cool/low-temperature, well-ventilated place away from heat and ignition sources.</li> <li>Keep away from sources of ignition.</li> <li>No Smoking.</li> <li>Do not enter confined spaces such as tanks or pits without following proper entry procedures.</li> <li>Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area.</li> <li>Harmful concentrations of hydrogen sulfide (H<sub>2</sub>S) gas can accumulate in excavations and low-lying areas as well as the vapor space of storage and bulk transport compartments.</li> <li>Keep product and empty container away from heat and sources of ignition.</li> <li>Storage containers should be grounded and bonded.</li> <li>Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.</li> <li>Store away from incompatible materials.</li> </ul>	SAFE STORAGE,		Store in a well-ventilated place.
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			Store away from incompatible materials.

Incompatible Products • Strong oxidized

Strong oxidizers such as nitrates, chlorates, peroxides.

Section 8:

# **Exposure Controls/Personal Protection**

CONTROL PARAMETERS:	CHEMICAL NAME	ACGIH	OSHA	NIOSH
EXPOSURE	2-Methylpentane	-	-	TWA 100 ppm
GUIDELINES				TWA 350 mg/m <sup>3</sup>
				Ceiling 510 ppm
				Ceiling 1800 mg/m <sup>3</sup>

3-Methylpen Re DAC	TED SUBMITTAL-	PUBLIC COPY	TWA 100 ppm
			TWO 350 mg/m <sup>3</sup>
			Ceiling 510 ppm
			Ceiling 1800 mg/m <sup>3</sup>
Benzene	TLV 0.5 ppm	PEL1ppm	TWA 0.1ppm
	TLV 1.6 mg/m <sup>3</sup>	STEL 5 ppm	STEL1ppm
	STEL 2.5 ppm		IDLH 500 ppm
	STEL 8 mg/m <sup>3</sup>		
Cyclohexane	TLV 100 ppm	PEL 300 ppm	TWA 300 ppm
	TLV 334 mg/m <sup>3</sup>	PEL 1050 mg/m <sup>3</sup>	TWA 1050 mg/m <sup>3</sup>
			IDLH 1300 ppm
-Pentane	TLV 600 ppm	PEL 1000 ppm	TWA 120 ppm
	TLV 1770 mg/m <sup>3</sup>	PEL 2950 mg/m <sup>3</sup>	TWA 350 mg/m <sup>3</sup>
			Ceiling 610 ppm
			Ceiling 1800 mg/m <sup>3</sup>
			IDLH 1500 ppm
MethylCyclohexane	TLV 400 ppm	PEL 500 ppm	TWA 400 ppm
	TLV 1610 mg/m <sup>3</sup>	PEL 2000 mg/m <sup>3</sup>	TWA 1600 mg/m <sup>3</sup>
			IDLH 1200 ppm
n-Butane	TLV 1000 ppm	-	TWA 800 ppm
			TWA 1900 mg/m <sup>3</sup>
n-Heptane	TLV 400 ppm	PEL 500 ppm	TWA 85 ppm
	TLV 1640 mg/m <sup>3</sup>	PEL 2000 mg/m <sup>3</sup>	TWA 350 mg/m <sup>3</sup>
	STEL 500 ppm		Ceiling 440 ppm
	STEL 2000 mg/m <sup>3</sup>		Ceiling 1800 mg/m <sup>3</sup>
			IDLH 750 ppm
n-Hexane	TLV 50 ppm	PEL 500 ppm	TWA 50 ppm
	TLV 176 mg/m <sup>3</sup>	PEL 1800 mg/m <sup>3</sup>	TWA 180 mg/m <sup>3</sup>
			IDLH 1100 ppm
n-Pentane	TLV 600 ppm	PEL 1000 ppm	TWA 120 ppm
	TLV 1770 mg/m <sup>3</sup>	PEL 2950 mg/m <sup>3</sup>	TWA 350 mg/m <sup>3</sup>
			Ceiling 610 ppm
			Ceiling 1800 mg/m <sup>3</sup>
			IDLH 1500 ppm
n-Octane	TLV 300 ppm	PEL 500 ppm	TWA 75 ppm
	TLV 1401 mg/m <sup>3</sup>	PEL 2350 mg/m <sup>3</sup>	TWA 350 mg/m <sup>3</sup>
			Ceiling 385 ppm
			Ceiling 1800 mg/m <sup>3</sup>
			IDLH 1000 ppm
n-Nonane	TLV 200 ppm	-	TWA 200 ppm
	$TLV 1050 mg/m^3$		$TWA 1050 mg/m^3$

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	ℂℹℇⅅℷ⅋ⅆ℞ℍℹℹÅℾ	-PUBERCOCOPY	TWA 100 ppm
	TLV 75 mg/m <sup>3</sup>	STEL 300 mg/m <sup>3</sup>	TWA 375 mg/m <sup>3</sup>
			STEL 150 ppm
			$STEL560mg/m^3$
			IDLH 500 ppm
Hydrogen sulfide	TLV1ppm	Ceiling 20 ppm	Ceiling 10 ppm
	TLV 1.4 mg/m <sup>3</sup>		Ceiling 15 mg/m <sup>3</sup>
	STEL5ppm		IDLH 100 ppm
	STEL 7 mg/m <sup>3</sup>		
Ethylbenzene	TLV 20 ppm	PEL 100 ppm	TWA 100 ppm
	TLV 87 mg/m <sup>3</sup>	PEL 435 mg/m <sup>3</sup>	TWA 435 mg/m <sup>3</sup>
			STEL 125 ppm
			STEL 545 mg/m <sup>3</sup>
			IDLH 800 ppm
Xylenes	TLV 100 ppm	PEL 100 ppm	TWA 100 ppm
	TLV 434 mg/m <sup>3</sup>	PEL 435 mg/m <sup>3</sup>	TWA 435 mg/m <sup>3</sup>
	STEL 150 ppm		STEL 150 ppm
	STEL 651 mg/m <sup>3</sup>		STEL 655 mg/m <sup>3</sup>
			IDLH 900 ppm
Adequate ventilation system     limit values. Prevent vap	stems as needed to control cor or build up by providing adequa	centrations of airborne contamina ate ventilation during and after use	ants below applicable thres Use only appropriately clas
electrical equipment.			
electrical equipment.	Wear face shield and e	eye protection.	
electrical equipment.	<ul> <li>Wear face shield and e</li> <li>The use of gloves (nitr irritation.</li> </ul>	eye protection. Ile or neoprene) is advised to preve	ent skin contact and possibl
electrical equipment. Eye and Face Skin and Body	<ul> <li>Wear face shield and e</li> <li>The use of gloves (nitr irritation.</li> <li>Wear protective glove sleeves and/or protective</li> </ul>	eye protection. ile or neoprene) is advised to preve s/protective clothing/eye protecti tive coveralls.	ent skin contact and possib on/face protection. Wear lo
electrical equipment. Eye and Face Skin and Body Respiratory	<ul> <li>Wear face shield and e</li> <li>The use of gloves (nitrivitation.</li> <li>Wear protective glove sleeves and/or protection</li> <li>Follow the OSHA respective Show the Show the OSHA respective Show the OSHA respe</li></ul>	eye protection. ile or neoprene) is advised to preve s/protective clothing/eye protecti- tive coveralls. irator regulations found in 29 CFF 'MSHA or European Standard EN ceeded or symptoms are experier	ent skin contact and possib on/face protection. Wear lo 1910.134 or European Stan 149 approved respirator if need.

# 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			

APPROPRIATE ENGINEERING CONTROLS

INDIVIDUAL PROTECTION MEASURES

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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 1330 °F 28.1 to 721.1 °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 mm²/s		

# Section 10: Stability and Reactivity

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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	Inhalation	May cause irritation of respiratory tract. May cause drowsiness and dizziness.
OFEXPOSURE	Eye Contact	Causes serious eye irritation.
	Skin Contact	Causes skin irritation.
#### REDACTEDInStaliBMaycauAdgeRtolBatl@infatioR, Nausea, vomiting and diarrhea. Ingestion

• Potential for aspiration if swallowed.

• Aspiration may cause pulmonary edema and pneumonitis.

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TOXICOLOGICAL DATA	CHEMICAL NAME	LD50 ORAL	LD50 DERMAL	LC50 INHALATION		
	Benzene	1800 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/m³ (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/m³ ( 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	<ul> <li>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 cycle and embryo/fetotoxicity, but not teratogenicity.</li> </ul>				

	Hydrogen Su <mark>Rate Daal</mark>		AllationAlcology	Breffin GO	$(250-600 \text{ ppm} \text{ H}_2\text{S} \text{ vapors can produce eye and})$		
		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	<ul> <li>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.</li> </ul>					
DELAYED AND	Sensitization	No information available					
AND ALSO CHRONIC	Mutagenic Effects	May cause genetic defects					
SHORT- AND LONG- TERM EXPOSURE	Carcinogenicity	May cause	ecancer				
	CHEMICAL NAME	ACGIH	IARC	NTP	OSHA		
	Benzene	A1	Group1	Known	Х		
	Toluene	A4	Group 3	Evidence	-		
	Ethylbenzene	A3	Group 2B	Evidence	Х		
	Xylenes	A4	Group 3	Evidence	-		
REPRODUCTIVE TOXICITY	Suspected of damaging	fertility or the unbc	orn child.				
STOT - SINGLE EXPOSURE	No information available.						
STOT - REPEATED EXPOSURE	Causes damage to organ	ns through prolong	ged or repeated e	exposure.			
ASPIRATION HAZARD	May be fatal if swallowed a	and enters airways	Risk of serious da	amage to the lun	gs (by aspiration).		

# Section 12:

# REDACTED SUBMITTAL-PUBLIC COPY Ecological Information

#### ECOTOXICITY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Benzene	EC5072h:=29mg/L (Pseudokirchneriella	LC50 96 h: 10.7 - 14.7 mg/L flow- through (Pimephales promelas)	EC50 48 h: 8.76 - 15.6 mg/L Static (Daphnia magna)	-
	subcapitata)	LC50 96 h: = 5.3 mg/L flow- through (Oncorhynchus mykiss)	EC50 48 h: = 10 mg/L (Daphnia magna)	
		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)		
Cyclohexane	EC50 72 h: > 500 mg/L (Desmodesmus subspicatus)	LC50 96 h: 3.96 - 5.18 mg/L flow- through (Pimephales promelas)	EC50 24 h: > 400 mg/L (Daphnia magna	EC50 = 85.5 mg/L 5 min EC50 = 93 mg/L 10 min
		LC50 96 h: 23.03 - 42.07 mg/L static (Pimenhales prometas)		(Microorganisms)
		LC50 96 h: 24.99 - 44.69 mg/L		
		static (Lepomis macrochirus) LC50 96 h: 48.87 - 68.76 mg/L		
		static (Poecilia reticulata)		
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 = 890 mg/L 30 min (Microorganisms)
			EC50 48 h: = 0.02856 mg/L (Daphnia magna)	EC50 <1.67hr: 120 µg/l Mytilus edulis (Common Bay Mussel)
n-Undecane	-	-	-	-
n-Dodecane		-	-	-
n-Tridecane	-	-	-	-

#### ECOTOXICITY

# REDACTED SUBMITTAL-PUBLIC COPY

CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY
Toluene	EC50: >433 mg/L Pseudokirchneriella subcapitata 96 h	LC50: 15.22 - 19.05 mg/L Pimephales promelas 96 h flow-through	EC50 48 h: 5.46 - 9.83 mg/L Static (Daphnia magna) EC50 48 h: = 11.5 mg/L	EC50 = 19.7 mg/L 30 min (Microorganisms)
	EC50: 12.5 mg/L Pseudokirchneriella subcapitata 72 h static	LC50: 12.6 mg/L Pimephales promelas 96 h static	(Daphnia magna)	
		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		
Hydrogen sulfide		LC50 96h: 49 µg/l Oncorhynchus mykiss (Rainbow Trout) eggs	EC50 48h: 62 µg/l Gammarus pseudolimnaeus (Scud)	
		LC50 24h: 1059.7 µg/l Pimephales promelas (Fathead Minnow)		
Ethylbenzene	EC50 72 h: = 4.6 mg/L (Pseudokirchneriella	LC50 96 h: 11.0 - 18.0 mg/L static (Oncorhynchus mykiss)	EC50 48 h: 1.8 - 2.4 mg/L (Daphnia magna)	EC50 = 9.68 mg/L 30 min EC50 = 96mg/L 24 h
	subcapitata) EC50 96 h: > 438 ma/L	LC50 96 h: = 4.2 mg/L semi- static (Oncorhynchus mykiss)		(Microorganisms)
	(Pseudokirchneriella subcapitata)	LC50 96 h: 7.55 - 11 mg/L flow-		
	EC50 72 h: 2.6 - 11.3 mg/L static (Pseudokirchneriella	LC50 96 h = 32 mg/L static		
	subcapitata) EC50.96 h 17 - 76 mg/l	LC50 96 h: 9.1 - 15.6 mg/L static		
	EC50 96 h: 1.7 - 7.6 mg/L static (Pseudokirchneriella subcapitata) EC50 72 h: = 11 mg/L (Pseudokirchneriella subcapitata)	(Prinepriales prometas) LC50 96 h: = 9.6 mg/L static (Poecilia reticulata)		

ECOTOXICITY	REDACTED SUBMITTAL-PUBLIC COPY						
CHEMICAL NAME	TOXICITY TO ALGAE	TOXICITY TO FISH	DAPHNIA MAGNA (WATER FLEA)	OTHER TOXICITY			
Xylenes	EC50 72 h: = 11 mg/L (Pseudokirchneriella	LC50 96 h: = 13.4 mg/L flow- through (Pimephales promelas)	EC50 48 h: = 3.82 mg/L (water flea)	-			
	subcapitata)	LC50 96 h: 2.661 - 4.093 mg/L static (Oncorhynchus mykiss)	LC50 48 h: = 0.6 mg/L (Gammarus lacustris)				
		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)					

#### PERSISTENCE AND DEGRADABILITY

No information available

BIOACCUMULATIVE	CHEMICAL	LOGPOW
	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

# CyclohexaneREDACTED: SUBMITTAL-PUBLIC COPY

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
No information available	

#### OTHER ADVERSE EFFECTS

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).
		<ul> <li>It is the responsibility of the user to consult federal, state and local waste regulations to determine appropriate disposal options.</li> </ul>

Packaging WREDACTEDCStdBMMTehAlbeRUBble@Q22

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	l	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	None					

**FOR USER** 

# Section 15:

# **Regulatory Information**

U.SCERCLA/ SARA-HAZARDOUS	COMPONENT	CAS#	AMOUNT
SUBSTANCES AND THEIR REPORTABLE QUANTITIES	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.SCWA	COMPONENREDACTEDAS⊌BMITTAL-PUBLMOUDOPY				
ACT) - REPORTABLE	Hydrogen Sulfide	7783-06-4	100 lb RQ		
DESIGNATED HAZARDOUS SUBSTANCES	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)	COMPONENT	CAS#	AMOUNT		
- RECOMMENDED WATER QUALITY CRITERIA - CCC FOR FRESHWATER LIFE	Hydrogen Sulfide	7783-06-4	2.0 µg/L CCC		
U.S CWA (CLEAN	COMPONENT	CAS#	AMOUNT		
• RECOMMENDED WATER QUALITY CRITERIA - CCC FOR SALTWATER LIFE	HydrogenSulfide	7783-06-4	2.0 µg/L CCC		
U.S CWA (CLEAN	COMPONENT	CAS#	LISTED		
- HAZARDOUS	Hydrogen Sulfide	7783-06-4	Х		
SOBOTANCES	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	Х		
	Heptane	142-82-5	Not Listed		
	Toluene	108-88-3	Х		
	Xylene	1330-20-7	Х		
	Benzene	71-43-2	Х		

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### Butane REDACTED Sta BMITTAL-PUBLACSCOPY

Hexane	110-54-3	NotListed	
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			
COMPONENT	CAS#	LISTED	
Hydrogen Sulfide	7783-06-4	NotListed	
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	NotListed	
Decane	124-18-5	NotListed	
Octane	111-65-9	NotListed	
Dodecane	112-40-3	Not Listed	
Ethylbenzene	100-41-4	Х	
Heptane	142-82-5	Not Listed	
Toluene	108-88-3	Х	
Xylene	1330-20-7	Not Listed	
Benzene	71-43-2	Х	
Butane	106-97-8	Not Listed	
Hexane	110-54-3	Not Listed	
2-Methylpentane	107-83-5	Not Listed	
3-Methylpentane	96-14-0	NotListed	

#### U.S.-CWA (CLEAN WATER ACT) - HAZARDOUS SUBSTANCES

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### Tridecane REDACTE® StdBMITTAL-PUBLIC COPY

Undecane	1120-21-4	NotListed	
2-Methylheptane	592-27-8	NotListed	

#### **US-STATE-RIGHT-TO-KNOW**

CHEMICAL	NEW JERSEY	MASS	ACHUSETTS	PENNSYL	/ANIA	ILLINOIS	<b>RHODE ISLAND</b>
Nonane	Х	Х		Х		-	Х
Decane	Х	-		Х		-	Х
Hexane	Х	Х		Х		Х	Х
MethylCyclohexane	Х	Х		Х		-	Х
Octane	Х	Х		Х		-	Х
n-Heptane	Х	Х		Х		-	Х
Butane	Х	Х		Х		-	Х
Ethylbenzene	Х	Х		Х		Х	Х
Toluene	Х	Х		Х		Х	Х
Cyclohexane	Х	Х		Х		-	Х
Xylene, mixed isomers	Х	Х		Х		Х	Х
Benzene	Х	Х		Х		Х	Х
CANADA-WHMIS- CLASSIFICATIONS OF	COMPONENT		CAS#		CLASS	FICATION	
SUBSTANCES	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	

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### n-Pentane REDACTED Sto BMITTAL-PUBEIC COPY

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			
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	
COMPONENT	CAS #	AMOUNT	
Ethylbenzene	100-41-4	25 µg/L	
Toluene	108-88-3	215 µg/L	
Benzene	71-43-2	110 µg/L	
COMPONENT	CAS #	LISTED	
Hydrogen sulfide	7783-06-4	Х	
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	Х	
Decane	124-18-5	Not Listed	
Decane Octane	124-18-5 111-65-9	Not Listed	

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR FRESHWATER AQUATIC LIFE

CANADA - COUNCIL OF MINISTERS OF THE ENVIRONMENT - WATER QUALITY GUIDELINES FOR MARINE AQUATIC LIFE

CANADA -

ENVIRONMENTAL EMERGENCIES

# Dodecane REDACTED2SUBMITTAL-PUBLdCsGOPY

Ethylbenzene	100-41-4	Х
Heptane	142-82-5	NotListed
Toluene	108-88-3	Х
Xylene	1330-20-7	Х
Benzene	71-43-2	Х
Butane	106-97-8	Х
Hexane	110-54-3	NotListed
2-Methylpentane	107-83-5	NotListed
3-Methylpentane	96-14-0	NotListed
Tridecane	629-50-5	NotListed
Undecane	1120-21-4	NotListed
2-Methylheptane	592-27-8	NotListed
Petroleum Hydrocarbons	68919-39-1	NotListed

X= The component is listed

Section 16:

# • Other Information

NFPA	2 1						
	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 presen Sheet (SDS). However, i or representation, expre nor is any authorization be assumed by vendor practices or from any ha	ted herein is based on data cons SDS's may not be used as a com ess or implied, is made as to the a given or implied to practice any p for any damage or injury resultin azards inherent in the nature of th	idered to be accurate as of the imercial specification sheet of r accuracy or completeness of th patented invention without a lice g from abnormal use, from any t ine product.	date of preparation of this Safety Data nanufacturer or seller, and no warranty e foregoing data and safety information, ense. In addition, no responsibility can failure to adhere to recommended			

### CENTRAL REGION

FIELD EMERGENCY RESPONSE PLAN

Effective 2017/2018

ENBRIDGE

# 13.0 FORMS

The following forms should be used, when applicable, in the initial phases of an emergency response

### **Table of Contents**

ICP 001	Receiving Emergency Information
ICP 002	First Responder Checklist
ICP 005	Threat Checklist
ICP 006	Site Monitoring Template
ICP 012	Elevated Security Measures Checklist
ICS 201-1	Incident Briefing Map/Sketch
ICS 201-2	Summary of Current Actions
ICS 201-3/ ICS 207	Current Organization
ICS 201-4	Resource Summary
ICS 201-5	Site Safety and Control Analysis
ICS 204	Assignment List
ICS 214a	Individual Logs

	REDACTED SUBN	<b>IITTAL-PUBLIC</b>	COPY
CENTRAL REGION			SENBRIDGE

FIELD EMERGENCY RESPONSE PLAN

Effective 2017/2018

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**Receiving Emergency Information** 

and the second	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:		1.0
and the second se	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	and the second
If this is a potential emergency and y	ou are the first Enbridge point-or	f-contact, call the Control Centre at:
US Regions 1-800-858-5253	Cushing Control Cer 1-918-223-2461	ntre
CND Region 1-877-420-8800	Enbridge Media Hotli 1-888-992-0997	ine Canada
Athabasca and Western Region 1-888-813-6844	Enbridge Media Hotl 1-800-496-8142	ine U.S.
In Quebec 1-780-420-8899		
North Dakota Region 1-888-838-4534		
and the second se	Other Information	
Give Warning Information for NGL/Crude oil if appropriate (see		





**Initial Response Checklist** 

Purpo	se: 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).
EXPL	ORE – 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.
	<ul> <li>Conduct a field level hazard assessment to identify and mitigate all hazards including potential for fire, explosion, and hazardous toxic vapors.</li> <li>Determine the wind direction and approach cautiously from upwind.</li> <li>Explore the suspected release area only when wearing appropriate PPE using the buddy system if possible.</li> <li>Ensure safety of personnel in the area.</li> <li>Eliminate or shut off all potential ignition sources in the immediate area</li> <li>Use intrinsically safe equipment (e.g., flashlights, two-way radios, gas detectors with audible alarms).</li> </ul>
	<ul> <li>If appropriate, request surveillance fly-over to determine: <ul> <li>If there is any abnormal activity and dead vegetation in the vicinity of a pipeline;</li> <li>Size and description of oil slick;</li> <li>Direction of movement;</li> <li>Coordinates of leading and trailing edge of oil slick;</li> <li>Sensitivities endangered; and</li> <li>Areas of population that are threatened.</li> </ul> </li> <li>If radio contact cannot be made; the line flyer will land report to Company management by telephone</li> </ul>
	Maintain regular/scheduled communication with the Control Centre and Regional Management/on-call person.
APPR	OACH
	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)
CONF	IRM & CONTROL
	Begin a 214A Individual log when notified of an incident and continue documenting key actions throughout the response.
	<ul> <li>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: <ul> <li>Assess the spill threat, site safety, and parameters such as spill volume, extent and direction of movement.</li> <li>Has pipeline(s) been shut down?</li> <li>Has wind direction been confirmed and windsock erected?</li> <li>Has the public been protected or evacuation considered if necessary?</li> <li>Have all ignition sources been identified and eliminated?</li> <li>Have personal protection and safety requirements been established and communicated?</li> <li>Is adequate fire protection equipment available and in place?</li> <li>Are tank and VAC-truck electrical equipment properly grounded?</li> <li>Have decontamination sites and procedures been established?</li> </ul> </li> </ul>

. 1	<ul> <li>Eliminate sources of vapor cloud ignition, consider the ignition of NGL. Shut down all engines and motors.</li> <li>Establish Exclusion zone and Safe Work Areas (Hot, Warm, and Cold).</li> </ul>
	<ul> <li>If on water, consult Control Point and HCA maps for appropriate response strategies for incoming resources.</li> <li>Review pipeline alignment sheets to become familiar with the location of mainline valves and elevation characteristics.</li> <li>Review ESA maps for the location of any sensitive area that may be impacted (Annex 3).</li> </ul>
	Once support has arrived conduct transfer of command and start preparing for tactical and planning meetings.

Retention: Retained in the Region Permanently

Page 1 of 2 VERSION 2: (Revised August 9, 2016)



# **Initial Response Checklist**

COM	MUNICATION / NOTIFICATIONS
	<ul> <li>Initiate actions to notify government agencies including local authorities of area affected or at risk areas via the Control Centre, Regional Management or designate.</li> <li>Complete notifications for emergency call-out, including regulatory agencies. This will be done by Regional Management or designate.</li> <li>If excavating, has One-Call agency been notified?</li> <li>Has a Preliminary Incident Report been issued?</li> <li>Has a radio channel been established for communication between the site and other personnel in field?</li> <li>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.</li> <li>Notify the appropriate Company management.</li> <li>Advise neighboring property owners and operators of any threat to their property or personnel.</li> <li>Notify appropriate federal, state and local government agencies, including local utilities.</li> </ul>
INCIE	ENT COMMAND
	<ul> <li>Once it has been determined to activate the ICS, the IC will initiate the following actions:</li> <li>Confirm that containment equipment and oil spill contractors have been deployed.</li> <li>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.</li> <li>Direct initial response actions</li> <li>Begin development of an initial incident action plan (ICS 201 Forms).</li> </ul>
EMER	RGENCY SHUT DOWN PROCEDURES
	<ul> <li>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: <ul> <li>Shutting in the line at the nearest block valves.</li> <li>Notifying the nearest pump station and/or the appropriate Control Center.</li> </ul> </li> <li>Maintenance crewmembers should notify their immediate supervisor who will in turn notify appropriate Company contacts.</li> <li>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.</li> </ul> Once a leak site has been located, the following information should be obtained: <ul> <li>Have all ignition sources been eliminated?</li> <li>Are any water intakes at risk?</li> <li>Are any schools, homes or commercial properties at risk and should they be evacuated?</li> <li>Should access to the area be restricted (roads blocked)? If so, assistance should be requested from law enforcement agencies.</li> <li>Have local response agencies been advised of the product's characteristics and handling precautions which are described in the SDS?</li> <li>Are railroads or utility companies in the area and have they been notified?</li> <li>Will product flow into any waterways or roadways?</li> <li>In the U.S. work with Company Environmental Department to conduct a Natural Resource Damage Assessment.</li> </ul>

Retention: Retained in the Region Permanently

Page **2** of **2** VERSION 2: (Revised August 9, 2016)



### **Threat Checklist**

Date:					SUSPICIOUS PACKAGE/MAIL	
Person	receiving threat/su	– Jspicious pack	ade.		Time delivered/discovered:	
Time re	ceived:		-9		Location of delivery/discovery:	
If humb		in a ta di			Who/how delivered or discovered:	
	one, time call term	linated:			Characteristics of package/mail (Select	all that apply)
Phone r	iumber displayed	by Caller ID: _	.,		Actual threat message	Excessive postage
Work lo	cation of person r	eceiving threat	t/suspicious		Marked with any threatening	Excessive weight
раскаде	9				Inappropriate or unusual labeling	Ticking sound
EXACT	WORDING OF T	HREAT			Strange or no return address	
					Misspelled common words	
					City of postmark does not match return	rn address city
					Oil stains, discoloration or odor	
					Lopsided/uneven package of envelop	0e
					Excessive tape, string, or packing main incorrect titles or title without a name	alendis
					Handwritten or poorly typed address	
					Protruding wires or aluminum foil	
04115						
CALLE	R/SUSPECT VOI			t all that apply)	BOMB THREAT QUESTIONS	
Gender		remaie	Ð		When is the bomb going to explode?	
Age:	Child	Teen	20-29	30-39	Where did you put the bomb?	
	40-49	50-59	Older		Where is it right now?	
Voice c	haracteristics:	Loud	Soft	Deep	Did you place the bomb? Why?	
	Whisper	Stutter	Lisp	Fast	Do you know who placed the bomb?	
	Slow	Normal	Nasal	Slurred	What does it look I ke?	
	Broken	Disguised	d Squeaky		What kind of bomb is it?	
Accent		Other:			What will make the bomb explode?	
Manner	: Angry	Excited	Giggling	Crying	What is your name?	
	Sincere	Stressed	Calm	, ,	Where are you calling from?	
Langua	<b>ne:</b> Well-spo	ken	Incoherent	Irrational	What is your address?	
Langua	ge. Weil spe		meenerent	mational	Have you noticed anyone else?	
BACKG	ROUND NOISE				Whom do you represent?	
Street r	oises:				Do you know that there are innocent peop	le in the building that may be
House/	esidence noises:				injured or killed? Yes No (se	elect if either is confirmed)
Aircraft					NOTES	
Voices:						
Music:						
Machin	ery:					
Bar/Tav	vern:					
Other:						



Site Monitoring Template

Date:		Time:		- L	Wind Di	r.	Wind S	peed		Temp.
Event Descri	ption:	-1/					12			
Location Description	Time	PID / FID	H <sub>2</sub> S	SO2	co	LEL	O <sub>2</sub>	Benzene	Other	Comments
1.										
2.										
3.						-				
4.										
5.										
6.										
7.										
8.						-				
9.										
10.	-									



**Elevated Security Measures Checklist** 

**ICP 012** 

<b>ELEVATED SECURITY MEASURES</b>	•
& PRE-CHECKLIST	



ELEV	ATED SECURITY MEASUR	RES	
	Ensure gates are locked of	r secured in the closed position at all times.	
	Limit visitors and confirm	with an employee that the visitor is expected	d before allowing access.
	All unknown visitors must	be escorted by company personnel at all tir	nes.
	Employees entering facility	y after regular work hours must contact shift	personnel.
	Identify resource requirem availability to assist with 2 security guard at locations	ents for security service (i.e., number of sec 24-hour coverage as required. Consideration open to the public.	urity officers), and confirm n should be given to posting a
	Employees must complete	yard and perimeter circle checks 2 times pe	er day.
	Employees must complete storage areas, tank and pe closed position at all times	e daily inspections of buildings (including thos erimeter fencing (alter times). Ensure gates	e that are not regularly used); are locked or secured in the
PRE-C	CHECKLIST		
	Determine available contr	act security staff on hand for while security i	measures are elevated.
	Consider options for proje	ct/work restrictions or postponement.	
	Take into consideration er	nployee compliment and work start/end time	es.
	Review access/egress po	ints for deliveries, employee access and pro	oject work.
	Review current camera vi	ews with respect to gates.	
	Confirm current recording	capabilities for all site cameras.	
	Ensure all cameras and re	ecording equipment are set with current time	e/date stamps.
	Engage with Local Policin	g.	
	Ensure vicinity ownership	contacts/contractors are contacted.	
	Consider alternative acces	ss/egress points.	
	CONTACTS	NAME	PHONE NUMBER
Directo	or/Sr. Manager/Manager		
Super	visor		
Regio	nal Security		



ICS 201-1

Incident:	Prepared By:	at:
Period:	Version Name:	



**Summary of Current Actions** 

Incident:		Prepared By: at:
Period:	to	Version Name:
		Incident Information
	İr	nitial Incident Objectives
_		
West Area	Su	mmary of Current Actions
Date/Time		Action Notes
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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.



**Operations Section** 





# REDACTED SUBMITTAL-PUBLIC COPY Resource Summary

Incident:					Period:				
D	Supplier	Resource Type	Description	Quantity	Size	Area of Operation	Status	Status Date/Time	
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					-				



Site Safety and Control Analysis

**ICS 201-5** 

Period:	
criod.	Version Name:
	Site Control
I. Is Site Control set up?	2. Is there an on-scene command post? □ Yes ■ No If so, where?
<ul> <li>B. Have all personnel been accounted for?</li> <li></li></ul>	Injuries: Fatalities: Unaccounted: Trapped:
<ul> <li>Are observers involved, or rescue attempts planned?</li> <li>Observers:          <ul> <li>Yes</li> <li>No</li> </ul> </li> <li>Rescuers:              <ul> <li>Yes</li> <li>No</li> </ul> </li> </ul>	5. Are decon areas setup? □ Yes ■ No If so, where?
Hazard identification, imme	ediate signs of: (if yes, explain in Remarks)
I. Electrical line(s) down or overhead?   Yes  No	2. Unidentified liquid or solid products visible?  Yes No
<ul> <li>Wind direction across incident:          Towards your position         Wind Speed:</li></ul>	4. Is a safe approach possible?  Yes No
5. Odors or smells?	6. Vapors visible?
7. Holes, ditches, fast water, cliffs, etc. nearby?	8. Fire, sparks, sources of ignition nearby?   Yes  No
9. Is local traffic a potential problem?	10. Product placards, color codes visible?
11. Other Hazards?	12. As you approach the scene from the upwind side, do you note a change in the status of any of the above?
13. Remarks:	
Hazard Mitigation: have you de	termined the necessity for any of the following?
I. Entry Objectives:	
2. Warning sign(s), barriers, color codes in place?	□ No
<ul> <li>B. Hazardous material being monitored?  <ul> <li>Yes</li> <li>N</li> </ul> </li> <li>3a. Sampling Equipment: <ul> <li>3b. Sampling location(s):</li> <li>3c. Sampling frequency:</li> <li>3d. Peak Reading:</li> <li>Personal exposure monitoring:</li> </ul> </li> </ul>	ο
A. 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:	
5. Emergency escape route established?  Query Yes Route?	□ No
7. Field responders briefed on hazards?	□ No
3. Remarks:	



Site Safety and Control Analysis

**ICS 201-5** 

	tial control perimeters (see Figure 1)		
	<ol> <li>Is there a Hot Zone established?</li> <li>If so, where?</li> </ol>	□ Yes	□ No
	2. Is there a Warm Zone established? If so, where?	□ Yes	🗆 No
HAZARD HAZARD HOT ZONE	3. Is there a Cold Zone established? If so, where?	□ Yes	□ No
COLD	4. Remarks: (Include any information on eva	acuation route et	ic.)
WIND DIRECTION Figure 1 Protective Zones			
ude any site sketches or photos of the protective zones (if availab	e):		



**Organization Assignment** 

Incident:		Prepared By	<i>r</i> :	at:	
Period:		Version Nam	ne:		
		Command Staff			
Title	Name	Mobile	Pager	Other	Radio
Federal (FOSC)					I have
State (SOSC) Prov					
RP(s)					-
Incident Commander					
Deputy Incident					
Safety Officer				-	· · · · · · · · · · · · · · · · · · ·
Information Officer		d (f			3
Liaison Officer					
Intelligence Officer		. C			1
					-
		Operations Section			1
Title	Name	Mobile	Pager	Other	Radio
Operations Section					
Deputy Operations					
Staging Area Manager					
Recovery & Prot. Branch		3 Q 1			
Emergency Resp.					
Air Ops Branch Director		L C			
Wildlife Branch Director					
Branch Director		P			
Division/Group					
Disposal Group		1 P			11
					1
		Planning Section			1
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					



**Organization Assignment** 

Incident:		Prepar	ed By:	at		
Period:	Version	Version Name:				
		Logistics sect	ion			
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 Secti	on			
Title	Name	Phone	Fax	Other	Radio	
Finance Section Chief						
Deputy Finance Section						
Time Unit Leader		(				
Procurement Unit						
Compensation/Claims						
Cost Unit Leader		(				
				1.		
				1		
			1			



Assignment List

Period: Title Operations Section Chief Branch Director Division/Group/STAM Supplier F	Name Incide Resource Type	Divisio	n: nel Affiliation uipment Quantity	Size	Contact Number(s)
Title Operations Section Chief Siranch Director Supplier  Supplier	Name Incide Resource Type	Operations Person	nel Affiliation	Size	Contact Number(s)
Title Operations Section Chief Branch Director Division/Group/STAM   Supplier  F	Name Incide Resource Type	ent Resources – Ec	Affiliation uipment Quantity	Size	Contact Number(s)
Deperations Section Chief Branch Director Division/Group/STAM  Supplier	Incide Resource Type	ent Resources – Ed Description	uipment Quantity	Size	Status
Branch Director Division/Group/STAM  Supplier  F	Incide Resource Type	ent Resources – Ed Description	uipment Quantity	Size	Status
Division/Group/STAM	Incide Resource Type	ent Resources – Eo	uipment Quantity	Size	Status
Supplier F	Incide Resource Type	ent Resources – Ed	uipment Quantity	Size	Status
Supplier F	Incide Resource Type	ent Resources – Ed Description	uipment Quantity	Size	Status
Supplier	Resource Type	Description	Quantity	Size	Status
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		in the second			
		Assignments			
	Special In	nstructions for Div	ision/Group		
		Communication	S		
Name/Function	Radio: Frequenc	y/System/Channe	F	Phone	Cell/Pager
3.7442.00.9.742.000.000.000.000.000.000				1.1.4	
			-		
	Eme	ergency Communi	ations		
Medical		Evacuation		1	Other
incurcu		_ rabation		1	- the
repared by (Resource Unit Lear	Annrouse	d by (Planning Sec	tion Chief)	Date/Time An	proved:



Assignment List

	Branch:	
Period:	Division:	
Prepared by Signature:	Task Force:	
Approved by Signature:	Group:	
	Tactical Objective	
	Description of Work	
	Location of Work	
	Work Assignment Special Instructions	
Sn	ecial Equipment/Supplies Needed for Assignm	
	colui Equipinicito Supplies ficcuca for Assigni	pent
op		nent
		nent
		nent
	Special Environmental Considerations	nent
	Special Environmental Considerations	nent
	Special Environmental Considerations	nent
	Special Environmental Considerations Special Site-Specific Safety Considerations	nent
	Special Environmental Considerations	nent
	Special Environmental Considerations Special Site-Specific Safety Considerations	nent
	Special Environmental Considerations Special Site-Specific Safety Considerations	nent
Shoreli	Special Environmental Considerations Special Site-Specific Safety Considerations ine Cleanup Assessment Team (SCAT) Considerations	erations
Shoreli	Special Environmental Considerations Special Site-Specific Safety Considerations	erations
Shoreli	Special Environmental Considerations Special Site-Specific Safety Considerations	erations
Shoreli	Special Environmental Considerations Special Site-Specific Safety Considerations ine Cleanup Assessment Team (SCAT) Consid	erations



**Individual Logs** 

Incident:	Prepared By:	at:
Period:	Version Name:	
	Activity Log	
Date/Time	Events/Notes	
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Retention: Retained in the Region Permanently