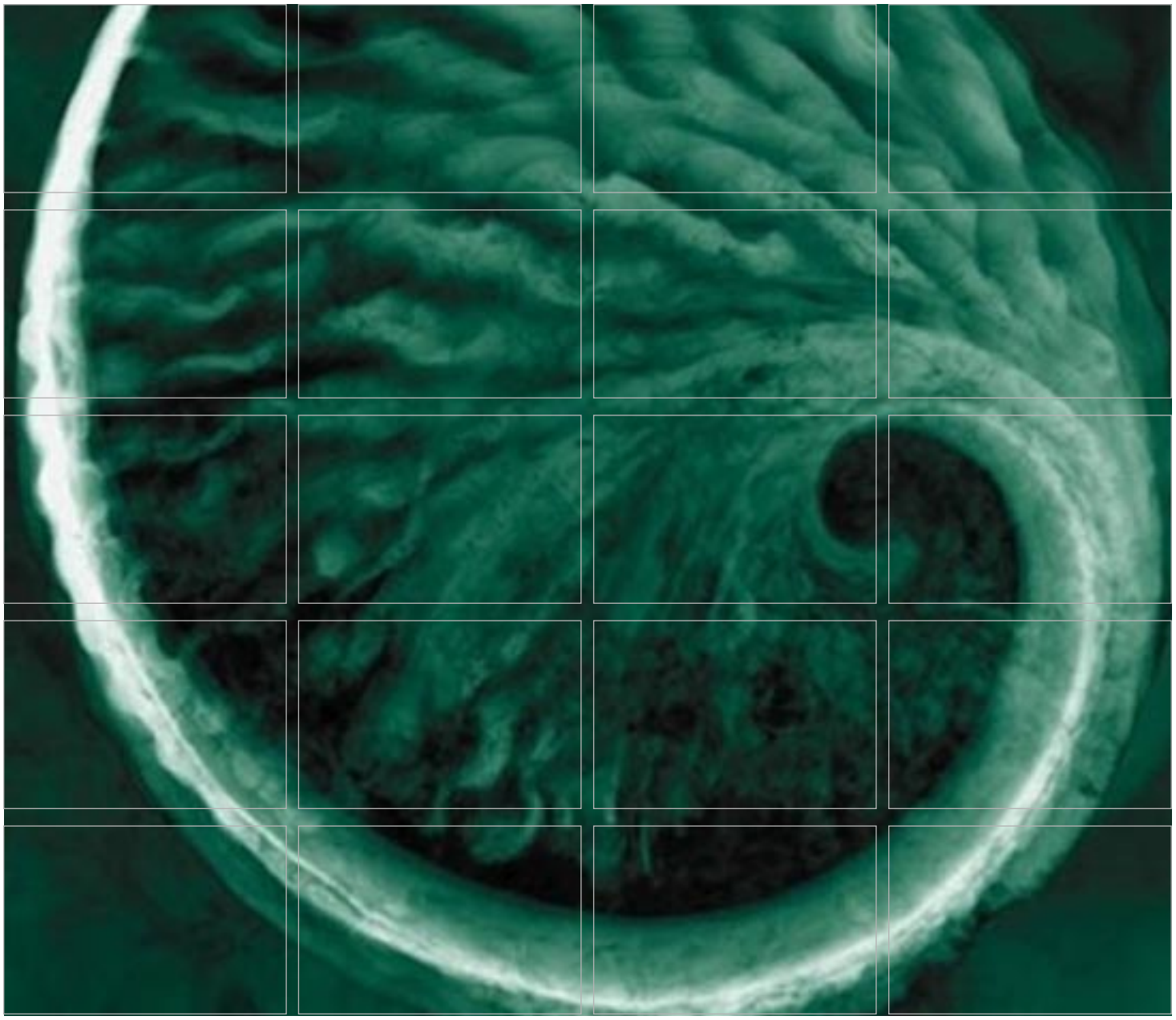

Permit Determination Form

Clarksburg Drilling Fluids
Clarksburg, West Virginia

February 2016

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Delivering sustainable solutions in a more competitive world

Baker Hughes, Inc.
2226 Philippi Pike
Clarksburg, West Virginia 26301

February 9, 2016

Mr. William F. Durham, Director
WV Department of Environmental Protection
Division of Air Quality
601 57th Street, SE
Charleston, West Virginia 25304

Re: Baker Hughes Oilfield Operations, Inc.
Clarksburg Fluids Permit Determination Request
Clarksburg, West Virginia

To The Agency:

Enclosed you will find a permit determination that has been created for the operational activities associated with the production of a synthetic-based and oil-based drilling mud located at 2226 Philippi Pike in Clarksburg, West Virginia. An evaluation of all site activities indicates that this facility is below the emission thresholds described in WV 45CSR13 for regulated air pollutants. Baker Hughes Oilfield Operations, Inc. wishes to utilize the state permit determination process to receive confirmation from the agency that this site does not require an air permit to operate. Based upon the permit engineer's familiarity with this Site, based upon his review of a previous submittal, Baker Hughes respectfully requests Mr. Jerry Williams be considered for assignment of this submittal.

Should you have any questions, please contact me at (713) 879-1646.

Sincerely,

Joshua Morrissette
Environmental Programs Manager

Enclosures:

Baker Hughes Clarksburg Drilling Fluids

Applicability Determination

The Baker Hughes Clarksburg Facility has been evaluated to determine the potential to emit (PTE) for all regulated air pollutants, in compliance with 45 CSR 13 Section 2.19. The results of the PTE determination have been compared to the definition of a stationary source, listed in 45 CSR 13 Section 2.24a-e. As displayed in the Table Below, the Baker Hughes Clarksburg Drilling Mud Facility does not meet the definition of a stationary source under West Virginia's minor source rule. Baker Hughes is opting to submit this permit determination, under 45 SCR 13 Section 5.13, in order to receive confirmation from the West Virginia Department of Environmental Protection, Division of Air Quality, that this facility does not require a 45 CSR 13 air permit.

Regulated Air Pollutant	PTE		WV 45CSR13 Permitting Thresholds	Threshold Exceeded (Y/N)	Does Pollutant Trigger Minor Source Status (Exceed 6 lb/hr AND 10 tpy Regulated Air Pollutant; OR 2 lb/hr OR 5 tpy Aggregated HAPs OR 45CSR27 TAP)
VOC Emissions	lb/hr	5.62	6.00	N	**No**
	tpy	6.83	10.00	N	
NO_x Emissions	lb/hr	0.43	6.00	N	**No**
	tpy	1.88	10.00	N	
CO Emissions	lb/hr	3.73	6.00	N	**No**
	tpy	16.32	10.00	Y	
SO_2 Emissions	lb/hr	1.32	6.00	N	**No**
	tpy	5.78	10.00	N	
PM_{10} Emissions	lb/hr	1.06	6.00	N	**No**
	tpy	3.86	10.00	N	
$PM_{2.5}$ Emissions	lb/hr	0.87	6.00	N	**No**
	tpy	3.67	10.00	N	
HAP Emissions	lb/hr	0.03	2.00	N	**No**
	tpy	0.13	5.00	N	
CO_2 Emissions	lb/hr	746	N/A	N/A	**N/A**
	tpy	3,268	N/A	N/A	
CH_4 Emissions	lb/hr	0.006	N/A	N/A	**N/A**
	tpy	0.03	N/A	N/A	
N_20 Emissions	lb/hr	0.00	N/A	N/A	**N/A**
	tpy	0.01	N/A	N/A	
CO_2e Emissions	lb/hr	747	N/A	N/A	**N/A**
	tpy	3,271	N/A	N/A	

WEST VIRGINIA
DEPARTMENT OF ENVIRONMENTAL PROTECTION
DIVISION OF AIR QUALITY
601 57th Street, SE
Charleston, WV 25304
Phone: (304) 926-0475
www.dep.wv.gov/daq

PERMIT DETERMINATION FORM (PDF)

FOR AGENCY USE ONLY: PLANT I.D. # _____

PDF # _____ PERMIT WRITER: _____

1. NAME OF APPLICANT (AS REGISTERED WITH THE WV SECRETARY OF STATE'S OFFICE):

Baker Hughes Oilfield Operations, Inc.

2. NAME OF FACILITY (IF DIFFERENT FROM ABOVE):

Clarksburg Drilling Fluids

3. NORTH AMERICAN INDUSTRY CLASSIFICATION SYSTEM (**NAICS**) CODE:

213112

4A. MAILING ADDRESS:

2226 Philippi Pike, Clarksburg, WV 26301

4B. PHYSICAL ADDRESS

2226 Philippi Pike, Clarksburg, WV 26301

5A. DIRECTIONS TO FACILITY (PLEASE PROVIDE **MAP** AS **ATTACHMENT A**): Directions from I-79

Traveling northbound on I-79, take exit 117. Turn left onto WV-58 W and travel for about 0.6 miles. Continue on WV-58 by turning right at the intersection. The facility is located on the right after traveling approximately 0.2 miles.

5B. NEAREST ROAD:
Philippi Pike

5C. NEAREST CITY OR TOWN:
Clarksburg

5D. COUNTY:
Harrison

5E. UTM NORTHING (KM):
4,346.06

5F. UTM EASTING (KM):
560.51

5G. UTM ZONE:
17

6A. INDIVIDUAL TO CONTACT IF MORE INFORMATION IS REQUIRED:
Joshua Morrissette

6B. TITLE:
Environmental Programs Manager

6C. TELEPHONE:
713-879-1646

6D. FAX:
713-879-1868

6E. E-MAIL:
Joshua.Morrissette @bakerhughes.com

7A. DAQ PLANT I.D. NO. (FOR AN EXISTING FACILITY ONLY):

N/A

7B. PLEASE LIST ALL CURRENT 45CSR13, 45CSR14, 45CSR19 AND/OR TITLE V (45CSR30) PERMIT NUMBERS ASSOCIATED WITH **THIS** PROCESS (FOR AN EXISTING FACILITY ONLY):

N/A

7C. IS THIS PDF BEING SUBMITTED AS THE RESULT OF AN ENFORCEMENT ACTION? IF YES, PLEASE LIST:

No

8A. TYPE OF EMISSION SOURCE (CHECK ONE):

☒ **NEW SOURCE** ☐ **ADMINISTRATIVE UPDATE**

☐ **MODIFICATION** ☐ **OTHER** (PLEASE EXPLAIN IN 11B)

8B. IF ADMINISTRATIVE UPDATE, DOES DAQ HAVE THE APPLICANT'S CONSENT TO UPDATE THE EXISTING PERMIT WITH THE INFORMATION CONTAINED HEREIN?

☐ **YES** ☐ **NO**

9. IS *DEMOLITION* OR PHYSICAL *RENOVATION* AT AN EXISTING FACILITY INVOLVED? ☐ **YES** ☒ **NO**

10A. DATE OF ANTICIPATED INSTALLATION OR CHANGE:

Existing

10B. DATE OF ANTICIPATED START-UP:

Existing

11A. PLEASE PROVIDE A **DETAILED PROCESS FLOW DIAGRAM** SHOWING EACH PROPOSED OR MODIFIED PROCESS EMISSION POINT AS **ATTACHMENT B**.

11B. PLEASE PROVIDE A **DETAILED PROCESS DESCRIPTION** AS **ATTACHMENT C**.

12. PLEASE PROVIDE **MATERIAL SAFETY DATA SHEETS (MSDS)** FOR ALL MATERIALS PROCESSED, USED OR PRODUCED AS **ATTACHMENT D**. FOR CHEMICAL PROCESSE, PLEASE PROVIDE A MSDS FOR EACH COMPOUND EMITTED TO AIR**.**

13A. **REGULATED AIR POLLUTANT EMISSIONS:**

⇒ **FOR A NEW FACILITY,** PLEASE PROVIDE PLANT WIDE EMISSIONS BASED ON THE POTENTIAL TO EMIT (PTE) FOR THE FOLLOWING AIR POLLUTANTS INCLUDING ALL PROCESSES.

⇒ **FOR AN EXISTING FACILITY,** PLEASE PROVIDE THE PROPOSED CHANGE IN EMISSIONS BASED ON THE PTE OF ALL PROCESS CHANGES FOR THE FOLLOWING AIR POLLUTANTS.

PTE FOR A GIVEN POLLUTANT IS TYPICALLY BEFORE AIR POLLUTION CONTROL DEVICES AND IS COLLECTED BASED ON THE MAXIMUM DESIGN CAPACITY OF PROCESS EQUIPMENT.

POLLUTANT	**HOURLY PTE** (LB/HR)	**YEARLY PTE** (TON/YR) (HOURLY PTE MULTIPLIED BY 8760 HR/YR) DIVIDED BY 2000 LB/TON
PM	**1.06**	**4.56**
PM_{10}	**1.06**	**4.56**
VOCs	**5.62**	**6.83**
CO	**3.73**	**16.32**
NO_x	**0.43**	**1.88**
SO_2	**1.32**	**5.78**
Pb	**NA**	**NA**
HAPs (AGGREGATE AMOUNT)	**0.03**	**0.15**
TAPs (INDIVIDUALLY)*	**NA**	**NA**
OTHER (INDIVIDUALLY)*	**NA**	**NA**
$CO2_e$	**747**	**3,271**

* ATTACH ADDITIONAL PAGES AS NEEDED

13B. PLEASE PROVIDE ALL **SUPPORTING CALCULATIONS** AS **ATTACHMENT E**.

CALCULATE AN HOURLY AND YEARLY PTE OF EACH PROCESS EMISSION POINT (SHOWN IN YOUR DETAILED PROCESS FLOW DIAGRAM) FOR ALL AIR POLLUTANTS LISTED ABOVE INCLUDING INDIVIDUAL HAP'S (LISTED IN SECTION 112[b] OF THE 1990 CAAA), TAP'S (LISTED IN 45CSR27), AND OTHER AIR POLLUTANTS (E.G. POLLUTANTS LISTED IN TABLE 45-13A OF 45CSR13, MINERAL ACIDS PER 45CSR7, ETC.).

14. **CERTIFICATION OF DATA**

I, JAMES KLEINSORGE (*TYPE NAME*) ATTEST THAT ALL THE REPRESENTATIONS CONTAINED IN THIS APPLICATION, OR APPENDED HERETO, ARE TRUE, ACCURATE, AND COMPLETE TO THE BEST OF MY KNOWLEDGE BASED ON INFORMATION AND BELIEF AFTER REASONABLE INQUIRY, AND THAT I AM A ***RESPONSIBLE OFFICIAL***** (*PRESIDENT, VICE PRESIDENT, SECRETARY OR TREASURER, GENERAL PARTNER OR SOLE PROPRIETOR*) OF THE APPLICANT.

SIGNATURE OF RESPONSIBLE OFFICIAL: James W. Kleinsorge

TITLE: PRODUCT LINE DIRECTOR NAR DATE: 2 / 9 / 16

THE DEFINITION OF THE PHRASE '*RESPONSIBLE OFFICIAL***' CAN BE FOUND AT 45CSR13, SECTION 2.23.

NOTE: PLEASE CHECK ENCLOSED ATTACHMENTS:

☒ **ATTACHMENT A** ☒ **ATTACHMENT B** ☒ **ATTACHMENT C** ☒ **ATTACHMENT D** ☒ **ATTACHMENT E**

RECORDS ON ALL CHANGES ARE REQUIRED TO BE KEPT AND MAINTAINED ON-SITE FOR TWO (2) YEARS.

THE PERMIT DETERMINATION FORM WITH THE INSTRUCTIONS CAN BE FOUND ON DAQ'S PERMITTING SECTION WEB SITE:

www.dep.wv.gov/daq

Attachment A

SITE MAP

SCALE

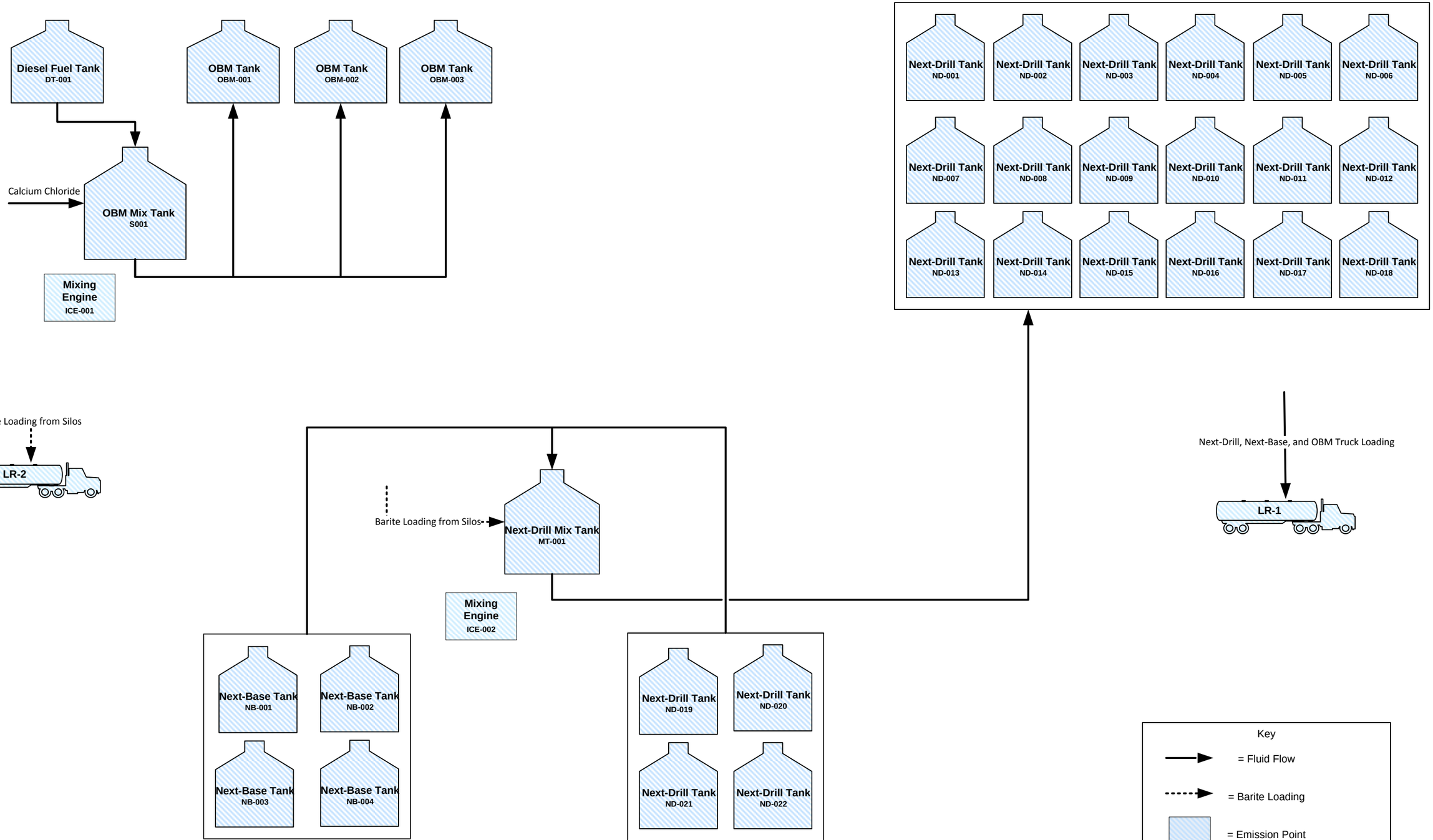
0 100 200 400 FEET

FB 3/2/15	**BAKER HUGHES** 2226 PHILIPPI PIKE CLARKSBURG, WEST VIRGINIA	Review GM CHK'D GM 0226915
ERM	Environmental Resources Management	FIGURE 1

Document Path: F:\Projects\B\Baker Hughes\Mud Plant Site Visit\Figures\A100.mxd

Attachment B

Baker Hughes, Inc.
Clarksburg Drilling Fluids
Process Flow Diagram



Attachment C

Attachment C – Process Description

The Baker Hughes Clarksburg Drilling Fluids Facility is a storage, blending, and distribution facility for Synthetic-Based Drilling Mud (SBM), Oil-Based Drilling Mud (OBM), and related materials. Liquid materials are received in tank trucks and unloaded into storage tanks prior to being transferred via an enclosed piping system to the mix tanks for blending. Solid materials are brought on site in sacks, barrels, buckets, and tank trucks. Materials transferred on site in the sacks, barrels, and buckets are drop-loaded into the Next-Drill Mix Tank (MT-001) during the blending of the product for both OBM and SBM. The site utilizes an enclosed mix tank to create the proprietary drilling mud. The mixing process includes the liquid loading of brine water, fresh water, and diesel fuel into the 500 bbl mixing tank (MT-001) for SBM and the 250 bbl mixing tank (MT-002) for OBM. Solid materials, including barite and other additives, are drop loaded through a hopper into the mix tank.

The Next-Base fluid is stored within 500 barrel frac tanks (NB-001 – NB-004) prior to being transferred into the Next-Drill Mix Tank. Fresh water (FW-001) and brine water (BW-001) are stored onsite in 250 barrel tanks. Two (2) 325 hp John Deere Tier IV diesel engines (ICE-001) are used to power the mixing tanks. Next-Drill is transferred to 500 barrel frac tanks (ND-001 – ND-0015). Next-Drill is also stored onsite 630 barrel enclosed tanks (ND-019 – ND-022). OBM is transferred and stored in 500 bbl frac tanks (OBM-1 – OBM-3).

Not all solids and liquids stored onsite are utilized in the blending process. Some materials are transferred from their storage tank directly to a tank truck for offsite delivery (LR-1, LR-2). Barite transported onto the site in tank trucks (LR-2) is unloaded to two bulk silos through an enclosed piping system. Emissions from the transfer of bulk solid materials are controlled using a filter system that utilizes a filter sock. This system controls emissions from solid material transfers to and from the bulk storage silos. Barite is used in the OBM to increase the weight of the mud. Barite can be loaded to tank trucks so that customers can increase the weight of the OBM mud on the well pad, as needed.

Attachment D

MATERIAL SAFETY DATA SHEET

MIL-BAR™ 410

BAKER HUGHES
Drilling Fluids

1. Product and Company Identification

Material name	**MIL-BAR™ 410**
Product use	Weighting Agent
Chemical name	Barium sulfate
Revision date	03-02-2010
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073
Emergency	CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Contact with this material can cause irritation to the skin, eyes and mucous membranes. Prolonged exposure may cause chronic effects. Cancer hazard.

Potential health effects

Eyes	Dust or powder may irritate eye tissue.
Skin	Health injuries are not known or expected under normal use. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).
Inhalation	Inhalation of dusts may cause respiratory irritation.
Ingestion	Health injuries are not known or expected under normal use. Ingestion of large amounts may produce gastrointestinal disturbances including irritation, nausea, and diarrhea.

Target organs Eyes. Lungs. Respiratory system.

Chronic effects Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material.

Potential environmental effects This material is not expected to be harmful to aquatic life.

3. Composition / Information on Ingredients

Components	CAS #	Percent
BARIUM SULFATE	7727-43-7	90 - 95
CRYSTALLINE SILICA, QUARTZ	14808-60-7	4 - 6
MICA	12001-26-2	1 - 3

4. First Aid Measures

First aid procedures

Eye contact	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops or persists.
Inhalation	Remove to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.
Ingestion	Have victim rinse mouth thoroughly with water. If swallowed, rinse mouth with water (only if the person is conscious). If ingestion of a large amount does occur, seek medical attention.

General advice If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties The product is not flammable.

Hazardous combustion products Combustion products include fumes, smoke, carbon monoxide, carbon dioxide and sulfur dioxide. May include oxides of nitrogen

Extinguishing media

Suitable extinguishing media Use any media suitable for the surrounding fires.

Protection of firefighters

Protective equipment and precautions for firefighters Use water spray to cool unopened containers. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk.

6. Accidental Release Measures

Personal precautions Keep unnecessary personnel away. Ventilate enclosed areas. Avoid inhalation of dust from the spilled material. Surfaces may become slippery after spillage.

Environmental precautions Prevent further leakage or spillage if safe to do so. Do not flush into surface water or sanitary sewer system.

Methods for containment Stop the flow of material, if this is without risk.

Methods for cleaning up Avoid the generation of dusts during clean-up. Do not flush with water. Forms smooth, slippery surfaces on floors, posing an accident risk. Vacuum or sweep up material and place in a disposal container. After removal flush contaminated area thoroughly with water.

7. Handling and Storage

Handling Handle and open container with care. Minimize dust generation and accumulation. Wear personal protective equipment. Avoid prolonged exposure. Do not breathe dust from this material. Do not get this material in your eyes, on your skin, or on your clothing. In case of insufficient ventilation, wear suitable respiratory equipment.

Storage Keep in a dry, cool and well-ventilated place. Keep away from Aluminium.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value	Form
BARIUM SULFATE (7727-43-7)	TWA	10 mg/m3	
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	TWA	0.025 mg/m3	Respirable fraction.
MICA (12001-26-2)	TWA	3 mg/m3	Respirable fraction.

U.S. - OSHA

Components	Type	Value	Form
BARIUM SULFATE (7727-43-7)	PEL	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
	TWA	5 mg/m3	Respirable fraction.
		10 mg/m3	Total dust.
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	TWA	0.1 mg/m3	Respirable.
		2.4 mppcf	Respirable.
		0.1 mg/m3	Respirable dust.
		0.3 mg/m3	Total dust.
MICA (12001-26-2)	TWA	3 mg/m3	Respirable dust.
		20 mppcf	

Engineering controls Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Eye wash fountain and emergency showers are recommended.

Personal protective equipment

Eye / face protection Wear dust goggles.

Hand protection Rubber or plastic gloves.

Skin protection Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.

Respiratory protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Suitable mask with particle filter P3 (European Norm 143)

General hygeine considerations Do not breathe dust. Wash hands before breaks and immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance / Color / Form Powder. Tan. Solid.

Odor None.

Form Solid.

pH 7 (2% aq. soln)

Melting point	Not available.
Freezing point	Not available.
Boiling point	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	4.1 g/ml @ 20 deg C
Relative density	4100 kg/m3
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Bulk density	1714 - 2163 kg/m3 @ 20 deg C
Molecular formula	Ba.H2-O4-S

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Exposure to water vapor.
Incompatible materials	Fluoride. Powerful oxidizers.
Hazardous decomposition products	May include oxides of nitrogen. May include oxides of phosphorus.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Chronic effects	Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material.
Carcinogenicity	This product contains crystalline silica. The International Agency for Research of Cancer has designated crystalline silica in the form of quartz or cristobalite a Group 1 (carcinogenic for humans).

IARC Monographs: Overall evaluation	
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	1 Carcinogenic to humans.
US ACGIH Threshold Limit Values: A2 carcinogen	
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	A2 Suspected human carcinogen.
US ACGIH Threshold Limit Values: A4 carcinogen	
BARIUM SULFATE (7727-43-7)	A4 Not classifiable as a human carcinogen.
US NTP Report on Carcinogens: Known carcinogen	
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	Known carcinogen.

12. Ecological Information

Ecotoxicological data

Components	Test Results
BARIUM SULFATE (7727-43-7)	EC50 Tubificid worm (Tubifex tubifex): 28.61 - 38.03 mg/l 48.00 hours

* Estimates for product may be based on additional component data not shown.

Ecotoxicity	This material is not expected to be harmful to aquatic life.
Persistence and degradability	The methods for determining the biological degradability are not applicable to inorganic substances.
Bioaccumulation / Accumulation	Not expected to bioaccumulate.

Mobility in environmental media This material is insoluble in water and will sink in the marine environment.

13. Disposal Considerations

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
CERCLA/SARA Hazardous Substances - Not applicable.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed: October 1, 1988 Carcinogenic.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

BARIUM SULFATE (7727-43-7) Listed.
CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed.
MICA (12001-26-2) Listed.

16. Other Information

HMIS® ratings Health: 1*
Flammability: 0
Physical hazard: 0
Personal protection: E

NFPA ratings	Health: 1 Flammability: 0 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	03-02-2010
Supercedes date	03-02-2010
This data sheet contains changes from the previous version in section(s):	This document has undergone significant changes and should be reviewed in its entirety.

Material Safety Data Sheet

1 . Product and company identification

Product name : CARBO-TEC™

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Emulsifier/Wetting Agent

Code : 1210DF

Validation date : 2/15/2012.

Print date : 2/15/2012.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid.

Odor : Solvents

Color : Brown. [Dark]

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE AND SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. ASPIRATION HAZARD.

Do not ingest. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation : Irritating to respiratory system.

Ingestion : Aspiration hazard if swallowed. Can enter lungs and cause damage.

Skin : Moderately irritating to the skin.

Eyes : Moderately irritating to eyes.

Potential chronic health effects

Chronic effects : Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : nausea or vomiting

Skin : irritation, redness, dryness, cracking

Eyes : irritation, watering, redness

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Distillates, (petroleum), hydrotreated light	64742-47-8	10 - 30

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products : No specific data.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose

6 . Accidental release measures

the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Distillates, (petroleum), hydrotreated light	US ACGIH	-	200	-	-	-	-	-	-	-	[1]

[1]Absorbed through skin.

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	:	Liquid.
Flash point	:	Closed cup: >100°C (>212°F)
Auto-ignition temperature	:	Not available.
Flammable limits	:	Not available.
Color	:	Brown. [Dark]
Odor	:	Solvents
pH	:	Not available.
Boiling/condensation point	:	Not available.
Initial Boiling Point	:	Not available.
Melting/freezing point	:	Not available.
Relative density	:	Not available.
Density	:	Not available.
Vapor density	:	Not available.
Odor threshold	:	Not available.
Evaporation rate	:	Not available.
VOC	:	Not available.
Viscosity	:	Not available.
Solubility (Water)	:	Not available.
Vapor pressure	:	Not available.
Pour Point	:	Not available.
Partition coefficient (LogKow)	:	Not available.

10 . Stability and Reactivity

Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	:	No specific data.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Carcinogenicity Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Distillates, (petroleum), hydrotreated light	A3	-	-	-	-	-

Chronic toxicity Remarks

1) Distillates, (petroleum), hydrotreated light

Not available.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Distillates, (petroleum), hydrotreated light	Acute LC50 2200 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus - 35 to 75 mm	4 days

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Distillates (petroleum), hydrotreated light
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Distillates (petroleum), hydrotreated light: Delayed (chronic) health hazard

15 . Regulatory information

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

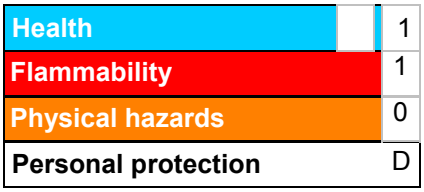
WHMIS (Canada) : Not controlled under WHMIS (Canada).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE AND SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. ASPIRATION HAZARD.

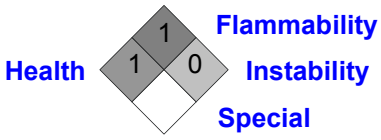
Hazardous Material Information System (U.S.A.) :



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



Date of printing : **2/15/2012.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : CARBO-GEL™

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Viscosifier

Code : 1135DF

Validation date : 8/2/2011.

Print date : 8/2/2011.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Solid. [Powder.]

Odor : Odorless.

Color : White.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

Fine dust clouds may form explosive mixtures with air. Handling and/or processing of this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose and throat. Keep away from heat, sparks and flame. Prevent dust accumulation. Do not breathe dust. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation : Irritating to respiratory system.

Ingestion : Ingestion may cause gastrointestinal irritation and diarrhea.

Skin : Moderately irritating to the skin.

Eyes : Moderately irritating to eyes. No significant irritation expected other than possible mechanical irritation.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Carcinogenicity : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Target organs : Contains material which may cause damage to the following organs: lungs, upper respiratory tract, eyes.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : Ingestion may cause nausea, diarrhea and vomiting.

Skin : irritation, redness

2 . Hazards identification

Eyes : irritation, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Crystalline silica, quartz	14808-60-7	1 - 5

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Fine dust clouds may form explosive mixtures with air.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

6 . Accidental release measures

Methods for cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Vacuum or sweep up material and place in a designated, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Crystalline silica, quartz	US ACGIH	-	0.025	-	-	-	-	-	-	-	[a]
Crystalline silica, quartz, as quartz	OSHA PEL 1989	-	0.1	-	-	-	-	-	-	-	[b]

Form: [a]Respirable fraction; see Appendix C [b]Respirable dust

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

8 . Exposure controls/personal protection

Personal protection

Respiratory : Approved/certified disposable particulate dust mask. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Solid. [Powder.]

Flash point : Not available.

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : White.

Odor : Odorless.

pH : 7 [Conc. (% w/w): 2%]

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : 1.7

Density : Not available.

Vapor density : Not available.

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Not available.

Solubility (Water) : Insoluble

Vapor pressure : Not available.

Pour Point : Not available.

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.

Materials to avoid : Reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Conditions of reactivity : Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge.

11 . Toxicological information

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Crystalline silica, quartz	A2	1	-	+	Proven.	-

Chronic toxicity Remarks

1) Crystalline silica, quartz

Not available.

12 . Ecological information

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material
Carcinogen
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Quartz (SiO2)
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Quartz (SiO2): Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.
Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :
Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

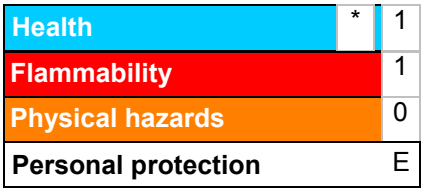
WHMIS (Canada) : Class D-2A: Material causing other toxic effects (Very toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

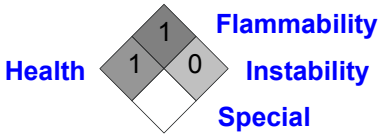
Hazardous Material Information System (U.S.A.) :



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



Date of printing : **8/2/2011.**

Indicates information that has changed from previously issued version.

Notice to reader

16 . Other information

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : CARBO-MUL™ LT

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Emulsifier/Wetting Agent

Code : 1628DF

Validation date : 12/9/2011.

Print date : 12/9/2011.

Version : 1.02

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid.

Color : Amber.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : DANGER!

COMBUSTIBLE LIQUID AND VAPOR. CAUSES DIGESTIVE TRACT, EYE AND SKIN BURNS. CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Static discharges can cause ignition or explosion when container is not bonded. Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Potential acute health effects

Inhalation : Severely irritating to the respiratory system. May cause sensitization by inhalation.

Ingestion : Harmful if swallowed. Corrosive to the digestive tract. Causes burns.

Skin : Corrosive to the skin. Causes burns. Harmful in contact with skin. May cause sensitization by skin contact.

Eyes : Corrosive to eyes. Causes burns.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Target organs : Contains material which may cause damage to the following organs: gastrointestinal tract, upper respiratory tract, skin, eyes, central nervous system (CNS).

Over-exposure signs/symptoms

2 . Hazards identification

Inhalation : respiratory tract irritation, coughing, wheezing and breathing difficulties, asthma

Ingestion : stomach pains

Skin : pain or irritation, redness, dryness, cracking, blistering may occur

Eyes : pain, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing respiratory and skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Tall oil fatty acids	61790-12-3	30 - 60
Distillates, (petroleum), hydrotreated light	64742-47-8	30 - 60
Citric acid	77-92-9	10 - 30
Diethylene triamine	111-40-0	5 - 10
Glycol ether	34590-94-8	5 - 10

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 20-60 minutes while holding the eyelid(s) open.

Skin contact : Wash affected area with soap and mild detergent for at least 20 - 60 minutes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,nitrogen oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Distillates, (petroleum), hydrotreated light	US ACGIH	-	200	-	-	-	-	-	-	-	[1]
Diethylene triamine	US ACGIH	1	4.2	-	-	-	-	-	-	-	[1]
	OSHA PEL 1989	1	4	-	-	-	-	-	-	-	
Glycol ether	US ACGIH	100	606	-	150	909	-	-	-	-	[1]
	OSHA PEL	100	600	-	-	-	-	-	-	-	[1]
	OSHA PEL 1989	100	600	-	150	900	-	-	-	-	[1]

8 . Exposure controls/personal protection

[1]Absorbed through skin.

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and chemical resistant apron to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Closed cup: >65°C (>149°F)

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Amber.

Odor : Not available.

pH : Not available.

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : Not available.

Density : Not available.

Vapor density : Not available.

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Kinematic (40°C): >80 cSt

Solubility (Water) : Not available.

Vapor pressure : Not available.

Pour Point : Not available.

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Conditions of reactivity : Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Tall oil fatty acids	LD50 Oral	Rat	>10000 mg/kg	-
Citric acid	LD50 Oral	Rat	3 g/kg	-
	LD50 Oral	Rat	11700 mg/kg	-
Diethylene triamine	LD50 Dermal	Rabbit	1090 mg/kg	-
	LD50 Oral	Rat	1080 mg/kg	-
Glycol ether	LD50 Dermal	Rabbit	10 mL/kg	-
	LD50 Oral	Rat	5.5 mL/kg	-
	LD50 Oral	Rat	5400 uL/kg	-

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Distillates, (petroleum), hydrotreated light	A3	-	-	-	-	-

Chronic toxicity Remarks

1) Tall oil fatty acids

Not available.

2) Distillates, (petroleum), hydrotreated light

Not available.

3) Citric acid

Citric acid is a component of this product. Frequent intake of citrated beverages may cause erosion of dental enamel and irritation of mucous membranes (Clayton & Clayton, 1994). The potassium and sodium salts have mild diuretic effects when taken in gram quantities daily (Clayton & Clayton, 1994). Citric acid has generally been nontoxic in experimental animals. Rabbits tolerated up to 7.7% in the diet with no effect (Clayton & Clayton, 1994). It has been reported to have allergenic properties, however (Clayton & Clayton, 1994), and might cause contact dermatitis.

4) Diethylene triamine

Not available.

5) Glycol ether

Not available.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Distillates, (petroleum), hydrotreated light	Acute LC50 2200 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus - 35 to 75 mm	4 days
Citric acid	Acute LC50 160000 ug/L Marine water	Crustaceans - Green or Europeon shore crab - Carcinus maenas - Adult	48 hours
Diethylene triamine	Acute LC50 53500 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	Acute LC50 1014000 ug/L Fresh water	Fish - Guppy - Poecilia reticulata	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	NA1993	COMBUSTIBLE LIQUID,N.O.S (Contains: Distillates, (petroleum), hydrotreated light, Glycol ether)	Combustible liquid.	III		This material is not regulated by DOT if transported in a packaging </= 119 gallons.
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Combustible liquid
Corrosive material
Sensitizing material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Distillates (petroleum), hydrotreated light; Citric acid; Diethylenetriamine; (2-methoxymethylethoxy)propanol
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Distillates (petroleum), hydrotreated light: Delayed (chronic) health hazard; Citric acid: Immediate (acute) health hazard; Diethylenetriamine: Immediate (acute) health hazard; (2-methoxymethylethoxy)propanol: Fire hazard, Immediate (acute) health hazard

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

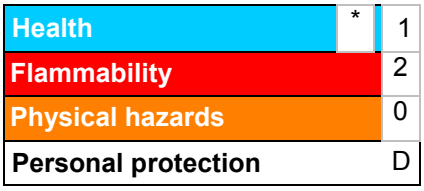
WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2B: Material causing other toxic effects (Toxic).
Class E: Corrosive material

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. CAUSES DIGESTIVE TRACT, EYE AND SKIN BURNS. CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Hazardous Material Information System (U.S.A.) :



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

16 . Other information

Date of printing : **12/9/2011.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : DIESEL OIL

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Drilling Fluid Base

Code : 5014DF

Validation date : 10/10/2012.

Print date : 10/10/2012.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid. [Clear.]

Odor : Characteristic.

Color : Brown. [Light]

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

COMBUSTIBLE LIQUID AND VAPOR. CAUSES SKIN IRRITATION. MAY CAUSE RESPIRATORY TRACT IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. SUSPECT CANCER HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE CANCER. ASPIRATION HAZARD.

At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Static discharges can cause ignition or explosion when container is not bonded. Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Potential acute health effects

Inhalation : Moderately irritating to the respiratory system.

Ingestion : Aspiration hazard if swallowed. Can enter lungs and cause damage.

Skin : Irritating to skin.

Eyes : Moderately irritating to eyes.

Potential chronic health effects

Carcinogenicity : Contains material which may cause cancer. Risk of cancer depends on duration and level of exposure.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : nausea or vomiting

Skin : irritation, redness

Eyes : irritation, watering, redness

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Diesel oil	68334-30-5	60 - 100
Ethylbenzene	100-41-4	0.1 - 1
Naphthalene	91-20-3	0.1 - 1

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : No specific data.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Water polluting material. May be harmful to the environment if released in large quantities.

6 . Accidental release measures

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Avoid release to the environment. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	**List name**	**ppm**	**mg/m³**	**Other**	**ppm**	**mg/m³**	**Other**	**ppm**	**mg/m³**	**Other**	**Notations**
Diesel oil, measured as total hydrocarbons	US ACGIH	-	100	-	-	-	-	-	-	-	[1] [a]
Ethylbenzene	US ACGIH	100	-	-	125	-	-	-	-	-	
	OSHA PEL	100	435	-	-	-	-	-	-	-	
	OSHA PEL 1989	100	435	-	125	545	-	-	-	-	
Naphthalene	US ACGIH	10	52	-	15	79	-	-	-	-	
	OSHA PEL	10	50	-	-	-	-	-	-	-	
	OSHA PEL 1989	10	50	-	15	75	-	-	-	-	

[1]Absorbed through skin.
Form: [a]Total hydrocarbons

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

8 . Exposure controls/personal protection

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid. [Clear.]

Flash point : Closed cup: 55 to 60°C (131 to 140°F) [ASTM D93]

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Brown. [Light]

Odor : Characteristic.

pH : Not available.

Boiling/condensation point : 145 to 370°C (293 to 698°F)

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : 0.81 to 0.87 (15°C)

Density : 7.2 (lbs/gal)

Vapor density : >2 [Air = 1]

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Kinematic (40°C): 1.7 cSt

Solubility (Water) : Not available.

Vapor pressure : Not available.

Pour Point : <-6°C (<21.2°F)

Partition coefficient (LogKow) : >3.5

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Diesel oil	LD50 Oral	Rat	7.5 g/kg	-
	LD50 Oral	Rat	7500 mg/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Dermal	Rabbit	17800 uL/kg	-
	LD50 Oral	Rat	3500 mg/kg	-
	LC50 Inhalation Vapor	Rat	55000 mg/m3	2 hours
Naphthalene	LD50 Dermal	Rabbit	>20 gm/kg	-
	LD50 Dermal	Rat	>2500 mg/kg	-
	LD50 Oral	Rat	490 mg/kg	-

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Diesel oil	A3	3	-	-	-	-
Ethylbenzene	A3	2B	-	-	-	-
Naphthalene	A4	2B	-	-	Possible	-

Chronic toxicity Remarks

1) Diesel oil

Not available.

2) Ethylbenzene

Not available.

3) Naphthalene

This product contains naphthalene. A National Toxicology Program (NTP) report concluded there is clear evidence to support carcinogenicity of naphthalene in male and female rats. These observations were based on 2-year inhalation studies in which the test animals were exposed to 10, 30, and 60 ppm naphthalene. In male and female rats, exposure to naphthalene caused significant increases in the incidence of nonneoplastic lesions of the nose (NTP TR-500). The relevance of the rodent findings to humans is questionable.

Naphthalene has caused hemolytic anemia, jaundice, cataracts (Shopp et al, 1984), allergic reactions (Tsyrkunov & Yakovleva, 1985), possible neurotoxicity (Riala et al, 1984), and aplastic anemia (Harden & Baetjer, 1978) in humans. Increased lung aveolar adenomas were seen in mice exposed to 30 ppm naphthalene for 6hrs/day for 6 months (ACGIH, 1992).

Naphthalene crosses the placenta leading to methemoglobinemia (decreased ability for the blood to carry oxygen), and/or hemolytic anemia, conditions considered especially dangerous to the unborn (Reprotext). Liver and kidney damage has also been seen with exposure to naphthalene (Reprotext).

Peripheral lens opacities occurred in 8 of 21 workers exposed to high levels of naphthalene fumes or vapors for 5 years, but cataracts have not been reported in other occupational studies. (Hathaway et al, 1991).

11 . Toxicological information

The International Agency for Research on Cancer (IARC) evaluated naphthalene and concluded that there was sufficient evidence for carcinogenicity in experimental animals, but inadequate evidence that it causes cancer in exposed humans. Accordingly, IARC classified naphthalene as a possible human carcinogen (Group 2B).

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Ethylbenzene	Acute EC50 2930 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <=24 hours	48 hours
	Acute LC50 >5200 ug/L Marine water	Crustaceans - Opossum shrimp - Americamysis bahia - <24 hours	48 hours
	Acute LC50 4200 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
	Chronic NOEC 6800 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - <=24 hours	48 hours
	Chronic NOEC 3300 ug/L Marine water	Fish - Atlantic silverside - Menidia menidia	96 hours
Naphthalene	Acute EC50 1.96 mg/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	Acute LC50 2350 ug/L Marine water	Crustaceans - Daggerblade grass shrimp - Palaemonetes pugio	48 hours
	Acute LC50 213 ug/L Fresh water	Fish - Crimson-spotted rainbowfish - Melanotaenia fluviatilis	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Partition coefficient: n-octanol/water : >3.5

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	NA1993	COMBUSTIBLE LIQUID,N.O.S (Contains: DIESEL FUEL)	Combustible liquid.	III		This material is not regulated by DOT if transported in a packaging </= 119 gallons.
TDG Classification	UN1202	DIESEL FUEL	3	III		-
IMDG Class	UN1202	DIESEL FUEL	3	III		-
IATA-DGR Class	UN1202	DIESEL FUEL	3	III		-

PG* : Packing group

DOT Reportable Quantity Naphthalene, 2525 gal of this product.

Marine pollutant Not applicable.

North-America NAERG : 128

15 . Regulatory information

HCS Classification : Combustible liquid
Irritating material
Carcinogen

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: No products were found.
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: No products were found.

CERCLA: Hazardous substances.: Ethylbenzene: 1000 lbs. (454 kg); naphthalene: 100 lbs. (45.4 kg);

Clean Water Act (CWA) 307: Ethylbenzene

Clean Water Act (CWA) 311: Ethylbenzene

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

15 . Regulatory information

SARA 313

	Product name	CAS number	Concentration
Supplier notification :	Ethylbenzene	100-41-4	0.1 - 1
	Naphthalene	91-20-3	0.1 - 1

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

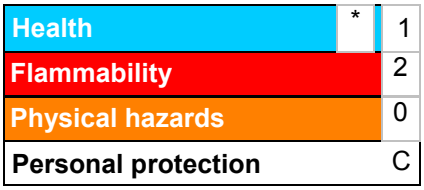
WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. CAUSES SKIN IRRITATION. MAY CAUSE RESPIRATORY TRACT IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. SUSPECT CANCER HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE CANCER. ASPIRATION HAZARD.

Hazardous Material Information System (U.S.A.) :



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **10/10/2012.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : Calcium Chloride Brine

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Not available.

Code : 5112DF

Validation date : 9/2/2011.

Print date : 9/2/2011.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid.

Odor : Odorless.

Color : Clear. Colorless.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : CAUTION!

MAY BE HARMFUL IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION.

Do not ingest. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Potential acute health effects

Inhalation : No known significant effects or critical hazards.

Ingestion : Harmful if swallowed.

Skin : Moderately irritating to the skin.

Eyes : Moderately irritating to eyes.

Potential chronic health effects

Over-exposure signs/symptoms

Inhalation : None known.

Ingestion : Ingestion may cause nausea, diarrhea and vomiting.

Skin : irritation, redness

Eyes : irritation, watering, redness

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Calcium chloride, anhydrous	10043-52-4	10 - 30

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products : halogenated compounds,metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
No exposure limit value known.											

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Closed cup: Not applicable.

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Clear. Colorless.

Odor : Odorless.

pH : Not available.

9 . Physical and chemical properties

Boiling/condensation point : >100°C (>212°F)
Initial Boiling Point : Not available.
Melting/freezing point : -14°C (6.8°F)
Relative density : 1.1 to 1.36 (20°C)
Density : Not available.
Vapor density : Not available.
Odor threshold : Not available.
Evaporation rate : Not available.
VOC : Not available.
Viscosity : Not available.
Solubility (Water) : Not available.
Vapor pressure : Not available.
Pour Point : Not available.
Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.
Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid : No specific data.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Calcium chloride, anhydrous	LD50 Oral	Rat	1 g/kg	-
	LD50 Oral	Rabbit	1384 mg/kg	-

Chronic toxicity Remarks

1) Calcium chloride, anhydrous

Not available.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Calcium chloride, anhydrous	Acute EC50 52000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - 12 hours	48 hours
	Acute LC50 270 mg/L Marine water	Crustaceans - Opossum shrimp - Americamysis bahia - 4 to 5 days	48 hours
	Acute LC50 2110 mg/L Fresh water	Fish - Fathead minnow - Pimephales promelas	96 hours
	Chronic NOEC 260.12 mg/L Marine water	Crustaceans - Opossum shrimp - Americamysis bahia - 4 to 5 days	48 hours
	Chronic NOEC 0.75 g/L Fresh water	Daphnia - Water flea - Daphnia magna - 5 days	48 hours

Conclusion/Summary : Not available.

Biodegradability

12 . Ecological information

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Calcium chloride
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Calcium chloride: Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

15 . Regulatory information

Canada

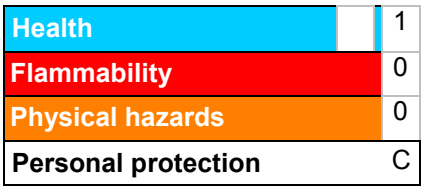
WHMIS (Canada) : Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : MAY BE HARMFUL IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION.

Hazardous Material Information System (U.S.A.) :



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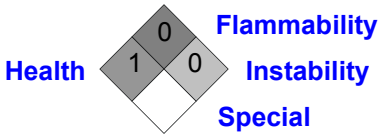
National Fire Protection Association (U.S.A.) :



Date of printing : **9/2/2011.**

Indicates information that has changed from previously issued version.

Notice to reader

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This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : LATIRATE

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Lubricant.

Code : 7200DF

Validation date : 1/5/2012.

Print date : 1/5/2012.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid.

Odor : Mild.

Color : Brown.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : CAUTION!

COMBUSTIBLE LIQUID AND VAPOR. MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. ASPIRATION HAZARD.

At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Static discharges can cause ignition or explosion when container is not bonded. Keep away from heat, sparks and flame. Do not ingest. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Potential acute health effects

Inhalation : Slightly irritating to the respiratory system.

Ingestion : Aspiration hazard if swallowed. Can enter lungs and cause damage.

Skin : Slightly irritating to the skin.

Eyes : Moderately irritating to eyes.

Potential chronic health effects

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : nausea or vomiting

Skin : irritation, redness

Eyes : irritation, watering, redness

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Acyclic Hydrocarbons	Proprietary	20 - 40

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
No exposure limit value known.											

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

8 . Exposure controls/personal protection

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Closed cup: 87.8°C (190°F) [Tagliabue.]

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Brown.

Odor : Mild.

pH : Not applicable.

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : Not available.

Density : 0.889 (g/cm^3)

Vapor density : Not available.

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Kinematic (20°C): 52.8891 cSt
Kinematic (40°C): 24.4138 cSt

Solubility (Water) : Partially soluble in water.

Vapor pressure : Not available.

Pour Point : -7°C (19.4°F)

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

No additional information.

12 . Ecological information

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Combustible liquid
Irritating material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Undecane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Undecane: Fire hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

15 . Regulatory information

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

WHMIS (Canada) : Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : At least one component is not listed in DSL but all such components are listed in NDSL.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. ASPIRATION HAZARD.

Hazardous Material Information System (U.S.A.) :

Health	1
Flammability	1
Physical hazards	0
Personal protection	D

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **1/5/2012.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1. Product and company identification

Product name : MILGEL™

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Viscosifier

Code : 1284DF

Validation date : 12/5/2011.

Print date : 12/5/2011.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2. Hazards identification

Physical state : Solid. [Powder.]

Odor : Odorless.

Color : Beige.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

Fine dust clouds may form explosive mixtures with air. Handling and/or processing of this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose and throat. Keep away from heat, sparks and flame. Prevent dust accumulation. Do not breathe dust. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation : Irritating to respiratory system.

Ingestion : No known significant effects or critical hazards.

Skin : No known significant effects or critical hazards.

Eyes : Moderately irritating to eyes. No significant irritation expected other than possible mechanical irritation.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Carcinogenicity : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Target organs : Contains material which may cause damage to the following organs: lungs, upper respiratory tract, eyes.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : None known.

Skin : None known.

2 . Hazards identification

Eyes : irritation, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Crystalline silica, quartz	14808-60-7	1 - 5

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Fine dust clouds may form explosive mixtures with air.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

6 . Accidental release measures

Methods for cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Vacuum or sweep up material and place in a designated, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Crystalline silica, quartz	US ACGIH	-	0.025	-	-	-	-	-	-	-	[a]
Crystalline silica, quartz, as quartz	OSHA PEL 1989	-	0.1	-	-	-	-	-	-	-	[b]

Form: [a]Respirable fraction; see Appendix C [b]Respirable dust

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

8 . Exposure controls/personal protection

Personal protection

Respiratory : Approved/certified disposable particulate dust mask. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Solid. [Powder.]

Flash point : Not available.

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Beige.

Odor : Odorless.

pH : 9.5 [Conc. (% w/w): 10%]

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : 2.6

Density : Not available.

Vapor density : Not available.

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Not available.

Solubility (Water) : Insoluble

Vapor pressure : Not available.

Pour Point : Not available.

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Crystalline silica, quartz	A2	1	-	+	Proven.	-

Chronic toxicity Remarks

1) Crystalline silica, quartz

Not available.

12 . Ecological information

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material
Carcinogen
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Quartz (SiO2)
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Quartz (SiO2): Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :
Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

WHMIS (Canada) : Class D-2A: Material causing other toxic effects (Very toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

Hazardous Material Information System (U.S.A.) :

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **12/5/2011.**

Indicates information that has changed from previously issued version.

Notice to reader

16 . Other information

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

MATERIAL SAFETY DATA SHEET

MAGMA-GEL™ SE

Drilling Fluids

1. Product and Company Identification

Material name	**MAGMA-GEL™ SE**
Product use	Rheological Additive
Chemical description	Organophilic Clay
Revision date	02-01-2010
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073
Emergency	CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview	Harmful in contact with eyes. Prolonged exposure may cause chronic effects. Contact with this material can cause irritation to the skin, eyes and mucous membranes.
Potential health effects	
Eyes	Dust or powder may irritate eye tissue.
Skin	Health injuries are not known or expected under normal use.
Inhalation	Inhalation of dusts may cause respiratory irritation.
Ingestion	Health injuries are not known or expected under normal use.
Target organs	Eyes. Lungs. Respiratory system.
Chronic effects	Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material. Shortness of breath.
Signs and symptoms	Cough. Discomfort in the chest. Shortness of breath. Conjunctivitis. Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material.

3. Composition / Information on Ingredients

Components	CAS #	Percent
CRYSTALLINE SILICA, QUARTZ	14808-60-7	1.0 - 10.0
Non-hazardous and other components below reportable levels		> 90

4. First Aid Measures

First aid procedures	
Eye contact	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Skin contact	Wash off skin with soap and water. Get medical attention if irritation develops or persists.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.
Ingestion	If swallowed, rinse mouth with water (only if the person is conscious). If ingestion of a large amount does occur, seek medical attention.
Notes to physician	Symptoms may be delayed.
General advice	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties	Dusts at sufficient concentrations can form explosive mixtures with air.
Hazardous combustion products	Product is not considered combustible. Ammonia
Extinguishing media	
Suitable extinguishing media	Use any media suitable for the surrounding fires.

Protection of firefighters

Protective equipment and precautions for firefighters Move containers from fire area if you can do it without risk. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

6. Accidental Release Measures

Personal precautions Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. May cause a slippery condition when wet.

Evacuation procedures Keep unnecessary personnel away. Stay upwind.

Environmental precautions Do not flush into surface water or sanitary sewer system.

Methods for containment Stop the flow of material, if this is without risk. Contain the discharged material.

Methods for cleaning up Vacuum or sweep up material and place in a disposal container. Avoid the generation of dusts during clean-up. Do not flush with water. Forms smooth, slippery surfaces on floors, posing an accident risk.

7. Handling and Storage

Handling Wear personal protective equipment. Minimize dust generation and accumulation. In case of insufficient ventilation, wear suitable respiratory equipment.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value	Form
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	TWA	0.025 mg/m3	Respirable fraction.

U.S. - OSHA

Components	Type	Value	Form
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	TWA	0.1 mg/m3	Respirable.
		2.4 mppcf	Respirable.
		0.3 mg/m3	Total dust.
		0.1 mg/m3	Respirable dust.

Engineering controls Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Personal protective equipment

Eye / face protection Wear dust goggles.

Hand protection Rubber or plastic gloves.

Skin protection Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.

Respiratory protection Half mask with a particle filter P1 (EN 143). When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

General hygeine considerations Do not breathe dust. Wash hands before breaks and immediately after handling the product.

9. Physical & Chemical Properties

Appearance / Color / Form Powder. Off-white. Solid.

Odor Odourless.

Form Solid.

pH Not available.

Melting point Not available.

Freezing point Not available.

Boiling point Not available.

Flash point Not available.

Evaporation rate Not available.

Flammability limits in air, upper, % by volume Not available.

Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	1.7
Relative density	1.7 g/cm3 @ 20°C
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	None known.
Incompatible materials	None known.
Hazardous decomposition products	Carbon oxides.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Chronic effects Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material.

Carcinogenicity

IARC Monographs: Overall evaluation

CRYSTALLINE SILICA, QUARTZ (14808-60-7) 1 Carcinogenic to humans.

US ACGIH Threshold Limit Values: A2 carcinogen

CRYSTALLINE SILICA, QUARTZ (14808-60-7) A2 Suspected human carcinogen.

US NTP Report on Carcinogens: Known carcinogen

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Known carcinogen.

12. Ecological Information

Ecotoxicity	This material is not expected to be harmful to aquatic life.
Persistence and degradability	Not available.
Bioaccumulation / Accumulation	Not expected to bioaccumulate.
Mobility in environmental media	This material is insoluble in water and will sink in the marine environment.

13. Disposal Considerations

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed: October 1, 1988 Carcinogenic.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed.

16. Other Information

HMIS® ratings	Health: 2 Flammability: 1 Physical hazard: 0 Personal protection: E
NFPA ratings	Health: 2 Flammability: 1 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	02-01-2010
Supercedes date	02-21-2007

This data sheet contains changes from the previous version in section(s):

Hazards Identification: US Hazardous
Composition / Information on Ingredients: Disclosure Overrides
Fire Fighting Measures: Fire & Explosion Properties
Fire Fighting Measures: Hazardous combustion products
Fire Fighting Measures: Protective equipment and precautions for firefighters
Exposure Controls / Personal Protection: Exposure guidelines
Physical & Chemical Properties: Physical & Chemical Properties
Physical & Chemical Properties: Solubility
Chemical Stability & Reactivity Information: Hazardous decomposition products
Ecological Information: Ecotoxicity
Disposal Considerations: Disposal instructions
Regulatory Information: US federal regulations
Other Information: Disclaimer

MATERIAL SAFETY DATA SHEET

MIL-LIME™

Drilling Fluids

1. Product and Company Identification

Material name	**MIL-LIME™**
Chemical name	Calcium hydroxide
Chemical description	Lime
Synonym(s)	LIME, HYDRATED
Revision date	02-13-2009
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073
Emergency	CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Harmful in contact with eyes. Risk of serious damage to eyes. Irritating to skin. Prolonged exposure may cause chronic effects.

Potential health effects

Eyes Contact will irritate or burn eyes. Eye contact may result in corneal injury.

Skin Can cause redness, inflammation, irritation. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

Inhalation Dusts of this product may cause irritation of the nose, throat, and respiratory tract.

Ingestion Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Target organs Eyes. Respiratory system. Skin.

Chronic effects Shortness of breath. May cause delayed lung damage. Prolonged skin contact may defat the skin and produce dermatitis. Conjunctiva.

3. Composition / Information on Ingredients

Components	CAS #	Percent
CALCIUM HYDROXIDE	1305-62-0	90 - 100

Composition comments This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

4. First Aid Measures

First aid procedures

Eye contact Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Skin contact Remove and isolate contaminated clothing and shoes. Immediately flush skin with plenty of water. Wash off with warm water and soap. Get medical attention immediately.

Inhalation Remove to fresh air. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion Do not induce vomiting. If conscious, drink plenty of water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Get medical attention immediately.

Notes to physician Symptoms may be delayed. If breathing is difficult, give oxygen.

General advice Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire Fighting Measures

Hazardous combustion products Carbon monoxide, carbon dioxide, various hydrocarbon fragments as well as thick smoke.

Extinguishing media

Suitable extinguishing media Use extinguishing agent suitable for type of surrounding fire.

Protection of firefighters

Protective equipment and precautions for firefighters	Move containers from fire area if you can do it without risk. Cool containers with flooding quantities of water until well after fire is out. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

6. Accidental Release Measures

Personal precautions	Surfaces may become slippery after spillage. Do not touch or walk through spilled material. Wear appropriate protective equipment and clothing during clean-up. For recommended protective clothing and equipment, see section 8 "Exposure Controls and Personal Protection".
Evacuation procedures	Keep unnecessary personnel away.
Environmental precautions	Do not contaminate surface water. Avoid subsoil penetration.
Methods for containment	Stop the flow of material, if this is without risk. Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up	Sweep up or gather material and place in appropriate container for disposal. Avoid the generation of dusts during clean-up. Ventilate the contaminated area.

7. Handling and Storage

Handling	Minimize dust generation and accumulation. Do not use in areas without adequate ventilation. Do not breathe dust. Avoid contact with skin and eyes.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep this material away from food, drink and animal feed. Do not store together with sulphates and strong acids.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Material	Type	Value
MIL-LIME™ (1305-62-0)	TWA	5 mg/m3

U.S. - OSHA

Material	Type	Value	Form
MIL-LIME™ (1305-62-0)	PEL	15 mg/m3	Total dust.
		5 mg/m3	Respirable fraction.
	TWA	5 mg/m3	

Engineering controls	Ensure adequate ventilation, especially in confined areas.

Personal protective equipment

Eye / face protection	Wear dust goggles. Face-shield.
Hand protection	Chemical resistant gloves made of butyl rubber or nitrile rubber category III according to EN 374.
Skin protection	Use of protective coveralls and long sleeves is recommended. Rubber or plastic boots.
Respiratory protection	Half mask with a particle filter P2 (EN 143).
General hygeine considerations	Wash hands before breaks and immediately after handling the product. Avoid contact with the skin and the eyes. Keep away from food and drink. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance / Color / Form	Crystalline. White. Solid.
Odor	Odourless.
Form	Solid.
pH	12.4 at 25 C (sat. soln)
Melting point	1076 °F (580 °C)
Freezing point	1076 °F (580 °C)
Boiling point	Not available.
Flash point	Not available.
Evaporation rate	1
Flammability	Not available.
Flammability limits in air, upper, % by volume	Not available.

Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	< -0.0001 kPa at 25°C
Vapor density	Not available.
Specific gravity	2.24
Relative density	Not available.
Solubility	Soluble in water
Solubility (water)	2 g/l at 32°F
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Bulk density	0.2 - 0.8 g/cm3 at 20°C
Percent volatile	5 % in water
Molecular weight	74.1000 g/mol
Molecular formula	Ca-H2-O2

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Exposure to moisture.
Incompatible materials	This product reacts with acids. Nitroethane. Nitropropane. Nitromethane. Nitroparaffins. Maleic anhydride. Sulphates.
Hazardous decomposition products	Calcium oxide
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Further information	Causes severe irritation of eyes, skin and mucous membranes.

12. Ecological Information

Ecotoxicity	This material is not expected to be harmful to aquatic life.
Persistence and degradability	This material is inorganic and not subject to biodegradation. This material reacts with atmospheric and dissolved carbon dioxide to form calcium carbonate (chalk).
Bioaccumulation / Accumulation	Not expected to bioaccumulate.
Mobility in environmental media	This product will disperse readily in bodies of water or in wet soil.

13. Disposal Considerations

Disposal instructions	Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations	All components are on the U.S. EPA TSCA Inventory List. CERCLA/SARA Hazardous Substances - Not applicable.

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Food and Drug Administration (FDA)

Total food additive
Direct food additive
GRAS food additive

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

16. Other Information

HMIS® ratings

Health: 3
Flammability: 0
Physical hazard: 0
Personal protection: J

NFPA ratings

Health: 3
Flammability: 0
Instability: 0

Disclaimer The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

EU preparer Maria Ramirez - Tel +44 (0)1224 721226

US preparer Cheryl Hood - Tel +1 713-625-4888

Issue date 02-13-2009

Supercedes date 02-07-2008

This data sheet contains changes from the previous version in section(s): This document has undergone significant changes and should be reviewed in its entirety.

MATERIAL SAFETY DATA SHEET

ECCO-BLOK

BAKER HUGHES
Drilling Fluids

1. Product and Company Identification

Material name	**ECCO-BLOK**
Product use	Filtration Control Agent
Chemical name	Gilsonite
Revision date	07-15-2009
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073
Emergency	CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview	Combustible Material: may burn but does not ignite readily. May be ignited by heat, sparks or flames. Irritating to eyes and respiratory system.
Potential health effects	
Eyes	Contact with eyes may cause irritation.
Skin	Health injuries are not known or expected under normal use.
Inhalation	Dusts of this product may cause irritation of the nose, throat, and respiratory tract.
Ingestion	Health injuries are not known or expected under normal use.
Signs and symptoms	Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

3. Composition / Information on Ingredients

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

Composition comments	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

4. First Aid Measures

First aid procedures	
Eye contact	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Skin contact	Remove contaminated clothing. Wash off skin with soap and water. Launder contaminated clothing before reuse. Get medical attention if irritation develops or persists.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.
Ingestion	Have victim rinse mouth thoroughly with water. If ingestion of a large amount does occur, seek medical attention.
General advice	If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties	Dusts at sufficient concentrations can form explosive mixtures with air.
Hazardous combustion products	Decomposition of this product may emit oxides of nitrogen and carbon monoxide.
Extinguishing media	
Suitable extinguishing media	Dry chemical, foam, carbon dioxide, water fog.
Protection of firefighters	
Protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk. Do not scatter spilled material with high pressure water streams.

6. Accidental Release Measures

Personal precautions	Do not touch or walk through spilled material.
Evacuation procedures	Keep unnecessary personnel away.

Environmental precautions	Prevent further leakage or spillage if safe to do so.
Methods for containment	Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up	Avoid dust formation. Sweep up or gather material and place in appropriate container for disposal.

7. Handling and Storage

Handling	Minimize dust generation and accumulation. Avoid contact with eyes. Do not breathe dust from this material. Do not handle or store near an open flame, heat or other sources of ignition.
Storage	Use care in handling/storage. Keep away from heat, sparks, and flame. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Exposure guidelines	Nuisance Particulates: OSHA PEL 15 mg/m3 (total dust) - 8-hr. TWA 5 mg/m3 (respirable dust) - 8-hr. TWA ACGIH TLV 10 mg/m3 (inhalable) 8-hr TWA 3 mg/m3 (respirable) 8-hr TWA
Engineering controls	Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Personal protective equipment	
Eye / face protection	Safety glasses with side-shields.or Wear dust goggles.
Hand protection	Protective gloves.
Skin protection	Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.
Respiratory protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
General hygeine considerations	When using do not smoke. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product.

9. Physical & Chemical Properties

Appearance / Color / Form	Powder. Black. Solid.
Odor	Mild.
Form	Solid.
pH	Not available.
Melting point	275 - 400 °F (135 - 204.4 °C)
Freezing point	Not available.
Boiling point	Not available.
Flash point	> 600 °F (> 315.6 °C) Cleveland Open Cup
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	Not available.
Relative density	1.06 g/cm3
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
VOC	0 % estimated
Percent volatile	0 % estimated

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.

Conditions to avoid	Direct sources of heat. Dust may form explosive mixture in air.
Incompatible materials	This product may react with strong oxidizing agents.
Hazardous decomposition products	May include oxides of nitrogen. Carbon oxides.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Local effects Irritating to eyes and respiratory system.

12. Ecological Information

Persistence and degradability Not available.

13. Disposal Considerations

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	No

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

16. Other Information

HMIS® ratings	Health: 0 Flammability: 0 Physical hazard: 0 Personal protection: J
NFPA ratings	Health: 0 Flammability: 0 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	07-15-2009

MATERIAL SAFETY DATA SHEET

BLACK-MAGIC® SFT

Drilling Fluids

1. Product and Company Identification

Material name **BLACK-MAGIC® SFT**

Product use Spotting Fluid Concentrate

Chemical description Asphalt/Lubricant Mixture

Revision date 02-09-2009

Supplier Baker Hughes Drilling Fluids
2001 Rankin Rd.
Houston, TX 77073

Emergency CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Product may form explosive dust/air mixtures if high concentration of product dust is suspended in air.

Product dust may be irritating to eyes, skin and respiratory system.

Potential health effects

Eyes This product may cause severe irritation, redness, or blurred vision. Contact will irritate or burn eyes and Dust or powder may irritate eye tissue and Eye contact may result in corneal injury.

Skin This product may cause irritation to the skin. Repeated or prolonged skin contact may cause skin irritation and/or dermatitis and sensitization of susceptible persons.

Inhalation Inhalation of vapors/fumes generated by heating this product may cause respiratory irritation with throat discomfort, coughing or difficulty breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Target organs Eyes. Respiratory system. Skin.

Chronic effects Shortness of breath. May cause delayed lung damage.

3. Composition / Information on Ingredients

Components	CAS #	Percent
ASPHALT	8052-42-4	> 60
CALCIUM HYDROXIDE	1305-62-0	10 - 20
SODIUM DODECYLBENZENESULFONATE	25155-30-0	5 - 10
DIATOMACEOUS EARTH	61790-53-2	3 - 7
Non-hazardous and other components below reportable levels		2.5 - 10

4. First Aid Measures

First aid procedures

Eye contact Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.

Skin contact Wash off skin with soap and water. Remove and isolate contaminated clothing and shoes. Get medical attention if irritation develops or persists. Wash clothing separately before reuse.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.

Ingestion Have victim rinse mouth thoroughly with water. Do not induce vomiting without medical advice. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Get medical attention immediately.

General advice Keep victim warm. Keep victim under observation. In case of shortness of breath, give oxygen. If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties Dusts at sufficient concentrations can form explosive mixtures with air. Can burn in fire, releasing toxic vapors.

Hazardous combustion products	Combustion products include fumes, smoke, carbon monoxide, carbon dioxide and sulfur dioxide. Hydrogen sulfide.

Extinguishing media

Suitable extinguishing media	Treat as a hydrocarbon-type fire. Use water to cool fire-exposed containers and to protect personnel. Do not direct a solid stream of water or foam into hot, burning pools; this may result in frothing and increase fire intensity.

Protection of firefighters

Protective equipment and precautions for firefighters	Move containers from fire area if you can do it without risk. Cool containers with flooding quantities of water until well after fire is out. Do not scatter spilled material with high pressure water streams. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

6. Accidental Release Measures

Personal precautions	Keep people away from and upwind of spill/leak. Do not touch or walk through spilled material. Ventilate closed spaces before entering. Keep out of low areas.
Environmental precautions	Do not contaminate water.
Methods for containment	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up	Avoid dust formation. Should not be released into the environment. Sweep up or gather material and place in appropriate container for disposal.

7. Handling and Storage

Handling	Do not handle or store near an open flame, heat or other sources of ignition. All equipment used when handling the product must be grounded. Do not get this material in your eyes, on your skin, or on your clothing. Wash hands after handling and before eating.
Storage	Keep away from heat and sources of ignition. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value	Form
ASPHALT (8052-42-4)	TWA	0.5 mg/m3	Inhalable fraction.

U.S. - OSHA

Components	Type	Value
DIATOMACEOUS EARTH (61790-53-2)	TWA	20 mppcf 6 mg/m3

Engineering controls	Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Personal protective equipment

Eye / face protection	Wear dust goggles. Face-shield. Eye wash fountain is recommended.
Hand protection	Protective gloves.
Skin protection	Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.
Respiratory protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
General hygeine considerations	When using do not smoke. Avoid contact with the skin and the eyes. Keep away from food and drink. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product. Emergency showers are required.

9. Physical & Chemical Properties

Appearance / Color / Form	Powder. Grey. Solid.
Odor	Hydrocarbon-like.
Form	Solid.
pH	Not available.
Melting point	1076 °F (580 °C) estimated
Freezing point	Not available.

Boiling point	699.8 °F (371.1 °C) estimated
Flash point	Not available.
Evaporation rate	Not available.
Flammability	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	4.31 hPa estimated
Vapor density	Not available.
Specific gravity	Not available.
Relative density	Not available.
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	905 °F (485 °C) estimated
Decomposition temperature	Not available.
VOC	0 % estimated
Percent volatile	0 % estimated

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	High temperatures. Heat, flames and sparks.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Upon decomposition, this product emits oxides of sulfur, carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons. Hydrogen sulfide.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
BLACK-MAGIC® SFT (Mixture)	Acute Oral LD50 Rat: 25801 mg/kg estimated
	Acute Other LD50 Mouse: 484 mg/kg estimated
Components	**Test Results**
DIATOMACEOUS EARTH (61790-53-2)	Acute Oral LD50 Mouse: > 15000 mg/kg
	Acute Oral LD50 Rat: > 22500 mg/kg

* Estimates for product may be based on additional component data not shown.

Acute effects	Acute LD50: 25801 mg/kg, Rat, Oral, estimated Acute LD50: 484 mg/kg, Mouse, Other, estimated
Local effects	Irritating to eyes, respiratory system and skin.
Chronic effects	Prolonged or repeated exposure may cause lung injury. Repeated or prolonged skin contact may cause skin irritation and/or dermatitis and sensitization of susceptible persons.
Carcinogenicity	Possible cancer hazard based on tests with laboratory animals.

12. Ecological Information

Ecotoxicological data

Product	Test Results
BLACK-MAGIC® SFT (Mixture)	EC50 Daphnia: 125 mg/l 48.00 Hours estimated
	LC50 Fish: 92.15 mg/l 96.00 Hours estimated
Components	**Test Results**
SODIUM DODECYLBENZENESULFONATE (25155-30-0)	EC50 Water flea (Ceriodaphnia dubia): 3.26 - 14.51 mg/l 48.00 Hours

Components	Test Results
SODIUM DODECYLBENZENESULFONATE (25155-30-0)	LC50 Rainbow trout,donaldson trout (Oncorhynchus mykiss): 3.2 - 5.6 mg/l 96.00 Hours

* Estimates for product may be based on additional component data not shown.

Ecotoxicity Components of this product are hazardous to aquatic life.

Environmental effects An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and degradability Not available.

13. Disposal Considerations

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations. Do not dispose of waste into sewer.

14. Transport Information

DOT

Not regulated as hazardous goods.

IATA

Not regulated as hazardous goods.

IMDG

Not regulated as hazardous goods.

15. Regulatory Information

US federal regulations All components are on the U.S. EPA TSCA Inventory List.

CERCLA (Superfund) reportable quantity

ASPHALT: 100.0000
SODIUM DODECYLBENZENESULFONATE: 1000.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

16. Other Information

HMIS® ratings	Health: 1 Flammability: 1 Physical hazard: 0 Personal protection: D
NFPA ratings	Health: 1 Flammability: 1 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	02-09-2009
Supercedes date	02-09-2009
This data sheet contains changes from the previous version in section(s):	This document has undergone significant changes and should be reviewed in its entirety.

MATERIAL SAFETY DATA SHEET

BLACK-MAGIC™

Drilling Fluids

1. Product and Company Identification

Material name BLACK-MAGIC™

Product use Spotting Fluid

Chemical description Diesel Oil/Fatty Acid/Asphalt Blend

Revision date 03-30-2010

Supplier Baker Hughes Drilling Fluids
2001 Rankin Rd.
Houston, TX 77073

Emergency CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Flammable/Combustible Material. Harmful: may cause lung damage if swallowed. Irritating to eyes, respiratory system and skin. Prolonged exposure may cause chronic effects.

Potential health effects

Eyes Liquid or vapors may irritate the eyes.

Skin This product may cause irritation to the skin. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

Inhalation Excessive inhalation of this product may cause headache, dizziness, blurred vision, nausea and vomiting. Vapor inhalation and/or skin absorption can cause central nervous system effects and blindness.

Ingestion Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. Harmful: may cause lung damage if swallowed.

Target organs Eyes. Respiratory system. Skin.

Chronic effects May cause delayed lung damage. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

3. Composition / Information on Ingredients

Components	CAS #	Percent
DIESEL OIL (PETROLEUM)	68334-30-5	> 70
ASPHALT	8052-42-4	10 - 15
CALCIUM HYDROXIDE	1305-62-0	3 - 5
Non-hazardous and other components below reportable levels		10 - 20

4. First Aid Measures

First aid procedures

Eye contact Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.

Skin contact Remove and isolate contaminated clothing and shoes. Wash off immediately with soap and plenty of water. If skin irritation persists, call a physician. Launder contaminated clothing before reuse.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.

Ingestion If swallowed, seek medical advice immediately and show this container or label. Give several glasses of water.

General advice Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Keep victim under observation.

5. Fire Fighting Measures

Flammable properties Flammable Liquid. Vapors may form explosive mixtures with air.

Hazardous combustion products Carbon monoxide and carbon dioxide. Sulfur oxides.

Extinguishing media

Suitable extinguishing media Dry chemical, CO2, water spray or regular foam. Do not use water jet.

Protection of firefighters

Protective equipment and precautions for firefighters Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Use water spray to cool unopened containers.

6. Accidental Release Measures

Personal precautions Keep unnecessary personnel away. Stay upwind. Keep out of low areas. Local authorities should be advised if significant spillages cannot be contained.

Environmental precautions Prevent further leakage or spillage if safe to do so. Do not contaminate water. Do not flush into surface water or sanitary sewer system.

Methods for containment Stop the flow of material, if this is without risk. Prevent entry into waterways, sewers, basements or confined areas. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water.

Methods for cleaning up Should not be released into the environment. Dike far ahead of liquid spill for later disposal. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After removal flush contaminated area thoroughly with water.

7. Handling and Storage

Handling Use only in area provided with appropriate exhaust ventilation. Do not breathe gas/fumes/vapor/spray. Wear personal protective equipment. Do not get this material in your eyes, on your skin, or on your clothing. All equipment used when handling the product must be grounded.

Storage Keep away from heat, sparks, and flame. Use appropriate container to avoid environmental contamination. Keep containers tightly closed in a dry, cool and well-ventilated place. Prevent electrostatic charge build-up by using common bonding and grounding techniques.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value	Form
ASPHALT (8052-42-4)	TWA	0.5 mg/m3	Inhalable fraction.
DIESEL OIL (PETROLEUM) (68334-30-5)	TWA	100 mg/m3	Inhalable fraction and vapor.

Engineering controls Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Eye wash fountain and emergency showers are recommended.

Personal protective equipment

Eye / face protection Wear chemical goggles and face shield.

Hand protection Neopreneor solvent-resistant gloves (butyl-rubber).

Skin protection Use of impervious boots is recommended. Use of protective coveralls and long sleeves is recommended.

Respiratory protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

9. Physical & Chemical Properties

Appearance / Color / Form Emulsion Black. Liquid.

Odor Hydrocarbon-like.

Form Liquid.

pH Not available.

Melting point Not available.

Freezing point Not available.

Boiling point 699.8 °F (371.1 °C) estimated

Flash point 131 - 140 °F (55 - 60 °C) Pensky-Martens Closed Cup

Evaporation rate Not available.

Flammability limits in air, upper, % by volume 1 %

Flammability limits in air, lower, % by volume	6 %
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	0.8 - 0.9
Relative density	Not available.
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	428 °F (220 °C)
Decomposition temperature	Not available.

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Heat, flames and sparks.
Incompatible materials	Strong oxidizing agents. Caustics. Strong acids.
Hazardous decomposition products	May include oxides of carbon. May include oxides of phosphorus.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Sensitization

US ACGIH Threshold Limit Values: Skin designation

DIESEL OIL (PETROLEUM) (68334-30-5)	Can be absorbed through the skin.

Local effects	Contact may irritate or burn eyes. Irritating to skin.
Chronic effects	Hazardous by OSHA criteria. Prolonged or repeated exposure may cause lung injury.
Carcinogenicity	Hazardous by OSHA criteria. Cancer hazard.

IARC Monographs: Overall evaluation

ASPHALT (8052-42-4)	2B Possibly carcinogenic to humans.
ASPHALT (8052-42-4)	3 Not classifiable as to carcinogenicity to humans.

US ACGIH Threshold Limit Values: A3 carcinogen

DIESEL OIL (PETROLEUM) (68334-30-5)	A3 Confirmed animal carcinogen with unknown relevance to humans.

US ACGIH Threshold Limit Values: A4 carcinogen

ASPHALT (8052-42-4)	A4 Not classifiable as a human carcinogen.

Corrosivity	Not expected to be hazardous by OSHA criteria.
Mutagenicity	Not expected to be hazardous by OSHA criteria.
Neurological effects	Not expected to be hazardous by OSHA criteria.
Reproductive effects	Not expected to be hazardous by OSHA criteria.
Teratogenicity	Not expected to be hazardous by OSHA criteria.

12. Ecological Information

Ecotoxicity	Components of this product are hazardous to aquatic life.
Environmental effects	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Aquatic toxicity	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Persistence and degradability	Not available.
Mobility in environmental media	This material is insoluble in water and will float on the surface of the water.

13. Disposal Considerations

Waste codes	D001: Waste Flammable material with a flash point <140 F
Disposal instructions	Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Basic shipping requirements:

Proper shipping name	Flammable liquids, n.o.s. (DIESEL OIL (PETROLEUM))
Hazard class	3
UN number	UN1993
Packing group	III

Additional information:

Special provisions	B1, B52, IB3, T4, TP1, TP29
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242
ERG number	128

IATA

Basic shipping requirements:

Proper shipping name	Flammable liquid, n.o.s. (DIESEL OIL (PETROLEUM))
Hazard class	3
UN number	1993
Packing group	III

IMDG

Basic shipping requirements:

Proper shipping name	FLAMMABLE LIQUID, N.O.S. (DIESEL OIL (PETROLEUM))
Hazard class	3
UN number	1993
Packing group	III

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

FDA: Direct food substances affirmed as generally recognized as safe (GRAS) (21 CFR 184): Reference

CALCIUM HYDROXIDE (1305-62-0) 184.1205

CERCLA (Superfund) reportable quantity

ASPHALT: 100.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

ASPHALT (8052-42-4) Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

ASPHALT (8052-42-4) Listed: January 1, 1990 Carcinogenic.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

ASPHALT (8052-42-4) Listed.
CALCIUM HYDROXIDE (1305-62-0) Listed.
DIESEL OIL (PETROLEUM) (68334-30-5) Listed.

US - Pennsylvania RTK - Hazardous Substances: Special hazard

ASPHALT (8052-42-4) Special hazard.

16. Other Information

HMIS® ratings Health: 2*
Flammability: 2
Physical hazard: 0
Personal protection: H

NFPA ratings Health: 2
Flammability: 2
Instability: 0

Disclaimer The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

EU preparer Shona Hamilton - Tel +44 (0)1224 720867

US preparer Cheryl Hood - Tel +1 713-625-4888

Issue date 03-30-2010

Supercedes date	10-01-2009
This data sheet contains changes from the previous version in section(s):	This document has undergone significant changes and should be reviewed in its entirety.

MATERIAL SAFETY DATA SHEET

CARBO-DRILL OIL BASED MUD

BAKER HUGHES
Drilling Fluids

1. Product and Company Identification

Material name CARBO-DRILL OIL BASED MUD

Version # 02

Revision date 08-27-2008

Chemical description Oil Based Mud System

Supplier Baker Hughes Drilling Fluids
2001 Rankin Rd.
Houston, TX 77073
For Emergencies, call CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Combustible liquid and vapor. Toxic by inhalation. May be fatal if inhaled. Irritating to eyes, respiratory system and skin. Prolonged exposure may cause chronic effects.

Potential health effects

Eyes Contact may irritate or burn eyes.

Skin Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

Inhalation May cause irritation of respiratory tract. Can cause severe central nervous system depression (including unconsciousness). Headaches, dizziness, nausea, decreased blood pressure, changes in heart rate, and cyanosis may result from overexposure to vapor or skin exposure. Exreme exposures may cause other CNS effects including death.

Ingestion Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

3. Composition / Information on Ingredients

Components	CAS #	Percent
FUELS, DIESEL, NO. 2	68476-34-6	< 80
NAPHTHALENE	91-20-3	< 1
Non-hazardous and other components below reportable levels		> 10

4. First Aid Measures

First aid procedures

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.

Skin contact Remove and isolate contaminated clothing and shoes. Wash off with soap and water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse.

Inhalation Move to fresh air. If breathing is difficult, give oxygen.

Ingestion Do not induce vomiting. Have victim rinse mouth thoroughly with water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Get medical attention immediately.

Notes to physician Symptoms may be delayed. Keep victim warm. In case of shortness of breath, give oxygen.

General advice Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire Fighting Measures

Flammable properties Combustible liquid. Runoff to sewer may cause fire or explosion hazard. Containers may explode when heated. Vapors may travel to a source of ignition and flash back.

Hazardous combustion products Fire may produce irritating, corrosive and/or toxic gases.

Extinguishing media

Suitable extinguishing media Dry chemical, foam, carbon dioxide. Caution: use of water spray may be inefficient.

Protection of firefighters

Protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk. Cool containers / tanks with water spray. Do not scatter spilled material with high pressure water streams.

6. Accidental Release Measures

Personal precautions	Keep people away from and upwind of spill/leak. Do not touch or walk through spilled material. Ventilate closed spaces before entering. Keep out of low areas.
Methods for containment	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent entry into waterways, sewers, basements or confined areas. Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.
Methods for cleaning up	Large Spills: Dike far ahead of liquid spill for later disposal. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean contaminated surface thoroughly.

7. Handling and Storage

Handling	Do not handle or store near an open flame, heat or other sources of ignition. Do not breathe gas/fumes/vapor/spray. Avoid contact with skin and eyes.
Storage	Keep away from heat, sparks, and flame. This material can accumulate static charge which may cause spark and become an ignition source. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value
NAPHTHALENE (91-20-3)	STEL	15 ppm
	TWA	10 ppm

U.S. - OSHA

Components	Type	Value
NAPHTHALENE (91-20-3)	PEL	10 ppm 50 mg/m3
	STEL	75 mg/m3 15 ppm
	TWA	10 ppm 50 mg/m3

Engineering controls	Provide local and general exhaust ventilation to effectively remove and prevent buildup of any vapors or mists generated from the handling of this product. If oil mist is generated, observe the OSHA exposure limit of 5 mg/m3.

Personal protective equipment

Eye / face protection	Wear safety glasses; chemical goggles (if splashing is possible).
Hand protection	Vitonor nitrile rubber gloves.
Skin protection	Use of impervious boots is recommended. Use of protective coveralls and long sleeves is recommended.
Respiratory protection	If airborne concentrations are above the applicable exposure limits, use NIOSH approved respiratory protection.
General hygeine considerations	When using do not smoke. Avoid contact with skin, eyes and clothing. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product.

9. Physical & Chemical Properties

Appearance / Color / Form	Brown. Liquid.
Odor	Hydrocarbon-like.
Form	Liquid.
pH	Not available.

Melting point	Not available.
Freezing point	Not available.
Boiling point	494.6 °F (257.2 °C) estimated
Flash point	> 174 °F (> 78.9 °C) Tag Closed Cup
Evaporation rate	Not available.
Flammability	Not available.
Flammability limits in air, upper, % by volume	0.3 %
Flammability limits in air, lower, % by volume	10 %
Vapor pressure	0.62 hPa estimated
Vapor density	> 1 (air = 1)
Specific gravity	1.74
Relative density	1.74 g/cm3
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	500 °F (260 °C) estimated
Decomposition temperature	Not available.
VOC	0.0443 % estimated
Percent volatile	10.6844 % estimated

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Heat, flames and sparks.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Upon decomposition, this product may yield sulfur dioxide, carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
DIESEL OIL BASED DRILLING MUD (Mixture)	Acute Dermal LD50 Rat: 74918 mg/kg estimated
	Acute Oral LD50 Rat: 19690 mg/kg estimated
Components	**Test Results**
NAPHTHALENE (91-20-3)	Acute Dermal LD50 New Zealand white rabbit: > 2000 mg/kg
	Acute Dermal LD50 Rat: > 20000 mg/kg
	Acute Oral LD50 Guinea pig: 1200 mg/kg
	Acute Oral LD50 Rat: 490 mg/kg
	Acute Oral LD50 Sherman rat: 2200 mg/kg
	Acute Oral LD50 Sprague-Dawley rat: 2600 mg/kg
	Acute Other LD50 Mouse: 100 mg/kg

* Estimates for product may be based on additional component data not shown.

Sensitization

US ACGIH Threshold Limit Values: Skin designation

FUELS, DIESEL, NO. 2 (68476-34-6)	Can be absorbed through the skin.
NAPHTHALENE (91-20-3)	Can be absorbed through the skin.

Local effects Irritating to eyes, respiratory system and skin. Toxic by inhalation.

Carcinogenicity

IARC Monographs on Occupational Exposures to Chemical Agents: Overall evaluation

NAPHTHALENE (91-20-3)	2B Possible carcinogen.

US ACGIH Threshold Limit Values: A3 carcinogen

FUELS, DIESEL, NO. 2 (68476-34-6)	Group A3 Confirmed animal carcinogen with unknown relevance to humans.

Carcinogenicity

US ACGIH Threshold Limit Values: A4 carcinogen

NAPHTHALENE (91-20-3) Group A4 Not classifiable as a human carcinogen.

US NTP Report on Carcinogens: Anticipated carcinogen

NAPHTHALENE (91-20-3) Anticipated carcinogen.

12. Ecological Information

Ecotoxicological data

Product	Test Results
DIESEL OIL BASED DRILLING MUD (Mixture)	EC50 Daphnia: 491 mg/l 48.00 Hours estimated
	LC50 Fish: 847 mg/l 96.00 Hours estimated
Components	**Test Results**
NAPHTHALENE (91-20-3)	EC50 Water flea (Daphnia magna): 1.09 - 3.4 mg/l 48.00 Hours
	LC50 Rainbow trout,donaldson trout (Oncorhynchus mykiss): 0.91 - 2.82 mg/l 96.00 Hours

* Estimates for product may be based on additional component data not shown.

Ecotoxicity Components of this product have been identified as having potential environmental concerns.

Environmental effects An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and degradability Not available.

13. Disposal Considerations

Waste codes

US RCRA Hazardous Waste U List: Reference

NAPHTHALENE (91-20-3) U165

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

Department of Transportation (DOT) Requirements

BULK SHIPMENTS (>119 gallons)

Basic shipping requirements:

Proper shipping name	Combustible liquid, n.o.s. (FUELS, DIESEL, NO. 2)
Hazard class	Comb liq
Subsidiary hazard class	None
UN number	NA1993
Packing group	III
Additional information:	
Special provisions	IB3, T1, T4, TP1
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	241

Department of Transportation (DOT) Requirements

NON-BULK SHIPMENTS (<119 gallons)

Not regulated as hazardous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

NAPHTHALENE (91-20-3) 0.1 %

US TSCA Section 12(b) Export Notification: Export Notification requirement/De minimis concentration

NAPHTHALENE (91-20-3) 0.1 % One-Time Export Notification only.

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - Yes Fire Hazard - Yes Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

NAPHTHALENE (91-20-3)	Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

NAPHTHALENE (91-20-3)	Listed: April 19, 2002 Carcinogenic.

US - New Jersey Community RTK (EHS Survey): Reportable threshold

FUELS, DIESEL, NO. 2 (68476-34-6)	10000 LBS
NAPHTHALENE (91-20-3)	500 LBS

US - Pennsylvania RTK - Hazardous Substances: Listed substance

FUELS, DIESEL, NO. 2 (68476-34-6)	Listed.
NAPHTHALENE (91-20-3)	Listed.

16. Other Information

HMIS® ratings	Health: 1* Flammability: 2 Physical hazard: 0 Personal protection: H
NFPA ratings	Health: 1 Flammability: 2 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	08-27-2008
Supercedes date	08-26-2008
This data sheet contains changes from the previous version in section(s):	Hazards Identification: Emergency overview Hazards Identification: Eyes Composition / Information on Ingredients: Ingredients Fire Fighting Measures: Protective equipment and precautions for firefighters Physical & Chemical Properties: Solubility

MATERIAL SAFETY DATA SHEET

OMNI-COTE®

BAKER HUGHES
Drilling Fluids

1. Product and Company Identification

Material name	**OMNI-COTE®**
Chemical description	Polyolefin/Organic Sulfonate Blend
Applications	High Temperature Emulsifier
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073 Emergency telephone number 713-439-8900

2. Composition / Information on Ingredients

Components	CAS #	Percent
2-ETHYLHEXANOL	104-76-7	8 - 10
Non-hazardous and other components below reportable levels		> 90

Composition comments This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

3. Hazards Identification

Emergency overview Irritating to eyes, respiratory system and skin.

Potential health effects

Routes of exposure	Eye contact. Skin contact.
Eyes	Contact with eyes may cause irritation.
Skin	Prolonged skin contact may cause skin irritation and/or dermatitis.
Inhalation	May cause irritation of respiratory tract.
Ingestion	Irritating to mouth, throat, and stomach.

4. First Aid Measures

First aid procedures

Eye contact	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Skin contact	Remove and isolate contaminated clothing and shoes. Wash off skin with soap and water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.
Ingestion	Do not induce vomiting. Give several glasses of water. Get medical attention immediately.

General advice Keep victim warm. Keep victim under observation. In case of shortness of breath, give oxygen. If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Hazardous combustion products Combustion products include fumes, smoke, carbon monoxide, carbon dioxide and sulfur dioxide.

Extinguishing media

Suitable extinguishing media Dry chemical, foam, carbon dioxide. Use water to cool fire-exposed containers and to protect personnel. Do not use a solid water stream as it may scatter and spread fire.

Protection of firefighters

Protective equipment for firefighters Move containers from fire area if you can do it without risk. Do not scatter spilled material with high pressure water streams. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

6. Accidental Release Measures

Personal precautions Do not touch or walk through spilled material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Evacuation procedures	Keep unnecessary personnel away. Ventilate closed spaces before entering. Stay upwind. Keep out of low areas.
Methods for containment	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent entry into waterways, sewers, basements or confined areas. Dike the spilled material, where this is possible.
Methods for cleaning up	Large Spills: Dike far ahead of liquid spill for later disposal. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean contaminated surface thoroughly.

7. Handling and Storage

Handling	Do not handle or store near an open flame, heat or other sources of ignition. Handle and open container with care. Do not get this material in your eyes, on your skin, or on your clothing. Do not breathe gas/fumes/vapor/spray.
Storage	Keep away from heat and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Engineering controls	Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Personal protective equipment	
Eye / face protection	Wear chemical goggles.
Skin protection	Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.
Hand protection	Impervious gloves.
Respiratory protection	No personal respiratory protective equipment normally required. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
General hygeine considerations	When using do not smoke. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. Physical and Chemical Properties

Appearance / Color / Form	Amber. Liquid.
Odor	Solvent.
Clarity	Not available
Odor threshold	Not available
Physical state	Liquid
pH	Not available
Melting point	Not available
Freezing point	Not available
Boiling point	365 °F (184.5 °C) estimated
Flash point	> 212 °F (> 100 °C)
Evaporation rate	Not available
Flammability limits in air, lower, % by volume	Not available
Flammability limits in air, upper, % by volume	Not available
Vapor pressure	Not available
Vapor density	Not available
Specific gravity	0.935 - 0.941
Relative density	6.6924 estimated
Solubility	Insoluble in water.
Octanol/H2O coeff	Not available
Auto-ignition temperature	447.8 °F (231 °C) estimated
Decomposition temperature	Not available
VOC (Weight %)	13.44 % estimated

10. Chemical Stability and Reativity Information

Chemical stability	Stable at normal conditions.

Conditions to avoid Heat, flames and sparks.

Incompatible materials This product may react with reducing agents. Strong oxidizing agents. Strong acids.

Hazardous decomposition products Upon decomposition this product emits acrid dense smoke with carbon dioxide, carbon monoxide, water and other products of combustion.

Possibility of hazardous reactions Will not occur.

11. Toxicological Information

Acute effects Acute LD50: 17273 mg/kg, Rat, Oral
Acute LD50: 22204 mg/kg, Rat, Dermal

Component analysis - LD50

Toxicology Data - Selected LD50s and LC50s

2-ETHYLHEXANOL	104-76-7	Oral LD50 Rat: 1516 mg/kg; Dermal LD50 Rat: >3000 mg/kg; Dermal LD50 Rabbit: 1970 mg/kg

Local effects Irritating to eyes, respiratory system and skin.

12. Ecological Information

Ecotoxicity Components of this product have been identified as having potential environmental concerns.

Environmental effects

Ecotoxicity - Freshwater Fish Species Data

2-ETHYLHEXANOL	104-76-7	96 Hr LC50 rainbow trout: 32 mg/L (static)

Ecotoxicity - Water Flea Data

2-ETHYLHEXANOL	104-76-7	24 Hr EC50 water flea: 270.0 mg/L (Static)

13. Disposal Considerations

Disposal instructions Dispose in accordance with all applicable regulations.

14. Transport Information

Department of Transportation (DOT) Requirements

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations CERCLA/SARA Hazardous Substances - Not applicable.

FEMA (Flavor and Extract Manufacturers Association) - FEMA Numbers

2-ETHYLHEXANOL	104-76-7	3151

Occupational Safety and Health Administration (OSHA)

29 CFR 1910.1200 hazardous chemical Yes

CERCLA (Superfund) reportable quantity None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (CCS)	No
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Japanese Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Korean Inventory of Chemicals (KICS)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

International regulations The product is classified and labelled in accordance with EC directives or respective national laws.

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

Massachusetts - Right To Know List

2-ETHYLHEXANOL	104-76-7	Present

Pennsylvania - RTK (Right to Know) List

2-ETHYLHEXANOL	104-76-7	Present

16. Other Information

HMIS ratings
Health: 1
Flammability: 1
Physical hazard: 0
Personal protection: G

NFPA ratings
Health: 1
Flammability: 1
Instability: 0

Disclaimer The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

US preparer Cheryl Hood - (713)625-4888

Issue date 06-26-2006

MATERIAL SAFETY DATA SHEET

SURF-COTE®

Drilling Fluids

1. Product and Company Identification

Material name SURF-COTE®

Chemical name Surfactant Blend

Chemical description Oil Mud Wetting Agent

Supplier Baker Hughes Drilling Fluids
2001 Rankin Rd.
Houston, TX 77073
Emergency telephone number 713-439-8900

2. Composition / Information on Ingredients

Components	CAS #	Percent
NAPHTHALENE	91-20-3	2 - 3.5
N-BUTANOL	71-36-3	10
1,2,4-Trimethylbenzene	95-63-6	< 3.5
NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	< 25
Non-hazardous and other components below reportable levels		40 - 60

3. Hazards Identification

Emergency overview Flammable/Combustible Material. May be ignited by heat, sparks or flames. Irritating to eyes, respiratory system and skin. Harmful if swallowed. Possible cancer hazard based on tests with laboratory animals.

Potential health effects

Routes of exposure Inhalation. Skin contact. Ingestion.

Eyes Contact can cause moderate to severe irritation and possible injury to the eyes.

Skin Irritating to skin.

Inhalation Irritating to respiratory system. Prolonged inhalation may be harmful.

Ingestion Harmful if swallowed.

Target organs Eyes. Respiratory system. Skin.

Chronic effects May cause cancer.

4. First Aid Measures

First aid procedures

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Skin contact Wash off immediately with plenty of water. Remove and isolate contaminated clothing and shoes. Wash clothing separately before reuse. Get medical attention if irritation develops or persists.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.

Ingestion Do not induce vomiting: contains petroleum distillates and/or aromatic solvents. Drink plenty of water. If material is ingested, immediately contact a physician or poison control center.

General advice Keep victim warm. Keep victim under observation. In case of shortness of breath, give oxygen. Take off contaminated clothing and shoes immediately. Call a physician if symptoms develop or persist.

5. Fire Fighting Measures

Flammable properties Vapor or gas may spread to distant ignition sources and flash back.

Hazardous combustion products Combustion products include fumes, smoke, carbon monoxide, carbon dioxide and sulfur dioxide.

Extinguishing media

Suitable extinguishing media Carbon dioxide (CO2). Alcohol foam. Dry chemical. Water Fog.

Protection of firefighters

Protective equipment for firefighters Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk. Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

6. Accidental Release Measures

Evacuation procedures Keep unnecessary personnel away. Ventilate closed spaces before entering. Stay upwind. Keep out of low areas.

Environmental precautions Do not contaminate water. Prevent further leakage or spillage if safe to do so.

Methods for containment Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent entry into waterways, sewers, basements or confined areas. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Use water spray to reduce vapors or divert vapor cloud drift.

Methods for cleaning up Eliminate ignition sources including sources of electrical, static or frictional sparks.

Large Spills: Do not allow material to contaminate ground water system. Dike far ahead of liquid spill for later disposal. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean contaminated surface thoroughly. After removal flush contaminated area thoroughly with water.

7. Handling and Storage

Handling Do not get this material in your eyes, on your skin, or on your clothing. Do not handle or store near an open flame, heat or other sources of ignition. Vapors may form explosive mixtures with air. All equipment used when handling the product must be grounded. Use this product with adequate ventilation. Wear personal protective equipment.

Storage Keep away from heat and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep this material away from food, drink and animal feed.

8. Exposure Controls / Personal Protection

Exposure limits

ACGIH

Components	CAS #	TWA	STEL	Ceiling
N-BUTANOL	71-36-3	20 ppm		
1,2,4-Trimethylbenzene	95-63-6	25 ppm		
NAPHTHALENE	91-20-3	10 ppm	15 ppm	

OSHA

Components	CAS #	TWA	STEL	Ceiling
N-BUTANOL	71-36-3	100 ppm		
NAPHTHALENE	91-20-3	10 ppm		

Engineering controls Provide adequate local exhaust ventilation to maintain worker exposure below exposure limits.

Personal protective equipment

Eye protection Wear chemical goggles.

Hand protection Neoprene gloves.

Skin and body protection Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended. Rubber or plastic apron.

Respiratory protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

General hygeine considerations Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product. Avoid contact with the skin and the eyes.

9. Physical and Chemical Properties

Appearance / Color / Form	Clear. Amber. Liquid.
Odor	Solvent.
Clarity	Not available
Odor threshold	Not available
Physical state	Liquid
pH	6 - 8
Melting point	-76 °F (-60 °C) estimated
Freezing point	Not available
Boiling point	244.4 °F (117.7 °C) estimated
Flash point	109.4 °F (43 °C) Pensky-Martens Closed Cup
Evaporation rate	Not available
Flammability limits in air, lower, % by volume	Not available
Flammability limits in air, upper, % by volume	Not available
Vapor pressure	Not available
Vapor density	Not available
Specific gravity	1.7486 estimated
Relative density	0.98 g/m3 at 20 C
Solubility	Insoluble in water.
Octanol/H2O coeff	Not available
Auto-ignition temperature	649.4 °F (343 °C) estimated
Decomposition temperature	Not available
VOC (Weight %)	20 % estimated
Percent volatile	10 %

10. Chemical Stability & Reactivity Information

Chemical stability	Instability caused by exposure to sources of ignition.
Conditions to avoid	Heat, flames and sparks.
Incompatible materials	Oxidizing materials.
Hazardous decomposition products	Upon decomposition, this product emits oxides of sulfur, carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Component analysis - LD50

Toxicology Data - Selected LD50s and LC50s

1,2,4-Trimethylbenzene	95-63-6	Inhalation LC50 Rat: 18 g/m3/4H; Oral LD50 Rat:3400 mg/kg; Dermal LD50 Rabbit:>3160 mg/kg
NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	Inhalation LC50 Rat: 590 mg/m3/4H; Oral LD50 Rat: 7050 mg/kg; Dermal LD50 Rabbit: 2 mL/kg
NAPHTHALENE	91-20-3	Inhalation LC50 Rat: >340 mg/m3/1H; Oral LD50 Rat:490 mg/kg; Dermal LD50 Rat:>2500 mg/kg; Dermal LD50 Rabbit:>20 g/kg
N-BUTANOL	71-36-3	Inhalation LC50 Rat: >17.7 mg/L/4H; Inhalation LC50 Rat:8000 ppm/4H; Oral LD50 Rat:790 mg/kg; Dermal LD50 Rabbit:3400 mg/kg

Local effects	Harmful if swallowed. May cause irritation of respiratory tract. May cause eye/skin irritation.
Chronic effects	Prolonged exposure may cause chronic effects.
Carcinogenicity	Possible cancer hazard based on tests with laboratory animals.

ACGIH - Threshold Limit Values - Carcinogens

NAPHTHALENE	91-20-3	A4 - Not Classifiable as a Human Carcinogen

Further information	Symptoms may be delayed.

12. Ecological Information

Ecotoxicity	Components of this product are hazardous to aquatic life.

Environmental effects

Ecotoxicity - Freshwater Algae Data

NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	72 Hr EC50 Skeletonema costatum: 2.5 mg/L
NAPHTHALENE	91-20-3	96 Hr EC50 Skeletonema costatum: 0.4 mg/L
N-BUTANOL	71-36-3	96 Hr EC50 Scenedesmus subspicatus: >500 mg/L; 72 Hr EC50 Scenedesmus subspicatus: >500 mg/L

Ecotoxicity - Freshwater Fish Species Data

1,2,4-Trimethylbenzene	95-63-6	96 Hr LC50 Pimephales promelas: 7.72 mg/L [flow-through]
NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	96 Hr LC50 Pimephales promelas: 19 mg/L [static]; 96 Hr LC50 Oncorhynchus mykiss: 2.34 mg/L; 96 Hr LC50 Lepomis macrochirus: 1740 mg/L [static]
NAPHTHALENE	91-20-3	96 Hr LC50 Pimephales promelas: 6.14 mg/L [flow-through]; 96 Hr LC50 Oncorhynchus mykiss: 1.60 mg/L [flow-through] (juvenile); 96 Hr LC50 Pimephales promelas: 6.08 mg/L [flow-through]; 96 Hr LC50 Pimephales promelas: 1.99 mg/L [static]
N-BUTANOL	71-36-3	96 Hr LC50 Pimephales promelas: 1510 mg/L [static] (33 days old); 96 Hr LC50 Pimephales promelas: 1740 mg/L [flow-through]; 96 Hr LC50 Leuciscus idus: 1200 mg/L

Ecotoxicity - Microtox Data

NAPHTHALENE	91-20-3	30 min EC50 Photobacterium phosphoreum: 0.93 mg/L; 18 Hr EC50 Pseudomonas putida: >20 mg/L
N-BUTANOL	71-36-3	5 min EC50 Photobacterium phosphoreum: 2041.4 mg/L; 30 min EC50 Photobacterium phosphoreum: 2186 mg/L; 17 Hr EC50 Pseudomonas putida: 4400 mg/L; 24 Hr EC50 Aerobic heterotroph: 3980 mg/L

Ecotoxicity - Water Flea Data

1,2,4-Trimethylbenzene	95-63-6	48 Hr EC50 Daphnia magna: 6.14 mg/L
NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	48 Hr EC50 Daphnia magna: 0.95 mg/L
NAPHTHALENE	91-20-3	48 Hr EC50 water flea: 2.16 mg/L
N-BUTANOL	71-36-3	48 Hr EC50 Daphnia magna: 1983 mg/L

Aquatic toxicity May cause long-term adverse effects in the aquatic environment.

13. Disposal Considerations

Waste codes D001: Waste Flammable material with a flash point <140 F

Disposal instructions Dispose in accordance with all applicable regulations. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

14. Transport Information

Department of Transportation (DOT) Requirements

Proper shipping name	Flammable liquids, n.o.s. (N-BUTANOL RQ = 50000 lbs)
Hazard class	3
UN number	UN1993
Packing group	III
Special provisions	B1, B52, IB3, T4, TP1, TP29
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242
ERG number	128

IATA

Proper shipping name	Flammable liquids, n.o.s. (N-BUTANOL)
Hazard class	3
UN number	UN1993
Packing group	III
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242
Labels required	3

IMDG

Proper shipping name	Flammable Liquid, n.o.s. (N-BUTANOL)
Hazard class	3
UN number	UN1993
Packing group	III
Marine pollutant	Alkylbenzenesulfonates, branched or straight chain
Packaging exceptions	150
Labels required	None

General DOT Regulated Marine Pollutant.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

FEMA (Flavor and Extract Manufacturers Association) - FEMA Numbers

N-BUTANOL	71-36-3	2178

NTP (National Toxicology Program) - Report on Carcinogens - Reasonably Anticipated to be Human Carcinogens

NAPHTHALENE	91-20-3	Reasonably Anticipated To Be A Human Carcinogen

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

1,2,4-Trimethylbenzene	95-63-6	1.0 % de minimis concentration
NAPHTHALENE	91-20-3	0.1 % de minimis concentration
N-BUTANOL	71-36-3	1.0 % de minimis concentration

U.S. - FDA - Color Additives Conditionally Approved for Use in Foods

N-BUTANOL	71-36-3	21 CFR 73.1

U.S. - FDA - Direct Food Additives

N-BUTANOL	71-36-3	21 CFR 172.515

Occupational Safety and Health Administration (OSHA)

29 CFR 1910.1200 hazardous chemical	Yes

CERCLA (Superfund) reportable quantity N-BUTYL ALCOHOL: 5000.0000
NAPHTHALENE: 100.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - Yes Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (CCS)	No
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Japanese Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Korean Inventory of Chemicals (KICS)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

Regulations The product is classified and labelled in accordance with EC directives or respective national laws.

IARC - Group 2B (Possibly Carcinogenic to Humans)

NAPHTHALENE	91-20-3	Monograph 82 [2002]

State regulations

WARNING: This product contains a chemical known to the State of California to cause cancer.

U.S. - California - Proposition 65 - Carcinogens List

NAPHTHALENE	91-20-3	carcinogen, initial date 4/19/02

U.S. - Massachusetts - Right To Know List

1,2,4-Trimethylbenzene	95-63-6	Present
NAPHTHALENE	91-20-3	Present
N-BUTANOL	71-36-3	Present

U.S. - New Jersey - Right to Know Hazardous Substance List

1,2,4-Trimethylbenzene	95-63-6	sn 2716
NAPHTHALENE	91-20-3	sn 1322
N-BUTANOL	71-36-3	sn 1330

U.S. - Pennsylvania - RTK (Right to Know) List

1,2,4-Trimethylbenzene	95-63-6	Environmental hazard
NAPHTHALENE	91-20-3	Environmental hazard
N-BUTANOL	71-36-3	Present

16. Other Information

HMIS® ratings

Health: 2
Flammability:2
Physical hazard: 0
Personal protection: H

NFPA ratings

Health: 2
Flammability: 2
Instability: 0

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

US preparer

Cheryl Hood

Issue date

14-May-2008

Supercedes date

04-25-2007

MSDS sections updated

Physical & Chemical Properties: Solubility
Regulatory Information: Canadian regulations

Material Safety Data Sheet

1 . Product and company identification

Product name	: CARBO-TROL™ 375
Supplier	: Baker Hughes Drilling Fluids A Baker Hughes Company 2001 Rankin Road Houston, TX 77073
Material Uses	: Special: Filtration Control Agent
Code	: 7188DF
Validation date	: 7/5/2012.
Print date	: 7/5/2012.
Version	: 4
In case of emergency	: For Chemical Emergency: 713-439-8900 1-800-424-9300

2 . Hazards identification

Physical state	: Solid. [Powder.]
Odor	: Characteristic.
Color	: Black.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: WARNING! CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE EYE AND SKIN IRRITATION. Fine dust clouds may form explosive mixtures with air. Handling and/or processing of this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose and throat. Keep away from heat, sparks and flame. Prevent dust accumulation. Do not breathe dust. Do not get on skin or clothing. Avoid contact with eyes. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation	: Irritating to respiratory system.
Ingestion	: No known significant effects or critical hazards.
Skin	: Moderately irritating to the skin. May cause sensitization by skin contact.
Eyes	: Moderately irritating to eyes. No significant irritation expected other than possible mechanical irritation.

Potential chronic health effects

Chronic effects	: Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Over-exposure signs/symptoms

Inhalation	: respiratory tract irritation, coughing
Ingestion	: None known.
Skin	: irritation, redness
Eyes	: irritation, watering, redness
Medical conditions aggravated by over-exposure	: Pre-existing skin disorders may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

2 . Hazards identification

3 . Composition/information on ingredients

Name	CAS number	%
Asphaltite	12002-43-6	60 - 100

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Fine dust clouds may form explosive mixtures with air.

Extinguishing media

Suitable : In case of fire, use water spray (fog), foam, dry chemical or CO_2.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : No specific data.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Vacuum or sweep up material and place in a designated, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
No exposure limit value known.											

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : Approved/certified disposable particulate dust mask. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

8 . Exposure controls/personal protection

Eyes	: Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.
Skin	: Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	: Solid. [Powder.]
Flash point	: Closed cup: Not applicable.
Auto-ignition temperature	: Not available.
Flammable limits	: Not available.
Color	: Black.
Odor	: Characteristic.
pH	: Not available.
Boiling/condensation point	: Not available.
Initial Boiling Point	: Not available.
Melting/freezing point	: 200 to 228°C (392 to 442.4°F)
Relative density	: 1.088
Density	: Not available.
Vapor density	: Not available.
Volatility	: 2 to 10% (v/v)
Odor threshold	: Not available.
Evaporation rate	: Not available.
VOC	: Not available.
Viscosity	: Not available.
Solubility (Water)	: Insoluble
Vapor pressure	: Not available.
Pour Point	: Not available.
Partition coefficient (LogKow)	: Not available.

10 . Stability and Reactivity

Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	: Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

No additional information.

Chronic toxicity Remarks

1) Asphaltite

Not available.

12 . Ecological information

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material
Sensitizing material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: Not determined.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: No products were found.
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: No products were found.

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

15 . Regulatory information

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : Not determined.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE EYE AND SKIN IRRITATION.

Hazardous Material Information System (U.S.A.) :

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **7/5/2012.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

MATERIAL SAFETY DATA SHEET

MIL-BAR™ 410

BAKER HUGHES
Drilling Fluids

1. Product and Company Identification

Material name	**MIL-BAR™ 410**
Product use	Weighting Agent
Chemical name	Barium sulfate
Revision date	03-02-2010
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073
Emergency	CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Contact with this material can cause irritation to the skin, eyes and mucous membranes. Prolonged exposure may cause chronic effects. Cancer hazard.

Potential health effects

Eyes	Dust or powder may irritate eye tissue.
Skin	Health injuries are not known or expected under normal use. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).
Inhalation	Inhalation of dusts may cause respiratory irritation.
Ingestion	Health injuries are not known or expected under normal use. Ingestion of large amounts may produce gastrointestinal disturbances including irritation, nausea, and diarrhea.

Target organs Eyes. Lungs. Respiratory system.

Chronic effects Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material.

Potential environmental effects This material is not expected to be harmful to aquatic life.

3. Composition / Information on Ingredients

Components	CAS #	Percent
BARIUM SULFATE	7727-43-7	90 - 95
CRYSTALLINE SILICA, QUARTZ	14808-60-7	4 - 6
MICA	12001-26-2	1 - 3

4. First Aid Measures

First aid procedures

Eye contact	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Skin contact	Wash off with soap and water. Get medical attention if irritation develops or persists.
Inhalation	Remove to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.
Ingestion	Have victim rinse mouth thoroughly with water. If swallowed, rinse mouth with water (only if the person is conscious). If ingestion of a large amount does occur, seek medical attention.

General advice If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties The product is not flammable.

Hazardous combustion products Combustion products include fumes, smoke, carbon monoxide, carbon dioxide and sulfur dioxide. May include oxides of nitrogen

Extinguishing media

Suitable extinguishing media Use any media suitable for the surrounding fires.

Protection of firefighters

Protective equipment and precautions for firefighters Use water spray to cool unopened containers. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk.

6. Accidental Release Measures

Personal precautions Keep unnecessary personnel away. Ventilate enclosed areas. Avoid inhalation of dust from the spilled material. Surfaces may become slippery after spillage.

Environmental precautions Prevent further leakage or spillage if safe to do so. Do not flush into surface water or sanitary sewer system.

Methods for containment Stop the flow of material, if this is without risk.

Methods for cleaning up Avoid the generation of dusts during clean-up. Do not flush with water. Forms smooth, slippery surfaces on floors, posing an accident risk. Vacuum or sweep up material and place in a disposal container. After removal flush contaminated area thoroughly with water.

7. Handling and Storage

Handling Handle and open container with care. Minimize dust generation and accumulation. Wear personal protective equipment. Avoid prolonged exposure. Do not breathe dust from this material. Do not get this material in your eyes, on your skin, or on your clothing. In case of insufficient ventilation, wear suitable respiratory equipment.

Storage Keep in a dry, cool and well-ventilated place. Keep away from Aluminium.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value	Form
BARIUM SULFATE (7727-43-7)	TWA	10 mg/m3	
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	TWA	0.025 mg/m3	Respirable fraction.
MICA (12001-26-2)	TWA	3 mg/m3	Respirable fraction.

U.S. - OSHA

Components	Type	Value	Form
BARIUM SULFATE (7727-43-7)	PEL	5 mg/m3	Respirable fraction.
		15 mg/m3	Total dust.
	TWA	5 mg/m3	Respirable fraction.
		10 mg/m3	Total dust.
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	TWA	0.1 mg/m3	Respirable.
		2.4 mppcf	Respirable.
		0.1 mg/m3	Respirable dust.
		0.3 mg/m3	Total dust.
MICA (12001-26-2)	TWA	3 mg/m3	Respirable dust.
		20 mppcf	

Engineering controls Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Eye wash fountain and emergency showers are recommended.

Personal protective equipment

Eye / face protection Wear dust goggles.

Hand protection Rubber or plastic gloves.

Skin protection Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.

Respiratory protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators. Suitable mask with particle filter P3 (European Norm 143)

General hygeine considerations Do not breathe dust. Wash hands before breaks and immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance / Color / Form Powder. Tan. Solid.

Odor None.

Form Solid.

pH 7 (2% aq. soln)

Melting point	Not available.
Freezing point	Not available.
Boiling point	Not available.
Flash point	Not available.
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	4.1 g/ml @ 20 deg C
Relative density	4100 kg/m3
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Bulk density	1714 - 2163 kg/m3 @ 20 deg C
Molecular formula	Ba.H2-O4-S

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Exposure to water vapor.
Incompatible materials	Fluoride. Powerful oxidizers.
Hazardous decomposition products	May include oxides of nitrogen. May include oxides of phosphorus.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Chronic effects	Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material.
Carcinogenicity	This product contains crystalline silica. The International Agency for Research of Cancer has designated crystalline silica in the form of quartz or cristobalite a Group 1 (carcinogenic for humans).

IARC Monographs: Overall evaluation	
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	1 Carcinogenic to humans.
US ACGIH Threshold Limit Values: A2 carcinogen	
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	A2 Suspected human carcinogen.
US ACGIH Threshold Limit Values: A4 carcinogen	
BARIUM SULFATE (7727-43-7)	A4 Not classifiable as a human carcinogen.
US NTP Report on Carcinogens: Known carcinogen	
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	Known carcinogen.

12. Ecological Information

Ecotoxicological data

Components	Test Results
BARIUM SULFATE (7727-43-7)	EC50 Tubificid worm (Tubifex tubifex): 28.61 - 38.03 mg/l 48.00 hours

* Estimates for product may be based on additional component data not shown.

Ecotoxicity	This material is not expected to be harmful to aquatic life.
Persistence and degradability	The methods for determining the biological degradability are not applicable to inorganic substances.
Bioaccumulation / Accumulation	Not expected to bioaccumulate.

Mobility in environmental media This material is insoluble in water and will sink in the marine environment.

13. Disposal Considerations

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
CERCLA/SARA Hazardous Substances - Not applicable.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	No

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed: October 1, 1988 Carcinogenic.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

BARIUM SULFATE (7727-43-7) Listed.
CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed.
MICA (12001-26-2) Listed.

16. Other Information

HMIS® ratings Health: 1*
Flammability: 0
Physical hazard: 0
Personal protection: E

NFPA ratings	Health: 1 Flammability: 0 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	03-02-2010
Supercedes date	03-02-2010
This data sheet contains changes from the previous version in section(s):	This document has undergone significant changes and should be reviewed in its entirety.

Material Safety Data Sheet

1 . Product and company identification

Product name : CARBO-TEC™

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Emulsifier/Wetting Agent

Code : 1210DF

Validation date : 2/15/2012.

Print date : 2/15/2012.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid.

Odor : Solvents

Color : Brown. [Dark]

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE AND SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. ASPIRATION HAZARD.

Do not ingest. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation : Irritating to respiratory system.

Ingestion : Aspiration hazard if swallowed. Can enter lungs and cause damage.

Skin : Moderately irritating to the skin.

Eyes : Moderately irritating to eyes.

Potential chronic health effects

Chronic effects : Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : nausea or vomiting

Skin : irritation, redness, dryness, cracking

Eyes : irritation, watering, redness

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Distillates, (petroleum), hydrotreated light	64742-47-8	10 - 30

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products : No specific data.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose

6 . Accidental release measures

the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Distillates, (petroleum), hydrotreated light	US ACGIH	-	200	-	-	-	-	-	-	-	[1]

[1]Absorbed through skin.

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	:	Liquid.
Flash point	:	Closed cup: >100°C (>212°F)
Auto-ignition temperature	:	Not available.
Flammable limits	:	Not available.
Color	:	Brown. [Dark]
Odor	:	Solvents
pH	:	Not available.
Boiling/condensation point	:	Not available.
Initial Boiling Point	:	Not available.
Melting/freezing point	:	Not available.
Relative density	:	Not available.
Density	:	Not available.
Vapor density	:	Not available.
Odor threshold	:	Not available.
Evaporation rate	:	Not available.
VOC	:	Not available.
Viscosity	:	Not available.
Solubility (Water)	:	Not available.
Vapor pressure	:	Not available.
Pour Point	:	Not available.
Partition coefficient (LogKow)	:	Not available.

10 . Stability and Reactivity

Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	:	No specific data.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Carcinogenicity Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Distillates, (petroleum), hydrotreated light	A3	-	-	-	-	-

Chronic toxicity Remarks

1) Distillates, (petroleum), hydrotreated light

Not available.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Distillates, (petroleum), hydrotreated light	Acute LC50 2200 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus - 35 to 75 mm	4 days

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Distillates (petroleum), hydrotreated light
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Distillates (petroleum), hydrotreated light: Delayed (chronic) health hazard

15 . Regulatory information

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

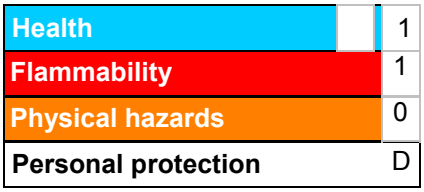
WHMIS (Canada) : Not controlled under WHMIS (Canada).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE AND SKIN IRRITATION. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. ASPIRATION HAZARD.

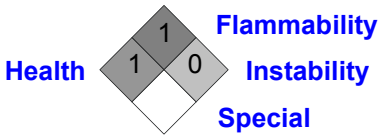
Hazardous Material Information System (U.S.A.) :



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



Date of printing : **2/15/2012.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : CARBO-GEL™

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Viscosifier

Code : 1135DF

Validation date : 8/2/2011.

Print date : 8/2/2011.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Solid. [Powder.]

Odor : Odorless.

Color : White.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

Fine dust clouds may form explosive mixtures with air. Handling and/or processing of this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose and throat. Keep away from heat, sparks and flame. Prevent dust accumulation. Do not breathe dust. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation : Irritating to respiratory system.

Ingestion : Ingestion may cause gastrointestinal irritation and diarrhea.

Skin : Moderately irritating to the skin.

Eyes : Moderately irritating to eyes. No significant irritation expected other than possible mechanical irritation.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Carcinogenicity : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Target organs : Contains material which may cause damage to the following organs: lungs, upper respiratory tract, eyes.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : Ingestion may cause nausea, diarrhea and vomiting.

Skin : irritation, redness

2 . Hazards identification

Eyes : irritation, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Crystalline silica, quartz	14808-60-7	1 - 5

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Fine dust clouds may form explosive mixtures with air.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

6 . Accidental release measures

Methods for cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Vacuum or sweep up material and place in a designated, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Crystalline silica, quartz	US ACGIH	-	0.025	-	-	-	-	-	-	-	[a]
Crystalline silica, quartz, as quartz	OSHA PEL 1989	-	0.1	-	-	-	-	-	-	-	[b]

Form: [a]Respirable fraction; see Appendix C [b]Respirable dust

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

8 . Exposure controls/personal protection

Personal protection

Respiratory : Approved/certified disposable particulate dust mask. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Solid. [Powder.]

Flash point : Not available.

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : White.

Odor : Odorless.

pH : 7 [Conc. (% w/w): 2%]

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : 1.7

Density : Not available.

Vapor density : Not available.

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Not available.

Solubility (Water) : Insoluble

Vapor pressure : Not available.

Pour Point : Not available.

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.

Materials to avoid : Reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Conditions of reactivity : Flammable in the presence of the following materials or conditions: open flames, sparks and static discharge.

11 . Toxicological information

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Crystalline silica, quartz	A2	1	-	+	Proven.	-

Chronic toxicity Remarks

1) Crystalline silica, quartz

Not available.

12 . Ecological information

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material
Carcinogen
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Quartz (SiO2)
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Quartz (SiO2): Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.
Clean Air Act (CAA) 112 accidental release prevention: No products were found.
Clean Air Act (CAA) 112 regulated flammable substances: No products were found.
Clean Air Act (CAA) 112 regulated toxic substances: No products were found.
Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :
Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

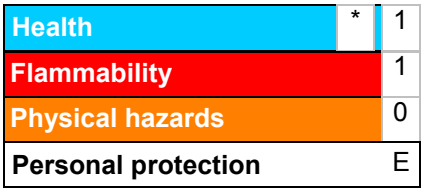
WHMIS (Canada) : Class D-2A: Material causing other toxic effects (Very toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

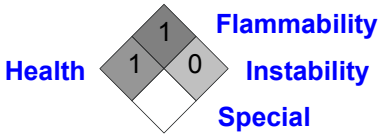
Hazardous Material Information System (U.S.A.) :



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



Date of printing : **8/2/2011.**

Indicates information that has changed from previously issued version.

Notice to reader

16 . Other information

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : CARBO-MUL™ LT

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Emulsifier/Wetting Agent

Code : 1628DF

Validation date : 12/9/2011.

Print date : 12/9/2011.

Version : 1.02

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid.

Color : Amber.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : DANGER!

COMBUSTIBLE LIQUID AND VAPOR. CAUSES DIGESTIVE TRACT, EYE AND SKIN BURNS. CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Static discharges can cause ignition or explosion when container is not bonded. Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Potential acute health effects

Inhalation : Severely irritating to the respiratory system. May cause sensitization by inhalation.

Ingestion : Harmful if swallowed. Corrosive to the digestive tract. Causes burns.

Skin : Corrosive to the skin. Causes burns. Harmful in contact with skin. May cause sensitization by skin contact.

Eyes : Corrosive to eyes. Causes burns.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels. Prolonged or repeated contact can defat the skin and lead to irritation, cracking and/or dermatitis.

Target organs : Contains material which may cause damage to the following organs: gastrointestinal tract, upper respiratory tract, skin, eyes, central nervous system (CNS).

Over-exposure signs/symptoms

2 . Hazards identification

Inhalation : respiratory tract irritation, coughing, wheezing and breathing difficulties, asthma

Ingestion : stomach pains

Skin : pain or irritation, redness, dryness, cracking, blistering may occur

Eyes : pain, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing respiratory and skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Tall oil fatty acids	61790-12-3	30 - 60
Distillates, (petroleum), hydrotreated light	64742-47-8	30 - 60
Citric acid	77-92-9	10 - 30
Diethylene triamine	111-40-0	5 - 10
Glycol ether	34590-94-8	5 - 10

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush the eye(s) continuously with lukewarm, gently flowing water for at least 20-60 minutes while holding the eyelid(s) open.

Skin contact : Wash affected area with soap and mild detergent for at least 20 - 60 minutes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide,nitrogen oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Distillates, (petroleum), hydrotreated light	US ACGIH	-	200	-	-	-	-	-	-	-	[1]
Diethylene triamine	US ACGIH	1	4.2	-	-	-	-	-	-	-	[1]
	OSHA PEL 1989	1	4	-	-	-	-	-	-	-	
Glycol ether	US ACGIH	100	606	-	150	909	-	-	-	-	[1]
	OSHA PEL	100	600	-	-	-	-	-	-	-	[1]
	OSHA PEL 1989	100	600	-	150	900	-	-	-	-	[1]

8 . Exposure controls/personal protection

[1]Absorbed through skin.

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and chemical resistant apron to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Closed cup: >65°C (>149°F)

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Amber.

Odor : Not available.

pH : Not available.

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : Not available.

Density : Not available.

Vapor density : Not available.

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Kinematic (40°C): >80 cSt

Solubility (Water) : Not available.

Vapor pressure : Not available.

Pour Point : Not available.

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Conditions of reactivity : Slightly flammable in the presence of the following materials or conditions: open flames, sparks and static discharge and heat.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Tall oil fatty acids	LD50 Oral	Rat	>10000 mg/kg	-
Citric acid	LD50 Oral	Rat	3 g/kg	-
	LD50 Oral	Rat	11700 mg/kg	-
Diethylene triamine	LD50 Dermal	Rabbit	1090 mg/kg	-
	LD50 Oral	Rat	1080 mg/kg	-
Glycol ether	LD50 Dermal	Rabbit	10 mL/kg	-
	LD50 Oral	Rat	5.5 mL/kg	-
	LD50 Oral	Rat	5400 uL/kg	-

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Distillates, (petroleum), hydrotreated light	A3	-	-	-	-	-

Chronic toxicity Remarks

1) Tall oil fatty acids

Not available.

2) Distillates, (petroleum), hydrotreated light

Not available.

3) Citric acid

Citric acid is a component of this product. Frequent intake of citrated beverages may cause erosion of dental enamel and irritation of mucous membranes (Clayton & Clayton, 1994). The potassium and sodium salts have mild diuretic effects when taken in gram quantities daily (Clayton & Clayton, 1994). Citric acid has generally been nontoxic in experimental animals. Rabbits tolerated up to 7.7% in the diet with no effect (Clayton & Clayton, 1994). It has been reported to have allergenic properties, however (Clayton & Clayton, 1994), and might cause contact dermatitis.

4) Diethylene triamine

Not available.

5) Glycol ether

Not available.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Distillates, (petroleum), hydrotreated light	Acute LC50 2200 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus - 35 to 75 mm	4 days
Citric acid	Acute LC50 160000 ug/L Marine water	Crustaceans - Green or Europeon shore crab - Carcinus maenas - Adult	48 hours
Diethylene triamine	Acute LC50 53500 ug/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	Acute LC50 1014000 ug/L Fresh water	Fish - Guppy - Poecilia reticulata	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	NA1993	COMBUSTIBLE LIQUID,N.O.S (Contains: Distillates, (petroleum), hydrotreated light, Glycol ether)	Combustible liquid.	III		This material is not regulated by DOT if transported in a packaging </= 119 gallons.
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Combustible liquid
Corrosive material
Sensitizing material
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Distillates (petroleum), hydrotreated light; Citric acid; Diethylenetriamine; (2-methoxymethylethoxy)propanol
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Distillates (petroleum), hydrotreated light: Delayed (chronic) health hazard; Citric acid: Immediate (acute) health hazard; Diethylenetriamine: Immediate (acute) health hazard; (2-methoxymethylethoxy)propanol: Fire hazard, Immediate (acute) health hazard

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

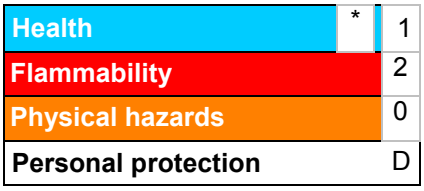
WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2B: Material causing other toxic effects (Toxic).
Class E: Corrosive material

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. CAUSES DIGESTIVE TRACT, EYE AND SKIN BURNS. CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY BE HARMFUL IF ABSORBED THROUGH SKIN OR IF SWALLOWED. PROLONGED OR REPEATED CONTACT MAY DRY SKIN AND CAUSE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Hazardous Material Information System (U.S.A.) :



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

16 . Other information

Date of printing : **12/9/2011.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : DIESEL OIL

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Drilling Fluid Base

Code : 5014DF

Validation date : 10/10/2012.

Print date : 10/10/2012.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid. [Clear.]

Odor : Characteristic.

Color : Brown. [Light]

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

COMBUSTIBLE LIQUID AND VAPOR. CAUSES SKIN IRRITATION. MAY CAUSE RESPIRATORY TRACT IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. SUSPECT CANCER HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE CANCER. ASPIRATION HAZARD.

At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Static discharges can cause ignition or explosion when container is not bonded. Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not ingest. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Potential acute health effects

Inhalation : Moderately irritating to the respiratory system.

Ingestion : Aspiration hazard if swallowed. Can enter lungs and cause damage.

Skin : Irritating to skin.

Eyes : Moderately irritating to eyes.

Potential chronic health effects

Carcinogenicity : Contains material which may cause cancer. Risk of cancer depends on duration and level of exposure.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : nausea or vomiting

Skin : irritation, redness

Eyes : irritation, watering, redness

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Diesel oil	68334-30-5	60 - 100
Ethylbenzene	100-41-4	0.1 - 1
Naphthalene	91-20-3	0.1 - 1

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.

Hazardous thermal decomposition products : No specific data.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Water polluting material. May be harmful to the environment if released in large quantities.

6 . Accidental release measures

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

If RQ (Reportable Quantity) is exceeded, report to National Spill Response Office at 1-800-424-8802.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing vapor or mist. Avoid release to the environment. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	**List name**	**ppm**	**mg/m³**	**Other**	**ppm**	**mg/m³**	**Other**	**ppm**	**mg/m³**	**Other**	**Notations**
Diesel oil, measured as total hydrocarbons	US ACGIH	-	100	-	-	-	-	-	-	-	[1] [a]
Ethylbenzene	US ACGIH	100	-	-	125	-	-	-	-	-	
	OSHA PEL	100	435	-	-	-	-	-	-	-	
	OSHA PEL 1989	100	435	-	125	545	-	-	-	-	
Naphthalene	US ACGIH	10	52	-	15	79	-	-	-	-	
	OSHA PEL	10	50	-	-	-	-	-	-	-	
	OSHA PEL 1989	10	50	-	15	75	-	-	-	-	

[1]Absorbed through skin.
Form: [a]Total hydrocarbons

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

8 . Exposure controls/personal protection

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid. [Clear.]

Flash point : Closed cup: 55 to 60°C (131 to 140°F) [ASTM D93]

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Brown. [Light]

Odor : Characteristic.

pH : Not available.

Boiling/condensation point : 145 to 370°C (293 to 698°F)

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : 0.81 to 0.87 (15°C)

Density : 7.2 (lbs/gal)

Vapor density : >2 [Air = 1]

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Kinematic (40°C): 1.7 cSt

Solubility (Water) : Not available.

Vapor pressure : Not available.

Pour Point : <-6°C (<21.2°F)

Partition coefficient (LogKow) : >3.5

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Diesel oil	LD50 Oral	Rat	7.5 g/kg	-
	LD50 Oral	Rat	7500 mg/kg	-
Ethylbenzene	LD50 Dermal	Rabbit	>5000 mg/kg	-
	LD50 Dermal	Rabbit	17800 uL/kg	-
	LD50 Oral	Rat	3500 mg/kg	-
	LC50 Inhalation Vapor	Rat	55000 mg/m3	2 hours
Naphthalene	LD50 Dermal	Rabbit	>20 gm/kg	-
	LD50 Dermal	Rat	>2500 mg/kg	-
	LD50 Oral	Rat	490 mg/kg	-

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Diesel oil	A3	3	-	-	-	-
Ethylbenzene	A3	2B	-	-	-	-
Naphthalene	A4	2B	-	-	Possible	-

Chronic toxicity Remarks

1) Diesel oil

Not available.

2) Ethylbenzene

Not available.

3) Naphthalene

This product contains naphthalene. A National Toxicology Program (NTP) report concluded there is clear evidence to support carcinogenicity of naphthalene in male and female rats. These observations were based on 2-year inhalation studies in which the test animals were exposed to 10, 30, and 60 ppm naphthalene. In male and female rats, exposure to naphthalene caused significant increases in the incidence of nonneoplastic lesions of the nose (NTP TR-500). The relevance of the rodent findings to humans is questionable.

Naphthalene has caused hemolytic anemia, jaundice, cataracts (Shopp et al, 1984), allergic reactions (Tsyrkunov & Yakovleva, 1985), possible neurotoxicity (Riala et al, 1984), and aplastic anemia (Harden & Baetjer, 1978) in humans. Increased lung aveolar adenomas were seen in mice exposed to 30 ppm naphthalene for 6hrs/day for 6 months (ACGIH, 1992).

Naphthalene crosses the placenta leading to methemoglobinemia (decreased ability for the blood to carry oxygen), and/or hemolytic anemia, conditions considered especially dangerous to the unborn (Reprotext). Liver and kidney damage has also been seen with exposure to naphthalene (Reprotext).

Peripheral lens opacities occurred in 8 of 21 workers exposed to high levels of naphthalene fumes or vapors for 5 years, but cataracts have not been reported in other occupational studies. (Hathaway et al, 1991).

11 . Toxicological information

The International Agency for Research on Cancer (IARC) evaluated naphthalene and concluded that there was sufficient evidence for carcinogenicity in experimental animals, but inadequate evidence that it causes cancer in exposed humans. Accordingly, IARC classified naphthalene as a possible human carcinogen (Group 2B).

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Ethylbenzene	Acute EC50 2930 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - Neonate - <=24 hours	48 hours
	Acute LC50 >5200 ug/L Marine water	Crustaceans - Opossum shrimp - Americamysis bahia - <24 hours	48 hours
	Acute LC50 4200 ug/L Fresh water	Fish - Rainbow trout,donaldson trout - Oncorhynchus mykiss	96 hours
	Chronic NOEC 6800 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - <=24 hours	48 hours
	Chronic NOEC 3300 ug/L Marine water	Fish - Atlantic silverside - Menidia menidia	96 hours
Naphthalene	Acute EC50 1.96 mg/L Fresh water	Daphnia - Water flea - Daphnia magna	48 hours
	Acute LC50 2350 ug/L Marine water	Crustaceans - Daggerblade grass shrimp - Palaemonetes pugio	48 hours
	Acute LC50 213 ug/L Fresh water	Fish - Crimson-spotted rainbowfish - Melanotaenia fluviatilis	96 hours

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

Partition coefficient: n-octanol/water : >3.5

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	NA1993	COMBUSTIBLE LIQUID,N.O.S (Contains: DIESEL FUEL)	Combustible liquid.	III		This material is not regulated by DOT if transported in a packaging </= 119 gallons.
TDG Classification	UN1202	DIESEL FUEL	3	III		-
IMDG Class	UN1202	DIESEL FUEL	3	III		-
IATA-DGR Class	UN1202	DIESEL FUEL	3	III		-

PG* : Packing group

DOT Reportable Quantity Naphthalene, 2525 gal of this product.

Marine pollutant Not applicable.

North-America NAERG : 128

15 . Regulatory information

HCS Classification : Combustible liquid
Irritating material
Carcinogen

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: No products were found.
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: No products were found.

CERCLA: Hazardous substances.: Ethylbenzene: 1000 lbs. (454 kg); naphthalene: 100 lbs. (45.4 kg);

Clean Water Act (CWA) 307: Ethylbenzene

Clean Water Act (CWA) 311: Ethylbenzene

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

15 . Regulatory information

SARA 313

	Product name	CAS number	Concentration
Supplier notification :	Ethylbenzene	100-41-4	0.1 - 1
	Naphthalene	91-20-3	0.1 - 1

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

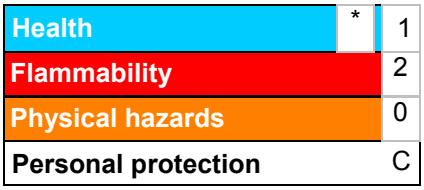
WHMIS (Canada) : Class B-3: Combustible liquid with a flash point between 37.8°C (100°F) and 93.3°C (200°F).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. CAUSES SKIN IRRITATION. MAY CAUSE RESPIRATORY TRACT IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. SUSPECT CANCER HAZARD - CONTAINS MATERIAL WHICH MAY CAUSE CANCER. ASPIRATION HAZARD.

Hazardous Material Information System (U.S.A.) :



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The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **10/10/2012.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : Calcium Chloride Brine

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Not available.

Code : 5112DF

Validation date : 9/2/2011.

Print date : 9/2/2011.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid.

Odor : Odorless.

Color : Clear. Colorless.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : CAUTION!

MAY BE HARMFUL IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION.

Do not ingest. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. Wash thoroughly after handling.

Potential acute health effects

Inhalation : No known significant effects or critical hazards.

Ingestion : Harmful if swallowed.

Skin : Moderately irritating to the skin.

Eyes : Moderately irritating to eyes.

Potential chronic health effects

Over-exposure signs/symptoms

Inhalation : None known.

Ingestion : Ingestion may cause nausea, diarrhea and vomiting.

Skin : irritation, redness

Eyes : irritation, watering, redness

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Calcium chloride, anhydrous	10043-52-4	10 - 30

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products : halogenated compounds,metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
No exposure limit value known.											

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : No special ventilation requirements. Good general ventilation should be sufficient to control worker exposure to airborne contaminants. If this product contains ingredients with exposure limits, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Closed cup: Not applicable.

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Clear. Colorless.

Odor : Odorless.

pH : Not available.

9 . Physical and chemical properties

Boiling/condensation point : >100°C (>212°F)
Initial Boiling Point : Not available.
Melting/freezing point : -14°C (6.8°F)
Relative density : 1.1 to 1.36 (20°C)
Density : Not available.
Vapor density : Not available.
Odor threshold : Not available.
Evaporation rate : Not available.
VOC : Not available.
Viscosity : Not available.
Solubility (Water) : Not available.
Vapor pressure : Not available.
Pour Point : Not available.
Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.
Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid : No specific data.
Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Calcium chloride, anhydrous	LD50 Oral	Rat	1 g/kg	-
	LD50 Oral	Rabbit	1384 mg/kg	-

Chronic toxicity Remarks

1) Calcium chloride, anhydrous

Not available.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Calcium chloride, anhydrous	Acute EC50 52000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - 12 hours	48 hours
	Acute LC50 270 mg/L Marine water	Crustaceans - Opossum shrimp - Americamysis bahia - 4 to 5 days	48 hours
	Acute LC50 2110 mg/L Fresh water	Fish - Fathead minnow - Pimephales promelas	96 hours
	Chronic NOEC 260.12 mg/L Marine water	Crustaceans - Opossum shrimp - Americamysis bahia - 4 to 5 days	48 hours
	Chronic NOEC 0.75 g/L Fresh water	Daphnia - Water flea - Daphnia magna - 5 days	48 hours

Conclusion/Summary : Not available.

Biodegradability

12 . Ecological information

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Calcium chloride
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Calcium chloride: Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

15 . Regulatory information

Canada

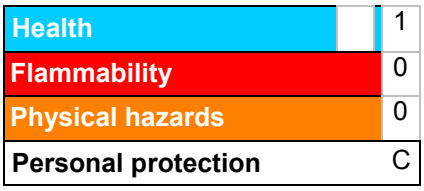
WHMIS (Canada) : Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : MAY BE HARMFUL IF SWALLOWED. MAY CAUSE EYE AND SKIN IRRITATION.

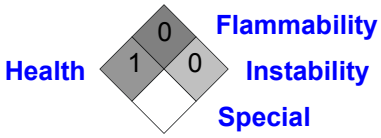
Hazardous Material Information System (U.S.A.) :



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



Date of printing : **9/2/2011.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1 . Product and company identification

Product name : LATIRATE

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Lubricant.

Code : 7200DF

Validation date : 1/5/2012.

Print date : 1/5/2012.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2 . Hazards identification

Physical state : Liquid.

Odor : Mild.

Color : Brown.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : CAUTION!

COMBUSTIBLE LIQUID AND VAPOR. MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. ASPIRATION HAZARD.

At elevated temperatures, vapors can form an ignitable or explosive mixture with air. Can form explosive mixtures at temperatures at or above the flash point. Static discharges can cause ignition or explosion when container is not bonded. Keep away from heat, sparks and flame. Do not ingest. Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling. Vapors can travel to a source of ignition and flashback. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material.

Potential acute health effects

Inhalation : Slightly irritating to the respiratory system.

Ingestion : Aspiration hazard if swallowed. Can enter lungs and cause damage.

Skin : Slightly irritating to the skin.

Eyes : Moderately irritating to eyes.

Potential chronic health effects

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : nausea or vomiting

Skin : irritation, redness

Eyes : irritation, watering, redness

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Acyclic Hydrocarbons	Proprietary	20 - 40

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

5 . Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : carbon dioxide,carbon monoxide

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not ingest. Avoid contact with eyes, skin and clothing. Avoid breathing vapor or mist. Use only with adequate ventilation. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a segregated and approved area. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
No exposure limit value known.											

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : If a risk assessment indicates it is necessary, use a properly fitted, air purifying or supplied air respirator complying with an approved standard. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

8 . Exposure controls/personal protection

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Liquid.

Flash point : Closed cup: 87.8°C (190°F) [Tagliabue.]

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Brown.

Odor : Mild.

pH : Not applicable.

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : Not available.

Density : 0.889 (g/cm^3)

Vapor density : Not available.

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Kinematic (20°C): 52.8891 cSt
Kinematic (40°C): 24.4138 cSt

Solubility (Water) : Partially soluble in water.

Vapor pressure : Not available.

Pour Point : -7°C (19.4°F)

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

No additional information.

12 . Ecological information

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Combustible liquid
Irritating material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Undecane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Undecane: Fire hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

15 . Regulatory information

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

WHMIS (Canada) : Class D-2B: Material causing other toxic effects (Toxic).

Canada (CEPA DSL): : At least one component is not listed in DSL but all such components are listed in NDSL.

16 . Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. MAY CAUSE RESPIRATORY TRACT, EYE AND SKIN IRRITATION. HARMFUL OR FATAL IF SWALLOWED. CAN ENTER LUNGS AND CAUSE DAMAGE. ASPIRATION HAZARD.

Hazardous Material Information System (U.S.A.) :

Health	1
Flammability	1
Physical hazards	0
Personal protection	D

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **1/5/2012.**

Indicates information that has changed from previously issued version.

Notice to reader

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The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet

1. Product and company identification

Product name : MILGEL™

Supplier : Baker Hughes Drilling Fluids
A Baker Hughes Company
2001 Rankin Road
Houston, TX 77073

Material Uses : Special: Viscosifier

Code : 1284DF

Validation date : 12/5/2011.

Print date : 12/5/2011.

Version : 1

In case of emergency : For Chemical Emergency:
713-439-8900
1-800-424-9300

2. Hazards identification

Physical state : Solid. [Powder.]

Odor : Odorless.

Color : Beige.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Emergency overview : WARNING!

CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

Fine dust clouds may form explosive mixtures with air. Handling and/or processing of this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose and throat. Keep away from heat, sparks and flame. Prevent dust accumulation. Do not breathe dust. Avoid contact with eyes, skin and clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation : Irritating to respiratory system.

Ingestion : No known significant effects or critical hazards.

Skin : No known significant effects or critical hazards.

Eyes : Moderately irritating to eyes. No significant irritation expected other than possible mechanical irritation.

Potential chronic health effects

Chronic effects : Contains material that may cause target organ damage, based on animal data. Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation.

Carcinogenicity : Contains material which can cause cancer. Risk of cancer depends on duration and level of exposure.

Target organs : Contains material which may cause damage to the following organs: lungs, upper respiratory tract, eyes.

Over-exposure signs/symptoms

Inhalation : respiratory tract irritation, coughing

Ingestion : None known.

Skin : None known.

2 . Hazards identification

Eyes : irritation, watering, redness

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

3 . Composition/information on ingredients

Name	CAS number	%
Crystalline silica, quartz	14808-60-7	1 - 5

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Fine dust clouds may form explosive mixtures with air.

Extinguishing media

Suitable : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : metal oxide/oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

6 . Accidental release measures

Methods for cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Vacuum or sweep up material and place in a designated, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
Crystalline silica, quartz	US ACGIH	-	0.025	-	-	-	-	-	-	-	[a]
Crystalline silica, quartz, as quartz	OSHA PEL 1989	-	0.1	-	-	-	-	-	-	-	[b]

Form: [a]Respirable fraction; see Appendix C [b]Respirable dust

Consult local authorities for acceptable exposure limits.

Only components of this product with established exposure limits appear in the box above.

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

8 . Exposure controls/personal protection

Personal protection

Respiratory : Approved/certified disposable particulate dust mask. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

Eyes : Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.

Skin : Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state : Solid. [Powder.]

Flash point : Not available.

Auto-ignition temperature : Not available.

Flammable limits : Not available.

Color : Beige.

Odor : Odorless.

pH : 9.5 [Conc. (% w/w): 10%]

Boiling/condensation point : Not available.

Initial Boiling Point : Not available.

Melting/freezing point : Not available.

Relative density : 2.6

Density : Not available.

Vapor density : Not available.

Odor threshold : Not available.

Evaporation rate : Not available.

VOC : Not available.

Viscosity : Not available.

Solubility (Water) : Insoluble

Vapor pressure : Not available.

Pour Point : Not available.

Partition coefficient (LogKow) : Not available.

10 . Stability and Reactivity

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Conditions to avoid : Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Crystalline silica, quartz	A2	1	-	+	Proven.	-

Chronic toxicity Remarks

1) Crystalline silica, quartz

Not available.

12 . Ecological information

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material
Carcinogen
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b)**: All components are listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Quartz (SiO2)
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Quartz (SiO2): Immediate (acute) health hazard, Delayed (chronic) health hazard

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :
Not listed

United States inventory (TSCA 8b) : All components are listed or exempted.

Canada

WHMIS (Canada) : Class D-2A: Material causing other toxic effects (Very toxic).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE EYE IRRITATION. CONTAINS MATERIAL THAT MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. CANCER HAZARD - CONTAINS MATERIAL WHICH CAN CAUSE CANCER.

Hazardous Material Information System (U.S.A.) :

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **12/5/2011.**

Indicates information that has changed from previously issued version.

Notice to reader

16 . Other information

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

MATERIAL SAFETY DATA SHEET

MAGMA-GEL™ SE

Drilling Fluids

1. Product and Company Identification

Material name	**MAGMA-GEL™ SE**
Product use	Rheological Additive
Chemical description	Organophilic Clay
Revision date	02-01-2010
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073
Emergency	CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview	Harmful in contact with eyes. Prolonged exposure may cause chronic effects. Contact with this material can cause irritation to the skin, eyes and mucous membranes.
Potential health effects	
Eyes	Dust or powder may irritate eye tissue.
Skin	Health injuries are not known or expected under normal use.
Inhalation	Inhalation of dusts may cause respiratory irritation.
Ingestion	Health injuries are not known or expected under normal use.
Target organs	Eyes. Lungs. Respiratory system.
Chronic effects	Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material. Shortness of breath.
Signs and symptoms	Cough. Discomfort in the chest. Shortness of breath. Conjunctivitis. Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material.

3. Composition / Information on Ingredients

Components	CAS #	Percent
CRYSTALLINE SILICA, QUARTZ	14808-60-7	1.0 - 10.0
Non-hazardous and other components below reportable levels		> 90

4. First Aid Measures

First aid procedures	
Eye contact	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Skin contact	Wash off skin with soap and water. Get medical attention if irritation develops or persists.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.
Ingestion	If swallowed, rinse mouth with water (only if the person is conscious). If ingestion of a large amount does occur, seek medical attention.
Notes to physician	Symptoms may be delayed.
General advice	Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties	Dusts at sufficient concentrations can form explosive mixtures with air.
Hazardous combustion products	Product is not considered combustible. Ammonia
Extinguishing media	
Suitable extinguishing media	Use any media suitable for the surrounding fires.

Protection of firefighters

Protective equipment and precautions for firefighters Move containers from fire area if you can do it without risk. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

6. Accidental Release Measures

Personal precautions Remove all sources of ignition. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. May cause a slippery condition when wet.

Evacuation procedures Keep unnecessary personnel away. Stay upwind.

Environmental precautions Do not flush into surface water or sanitary sewer system.

Methods for containment Stop the flow of material, if this is without risk. Contain the discharged material.

Methods for cleaning up Vacuum or sweep up material and place in a disposal container. Avoid the generation of dusts during clean-up. Do not flush with water. Forms smooth, slippery surfaces on floors, posing an accident risk.

7. Handling and Storage

Handling Wear personal protective equipment. Minimize dust generation and accumulation. In case of insufficient ventilation, wear suitable respiratory equipment.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value	Form
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	TWA	0.025 mg/m3	Respirable fraction.

U.S. - OSHA

Components	Type	Value	Form
CRYSTALLINE SILICA, QUARTZ (14808-60-7)	TWA	0.1 mg/m3	Respirable.
		2.4 mppcf	Respirable.
		0.3 mg/m3	Total dust.
		0.1 mg/m3	Respirable dust.

Engineering controls Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Personal protective equipment

Eye / face protection Wear dust goggles.

Hand protection Rubber or plastic gloves.

Skin protection Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.

Respiratory protection Half mask with a particle filter P1 (EN 143). When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

General hygeine considerations Do not breathe dust. Wash hands before breaks and immediately after handling the product.

9. Physical & Chemical Properties

Appearance / Color / Form Powder. Off-white. Solid.

Odor Odourless.

Form Solid.

pH Not available.

Melting point Not available.

Freezing point Not available.

Boiling point Not available.

Flash point Not available.

Evaporation rate Not available.

Flammability limits in air, upper, % by volume Not available.

Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	1.7
Relative density	1.7 g/cm3 @ 20°C
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	None known.
Incompatible materials	None known.
Hazardous decomposition products	Carbon oxides.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Chronic effects Chronic lung disease (silicosis) and/or lung cancer may result from prolonged/repeated breathing of the dust of this material.

Carcinogenicity

IARC Monographs: Overall evaluation

CRYSTALLINE SILICA, QUARTZ (14808-60-7) 1 Carcinogenic to humans.

US ACGIH Threshold Limit Values: A2 carcinogen

CRYSTALLINE SILICA, QUARTZ (14808-60-7) A2 Suspected human carcinogen.

US NTP Report on Carcinogens: Known carcinogen

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Known carcinogen.

12. Ecological Information

Ecotoxicity	This material is not expected to be harmful to aquatic life.
Persistence and degradability	Not available.
Bioaccumulation / Accumulation	Not expected to bioaccumulate.
Mobility in environmental media	This material is insoluble in water and will sink in the marine environment.

13. Disposal Considerations

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed: October 1, 1988 Carcinogenic.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

CRYSTALLINE SILICA, QUARTZ (14808-60-7) Listed.

16. Other Information

HMIS® ratings	Health: 2 Flammability: 1 Physical hazard: 0 Personal protection: E
NFPA ratings	Health: 2 Flammability: 1 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	02-01-2010
Supercedes date	02-21-2007

This data sheet contains changes from the previous version in section(s):

Hazards Identification: US Hazardous
Composition / Information on Ingredients: Disclosure Overrides
Fire Fighting Measures: Fire & Explosion Properties
Fire Fighting Measures: Hazardous combustion products
Fire Fighting Measures: Protective equipment and precautions for firefighters
Exposure Controls / Personal Protection: Exposure guidelines
Physical & Chemical Properties: Physical & Chemical Properties
Physical & Chemical Properties: Solubility
Chemical Stability & Reactivity Information: Hazardous decomposition products
Ecological Information: Ecotoxicity
Disposal Considerations: Disposal instructions
Regulatory Information: US federal regulations
Other Information: Disclaimer

MATERIAL SAFETY DATA SHEET

MIL-LIME™

Drilling Fluids

1. Product and Company Identification

Material name	**MIL-LIME™**
Chemical name	Calcium hydroxide
Chemical description	Lime
Synonym(s)	LIME, HYDRATED
Revision date	02-13-2009
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073
Emergency	CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Harmful in contact with eyes. Risk of serious damage to eyes. Irritating to skin. Prolonged exposure may cause chronic effects.

Potential health effects

Eyes Contact will irritate or burn eyes. Eye contact may result in corneal injury.

Skin Can cause redness, inflammation, irritation. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

Inhalation Dusts of this product may cause irritation of the nose, throat, and respiratory tract.

Ingestion Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract.

Target organs Eyes. Respiratory system. Skin.

Chronic effects Shortness of breath. May cause delayed lung damage. Prolonged skin contact may defat the skin and produce dermatitis. Conjunctiva.

3. Composition / Information on Ingredients

Components	CAS #	Percent
CALCIUM HYDROXIDE	1305-62-0	90 - 100

Composition comments This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

4. First Aid Measures

First aid procedures

Eye contact Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Skin contact Remove and isolate contaminated clothing and shoes. Immediately flush skin with plenty of water. Wash off with warm water and soap. Get medical attention immediately.

Inhalation Remove to fresh air. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion Do not induce vomiting. If conscious, drink plenty of water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Get medical attention immediately.

Notes to physician Symptoms may be delayed. If breathing is difficult, give oxygen.

General advice Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire Fighting Measures

Hazardous combustion products Carbon monoxide, carbon dioxide, various hydrocarbon fragments as well as thick smoke.

Extinguishing media

Suitable extinguishing media Use extinguishing agent suitable for type of surrounding fire.

Protection of firefighters

Protective equipment and precautions for firefighters	Move containers from fire area if you can do it without risk. Cool containers with flooding quantities of water until well after fire is out. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

6. Accidental Release Measures

Personal precautions	Surfaces may become slippery after spillage. Do not touch or walk through spilled material. Wear appropriate protective equipment and clothing during clean-up. For recommended protective clothing and equipment, see section 8 "Exposure Controls and Personal Protection".
Evacuation procedures	Keep unnecessary personnel away.
Environmental precautions	Do not contaminate surface water. Avoid subsoil penetration.
Methods for containment	Stop the flow of material, if this is without risk. Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up	Sweep up or gather material and place in appropriate container for disposal. Avoid the generation of dusts during clean-up. Ventilate the contaminated area.

7. Handling and Storage

Handling	Minimize dust generation and accumulation. Do not use in areas without adequate ventilation. Do not breathe dust. Avoid contact with skin and eyes.
Storage	Keep containers tightly closed in a dry, cool and well-ventilated place. Keep this material away from food, drink and animal feed. Do not store together with sulphates and strong acids.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Material	Type	Value
MIL-LIME™ (1305-62-0)	TWA	5 mg/m3

U.S. - OSHA

Material	Type	Value	Form
MIL-LIME™ (1305-62-0)	PEL	15 mg/m3	Total dust.
		5 mg/m3	Respirable fraction.
	TWA	5 mg/m3	

Engineering controls	Ensure adequate ventilation, especially in confined areas.

Personal protective equipment

Eye / face protection	Wear dust goggles. Face-shield.
Hand protection	Chemical resistant gloves made of butyl rubber or nitrile rubber category III according to EN 374.
Skin protection	Use of protective coveralls and long sleeves is recommended. Rubber or plastic boots.
Respiratory protection	Half mask with a particle filter P2 (EN 143).
General hygeine considerations	Wash hands before breaks and immediately after handling the product. Avoid contact with the skin and the eyes. Keep away from food and drink. Handle in accordance with good industrial hygiene and safety practice.

9. Physical & Chemical Properties

Appearance / Color / Form	Crystalline. White. Solid.
Odor	Odourless.
Form	Solid.
pH	12.4 at 25 C (sat. soln)
Melting point	1076 °F (580 °C)
Freezing point	1076 °F (580 °C)
Boiling point	Not available.
Flash point	Not available.
Evaporation rate	1
Flammability	Not available.
Flammability limits in air, upper, % by volume	Not available.

Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	< -0.0001 kPa at 25°C
Vapor density	Not available.
Specific gravity	2.24
Relative density	Not available.
Solubility	Soluble in water
Solubility (water)	2 g/l at 32°F
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
Bulk density	0.2 - 0.8 g/cm3 at 20°C
Percent volatile	5 % in water
Molecular weight	74.1000 g/mol
Molecular formula	Ca-H2-O2

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Exposure to moisture.
Incompatible materials	This product reacts with acids. Nitroethane. Nitropropane. Nitromethane. Nitroparaffins. Maleic anhydride. Sulphates.
Hazardous decomposition products	Calcium oxide
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Further information	Causes severe irritation of eyes, skin and mucous membranes.

12. Ecological Information

Ecotoxicity	This material is not expected to be harmful to aquatic life.
Persistence and degradability	This material is inorganic and not subject to biodegradation. This material reacts with atmospheric and dissolved carbon dioxide to form calcium carbonate (chalk).
Bioaccumulation / Accumulation	Not expected to bioaccumulate.
Mobility in environmental media	This product will disperse readily in bodies of water or in wet soil.

13. Disposal Considerations

Disposal instructions	Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations	All components are on the U.S. EPA TSCA Inventory List. CERCLA/SARA Hazardous Substances - Not applicable.

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Food and Drug Administration (FDA)

Total food additive
Direct food additive
GRAS food additive

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

16. Other Information

HMIS® ratings

Health: 3
Flammability: 0
Physical hazard: 0
Personal protection: J

NFPA ratings

Health: 3
Flammability: 0
Instability: 0

Disclaimer The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

EU preparer Maria Ramirez - Tel +44 (0)1224 721226

US preparer Cheryl Hood - Tel +1 713-625-4888

Issue date 02-13-2009

Supercedes date 02-07-2008

This data sheet contains changes from the previous version in section(s): This document has undergone significant changes and should be reviewed in its entirety.

MATERIAL SAFETY DATA SHEET

ECCO-BLOK

BAKER HUGHES
Drilling Fluids

1. Product and Company Identification

Material name	**ECCO-BLOK**
Product use	Filtration Control Agent
Chemical name	Gilsonite
Revision date	07-15-2009
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073
Emergency	CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview	Combustible Material: may burn but does not ignite readily. May be ignited by heat, sparks or flames. Irritating to eyes and respiratory system.
Potential health effects	
Eyes	Contact with eyes may cause irritation.
Skin	Health injuries are not known or expected under normal use.
Inhalation	Dusts of this product may cause irritation of the nose, throat, and respiratory tract.
Ingestion	Health injuries are not known or expected under normal use.
Signs and symptoms	Symptoms may include stinging, tearing, redness, swelling, and blurred vision. Inhalation of dust may cause shortness of breath, tightness of the chest, a sore throat and cough.

3. Composition / Information on Ingredients

The manufacturer lists no ingredients as hazardous according to OSHA 29 CFR 1910.1200.

Composition comments	This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

4. First Aid Measures

First aid procedures	
Eye contact	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Skin contact	Remove contaminated clothing. Wash off skin with soap and water. Launder contaminated clothing before reuse. Get medical attention if irritation develops or persists.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.
Ingestion	Have victim rinse mouth thoroughly with water. If ingestion of a large amount does occur, seek medical attention.
General advice	If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties	Dusts at sufficient concentrations can form explosive mixtures with air.
Hazardous combustion products	Decomposition of this product may emit oxides of nitrogen and carbon monoxide.
Extinguishing media	
Suitable extinguishing media	Dry chemical, foam, carbon dioxide, water fog.
Protection of firefighters	
Protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk. Do not scatter spilled material with high pressure water streams.

6. Accidental Release Measures

Personal precautions	Do not touch or walk through spilled material.
Evacuation procedures	Keep unnecessary personnel away.

Environmental precautions	Prevent further leakage or spillage if safe to do so.
Methods for containment	Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up	Avoid dust formation. Sweep up or gather material and place in appropriate container for disposal.

7. Handling and Storage

Handling	Minimize dust generation and accumulation. Avoid contact with eyes. Do not breathe dust from this material. Do not handle or store near an open flame, heat or other sources of ignition.
Storage	Use care in handling/storage. Keep away from heat, sparks, and flame. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Exposure guidelines	Nuisance Particulates: OSHA PEL 15 mg/m3 (total dust) - 8-hr. TWA 5 mg/m3 (respirable dust) - 8-hr. TWA ACGIH TLV 10 mg/m3 (inhalable) 8-hr TWA 3 mg/m3 (respirable) 8-hr TWA
Engineering controls	Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Personal protective equipment	
Eye / face protection	Safety glasses with side-shields.or Wear dust goggles.
Hand protection	Protective gloves.
Skin protection	Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.
Respiratory protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
General hygeine considerations	When using do not smoke. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product.

9. Physical & Chemical Properties

Appearance / Color / Form	Powder. Black. Solid.
Odor	Mild.
Form	Solid.
pH	Not available.
Melting point	275 - 400 °F (135 - 204.4 °C)
Freezing point	Not available.
Boiling point	Not available.
Flash point	> 600 °F (> 315.6 °C) Cleveland Open Cup
Evaporation rate	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	Not available.
Relative density	1.06 g/cm3
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	Not available.
Decomposition temperature	Not available.
VOC	0 % estimated
Percent volatile	0 % estimated

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.

Conditions to avoid	Direct sources of heat. Dust may form explosive mixture in air.
Incompatible materials	This product may react with strong oxidizing agents.
Hazardous decomposition products	May include oxides of nitrogen. Carbon oxides.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Local effects Irritating to eyes and respiratory system.

12. Ecological Information

Persistence and degradability Not available.

13. Disposal Considerations

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is not known to be a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

CERCLA/SARA Hazardous Substances - Not applicable.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - No Fire Hazard - No Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	No

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

16. Other Information

HMIS® ratings	Health: 0 Flammability: 0 Physical hazard: 0 Personal protection: J
NFPA ratings	Health: 0 Flammability: 0 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	07-15-2009

MATERIAL SAFETY DATA SHEET

BLACK-MAGIC® SFT

Drilling Fluids

1. Product and Company Identification

Material name **BLACK-MAGIC® SFT**

Product use Spotting Fluid Concentrate

Chemical description Asphalt/Lubricant Mixture

Revision date 02-09-2009

Supplier Baker Hughes Drilling Fluids
2001 Rankin Rd.
Houston, TX 77073

Emergency CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Product may form explosive dust/air mixtures if high concentration of product dust is suspended in air.

Product dust may be irritating to eyes, skin and respiratory system.

Potential health effects

Eyes This product may cause severe irritation, redness, or blurred vision. Contact will irritate or burn eyes and Dust or powder may irritate eye tissue and Eye contact may result in corneal injury.

Skin This product may cause irritation to the skin. Repeated or prolonged skin contact may cause skin irritation and/or dermatitis and sensitization of susceptible persons.

Inhalation Inhalation of vapors/fumes generated by heating this product may cause respiratory irritation with throat discomfort, coughing or difficulty breathing. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting.

Ingestion Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhea.

Target organs Eyes. Respiratory system. Skin.

Chronic effects Shortness of breath. May cause delayed lung damage.

3. Composition / Information on Ingredients

Components	CAS #	Percent
ASPHALT	8052-42-4	> 60
CALCIUM HYDROXIDE	1305-62-0	10 - 20
SODIUM DODECYLBENZENESULFONATE	25155-30-0	5 - 10
DIATOMACEOUS EARTH	61790-53-2	3 - 7
Non-hazardous and other components below reportable levels		2.5 - 10

4. First Aid Measures

First aid procedures

Eye contact Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.

Skin contact Wash off skin with soap and water. Remove and isolate contaminated clothing and shoes. Get medical attention if irritation develops or persists. Wash clothing separately before reuse.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.

Ingestion Have victim rinse mouth thoroughly with water. Do not induce vomiting without medical advice. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Get medical attention immediately.

General advice Keep victim warm. Keep victim under observation. In case of shortness of breath, give oxygen. If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Flammable properties Dusts at sufficient concentrations can form explosive mixtures with air. Can burn in fire, releasing toxic vapors.

Hazardous combustion products	Combustion products include fumes, smoke, carbon monoxide, carbon dioxide and sulfur dioxide. Hydrogen sulfide.

Extinguishing media

Suitable extinguishing media	Treat as a hydrocarbon-type fire. Use water to cool fire-exposed containers and to protect personnel. Do not direct a solid stream of water or foam into hot, burning pools; this may result in frothing and increase fire intensity.

Protection of firefighters

Protective equipment and precautions for firefighters	Move containers from fire area if you can do it without risk. Cool containers with flooding quantities of water until well after fire is out. Do not scatter spilled material with high pressure water streams. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

6. Accidental Release Measures

Personal precautions	Keep people away from and upwind of spill/leak. Do not touch or walk through spilled material. Ventilate closed spaces before entering. Keep out of low areas.
Environmental precautions	Do not contaminate water.
Methods for containment	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent entry into waterways, sewers, basements or confined areas.
Methods for cleaning up	Avoid dust formation. Should not be released into the environment. Sweep up or gather material and place in appropriate container for disposal.

7. Handling and Storage

Handling	Do not handle or store near an open flame, heat or other sources of ignition. All equipment used when handling the product must be grounded. Do not get this material in your eyes, on your skin, or on your clothing. Wash hands after handling and before eating.
Storage	Keep away from heat and sources of ignition. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value	Form
ASPHALT (8052-42-4)	TWA	0.5 mg/m3	Inhalable fraction.

U.S. - OSHA

Components	Type	Value
DIATOMACEOUS EARTH (61790-53-2)	TWA	20 mppcf 6 mg/m3

Engineering controls	Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Personal protective equipment

Eye / face protection	Wear dust goggles. Face-shield. Eye wash fountain is recommended.
Hand protection	Protective gloves.
Skin protection	Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.
Respiratory protection	When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
General hygeine considerations	When using do not smoke. Avoid contact with the skin and the eyes. Keep away from food and drink. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product. Emergency showers are required.

9. Physical & Chemical Properties

Appearance / Color / Form	Powder. Grey. Solid.
Odor	Hydrocarbon-like.
Form	Solid.
pH	Not available.
Melting point	1076 °F (580 °C) estimated
Freezing point	Not available.

Boiling point	699.8 °F (371.1 °C) estimated
Flash point	Not available.
Evaporation rate	Not available.
Flammability	Not available.
Flammability limits in air, upper, % by volume	Not available.
Flammability limits in air, lower, % by volume	Not available.
Vapor pressure	4.31 hPa estimated
Vapor density	Not available.
Specific gravity	Not available.
Relative density	Not available.
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	905 °F (485 °C) estimated
Decomposition temperature	Not available.
VOC	0 % estimated
Percent volatile	0 % estimated

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	High temperatures. Heat, flames and sparks.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Upon decomposition, this product emits oxides of sulfur, carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons. Hydrogen sulfide.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
BLACK-MAGIC® SFT (Mixture)	Acute Oral LD50 Rat: 25801 mg/kg estimated
	Acute Other LD50 Mouse: 484 mg/kg estimated
Components	**Test Results**
DIATOMACEOUS EARTH (61790-53-2)	Acute Oral LD50 Mouse: > 15000 mg/kg
	Acute Oral LD50 Rat: > 22500 mg/kg

* Estimates for product may be based on additional component data not shown.

Acute effects	Acute LD50: 25801 mg/kg, Rat, Oral, estimated Acute LD50: 484 mg/kg, Mouse, Other, estimated
Local effects	Irritating to eyes, respiratory system and skin.
Chronic effects	Prolonged or repeated exposure may cause lung injury. Repeated or prolonged skin contact may cause skin irritation and/or dermatitis and sensitization of susceptible persons.
Carcinogenicity	Possible cancer hazard based on tests with laboratory animals.

12. Ecological Information

Ecotoxicological data

Product	Test Results
BLACK-MAGIC® SFT (Mixture)	EC50 Daphnia: 125 mg/l 48.00 Hours estimated
	LC50 Fish: 92.15 mg/l 96.00 Hours estimated
Components	**Test Results**
SODIUM DODECYLBENZENESULFONATE (25155-30-0)	EC50 Water flea (Ceriodaphnia dubia): 3.26 - 14.51 mg/l 48.00 Hours

Components	Test Results
SODIUM DODECYLBENZENESULFONATE (25155-30-0)	LC50 Rainbow trout,donaldson trout (Oncorhynchus mykiss): 3.2 - 5.6 mg/l 96.00 Hours

* Estimates for product may be based on additional component data not shown.

Ecotoxicity Components of this product are hazardous to aquatic life.

Environmental effects An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and degradability Not available.

13. Disposal Considerations

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations. Do not dispose of waste into sewer.

14. Transport Information

DOT

Not regulated as hazardous goods.

IATA

Not regulated as hazardous goods.

IMDG

Not regulated as hazardous goods.

15. Regulatory Information

US federal regulations All components are on the U.S. EPA TSCA Inventory List.

CERCLA (Superfund) reportable quantity

ASPHALT: 100.0000
SODIUM DODECYLBENZENESULFONATE: 1000.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

16. Other Information

HMIS® ratings	Health: 1 Flammability: 1 Physical hazard: 0 Personal protection: D
NFPA ratings	Health: 1 Flammability: 1 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	02-09-2009
Supercedes date	02-09-2009
This data sheet contains changes from the previous version in section(s):	This document has undergone significant changes and should be reviewed in its entirety.

MATERIAL SAFETY DATA SHEET

BLACK-MAGIC™

Drilling Fluids

1. Product and Company Identification

Material name BLACK-MAGIC™

Product use Spotting Fluid

Chemical description Diesel Oil/Fatty Acid/Asphalt Blend

Revision date 03-30-2010

Supplier Baker Hughes Drilling Fluids
2001 Rankin Rd.
Houston, TX 77073

Emergency CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Flammable/Combustible Material. Harmful: may cause lung damage if swallowed. Irritating to eyes, respiratory system and skin. Prolonged exposure may cause chronic effects.

Potential health effects

Eyes Liquid or vapors may irritate the eyes.

Skin This product may cause irritation to the skin. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

Inhalation Excessive inhalation of this product may cause headache, dizziness, blurred vision, nausea and vomiting. Vapor inhalation and/or skin absorption can cause central nervous system effects and blindness.

Ingestion Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. Harmful: may cause lung damage if swallowed.

Target organs Eyes. Respiratory system. Skin.

Chronic effects May cause delayed lung damage. Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

3. Composition / Information on Ingredients

Components	CAS #	Percent
DIESEL OIL (PETROLEUM)	68334-30-5	> 70
ASPHALT	8052-42-4	10 - 15
CALCIUM HYDROXIDE	1305-62-0	3 - 5
Non-hazardous and other components below reportable levels		10 - 20

4. First Aid Measures

First aid procedures

Eye contact Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.

Skin contact Remove and isolate contaminated clothing and shoes. Wash off immediately with soap and plenty of water. If skin irritation persists, call a physician. Launder contaminated clothing before reuse.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.

Ingestion If swallowed, seek medical advice immediately and show this container or label. Give several glasses of water.

General advice Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Keep victim under observation.

5. Fire Fighting Measures

Flammable properties Flammable Liquid. Vapors may form explosive mixtures with air.

Hazardous combustion products Carbon monoxide and carbon dioxide. Sulfur oxides.

Extinguishing media

Suitable extinguishing media Dry chemical, CO2, water spray or regular foam. Do not use water jet.

Protection of firefighters

Protective equipment and precautions for firefighters Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk. In the event of fire, cool tanks with water spray. Use water spray to cool unopened containers.

6. Accidental Release Measures

Personal precautions Keep unnecessary personnel away. Stay upwind. Keep out of low areas. Local authorities should be advised if significant spillages cannot be contained.

Environmental precautions Prevent further leakage or spillage if safe to do so. Do not contaminate water. Do not flush into surface water or sanitary sewer system.

Methods for containment Stop the flow of material, if this is without risk. Prevent entry into waterways, sewers, basements or confined areas. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water.

Methods for cleaning up Should not be released into the environment. Dike far ahead of liquid spill for later disposal. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. After removal flush contaminated area thoroughly with water.

7. Handling and Storage

Handling Use only in area provided with appropriate exhaust ventilation. Do not breathe gas/fumes/vapor/spray. Wear personal protective equipment. Do not get this material in your eyes, on your skin, or on your clothing. All equipment used when handling the product must be grounded.

Storage Keep away from heat, sparks, and flame. Use appropriate container to avoid environmental contamination. Keep containers tightly closed in a dry, cool and well-ventilated place. Prevent electrostatic charge build-up by using common bonding and grounding techniques.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value	Form
ASPHALT (8052-42-4)	TWA	0.5 mg/m3	Inhalable fraction.
DIESEL OIL (PETROLEUM) (68334-30-5)	TWA	100 mg/m3	Inhalable fraction and vapor.

Engineering controls Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Eye wash fountain and emergency showers are recommended.

Personal protective equipment

Eye / face protection Wear chemical goggles and face shield.

Hand protection Neopreneor solvent-resistant gloves (butyl-rubber).

Skin protection Use of impervious boots is recommended. Use of protective coveralls and long sleeves is recommended.

Respiratory protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

9. Physical & Chemical Properties

Appearance / Color / Form Emulsion Black. Liquid.

Odor Hydrocarbon-like.

Form Liquid.

pH Not available.

Melting point Not available.

Freezing point Not available.

Boiling point 699.8 °F (371.1 °C) estimated

Flash point 131 - 140 °F (55 - 60 °C) Pensky-Martens Closed Cup

Evaporation rate Not available.

Flammability limits in air, upper, % by volume 1 %

Flammability limits in air, lower, % by volume	6 %
Vapor pressure	Not available.
Vapor density	Not available.
Specific gravity	0.8 - 0.9
Relative density	Not available.
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	428 °F (220 °C)
Decomposition temperature	Not available.

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Heat, flames and sparks.
Incompatible materials	Strong oxidizing agents. Caustics. Strong acids.
Hazardous decomposition products	May include oxides of carbon. May include oxides of phosphorus.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Sensitization

US ACGIH Threshold Limit Values: Skin designation

DIESEL OIL (PETROLEUM) (68334-30-5)	Can be absorbed through the skin.

Local effects	Contact may irritate or burn eyes. Irritating to skin.
Chronic effects	Hazardous by OSHA criteria. Prolonged or repeated exposure may cause lung injury.
Carcinogenicity	Hazardous by OSHA criteria. Cancer hazard.

IARC Monographs: Overall evaluation

ASPHALT (8052-42-4)	2B Possibly carcinogenic to humans.
ASPHALT (8052-42-4)	3 Not classifiable as to carcinogenicity to humans.

US ACGIH Threshold Limit Values: A3 carcinogen

DIESEL OIL (PETROLEUM) (68334-30-5)	A3 Confirmed animal carcinogen with unknown relevance to humans.

US ACGIH Threshold Limit Values: A4 carcinogen

ASPHALT (8052-42-4)	A4 Not classifiable as a human carcinogen.

Corrosivity	Not expected to be hazardous by OSHA criteria.
Mutagenicity	Not expected to be hazardous by OSHA criteria.
Neurological effects	Not expected to be hazardous by OSHA criteria.
Reproductive effects	Not expected to be hazardous by OSHA criteria.
Teratogenicity	Not expected to be hazardous by OSHA criteria.

12. Ecological Information

Ecotoxicity	Components of this product are hazardous to aquatic life.
Environmental effects	An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Aquatic toxicity	Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Persistence and degradability	Not available.
Mobility in environmental media	This material is insoluble in water and will float on the surface of the water.

13. Disposal Considerations

Waste codes	D001: Waste Flammable material with a flash point <140 F
Disposal instructions	Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

DOT

Basic shipping requirements:

Proper shipping name	Flammable liquids, n.o.s. (DIESEL OIL (PETROLEUM))
Hazard class	3
UN number	UN1993
Packing group	III

Additional information:

Special provisions	B1, B52, IB3, T4, TP1, TP29
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242
ERG number	128

IATA

Basic shipping requirements:

Proper shipping name	Flammable liquid, n.o.s. (DIESEL OIL (PETROLEUM))
Hazard class	3
UN number	1993
Packing group	III

IMDG

Basic shipping requirements:

Proper shipping name	FLAMMABLE LIQUID, N.O.S. (DIESEL OIL (PETROLEUM))
Hazard class	3
UN number	1993
Packing group	III

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

FDA: Direct food substances affirmed as generally recognized as safe (GRAS) (21 CFR 184): Reference

CALCIUM HYDROXIDE (1305-62-0) 184.1205

CERCLA (Superfund) reportable quantity

ASPHALT: 100.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations WARNING: This product contains a chemical known to the State of California to cause cancer.

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

ASPHALT (8052-42-4) Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

ASPHALT (8052-42-4) Listed: January 1, 1990 Carcinogenic.

US - Pennsylvania RTK - Hazardous Substances: Listed substance

ASPHALT (8052-42-4) Listed.
CALCIUM HYDROXIDE (1305-62-0) Listed.
DIESEL OIL (PETROLEUM) (68334-30-5) Listed.

US - Pennsylvania RTK - Hazardous Substances: Special hazard

ASPHALT (8052-42-4) Special hazard.

16. Other Information

HMIS® ratings Health: 2*
Flammability: 2
Physical hazard: 0
Personal protection: H

NFPA ratings Health: 2
Flammability: 2
Instability: 0

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EU preparer Shona Hamilton - Tel +44 (0)1224 720867

US preparer Cheryl Hood - Tel +1 713-625-4888

Issue date 03-30-2010

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This data sheet contains changes from the previous version in section(s):	This document has undergone significant changes and should be reviewed in its entirety.

MATERIAL SAFETY DATA SHEET

CARBO-DRILL OIL BASED MUD

BAKER HUGHES
Drilling Fluids

1. Product and Company Identification

Material name CARBO-DRILL OIL BASED MUD

Version # 02

Revision date 08-27-2008

Chemical description Oil Based Mud System

Supplier Baker Hughes Drilling Fluids
2001 Rankin Rd.
Houston, TX 77073
For Emergencies, call CHEMTREC 800-424-9300

2. Hazards Identification

Emergency overview Combustible liquid and vapor. Toxic by inhalation. May be fatal if inhaled. Irritating to eyes, respiratory system and skin. Prolonged exposure may cause chronic effects.

Potential health effects

Eyes Contact may irritate or burn eyes.

Skin Prolonged or repeated contact can result in defatting and drying of the skin which may result in skin irritation and dermatitis (rash).

Inhalation May cause irritation of respiratory tract. Can cause severe central nervous system depression (including unconsciousness). Headaches, dizziness, nausea, decreased blood pressure, changes in heart rate, and cyanosis may result from overexposure to vapor or skin exposure. Exreme exposures may cause other CNS effects including death.

Ingestion Ingestion can cause gastrointestinal irritation, nausea, vomiting and diarrhea. Ingestion of larger amounts may cause defects to the central nervous system (e.g. dizziness, headache). Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

3. Composition / Information on Ingredients

Components	CAS #	Percent
FUELS, DIESEL, NO. 2	68476-34-6	< 80
NAPHTHALENE	91-20-3	< 1
Non-hazardous and other components below reportable levels		> 10

4. First Aid Measures

First aid procedures

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.

Skin contact Remove and isolate contaminated clothing and shoes. Wash off with soap and water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse.

Inhalation Move to fresh air. If breathing is difficult, give oxygen.

Ingestion Do not induce vomiting. Have victim rinse mouth thoroughly with water. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration. Get medical attention immediately.

Notes to physician Symptoms may be delayed. Keep victim warm. In case of shortness of breath, give oxygen.

General advice Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves.

5. Fire Fighting Measures

Flammable properties Combustible liquid. Runoff to sewer may cause fire or explosion hazard. Containers may explode when heated. Vapors may travel to a source of ignition and flash back.

Hazardous combustion products Fire may produce irritating, corrosive and/or toxic gases.

Extinguishing media

Suitable extinguishing media Dry chemical, foam, carbon dioxide. Caution: use of water spray may be inefficient.

Protection of firefighters

Protective equipment and precautions for firefighters	Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk. Cool containers / tanks with water spray. Do not scatter spilled material with high pressure water streams.

6. Accidental Release Measures

Personal precautions	Keep people away from and upwind of spill/leak. Do not touch or walk through spilled material. Ventilate closed spaces before entering. Keep out of low areas.
Methods for containment	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent entry into waterways, sewers, basements or confined areas. Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible.
Methods for cleaning up	Large Spills: Dike far ahead of liquid spill for later disposal. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean contaminated surface thoroughly.

7. Handling and Storage

Handling	Do not handle or store near an open flame, heat or other sources of ignition. Do not breathe gas/fumes/vapor/spray. Avoid contact with skin and eyes.
Storage	Keep away from heat, sparks, and flame. This material can accumulate static charge which may cause spark and become an ignition source. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Occupational exposure limits

ACGIH

Components	Type	Value
NAPHTHALENE (91-20-3)	STEL	15 ppm
	TWA	10 ppm

U.S. - OSHA

Components	Type	Value
NAPHTHALENE (91-20-3)	PEL	10 ppm 50 mg/m3
	STEL	75 mg/m3 15 ppm
	TWA	10 ppm 50 mg/m3

Engineering controls	Provide local and general exhaust ventilation to effectively remove and prevent buildup of any vapors or mists generated from the handling of this product. If oil mist is generated, observe the OSHA exposure limit of 5 mg/m3.

Personal protective equipment

Eye / face protection	Wear safety glasses; chemical goggles (if splashing is possible).
Hand protection	Vitonor nitrile rubber gloves.
Skin protection	Use of impervious boots is recommended. Use of protective coveralls and long sleeves is recommended.
Respiratory protection	If airborne concentrations are above the applicable exposure limits, use NIOSH approved respiratory protection.
General hygeine considerations	When using do not smoke. Avoid contact with skin, eyes and clothing. Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product.

9. Physical & Chemical Properties

Appearance / Color / Form	Brown. Liquid.
Odor	Hydrocarbon-like.
Form	Liquid.
pH	Not available.

Melting point	Not available.
Freezing point	Not available.
Boiling point	494.6 °F (257.2 °C) estimated
Flash point	> 174 °F (> 78.9 °C) Tag Closed Cup
Evaporation rate	Not available.
Flammability	Not available.
Flammability limits in air, upper, % by volume	0.3 %
Flammability limits in air, lower, % by volume	10 %
Vapor pressure	0.62 hPa estimated
Vapor density	> 1 (air = 1)
Specific gravity	1.74
Relative density	1.74 g/cm3
Solubility	Insoluble in water.
Solubility (water)	Not available.
Partition coefficient (n-octanol/water)	Not available.
Auto-ignition temperature	500 °F (260 °C) estimated
Decomposition temperature	Not available.
VOC	0.0443 % estimated
Percent volatile	10.6844 % estimated

10. Chemical Stability & Reactivity Information

Chemical stability	Stable at normal conditions.
Conditions to avoid	Heat, flames and sparks.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	Upon decomposition, this product may yield sulfur dioxide, carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Toxicological data

Product	Test Results
DIESEL OIL BASED DRILLING MUD (Mixture)	Acute Dermal LD50 Rat: 74918 mg/kg estimated
	Acute Oral LD50 Rat: 19690 mg/kg estimated
Components	**Test Results**
NAPHTHALENE (91-20-3)	Acute Dermal LD50 New Zealand white rabbit: > 2000 mg/kg
	Acute Dermal LD50 Rat: > 20000 mg/kg
	Acute Oral LD50 Guinea pig: 1200 mg/kg
	Acute Oral LD50 Rat: 490 mg/kg
	Acute Oral LD50 Sherman rat: 2200 mg/kg
	Acute Oral LD50 Sprague-Dawley rat: 2600 mg/kg
	Acute Other LD50 Mouse: 100 mg/kg

* Estimates for product may be based on additional component data not shown.

Sensitization

US ACGIH Threshold Limit Values: Skin designation

FUELS, DIESEL, NO. 2 (68476-34-6)	Can be absorbed through the skin.
NAPHTHALENE (91-20-3)	Can be absorbed through the skin.

Local effects Irritating to eyes, respiratory system and skin. Toxic by inhalation.

Carcinogenicity

IARC Monographs on Occupational Exposures to Chemical Agents: Overall evaluation

NAPHTHALENE (91-20-3)	2B Possible carcinogen.

US ACGIH Threshold Limit Values: A3 carcinogen

FUELS, DIESEL, NO. 2 (68476-34-6)	Group A3 Confirmed animal carcinogen with unknown relevance to humans.

Carcinogenicity

US ACGIH Threshold Limit Values: A4 carcinogen

NAPHTHALENE (91-20-3) Group A4 Not classifiable as a human carcinogen.

US NTP Report on Carcinogens: Anticipated carcinogen

NAPHTHALENE (91-20-3) Anticipated carcinogen.

12. Ecological Information

Ecotoxicological data

Product	Test Results
DIESEL OIL BASED DRILLING MUD (Mixture)	EC50 Daphnia: 491 mg/l 48.00 Hours estimated
	LC50 Fish: 847 mg/l 96.00 Hours estimated
Components	**Test Results**
NAPHTHALENE (91-20-3)	EC50 Water flea (Daphnia magna): 1.09 - 3.4 mg/l 48.00 Hours
	LC50 Rainbow trout,donaldson trout (Oncorhynchus mykiss): 0.91 - 2.82 mg/l 96.00 Hours

* Estimates for product may be based on additional component data not shown.

Ecotoxicity Components of this product have been identified as having potential environmental concerns.

Environmental effects An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Persistence and degradability Not available.

13. Disposal Considerations

Waste codes

US RCRA Hazardous Waste U List: Reference

NAPHTHALENE (91-20-3) U165

Disposal instructions Dispose of waste material according to Local, State, Federal, and Provincial Environmental Regulations.

14. Transport Information

Department of Transportation (DOT) Requirements

BULK SHIPMENTS (>119 gallons)

Basic shipping requirements:

Proper shipping name	Combustible liquid, n.o.s. (FUELS, DIESEL, NO. 2)
Hazard class	Comb liq
Subsidiary hazard class	None
UN number	NA1993
Packing group	III
Additional information:	
Special provisions	IB3, T1, T4, TP1
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	241

Department of Transportation (DOT) Requirements

NON-BULK SHIPMENTS (<119 gallons)

Not regulated as hazardous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration

NAPHTHALENE (91-20-3) 0.1 %

US TSCA Section 12(b) Export Notification: Export Notification requirement/De minimis concentration

NAPHTHALENE (91-20-3) 0.1 % One-Time Export Notification only.

CERCLA (Superfund) reportable quantity

None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - No Delayed Hazard - Yes Fire Hazard - Yes Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	Yes
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT): Listed substance

NAPHTHALENE (91-20-3)	Listed.

US - California Proposition 65 - CRT: Listed date/Carcinogenic substance

NAPHTHALENE (91-20-3)	Listed: April 19, 2002 Carcinogenic.

US - New Jersey Community RTK (EHS Survey): Reportable threshold

FUELS, DIESEL, NO. 2 (68476-34-6)	10000 LBS
NAPHTHALENE (91-20-3)	500 LBS

US - Pennsylvania RTK - Hazardous Substances: Listed substance

FUELS, DIESEL, NO. 2 (68476-34-6)	Listed.
NAPHTHALENE (91-20-3)	Listed.

16. Other Information

HMIS® ratings	Health: 1* Flammability: 2 Physical hazard: 0 Personal protection: H
NFPA ratings	Health: 1 Flammability: 2 Instability: 0
Disclaimer	The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.
US preparer	Cheryl Hood - Tel +1 713-625-4888
Issue date	08-27-2008
Supercedes date	08-26-2008
This data sheet contains changes from the previous version in section(s):	Hazards Identification: Emergency overview Hazards Identification: Eyes Composition / Information on Ingredients: Ingredients Fire Fighting Measures: Protective equipment and precautions for firefighters Physical & Chemical Properties: Solubility

MATERIAL SAFETY DATA SHEET

OMNI-COTE®

BAKER HUGHES
Drilling Fluids

1. Product and Company Identification

Material name	**OMNI-COTE®**
Chemical description	Polyolefin/Organic Sulfonate Blend
Applications	High Temperature Emulsifier
Supplier	Baker Hughes Drilling Fluids 2001 Rankin Rd. Houston, TX 77073 Emergency telephone number 713-439-8900

2. Composition / Information on Ingredients

Components	CAS #	Percent
2-ETHYLHEXANOL	104-76-7	8 - 10
Non-hazardous and other components below reportable levels		> 90

Composition comments This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

3. Hazards Identification

Emergency overview Irritating to eyes, respiratory system and skin.

Potential health effects

Routes of exposure	Eye contact. Skin contact.
Eyes	Contact with eyes may cause irritation.
Skin	Prolonged skin contact may cause skin irritation and/or dermatitis.
Inhalation	May cause irritation of respiratory tract.
Ingestion	Irritating to mouth, throat, and stomach.

4. First Aid Measures

First aid procedures

Eye contact	Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation develops or persists.
Skin contact	Remove and isolate contaminated clothing and shoes. Wash off skin with soap and water. Get medical attention if irritation develops or persists. Wash clothing separately before reuse.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.
Ingestion	Do not induce vomiting. Give several glasses of water. Get medical attention immediately.

General advice Keep victim warm. Keep victim under observation. In case of shortness of breath, give oxygen. If you feel unwell, seek medical advice (show the label where possible).

5. Fire Fighting Measures

Hazardous combustion products Combustion products include fumes, smoke, carbon monoxide, carbon dioxide and sulfur dioxide.

Extinguishing media

Suitable extinguishing media Dry chemical, foam, carbon dioxide. Use water to cool fire-exposed containers and to protect personnel. Do not use a solid water stream as it may scatter and spread fire.

Protection of firefighters

Protective equipment for firefighters Move containers from fire area if you can do it without risk. Do not scatter spilled material with high pressure water streams. Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask.

6. Accidental Release Measures

Personal precautions Do not touch or walk through spilled material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Evacuation procedures	Keep unnecessary personnel away. Ventilate closed spaces before entering. Stay upwind. Keep out of low areas.
Methods for containment	Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent entry into waterways, sewers, basements or confined areas. Dike the spilled material, where this is possible.
Methods for cleaning up	Large Spills: Dike far ahead of liquid spill for later disposal. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean contaminated surface thoroughly.

7. Handling and Storage

Handling	Do not handle or store near an open flame, heat or other sources of ignition. Handle and open container with care. Do not get this material in your eyes, on your skin, or on your clothing. Do not breathe gas/fumes/vapor/spray.
Storage	Keep away from heat and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure Controls / Personal Protection

Engineering controls	Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Personal protective equipment	
Eye / face protection	Wear chemical goggles.
Skin protection	Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended.
Hand protection	Impervious gloves.
Respiratory protection	No personal respiratory protective equipment normally required. When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
General hygeine considerations	When using do not smoke. Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. Physical and Chemical Properties

Appearance / Color / Form	Amber. Liquid.
Odor	Solvent.
Clarity	Not available
Odor threshold	Not available
Physical state	Liquid
pH	Not available
Melting point	Not available
Freezing point	Not available
Boiling point	365 °F (184.5 °C) estimated
Flash point	> 212 °F (> 100 °C)
Evaporation rate	Not available
Flammability limits in air, lower, % by volume	Not available
Flammability limits in air, upper, % by volume	Not available
Vapor pressure	Not available
Vapor density	Not available
Specific gravity	0.935 - 0.941
Relative density	6.6924 estimated
Solubility	Insoluble in water.
Octanol/H2O coeff	Not available
Auto-ignition temperature	447.8 °F (231 °C) estimated
Decomposition temperature	Not available
VOC (Weight %)	13.44 % estimated

10. Chemical Stability and Reativity Information

Chemical stability	Stable at normal conditions.

Conditions to avoid Heat, flames and sparks.

Incompatible materials This product may react with reducing agents. Strong oxidizing agents. Strong acids.

Hazardous decomposition products Upon decomposition this product emits acrid dense smoke with carbon dioxide, carbon monoxide, water and other products of combustion.

Possibility of hazardous reactions Will not occur.

11. Toxicological Information

Acute effects Acute LD50: 17273 mg/kg, Rat, Oral
Acute LD50: 22204 mg/kg, Rat, Dermal

Component analysis - LD50

Toxicology Data - Selected LD50s and LC50s

2-ETHYLHEXANOL	104-76-7	Oral LD50 Rat: 1516 mg/kg; Dermal LD50 Rat: >3000 mg/kg; Dermal LD50 Rabbit: 1970 mg/kg

Local effects Irritating to eyes, respiratory system and skin.

12. Ecological Information

Ecotoxicity Components of this product have been identified as having potential environmental concerns.

Environmental effects

Ecotoxicity - Freshwater Fish Species Data

2-ETHYLHEXANOL	104-76-7	96 Hr LC50 rainbow trout: 32 mg/L (static)

Ecotoxicity - Water Flea Data

2-ETHYLHEXANOL	104-76-7	24 Hr EC50 water flea: 270.0 mg/L (Static)

13. Disposal Considerations

Disposal instructions Dispose in accordance with all applicable regulations.

14. Transport Information

Department of Transportation (DOT) Requirements

Not regulated as dangerous goods.

IATA

Not regulated as dangerous goods.

IMDG

Not regulated as dangerous goods.

15. Regulatory Information

US federal regulations CERCLA/SARA Hazardous Substances - Not applicable.

FEMA (Flavor and Extract Manufacturers Association) - FEMA Numbers

2-ETHYLHEXANOL	104-76-7	3151

Occupational Safety and Health Administration (OSHA)

29 CFR 1910.1200 hazardous chemical Yes

CERCLA (Superfund) reportable quantity None

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - No

Section 302 extremely hazardous substance No

Section 311 hazardous chemical Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (CCS)	No
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Japanese Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Korean Inventory of Chemicals (KICS)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

International regulations The product is classified and labelled in accordance with EC directives or respective national laws.

State regulations This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.

Massachusetts - Right To Know List

2-ETHYLHEXANOL	104-76-7	Present

Pennsylvania - RTK (Right to Know) List

2-ETHYLHEXANOL	104-76-7	Present

16. Other Information

HMIS ratings
Health: 1
Flammability: 1
Physical hazard: 0
Personal protection: G

NFPA ratings
Health: 1
Flammability: 1
Instability: 0

Disclaimer The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

US preparer Cheryl Hood - (713)625-4888

Issue date 06-26-2006

MATERIAL SAFETY DATA SHEET

SURF-COTE®

Drilling Fluids

1. Product and Company Identification

Material name SURF-COTE®

Chemical name Surfactant Blend

Chemical description Oil Mud Wetting Agent

Supplier Baker Hughes Drilling Fluids
2001 Rankin Rd.
Houston, TX 77073
Emergency telephone number 713-439-8900

2. Composition / Information on Ingredients

Components	CAS #	Percent
NAPHTHALENE	91-20-3	2 - 3.5
N-BUTANOL	71-36-3	10
1,2,4-Trimethylbenzene	95-63-6	< 3.5
NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	< 25
Non-hazardous and other components below reportable levels		40 - 60

3. Hazards Identification

Emergency overview Flammable/Combustible Material. May be ignited by heat, sparks or flames. Irritating to eyes, respiratory system and skin. Harmful if swallowed. Possible cancer hazard based on tests with laboratory animals.

Potential health effects

Routes of exposure Inhalation. Skin contact. Ingestion.

Eyes Contact can cause moderate to severe irritation and possible injury to the eyes.

Skin Irritating to skin.

Inhalation Irritating to respiratory system. Prolonged inhalation may be harmful.

Ingestion Harmful if swallowed.

Target organs Eyes. Respiratory system. Skin.

Chronic effects May cause cancer.

4. First Aid Measures

First aid procedures

Eye contact Immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention immediately.

Skin contact Wash off immediately with plenty of water. Remove and isolate contaminated clothing and shoes. Wash clothing separately before reuse. Get medical attention if irritation develops or persists.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Call a physician if symptoms develop or persist.

Ingestion Do not induce vomiting: contains petroleum distillates and/or aromatic solvents. Drink plenty of water. If material is ingested, immediately contact a physician or poison control center.

General advice Keep victim warm. Keep victim under observation. In case of shortness of breath, give oxygen. Take off contaminated clothing and shoes immediately. Call a physician if symptoms develop or persist.

5. Fire Fighting Measures

Flammable properties Vapor or gas may spread to distant ignition sources and flash back.

Hazardous combustion products Combustion products include fumes, smoke, carbon monoxide, carbon dioxide and sulfur dioxide.

Extinguishing media

Suitable extinguishing media Carbon dioxide (CO2). Alcohol foam. Dry chemical. Water Fog.

Protection of firefighters

Protective equipment for firefighters Wear full protective clothing, including helmet, self-contained positive pressure or pressure demand breathing apparatus, protective clothing and face mask. Move containers from fire area if you can do it without risk. Collect contaminated fire extinguishing water separately. This must not be discharged into drains.

6. Accidental Release Measures

Evacuation procedures Keep unnecessary personnel away. Ventilate closed spaces before entering. Stay upwind. Keep out of low areas.

Environmental precautions Do not contaminate water. Prevent further leakage or spillage if safe to do so.

Methods for containment Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Prevent entry into waterways, sewers, basements or confined areas. This material is a water pollutant and should be prevented from contaminating soil or from entering sewage and drainage systems and bodies of water. Dike the spilled material, where this is possible. Use water spray to reduce vapors or divert vapor cloud drift.

Methods for cleaning up Eliminate ignition sources including sources of electrical, static or frictional sparks.

Large Spills: Do not allow material to contaminate ground water system. Dike far ahead of liquid spill for later disposal. Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean contaminated surface thoroughly. After removal flush contaminated area thoroughly with water.

7. Handling and Storage

Handling Do not get this material in your eyes, on your skin, or on your clothing. Do not handle or store near an open flame, heat or other sources of ignition. Vapors may form explosive mixtures with air. All equipment used when handling the product must be grounded. Use this product with adequate ventilation. Wear personal protective equipment.

Storage Keep away from heat and sources of ignition. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep this material away from food, drink and animal feed.

8. Exposure Controls / Personal Protection

Exposure limits

ACGIH

Components	CAS #	TWA	STEL	Ceiling
N-BUTANOL	71-36-3	20 ppm		
1,2,4-Trimethylbenzene	95-63-6	25 ppm		
NAPHTHALENE	91-20-3	10 ppm	15 ppm	

OSHA

Components	CAS #	TWA	STEL	Ceiling
N-BUTANOL	71-36-3	100 ppm		
NAPHTHALENE	91-20-3	10 ppm		

Engineering controls Provide adequate local exhaust ventilation to maintain worker exposure below exposure limits.

Personal protective equipment

Eye protection Wear chemical goggles.

Hand protection Neoprene gloves.

Skin and body protection Use of protective coveralls and long sleeves is recommended. Use of impervious boots is recommended. Rubber or plastic apron.

Respiratory protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.

General hygeine considerations Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and immediately after handling the product. Avoid contact with the skin and the eyes.

9. Physical and Chemical Properties

Appearance / Color / Form	Clear. Amber. Liquid.
Odor	Solvent.
Clarity	Not available
Odor threshold	Not available
Physical state	Liquid
pH	6 - 8
Melting point	-76 °F (-60 °C) estimated
Freezing point	Not available
Boiling point	244.4 °F (117.7 °C) estimated
Flash point	109.4 °F (43 °C) Pensky-Martens Closed Cup
Evaporation rate	Not available
Flammability limits in air, lower, % by volume	Not available
Flammability limits in air, upper, % by volume	Not available
Vapor pressure	Not available
Vapor density	Not available
Specific gravity	1.7486 estimated
Relative density	0.98 g/m3 at 20 C
Solubility	Insoluble in water.
Octanol/H2O coeff	Not available
Auto-ignition temperature	649.4 °F (343 °C) estimated
Decomposition temperature	Not available
VOC (Weight %)	20 % estimated
Percent volatile	10 %

10. Chemical Stability & Reactivity Information

Chemical stability	Instability caused by exposure to sources of ignition.
Conditions to avoid	Heat, flames and sparks.
Incompatible materials	Oxidizing materials.
Hazardous decomposition products	Upon decomposition, this product emits oxides of sulfur, carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.
Possibility of hazardous reactions	Will not occur.

11. Toxicological Information

Component analysis - LD50

Toxicology Data - Selected LD50s and LC50s

1,2,4-Trimethylbenzene	95-63-6	Inhalation LC50 Rat: 18 g/m3/4H; Oral LD50 Rat:3400 mg/kg; Dermal LD50 Rabbit:>3160 mg/kg
NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	Inhalation LC50 Rat: 590 mg/m3/4H; Oral LD50 Rat: 7050 mg/kg; Dermal LD50 Rabbit: 2 mL/kg
NAPHTHALENE	91-20-3	Inhalation LC50 Rat: >340 mg/m3/1H; Oral LD50 Rat:490 mg/kg; Dermal LD50 Rat:>2500 mg/kg; Dermal LD50 Rabbit:>20 g/kg
N-BUTANOL	71-36-3	Inhalation LC50 Rat: >17.7 mg/L/4H; Inhalation LC50 Rat:8000 ppm/4H; Oral LD50 Rat:790 mg/kg; Dermal LD50 Rabbit:3400 mg/kg

Local effects	Harmful if swallowed. May cause irritation of respiratory tract. May cause eye/skin irritation.
Chronic effects	Prolonged exposure may cause chronic effects.
Carcinogenicity	Possible cancer hazard based on tests with laboratory animals.

ACGIH - Threshold Limit Values - Carcinogens

NAPHTHALENE	91-20-3	A4 - Not Classifiable as a Human Carcinogen

Further information	Symptoms may be delayed.

12. Ecological Information

Ecotoxicity	Components of this product are hazardous to aquatic life.

Environmental effects

Ecotoxicity - Freshwater Algae Data

NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	72 Hr EC50 Skeletonema costatum: 2.5 mg/L
NAPHTHALENE	91-20-3	96 Hr EC50 Skeletonema costatum: 0.4 mg/L
N-BUTANOL	71-36-3	96 Hr EC50 Scenedesmus subspicatus: >500 mg/L; 72 Hr EC50 Scenedesmus subspicatus: >500 mg/L

Ecotoxicity - Freshwater Fish Species Data

1,2,4-Trimethylbenzene	95-63-6	96 Hr LC50 Pimephales promelas: 7.72 mg/L [flow-through]
NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	96 Hr LC50 Pimephales promelas: 19 mg/L [static]; 96 Hr LC50 Oncorhynchus mykiss: 2.34 mg/L; 96 Hr LC50 Lepomis macrochirus: 1740 mg/L [static]
NAPHTHALENE	91-20-3	96 Hr LC50 Pimephales promelas: 6.14 mg/L [flow-through]; 96 Hr LC50 Oncorhynchus mykiss: 1.60 mg/L [flow-through] (juvenile); 96 Hr LC50 Pimephales promelas: 6.08 mg/L [flow-through]; 96 Hr LC50 Pimephales promelas: 1.99 mg/L [static]
N-BUTANOL	71-36-3	96 Hr LC50 Pimephales promelas: 1510 mg/L [static] (33 days old); 96 Hr LC50 Pimephales promelas: 1740 mg/L [flow-through]; 96 Hr LC50 Leuciscus idus: 1200 mg/L

Ecotoxicity - Microtox Data

NAPHTHALENE	91-20-3	30 min EC50 Photobacterium phosphoreum: 0.93 mg/L; 18 Hr EC50 Pseudomonas putida: >20 mg/L
N-BUTANOL	71-36-3	5 min EC50 Photobacterium phosphoreum: 2041.4 mg/L; 30 min EC50 Photobacterium phosphoreum: 2186 mg/L; 17 Hr EC50 Pseudomonas putida: 4400 mg/L; 24 Hr EC50 Aerobic heterotroph: 3980 mg/L

Ecotoxicity - Water Flea Data

1,2,4-Trimethylbenzene	95-63-6	48 Hr EC50 Daphnia magna: 6.14 mg/L
NAPHTHA (PETROLEUM), HEAVY AROMATIC	64742-94-5	48 Hr EC50 Daphnia magna: 0.95 mg/L
NAPHTHALENE	91-20-3	48 Hr EC50 water flea: 2.16 mg/L
N-BUTANOL	71-36-3	48 Hr EC50 Daphnia magna: 1983 mg/L

Aquatic toxicity May cause long-term adverse effects in the aquatic environment.

13. Disposal Considerations

Waste codes D001: Waste Flammable material with a flash point <140 F

Disposal instructions Dispose in accordance with all applicable regulations. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container.

14. Transport Information

Department of Transportation (DOT) Requirements

Proper shipping name	Flammable liquids, n.o.s. (N-BUTANOL RQ = 50000 lbs)
Hazard class	3
UN number	UN1993
Packing group	III
Special provisions	B1, B52, IB3, T4, TP1, TP29
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242
ERG number	128

IATA

Proper shipping name	Flammable liquids, n.o.s. (N-BUTANOL)
Hazard class	3
UN number	UN1993
Packing group	III
Packaging exceptions	150
Packaging non bulk	203
Packaging bulk	242
Labels required	3

IMDG

Proper shipping name	Flammable Liquid, n.o.s. (N-BUTANOL)
Hazard class	3
UN number	UN1993
Packing group	III
Marine pollutant	Alkylbenzenesulfonates, branched or straight chain
Packaging exceptions	150
Labels required	None

General DOT Regulated Marine Pollutant.

15. Regulatory Information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.

FEMA (Flavor and Extract Manufacturers Association) - FEMA Numbers

N-BUTANOL	71-36-3	2178

NTP (National Toxicology Program) - Report on Carcinogens - Reasonably Anticipated to be Human Carcinogens

NAPHTHALENE	91-20-3	Reasonably Anticipated To Be A Human Carcinogen

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

1,2,4-Trimethylbenzene	95-63-6	1.0 % de minimis concentration
NAPHTHALENE	91-20-3	0.1 % de minimis concentration
N-BUTANOL	71-36-3	1.0 % de minimis concentration

U.S. - FDA - Color Additives Conditionally Approved for Use in Foods

N-BUTANOL	71-36-3	21 CFR 73.1

U.S. - FDA - Direct Food Additives

N-BUTANOL	71-36-3	21 CFR 172.515

Occupational Safety and Health Administration (OSHA)

29 CFR 1910.1200 hazardous chemical	Yes

CERCLA (Superfund) reportable quantity N-BUTYL ALCOHOL: 5000.0000
NAPHTHALENE: 100.0000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories	Immediate Hazard - Yes Delayed Hazard - Yes Fire Hazard - Yes Pressure Hazard - No Reactivity Hazard - No
Section 302 extremely hazardous substance	No
Section 311 hazardous chemical	Yes

Inventory status

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	No
Canada	Domestic Substances List (DSL)	No
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (CCS)	No
Europe	European Inventory of New and Existing Chemicals (EINECS)	No
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Japanese Inventory of Existing and New Chemical Substances (ENCS)	No
Korea	Korean Inventory of Chemicals (KICS)	No
New Zealand	New Zealand Inventory	No
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	No
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

Regulations The product is classified and labelled in accordance with EC directives or respective national laws.

IARC - Group 2B (Possibly Carcinogenic to Humans)

NAPHTHALENE	91-20-3	Monograph 82 [2002]

State regulations

WARNING: This product contains a chemical known to the State of California to cause cancer.

U.S. - California - Proposition 65 - Carcinogens List

NAPHTHALENE	91-20-3	carcinogen, initial date 4/19/02

U.S. - Massachusetts - Right To Know List

1,2,4-Trimethylbenzene	95-63-6	Present
NAPHTHALENE	91-20-3	Present
N-BUTANOL	71-36-3	Present

U.S. - New Jersey - Right to Know Hazardous Substance List

1,2,4-Trimethylbenzene	95-63-6	sn 2716
NAPHTHALENE	91-20-3	sn 1322
N-BUTANOL	71-36-3	sn 1330

U.S. - Pennsylvania - RTK (Right to Know) List

1,2,4-Trimethylbenzene	95-63-6	Environmental hazard
NAPHTHALENE	91-20-3	Environmental hazard
N-BUTANOL	71-36-3	Present

16. Other Information

HMIS® ratings

Health: 2
Flammability:2
Physical hazard: 0
Personal protection: H

NFPA ratings

Health: 2
Flammability: 2
Instability: 0

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

US preparer

Cheryl Hood

Issue date

14-May-2008

Supercedes date

04-25-2007

MSDS sections updated

Physical & Chemical Properties: Solubility
Regulatory Information: Canadian regulations

Material Safety Data Sheet

1 . Product and company identification

Product name	: CARBO-TROL™ 375
Supplier	: Baker Hughes Drilling Fluids A Baker Hughes Company 2001 Rankin Road Houston, TX 77073
Material Uses	: Special: Filtration Control Agent
Code	: 7188DF
Validation date	: 7/5/2012.
Print date	: 7/5/2012.
Version	: 4
In case of emergency	: For Chemical Emergency: 713-439-8900 1-800-424-9300

2 . Hazards identification

Physical state	: Solid. [Powder.]
Odor	: Characteristic.
Color	: Black.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Emergency overview	: WARNING! CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE EYE AND SKIN IRRITATION. Fine dust clouds may form explosive mixtures with air. Handling and/or processing of this material may generate a dust which can cause mechanical irritation of the eyes, skin, nose and throat. Keep away from heat, sparks and flame. Prevent dust accumulation. Do not breathe dust. Do not get on skin or clothing. Avoid contact with eyes. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Potential acute health effects

Inhalation	: Irritating to respiratory system.
Ingestion	: No known significant effects or critical hazards.
Skin	: Moderately irritating to the skin. May cause sensitization by skin contact.
Eyes	: Moderately irritating to eyes. No significant irritation expected other than possible mechanical irritation.

Potential chronic health effects

Chronic effects	: Repeated or prolonged inhalation of dust may lead to chronic respiratory irritation. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Over-exposure signs/symptoms

Inhalation	: respiratory tract irritation, coughing
Ingestion	: None known.
Skin	: irritation, redness
Eyes	: irritation, watering, redness
Medical conditions aggravated by over-exposure	: Pre-existing skin disorders may be aggravated by over-exposure to this product.

See toxicological information (Section 11)

2 . Hazards identification

3 . Composition/information on ingredients

Name	CAS number	%
Asphaltite	12002-43-6	60 - 100

4 . First aid measures

Eye contact : Get medical attention immediately. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wear suitable protective clothing and gloves. Remove contaminated clothing and shoes.

5 . Fire-fighting measures

Flammability of the product : Fine dust clouds may form explosive mixtures with air.

Extinguishing media

Suitable : In case of fire, use water spray (fog), foam, dry chemical or CO_2.

Not suitable : Do not use water jet.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : No specific data.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing dust. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up

Small spill : Move containers from spill area. Vacuum or sweep up material and place in a designated, labeled waste container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

6 . Accidental release measures

Large spill : Move containers from spill area. Approach release from upwind. Dike spill area and do not allow product to reach sewage system or surface or ground water. Notify any reportable spill to authorities. (See section 12 for environmental risks and 13 for disposal information.) Vacuum or sweep up material and place in a designated, labeled waste container. Avoid creating dusty conditions and prevent wind dispersal. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7 . Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Persons with a history of skin sensitization problems should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not ingest. Avoid breathing dust. Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Prevent dust accumulation. Use only with adequate ventilation. Electrical equipment and lighting should be protected to appropriate standards to prevent dust coming into contact with hot surfaces, sparks or other ignition sources. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8 . Exposure controls/personal protection

Occupational exposure limits		TWA (8 hours)			STEL (15 mins)			Ceiling			
Ingredients:	List name	ppm	mg/m³	Other	ppm	mg/m³	Other	ppm	mg/m³	Other	Notations
No exposure limit value known.											

If OSHA permissible exposure levels are shown above they are the OSHA 1989 levels or are from subsequent OSHA regulatory actions. Although the 1989 levels have been vacated the 11th Circuit Court of Appeals, Baker Hughes recommends that these lower exposure levels be observed as reasonable worker protection.

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Ensure that eyewash stations and safety showers are close to the workstation location. Take off contaminated clothing and wash before reuse.

Personal protection

Respiratory : Approved/certified disposable particulate dust mask. Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Hands : Chemical-resistant gloves.

8 . Exposure controls/personal protection

Eyes	: Wear chemical safety goggles. When transferring material wear face-shield in addition to chemical safety goggles.
Skin	: Wear long sleeves and other protective clothing to prevent repeated or prolonged skin contact.

9 . Physical and chemical properties

Physical state	: Solid. [Powder.]
Flash point	: Closed cup: Not applicable.
Auto-ignition temperature	: Not available.
Flammable limits	: Not available.
Color	: Black.
Odor	: Characteristic.
pH	: Not available.
Boiling/condensation point	: Not available.
Initial Boiling Point	: Not available.
Melting/freezing point	: 200 to 228°C (392 to 442.4°F)
Relative density	: 1.088
Density	: Not available.
Vapor density	: Not available.
Volatility	: 2 to 10% (v/v)
Odor threshold	: Not available.
Evaporation rate	: Not available.
VOC	: Not available.
Viscosity	: Not available.
Solubility (Water)	: Insoluble
Vapor pressure	: Not available.
Pour Point	: Not available.
Partition coefficient (LogKow)	: Not available.

10 . Stability and Reactivity

Chemical stability	: The product is stable.
Possibility of hazardous reactions	: Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	: Under normal conditions of storage and use, hazardous polymerization will not occur.
Conditions to avoid	: Avoid the creation of dust when handling and avoid all possible sources of ignition (spark or flame). Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Prevent dust accumulation.
Hazardous decomposition products	: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

11 . Toxicological information

No additional information.

Chronic toxicity Remarks

1) Asphaltite

Not available.

12 . Ecological information

Aquatic ecotoxicity

Conclusion/Summary : Not available.

Biodegradability

Conclusion/Summary : Not available.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe way. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	Not regulated.	Not available.	-	-		-
TDG Classification	Not regulated.	Not available.	-	-		-
IMDG Class	Not regulated.	Not available.	-	-		-
IATA-DGR Class	Not regulated.	Not available.	-	-		-

PG* : Packing group

DOT Reportable Quantity Not applicable.

Marine pollutant Not applicable.

North-America NAERG : Not available.

15 . Regulatory information

HCS Classification : Irritating material
Sensitizing material

U.S. Federal regulations : **United States inventory (TSCA 8b)**: Not determined.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: No products were found.
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: No products were found.

CERCLA: Hazardous substances.: No products were found.

Clean Water Act (CWA) 307: No products were found.

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

15 . Regulatory information

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) :

Not listed

United States inventory (TSCA 8b) : Not determined.

Canada

WHMIS (Canada) : Not controlled under WHMIS (Canada).

Canada (CEPA DSL): : All components are listed or exempted.

16 . Other information

Label requirements : CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC SKIN REACTION. MAY CAUSE EYE AND SKIN IRRITATION.

Hazardous Material Information System (U.S.A.) :

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :

Date of printing : **7/5/2012.**

Indicates information that has changed from previously issued version.

Notice to reader

NOTE: The information on this MSDS is based on data which is considered to be accurate. Baker Hughes Drilling Fluids, however, makes no guarantees or warranty, either expressed or implied of the accuracy or completeness of this information.

The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of this product.

This MSDS was prepared and is to be used for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Attachment E

Table E-1
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Emissions Summary
February 2016

Emission Source ID	Emission Point ID	Unit Description	VOC Emissions		NO_x Emissions		CO Emissions		SO_2 Emissions		PM Emissions		PM_{10} Emissions		$PM_{2.5}$ Emissions		HAP Emissions		CO_2 Emissions		CH_4 Emissions		N_2O Emissions		CO_2e Emissions	
			lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy	lb/hr	tpy
ND-001	ND-001	Next-Drill Tank	0.00	4.43E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-002	ND-002	Next-Drill Tank	0.00	4.43E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-003	ND-003	Next-Drill Tank	0.00	4.43E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-004	ND-004	Next-Drill Tank	0.00	4.43E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-005	ND-005	Next-Drill Tank	0.00	4.43E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-006	ND-006	Next-Drill Tank	0.00	4.43E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-007	ND-007	Next-Drill Tank	0.00	4.43E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-008	ND-008	Next-Drill Tank	0.00	4.43E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
OBM-1	OBM-1	Oil Based Mud	0.00	1.62E-02	--	--	--	--	--	--	--	--	--	--	--	--	0.00E+00	0.00E+00	--	--	--	--	--	--	--	--
OBM-2	OBM-2	Oil Based Mud	0.00	1.62E-02	--	--	--	--	--	--	--	--	--	--	--	--	0.00E+00	0.00E+00	--	--	--	--	--	--	--	--
OBM-3	OBM-3	Oil Based Mud	0.00	1.62E-02	--	--	--	--	--	--	--	--	--	--	--	--	0.00E+00	0.00E+00	--	--	--	--	--	--	--	--
DT-1	DT-1	Diesel Storage Tank	0.00	1.62E-02	--	--	--	--	--	--	--	--	--	--	--	--	0.00E+00	0.00E+00	--	--	--	--	--	--	--	--
FW-001	NA	Fresh Water Tank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
BW-001	NA	Brine Water Tank	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
ND-019	ND-019	Next-Drill Tank	1.01E-03	4.42E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-020	ND-020	Next-Drill Tank	1.01E-03	4.42E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-021	ND-021	Next-Drill Tank	1.01E-03	4.42E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
ND-022	ND-022	Next-Drill Tank	1.01E-03	4.42E-03	--	--	--	--	--	--	--	--	--	--	--	--	1.03E-05	4.50E-05	--	--	--	--	--	--	--	--
NB-001	NB-001	Next-Base Tank	0.01	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NB-002	NB-002	Next-Base Tank	0.01	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NB-003	NB-003	Next-Base Tank	0.01	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
NB-004	NB-004	Next-Base Tank	0.01	0.03	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
MT-001	MT-001	Mix Tank 1	0.96	0.43	--	--	--	--	--	--	0.06	0.01	0.06	0.01	0.02	2.20E-03	5.47E-04	2.39E-04	--	--	--	--	--	--	--	--
MT-002	MT-002	Mix Tank 2	0.89	0.10	--	--	--	--	--	--	0.06	0.01	0.06	0.01	0.02	2.20E-03			--	--	--	--	--	--	--	--
ICE-001	ICE-001	325 hp Diesel Engine	0.10	0.44	0.21	0.94	1.86	8.16	0.66	2.89	0.01	0.05	0.01	0.05	0.01	0.05	0.01	0.06	373.10	1634.18	3.10E-03	0.01	6.19E-04	2.71E-03	373.36	1635.33
ICE-002	ICE-002	325 hp Diesel Engine	0.10	0.44	0.21	0.94	1.86	8.16	0.66	2.89	0.01	0.05	0.01	0.05	0.01	0.05	0.01	0.06	373.10	1634.18	3.10E-03	0.01	6.19E-04	2.71E-03	373.36	1635.33
LR-1	LR-1	Liquid Loading Rack	2.44	0.43	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
LR-2	LR-2	Barite Loading Rack	--	--	--	--	--	--	--	--	0.81	3.54	0.81	3.54	0.81	3.54	--	--	--	--	--	--	--	--	--	--
FUG - 1	FUG - 1	Fugitive Leaks	1.08	4.75	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--	--
FUG-2	FUG-2	Haul Road Fugitives	--	--	--	--	--	--	--	--	0.49	0.91	0.12	0.22	2.99E-03	0.03	--	--	--	--	--	--	--	--	--	--
Total Uncontrolled Emissions:			**5.62**	**6.83**	**0.43**	**1.88**	**3.73**	**16.32**	**1.32**	**5.78**	**1.43**	**4.56**	**1.06**	**3.86**	**0.87**	**3.67**	**0.03**	**0.13**	**746.20**	**3268.36**	**0.01**	**0.03**	**1.24E-03**	**0.01**	**746.72**	**3270.65**
Total Controlled Emissions:			--	--	--	--	--	--	--	--	--	--					--	--	--	--	--	--	--	--	--	--
Site Total Emissions			**5.62**	**6.83**	**0.43**	**1.88**	**3.73**	**16.32**	**1.32**	**5.78**	**1.43**	**4.56**	**1.06**	**3.86**	**0.87**	**3.67**	**0.03**	**0.13**	**746.20**	**3268.36**	**0.01**	**0.03**	**1.24E-03**	**0.01**	**746.72**	**3270.65**
WV 45CSR13 Permitting Thresholds			6.00	10.00	6.00	10.00	6.00	10.00	6.00	10.00	14.00	18.00	6.00	10.00	6.00	10.00	2.00	5.00	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Threshold Exceeded (Y/N)			N	N	N	N	N	Y	N	N	N	N	N	N	N	N	N	N	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Does Pollutant Trigger Minor Source Status (Exceed 6 lb/hr AND 10 tpy Regulated Air Pollutant; OR 2 lb/hr OR 5 tpy Aggregated HAPs OR 45CSR27 TAP)			**No**		**No**		**No**		**No**		**No**		**No**		**No**		**No**		**N/A**		**N/A**		**N/A**		**N/A**	

Table E-2
Baker Hughes, Inc.
Clarksburg Drilling Fluids
ICE-001 Emission Summary
February 2016

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Basis / Source[1]	Fuel Consumption[2] (Btu/bhp-hr)	Engine Rating (bhp)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions[3] (tpy)
NOx	0.30	g/hp-hr	Tier 4 Emission Standards	7,000	325	8,760	0.21	0.94
CO	2.60	g/hp-hr	Tier 4 Emission Standards	7,000	325	8,760	1.86	8.16
VOC's	0.14	g/hp-hr	Tier 4 Emission Standards	7,000	325	8,760	0.10	0.44
PM	0.02	g/hp-hr	Tier 4 Emission Standards	7,000	325	8,760	0.01	0.05
SO_2	0.29	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	0.66	2.89
Benzene	9.33E-04	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	2.12E-03	0.01
Toluene	4.09E-04	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	9.30E-04	4.08E-03
Xylene	2.85E-04	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	6.48E-04	2.84E-03
Propylene	2.58E-03	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	0.01	0.03
1,3 - Butadiene	3.91E-05	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	8.90E-05	3.90E-04
Formaldehyde	1.18E-03	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	2.68E-03	0.01
Acetaldehyde	7.67E-04	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	1.74E-03	0.01
Acrolein	9.25E-05	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	2.10E-04	9.22E-04
CO_2	164	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	373.10	1634.18
CH_4[4]	3.00E-03	kg CH_4/mmBtu	40 CFR 98 Subpart C	7,000	325	8,760	3.10E-03	0.01
N_2O[4]	6.00E-04	kg N_2O/mmBtu	40 CFR 98 Subpart C	7,000	325	8,760	6.19E-04	2.71E-03
Total CO_2e[5]							373.36	1,635.33

Notes:

[1] - AP-42, Chapter 3.3 references are from the October 1996 revision.

[2] - An average brake-specific fuel of 7,000 Btu/bhp-hr, provided by AP-42 Section 3.3, was applied to this engine.

[3] - Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.

[4] - Methane (CH_4) and Nitrous Oxide (NO_x) emissions solved for using equation 40 CFR 98 Subpart C emission factors.

[5] - CO_2 equivalency solved for using Global Warming Potentials (GWPs) found in 40 CFR 98 Table A-1. GWP CO_2=1, GWP CH_4=25, GWP N_2O=298.

Example Equations:

AP-42 Max. Hourly Emission Rate (lb/hr) = Emission Factor (lb/mmBtu) x Engine Rating (bhp) x Fuel Consumption (Btu/bhp-hr) x (mmBtu/1,000,000 Btu)

40 CFR 98 Max. Hourly Emission Rate (lb/hr) = Emission Factor (kg GHG/mmBtu) x Engine Rating (bhp) x Fuel Consumption (Btu/bhp-hr) x (mmBtu/1,000,000 Btu) x (1 lb/ 2.2 kg)

Table E-2
Baker Hughes, Inc.
Clarksburg Drilling Fluids
ICE-002 Emission Summary
February 2016

Pollutant	Emission Factor	Emission Factor Units	Emission Factor Basis / Source[1]	Fuel Consumption[2] (Btu/bhp-hr)	Engine Rating (bhp)	Annual Operating Hours	Max. Hourly Emissions (lb/hr)	Max. Annual Emissions[3] (tpy)
NOx	0.30	g/hp-hr	Tier 4 Emission Standards	7,000	325	8,760	0.21	0.94
CO	2.60	g/hp-hr	Tier 4 Emission Standards	7,000	325	8,760	1.86	8.16
VOC's	0.14	g/hp-hr	Tier 4 Emission Standards	7,000	325	8,760	0.10	0.44
PM	0.02	g/hp-hr	Tier 4 Emission Standards	7,000	325	8,760	0.01	0.05
SO_2	0.29	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	0.66	2.89
Benzene	9.33E-04	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	2.12E-03	0.01
Toluene	4.09E-04	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	9.30E-04	4.08E-03
Xylene	2.85E-04	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	6.48E-04	2.84E-03
Propylene	2.58E-03	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	0.01	0.03
1,3 - Butadiene	3.91E-05	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	8.90E-05	3.90E-04
Formaldehyde	1.18E-03	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	2.68E-03	0.01
Acetaldehyde	7.67E-04	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	1.74E-03	0.01
Acrolein	9.25E-05	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	2.10E-04	9.22E-04
CO_2	164	lb/mmBtu	AP-42 Chapter 3.3	7,000	325	8,760	373.10	1634.18
CH_4[4]	3.00E-03	kg CH_4/mmBtu	40 CFR 98 Subpart C	7,000	325	8,760	3.10E-03	0.01
N_2O[4]	6.00E-04	kg N_2O/mmBtu	40 CFR 98 Subpart C	7,000	325	8,760	6.19E-04	2.71E-03
Total CO_2e[5]							373.36	1,635.33

Notes:

[1] - AP-42, Chapter 3.3 references are from the October 1996 revision.

[2] - An average brake-specific fuel of 7,000 Btu/bhp-hr, provided by AP-42 Section 3.3, was applied to this engine.

[3] - Max. Annual Emissions based upon Max. Hourly Emissions @ 8760 hr/yr.

[4] - Methane (CH_4) and Nitrous Oxide (NO_x) emissions solved for using equation 40 CFR 98 Subpart C emission factors.

[5] - CO_2 equivalency solved for using Global Warming Potentials (GWPs) found in 40 CFR 98 Table A-1. GWP CO_2=1, GWP CH_4=25, GWP N_2O=298.

Example Equations:

AP-42 Max. Hourly Emission Rate (lb/hr) = Emission Factor (lb/mmBtu) x Engine Rating (bhp) x Fuel Consumption (Btu/bhp-hr) x (mmBtu/1,000,000 Btu)

40 CFR 98 Max. Hourly Emission Rate (lb/hr) = Emission Factor (kg GHG/mmBtu) x Engine Rating (bhp) x Fuel Consumption (Btu/bhp-hr) x (mmBtu/1,000,000 Btu) x (1 lb/ 2.2 kg)

Table E-3a
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Drop Loading Emissions Summary
February 2016

EPN	Unit Description	Emission Type	Hourly Emissions (lb/hr)	Annual Emissions (tpy)
MT-001	Mix Tank 1 Hopper	PM_{10}	0.03	3.12E-03
MT-001	Mix Tank 1 Hopper	$PM_{2.5}$	0.01	1.10E-03
MT-001	Mix Tank 1	PM_{10}	0.03	3.12E-03
MT-001	Mix Tank 1	$PM_{2.5}$	0.01	1.10E-03
MT-002	Mix Tank 2 Hopper	PM_{10}	0.03	3.12E-03
MT-002	Mix Tank 2 Hopper	$PM_{2.5}$	0.01	1.10E-03
MT-002	Mix Tank 2	PM_{10}	0.03	3.12E-03
MT-002	Mix Tank 2	$PM_{2.5}$	0.01	1.10E-03
		TOTAL PM_{10}	**0.11**	**0.01**
		TOTAL $PM_{2.5}$	**0.04**	**4.41E-03**

Table E-3b
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Drop Loading Emissions
February 2016

Oil-Based Mud						
Description	CARBO-GEL II	MIL-LIME	ECCO-BLOK	MIL-BAR 410 (Barite)		
Amount Loaded per Batch (lb/batch)	1,000	500	500	48,000		
No. Batch Additions Per Hour (batch/hr)	1	1	1	1		
Annual Throughput (lb/year)	160,000	98,750	34,300	8,438,000		
Hourly Usage (lb/hr):	1,000	500	500	48,000		
Annual Usage (tpy):	80	49	17	4,219		

Synthetic-Based Mud						
Description	CARBO-GEL II	MIL-LIME	ECCO-BLOK	MIL-BAR 410 (Barite)		
Amount Loaded per Batch (lb/batch)	2,000	1,000	1,000	96,000		
No. Batch Additions Per Hour (batch/hr)	1	1	1	1		
Annual Throughput (lb/year)	320,000	197,500	68,600	16,876,000		
Hourly Usage (lb/hr):	2,000	1,000	1,000	96,000		
Annual Usage (tpy):	160	99	34	8,438		

EPN	Unit Description	Material Loaded	Emission Type	Emission Factor[1] (lb/ton)	Hourly Emissions[1] (lb/hr)	Annual Emissions[1] (tpy)
MT-001	Mix Tank 1 Hopper	CARBO-GEL II	PM_{10}	1.10E-03	5.50E-04	5.72E-05
MT-001	Mix Tank 1 Hopper	CARBO-GEL II	$PM_{2.5}$	3.88E-04	1.94E-04	2.02E-05
MT-001	Mix Tank 1	CARBO-GEL II	PM_{10}	1.10E-03	5.50E-04	5.72E-05
MT-001	Mix Tank 1	CARBO-GEL II	$PM_{2.5}$	3.88E-04	1.94E-04	2.02E-05
MT-001	Mix Tank 1 Hopper	MIL-LIME	PM_{10}	1.10E-03	2.75E-04	3.53E-05
MT-001	Mix Tank 1 Hopper	MIL-LIME	$PM_{2.5}$	3.88E-04	9.71E-05	1.25E-05
MT-001	Mix Tank 1	MIL-LIME	PM_{10}	1.10E-03	2.75E-04	3.53E-05
MT-001	Mix Tank 1	MIL-LIME	$PM_{2.5}$	3.88E-04	9.71E-05	1.25E-05
MT-001	Mix Tank 1 Hopper	ECCO-BLOK	PM_{10}	1.10E-03	2.75E-04	1.23E-05
MT-001	Mix Tank 1 Hopper	ECCO-BLOK	$PM_{2.5}$	3.88E-04	9.71E-05	4.33E-06
MT-001	Mix Tank 1	ECCO-BLOK	PM_{10}	1.10E-03	2.75E-04	1.23E-05
MT-001	Mix Tank 1	ECCO-BLOK	$PM_{2.5}$	3.88E-04	9.71E-05	4.33E-06
MT-001	Mix Tank 1 Hopper	MIL-BAR 410 (Barite)	PM_{10}	1.10E-03	2.64E-02	3.02E-03
MT-001	Mix Tank 1 Hopper	MIL-BAR 410 (Barite)	$PM_{2.5}$	3.88E-04	9.32E-03	1.06E-03
MT-001	Mix Tank 1	MIL-BAR 410 (Barite)	PM_{10}	1.10E-03	2.64E-02	3.02E-03
MT-001	Mix Tank 1	MIL-BAR 410 (Barite)	$PM_{2.5}$	3.88E-04	9.32E-03	1.06E-03
MT-002	Mix Tank 2 Hopper	CARBO-GEL II	PM_{10}	1.10E-03	5.50E-04	5.72E-05
MT-002	Mix Tank 2 Hopper	CARBO-GEL II	$PM_{2.5}$	3.88E-04	1.94E-04	2.02E-05
MT-002	Mix Tank 2	CARBO-GEL II	PM_{10}	1.10E-03	5.50E-04	5.72E-05
MT-002	Mix Tank 2	CARBO-GEL II	$PM_{2.5}$	3.88E-04	1.94E-04	2.02E-05
MT-002	Mix Tank 2 Hopper	MIL-LIME	PM_{10}	1.10E-03	2.75E-04	3.53E-05
MT-002	Mix Tank 2 Hopper	MIL-LIME	$PM_{2.5}$	3.88E-04	9.71E-05	1.25E-05
MT-002	Mix Tank 2	MIL-LIME	PM_{10}	1.10E-03	2.75E-04	3.53E-05
MT-002	Mix Tank 2	MIL-LIME	$PM_{2.5}$	3.88E-04	9.71E-05	1.25E-05
MT-002	Mix Tank 2 Hopper	ECCO-BLOK	PM_{10}	1.10E-03	2.75E-04	1.23E-05
MT-002	Mix Tank 2 Hopper	ECCO-BLOK	$PM_{2.5}$	3.88E-04	9.71E-05	4.33E-06
MT-002	Mix Tank 2	ECCO-BLOK	PM_{10}	1.10E-03	2.75E-04	1.23E-05
MT-002	Mix Tank 2	ECCO-BLOK	$PM_{2.5}$	3.88E-04	9.71E-05	4.33E-06
MT-002	Mix Tank 2 Hopper	MIL-BAR 410 (Barite)	PM_{10}	1.10E-03	2.64E-02	3.02E-03
MT-002	Mix Tank 2 Hopper	MIL-BAR 410 (Barite)	$PM_{2.5}$	3.88E-04	9.32E-03	1.06E-03
MT-002	Mix Tank 2	MIL-BAR 410 (Barite)	PM_{10}	1.10E-03	2.64E-02	3.02E-03
MT-002	Mix Tank 2	MIL-BAR 410 (Barite)	$PM_{2.5}$	3.88E-04	9.32E-03	1.06E-03
			TOTAL PM_{10}:		**0.11**	**0.01**
			TOTAL $PM_{2.5}$:		**0.04**	**4.41E-03**

Notes:
[1] - The dry product transfer point emissions result from dumping solid materials into designated bins. The emissions are based on crushed stone processing calculation methodology described in AP-42, Table 11.19.2-2, for conveyer transfer points. The $PM_{2.5}$ emission factor was calculated from the PM_{10} emission factor using Table E.2.2 category 4 particle distribution information in AP-42 Appendix B-2.

Sample Calculations:

Hourly Usage (lb/hr) = Amount Loaded per Batch (lb/batch) x No. Batches per Hour (batch/hr)

Hourly Usage: $\frac{1{,}000\ \text{lb}}{\text{batch}} \times \frac{1\ \text{batch}}{\text{hr}} = \frac{1000\ \text{lb}}{\text{hr}}$

Annual Usage (tpy) = Annual Throughput (lb/year) / 2000 lb/ton)

Annual Usage: $\frac{160{,}000\ \text{lb}}{\text{year}} \times \frac{\text{ton}}{2000\ \text{lb}} = \frac{80\ \text{ton}}{\text{year}}$

Adjusted Annual Usage (tpy) = 130% x Annual Usage (tpy)

Adjusted Annual Usage: $130\% \times \frac{80\ \text{ton}}{\text{year}} = \frac{104\ \text{ton}}{\text{year}}$

Hourly Emissions (lb/hr) = Hourly Usage (lb/hr) / 2000 (lb/ton) x Emission Factor (lb/ton)

Hourly PM_{10} Emissions: $\frac{1{,}000\ \text{lb}}{\text{hr}} \times \frac{\text{ton}}{2000\ \text{lb}} \times \frac{1.10\text{E-}03\ \text{lb}}{\text{ton}} = \frac{5.50\text{E-}04\ \text{lb}}{\text{hr}}$

Annual Emissions (tpy) = Adjusted Annual Usage (tpy) x Emission Factor (lb/ton)

Annual PM_{10} Emissions: $\frac{104\ \text{ton}}{\text{year}} \times \frac{1.10\text{E-}03\ \text{lb}}{\text{ton}} \times \frac{\text{ton}}{2000\ \text{lb}} = \frac{5.72\text{E-}05\ \text{ton}}{\text{year}}$

Table E-4
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Liquid Loading Emissions
February 2016

EPN	Storage Vessel	Receiving Vessel	Product Name	Max Filling Rate[1] (gal/hr)	Annual Throughput[2] (gal/year)	Loading Type	Saturation Factor (S)	Vapor Pressure at Max Temperature (psia)	Vapor Pressure at Avg Temperature (psia)	Vapor Molecular Weight at Max Temperature (lb/lbmol)	Vapor Molecular Weight at Avg Temperature (lb/lbmol)	Max Temperature (°F)	Avg Temperature (°F)	LL_{HOURLY}[3] (lb/1000 gal)	LL_{ANNUAL}[3] (lb/1000 gal)	VOC Emissions[3] lb/hr	VOC Emissions[3] tpy
LR-1	Next Drill Tanks	Trucks	Next-Drill	12,600	2,285,052	Submerged - Dedicated Normal Service	0.6	0.02	0.01	129.98	129.99	100	70	0.04	0.02	0.48	0.02
	Oil Based Mud Tanks	Trucks	Oil Based Mud	12,600	1,512,000	Submerged - Dedicated Normal Service	0.6	0.02	0.01	130.00	130.00	100	70	0.03	0.02	0.44	0.01
	Next-Base Tanks	Trucks	Next-Base	12,600	8,907,028	Submerged - Dedicated Normal Service	0.6	0.02	0.01	130.00	130.00	100	70	0.03	0.02	0.44	0.08
	Next-Base Tanks	Mix Tank	Next-Base	5,460	8,907,028	Splash	1.45	0.02	0.01	130.00	130.00	100	70	0.08	0.04	0.46	0.20
	Next-Drill Tanks	Mix Tank	Next-Drill	840	2,285,052	Splash	1.45	0.02	0.01	129.98	129.99	100	70	0.09	0.04	0.08	0.05
	Oil Based Mud Tanks	Mix Tank	OIl Based Mud	840	1,512,000	Splash	1.45	0.02	0.01	129.98	130.00	100	70	0.08	0.04	0.07	0.03
	Diesel Storage Tank	Mix Tank	Diesel Fuel	5,460	378,000	Splash	1.45	0.02	0.01	129.98	130.00	100	70	0.08	0.04	0.46	0.01
	Drum	Mix Tank	Next Mul	165	1,445,400	Splash	1.45	0.02	0.01	129.98	129.99	100	70	0.09	0.04	0.02	0.03
	Drum	Mix Tank	Next Lift	55	481,800	Splash	1.45	0.02	0.01	129.98	62.91	100	70	0.09	0.02	0.01	4.60E-03
															TOTAL:	**2.44**	**0.43**

Notes:

[1] - Max Filling Rates for Next-Drill and Next-Base to Trucks (Receiving Vessel) are based on filling a 100 bbl truck every 20 minutes (300 bbl/hr).

[2] - The annual throughputs for the tank unloading was determined using the limiting process component. The Drilling Fluids facility uses a mix of mechanical processes and manual labor inputs in the process. The fluid throughputs reflect BH personnel estimation of maximum throughput based upon the maximum number of batches that can occur in one year, accounting for mixing hold time and required down time of the process.

[3] - The following equation used to calculate loading emissions is based on Equation 1 from U.S. EPA's AP-42 Section 5.2.2.1.1:

$$LL = \frac{12.46 * SPM}{T}$$

Where:

LL : loading loss, lb/1000 gallons of liquid loaded
S : saturation factor from Table 5.2-1
P : true vapor pressure of liquid loaded, psia
M : molecular weight of vapors, lb/lbmol
T : temperature of bulk liquid loaded, °R

Sample Calculations:

LL_{hourly}: $\frac{12.46 \mid 0.6 \mid 0.02 \text{ psia} \mid 129.98 \text{ lb/lb-mol}}{100 + 460 \text{ °R}} = \frac{0.04 \text{ lb}}{1000 \text{ gal}}$

Hourly VOC Emissions: $\frac{0.04 \text{ lb}}{1000 \text{ gal}} \mid \frac{12{,}600 \text{ gal}}{\text{hr}} = \frac{0.48 \text{ lb}}{\text{hr}}$

LL_{annual}: $\frac{12.46 \mid 0.6 \mid 0.01 \text{ psia} \mid 129.99 \text{ lb/lb-mol}}{70 + 460 \text{ °R}} = \frac{0.02 \text{ lb}}{1000 \text{ gal}}$

Annual VOC Emissions: $\frac{0.02 \text{ lb}}{1000 \text{ gal}} \mid \frac{2{,}285{,}052 \text{ gal}}{\text{hr}} \mid \frac{\text{ton}}{2000 \text{ lb}} = \frac{0.02 \text{ ton}}{\text{year}}$

Table E-5
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Liquid Blending Emissions
February 2016

Product[1]	Next-Drill	Next-Base	Diesel Fuel	Oil Based Mud	
Hourly Fill Rate (V_r)[2]**:**	840	5,460	840	5,460	gal/hr
Annual Throughput (V_r)[3]**:**	2,285,052	8,907,028	378,000	1,512,000	gal/yr
Product Avg. Temp. (T):	70.00	70.00	70.00	70.00	°F
Product Max. Temp. (T):	100.00	100.00	100.00	100.00	°F
Product Vapor Pressure of Liquid at Avg. Temp. (P):	0.01	0.01	0.01	0.01	psi
Product Vapor Pressure of Liquid at Max. Temp. (P):	0.02	0.02	0.02	0.02	psi
Vapor Molecular Weight at Avg. Temp. (MW)	129.99	130.00	130.00	130.00	lb/lbmol
Vapor Molecular Weight at Max. Temp. (MW)	129.98	130.00	130.00	130.00	lb/lbmol

EPN	**Unit Description**	**Material Blended**	**Hourly VOC Emissions**[4,5] **(lb/hr)**	**Annual VOC Emissions**[4,5,6] **(tpy)**	**Hourly HAP Emissions**[4,5] **(lb/hr)**	**Annual HAP Emissions**[4,5,6] **(tpy)**
MT-001	Mix Tank 1	Next-Drill	0.05	0.03	5.47E-04	2.39E-04
MT-001	Mix Tank 1	Next-Base	0.35	0.12	--	--
MT-002	Mix Tank 2	Oil Based Mud	0.05	0.01		
MT-002	Mix Tank 2	Diesel Fuel	0.32	0.04		
		TOTAL:	**0.40**	**0.15**	**5.47E-04**	**2.39E-04**

Notes:

$$E_R = \frac{(P) * (V_r) * (MW)}{(R) * (T)}$$

E_R: mass emission rate (lb/hr or ton/yr)
P: vapor pressure (psi)
V_r: volumetric gas displacement rate (gal/hr or gal/yr)
MW: molecular weight of the VOC (lb/lb-mol)
R: ideal gas law constant (10.73159 ft^3·psi/lb-mol·°R)
T: temperature of the vessel vapor space (°R)

Sample Calculations:

Hourly Emissions:

$$\frac{0.02\ psi}{} \left| \frac{840\ gal}{hr} \right| \frac{ft^3}{7.48\ gal} \left| \frac{129.98\ lb}{lb\text{-}mol} \right| \frac{lb\text{-}mol\cdot°R}{10.732\ ft3\cdot psi} \left| \frac{}{70 + 460\ °R} \right| = \frac{0.05\ lb}{hr}$$

Annual Emissions:

$$\frac{0.01\ psi}{} \left| \frac{2{,}285{,}052\ gal}{yr} \right| \frac{ft^3}{7.48\ gal} \left| \frac{129.99\ lb}{lb\text{-}mol} \right| \frac{lb\text{-}mol\cdot°R}{10.732\ ft3\cdot psi} \left| \frac{}{70 + 460\ °R} \right| \frac{ton}{2000\ lb} = \frac{0.03\ ton}{yr}$$

Table E-6
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Baghouse Filter Emissions
February 2016

Description	EPN	Maximum Flowrate (cfm)	Filter Area[1] (ft^2)	Uncontrolled Outlet Barite Loading[2] (lb/ton)	Total Amount of Barite Loaded to Trucks[3] (tons/year)	Controlled Outlet Grain Loading (grain/scf)	Uncontrolled $PM/PM_{10}/PM_{2.5}$ Emissions		Controlled $PM/PM_{10}/PM_{2.5}$ Emissions[4]	
							(lb/hr)	(tpy)	(lb/hr)	(tpy)
Filter Sock Barite Loading	LR-2	30	339.29	0.02	388,515	0.02	0.81	3.54	0.01	0.02

Notes:

[1] From manufacturer specifications.

[2] Uncontrolled Barite Loading was calculated using AP-42 Section 13.2.4 - Aggregate Handling. Equation 1 of this section was applied to solve for the lb/ton emission factor for the loading of barite. The particulate size of 4.8 μm was used to apply the particle size multiplier, k. An annual average wind speed of 7 mph was applied and was based upon data gathered from weatherspark.com. The conservative estimation of material moisture content of 0.25% was applied based upon the ranges of source conditions for equation 1.

$$E = k(0.0032)\frac{\left(\frac{U}{5}\right)\text{^}1.3}{\left(\frac{M}{2}\right)\text{^}1.4}\ [\text{lb/ton}]$$

[3] The total amount of barite loaded to trucks is based upon site specific information that it takes 20 minutes to fill a 100 bbl truck. Based upon the known relative density of the barite, 4,100 kg/m3, the total annual amount of barite was solved for by applying the loading of three trucks per hour.

$$\frac{4{,}100\ \text{kg}}{\text{m}^3}\ \frac{1\ \text{lb}}{2.2\ \text{kg}}\ \frac{1\ \text{m}^3}{264.17\ \text{gal}}\ \frac{\text{ton}}{2000\ \text{lb}}\ \frac{4{,}200\ \text{gal}}{1\ \text{truck}}\ \frac{3\ \text{trucks}}{\text{hour}}\ \frac{8760\ \text{hours}}{\text{yr}} = \frac{388515.17\ \text{tons Barite}}{\text{year}}$$

[4] Controlled PM emissions are based on the maximum flowrate and outlet grain loading. It is assumed that the facility is operational for 8,760 hours per year. Outlet grain loading for uncontrolled emissions is based upon particle size for barium sulfate, precipitated powder = 4.8μm

Maximum flowrate * Outlet Grain Loading = Hourly PM Emissions
Hourly PM Emissions * Annual Operating Hours = Annual PM Emissions
See sample calculations below:

$$\frac{30\ \text{ft3}}{\text{min}}\ \frac{0.02\ \text{grain}}{\text{ft}^3}\ \frac{1\ \text{lb}}{7{,}000\ \text{grain}}\ \frac{60\ \text{min}}{\text{hr}} = \frac{0.01\ \text{lb PM}}{\text{hr}}$$

$$\frac{0.01\ \text{lb PM}}{\text{hr}}\ \frac{8{,}760\ \text{hr}}{\text{yr}}\ \frac{1\ \text{ton}}{2{,}000\ \text{lb}} = \frac{0.02\ \text{ton PM}}{\text{yr}}$$

Table E-7
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Storage Tank Emissions
February 2016

EPN	Unit Description	Product	Shell Length (ft)	Shell Width (ft)	Tank Capacity (gal)	Maximum Filling Rate[1] (gal/hr)	Annual Throughput[2] (gal/yr)	Turnovers	Annual VOC Working Losses[3] (lb/yr)	Annual VOC Breathing Losses[3] (lb/yr)	Annual HAP Working Losses[3] (lb/yr)	Annual HAP Breathing Losses[3] (lb/yr)	Hourly VOC Emissions (lb/hr)	Annual VOC Emissions (tpy)	Hourly HAP Emissions (lb/hr)	Annual HAP Emissions (tpy)
ND-001	Next-Drill Tank	Next-Drill	42	9.33	21,000	12,600	2,285,052	109	6.26	2.60	0.06	0.03	1.01E-03	4.43E-03	1.03E-05	4.50E-05
ND-002	Next-Drill Tank	Next-Drill	42	9.33	21,000	12,600	2,285,052	109	6.26	2.60	0.06	0.03	1.01E-03	4.43E-03	1.03E-05	4.50E-05
ND-003	Next-Drill Tank	Next-Drill	42	9.33	21,000	12,600	2,285,052	109	6.26	2.60	0.06	0.03	1.01E-03	4.43E-03	1.03E-05	4.50E-05
ND-004	Next-Drill Tank	Next-Drill	42	9.33	21,000	12,600	2,285,052	109	6.26	2.60	0.06	0.03	1.01E-03	4.43E-03	1.03E-05	4.50E-05
ND-005	Next-Drill Tank	Next-Drill	42	9.33	21,000	12,600	2,285,052	109	6.26	2.60	0.06	0.03	1.01E-03	4.43E-03	1.03E-05	4.50E-05
ND-006	Next-Drill Tank	Next-Drill	42	9.33	21,000	12,600	2,285,052	109	6.26	2.60	0.06	0.03	1.01E-03	4.43E-03	1.03E-05	4.50E-05
ND-007	Next-Drill Tank	Next-Drill	42	9.33	21,000	12,600	2,285,052	109	6.26	2.60	0.06	0.03	1.01E-03	4.43E-03	1.03E-05	4.50E-05
ND-008	Next-Drill Tank	Next-Drill	42	9.33	21,000	12,600	2,285,052	109	6.26	2.60	0.06	0.03	1.01E-03	4.43E-03	1.03E-05	4.50E-05
OBM-1	Oil Based Mud Tank	OBM	42	9.33	21,000	12,600	1,512,000	72	21.98	10.50	--	--	3.71E-03	1.62E-02	0.00	0.00
OBM-2	Oil Based Mud Tank	OBM	42	9.33	21,000	12,600	1,512,000	72	21.98	10.50	--	--	3.71E-03	1.62E-02	0.00	0.00
OBM-3	Oil Based Mud Tank	OBM	42	9.33	21,000	12,600	1,512,000	72	21.98	10.50	--	--	3.71E-03	1.62E-02	0.00	0.00
DT-1	Diesel Storage Tank	Diesel Fuel	42	9.33	21,000	12,600	1,512,000	72	21.98	10.50	--	--	3.71E-03	1.62E-02	0.00	0.00
FW-001	Fresh Water Tank	Fresh Water	42	9.33	21,000	12,600	1,712,550	82	--	--	--	--	--	--	--	--
BW-001	Brine Water Tank	Brine Water	42	9.33	10,500	10,500	1,712,550	163	--	--	--	--	--	--	--	--
ND-019	Next-Drill Tank	Next-Drill	42	10.75	26,460	12,600	2,285,052	86	7.27	1.56	0.07	0.02	1.01E-03	4.42E-03	1.03E-05	4.50E-05
ND-020	Next-Drill Tank	Next-Drill	42	10.75	26,460	12,600	2,285,052	86	7.27	1.56	0.07	0.02	1.01E-03	4.42E-03	1.03E-05	4.50E-05
ND-021	Next-Drill Tank	Next-Drill	42	10.75	26,460	12,600	2,285,052	86	7.27	1.56	0.07	0.02	1.01E-03	4.42E-03	1.03E-05	4.50E-05
ND-022	Next-Drill Tank	Next-Drill	42	10.75	26,460	12,600	2,285,052	86	7.27	1.56	0.07	0.02	1.01E-03	4.42E-03	1.03E-05	4.50E-05
NB-001	Next-Base Tank	Next-Base	42	9.33	21,000	5,460	8,907,028	424	53.01	10.56	--	--	0.01	3.18E-02	--	--
NB-002	Next-Base Tank	Next-Base	42	9.33	21,000	5,460	8,907,028	424	53.01	10.56	--	--	0.01	3.18E-02	--	--
NB-003	Next-Base Tank	Next-Base	42	9.33	21,000	5,460	8,907,028	424	53.01	10.56	--	--	0.01	3.18E-02	--	--
NB-004	Next-Base Tank	Next-Base	42	9.33	21,000	5,460	8,907,028	424	53.01	10.56	--	--	0.01	3.18E-02	--	--
												TOTAL	**0.06**	**0.25**	**1.23E-04**	**5.40E-04**

Notes:
[1] Maximum Fill Rate of 12,600 gal/hr was provided by Baker Hughes personnel.
[2] The annual throughputs for the tanks was determined using the limiting process component. The Drilling Fluids facility uses a mix of mechanical processes and manual labor inputs in the process. The fluid throughputs reflect BH personnel estimation of maximum throughput based upon the maximum number of batches that can occur in one year, accounting for mixing hold time and required down time of the process.
[3] Annual emissions were calculated using EPA TANKS 4.0.9d program.

Table E-8
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Fugitive Emissions
February 2016

EPN	Component Type	Number of Components	Emission Factors[1] (lb/hr/Comp.)	Control Efficiency %	Total Emissions		Wt % VOC	VOC Emissions	
					(lb/hr)	(tpy)		(lb/hr)	(tpy)
FUG	Valves - Light Liquid Service	21	0.0035	0	0.07	0.32	100	0.07	0.32
FUG	Pumps - Light Liquid Service	3	0.0386	0	0.12	0.51	100	0.12	0.51
FUG	Flanges - Light Liquid Service	57	0.0005	0	0.03	0.12	100	0.03	0.12
FUG	Pressure Relief Valves	3	0.2293	0	0.69	3.01	100	0.69	3.01
FUG	Open Ended Lines	20	0.004	0	0.08	0.35	100	0.08	0.35
FUG	Sampling Connections	3	0.033	0	0.10	0.43	100	0.10	0.43
							Total Fugitive Emissions:	**1.08**	**4.75**

Notes:
[1] Emission Factors used are SOCMI without ethylene, per October 2000 Texas Commission on Environmental Quality "Equipment Leak Fugitives" Guidance Document.

Table E-9
Baker Hughes, Inc.
Clarksburg Drilling Fluids
Haul Road Fugitive Emissions
February 2016

Constant	Industrial Unpaved Roads		
	PM	PM-10	PM-2.5
k (lb/VMT)	4.9	1.5	0.15
a	0.7	0.9	0.9
b	0.45	0.45	0.45

where

k — Particle size multiplier[1]
s — 4.8 Silt content of road surface material (%)
p — 150 Number of days per year with precipitation

Constant	Industrial Paved Roads		
	PM	PM-10	PM-2.5
k =	0.011	0.0022	0.001
sL =	0.6		
P =	150		
N =	365		

where

sL — road surface silt loading (g/ft^2)
N — number of days in averaging period

Item Number	Description	Number of Wheels	W Mean Vehicle Weight (tons)	Mean Vehicle Speed (mph)	Miles per Trip	Maximum Trips per Hour	Maximum Trips per Year	Control Device ID Number	Control Efficiency (%)	PM Emissions (lbs/hr)	PM Emissions (tons/yr)	PM-10 Emissions (lbs/hr)	PM-10 Emissions (tons/yr)	PM-2.5 Emissions (lbs/hr)	PM-2.5 Emissions (tons/yr)
1	Product Loading - Unpaved Portion	14	30	10	0.10	1	3,025	NA	NA	0.43	0.65	0.11	0.17	0.01	0.02
2	Product Loading - Paved Portion	14	30	10	0.28	1	3,025	NA	NA	0.06	0.27	0.01	0.05	0.00	0.01
									Totals:	**0.49**	**0.91**	**0.12**	**0.22**	**0.01**	**0.03**

Notes:

[1] - Particle Size Multiplier used from AP-42 13.2.2 - Final Version 11/2006

[2] - Silt Content of Road Surface uses Sand and Gravel Processing Plant Road from AP-42 13.2.2 - Final Version 11/2006

[3] - Number of days per year with precipitation >0.01 in3 found using AP-42 13.2.2 Figure 13.2.2-1 - Final Version 11/2006

4 - The silt loading factor of 0.6 g/m2 was selected based upon the availability of data. The paved access road into the Baker Hughes facility is directly off Phillipi Pike, a state road. The factors presented in AP-42 for industrial paved haul roads are biased high based upon the type of operations available. The small access road to the Baker Hughes Drilling Fluids is a small road most comparable to a public paved road, based upon the subset of data available in AP-42.

Example Calculations:

Emissions (lb/Vehicle Mile Traveled) - $E = k \times (s/12)^a \times (W/3)^b$ — Equation 1a from AP-42 13.2.2 - Final Version 11/2006

Size Specific Emissions (lb/VMT) - $E_{ext} = E[(365-p)/365]$ — Equation 2 from AP-42 13.2.2 - Final Version 11/2006

Emission Estimate For Paved Haulroads

Emissions (lb/Vehicle Mile Traveled) - $E = [k(sL)^{0.91} \times (W)^{1.02}](1-1.2P/N)$

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	OBM 1 - OBM 3, Diesel Storage 1
City:	Charleston
State:	West Virginia
Company:	
Type of Tank:	Horizontal Tank
Description:	TANKS runs for OBM 1 - OBM 3

Tank Dimensions

Shell Length (ft):	42.00
Diameter (ft):	9.33
Volume (gallons):	21,000.00
Turnovers:	5,256.00
Net Throughput(gal/yr):	110,376,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

OBM 1 - OBM 3, Diesel Storage 1 - Horizontal Tank
Charleston, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	66.21	54.54	77.87	59.32	0.0081	0.0054	0.0114	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

OBM 1 - OBM 3, Diesel Storage 1 - Horizontal Tank
Charleston, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	10.4978
Vapor Space Volume (cu ft):	1,828.9541
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0849
Vented Vapor Saturation Factor:	0.9980
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,828.9541
Tank Diameter (ft):	9.3300
Effective Diameter (ft):	22.3424
Vapor Space Outage (ft):	4.6650
Tank Shell Length (ft):	42.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Daily Avg. Liquid Surface Temp. (deg. R):	525.8765
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9933
Tank Paint Solar Absorptance (Shell):	0.8900
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0849
Daily Vapor Temperature Range (deg. R):	46.6683
Daily Vapor Pressure Range (psia):	0.0060
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0054
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0114
Daily Avg. Liquid Surface Temp. (deg R):	525.8765
Daily Min. Liquid Surface Temp. (deg R):	514.2094
Daily Max. Liquid Surface Temp. (deg R):	537.5436
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9980
Vapor Pressure at Daily Average Liquid:	
Surface Temperature (psia):	0.0081
Vapor Space Outage (ft):	4.6650
Working Losses (lb):	474.1603
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Annual Net Throughput (gal/yr.):	110,376,000.0000
Annual Turnovers:	5,256.0000
Turnover Factor:	0.1724
Tank Diameter (ft):	9.3300
Working Loss Product Factor:	1.0000
Total Losses (lb):	484.6581

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

OBM 1 - OBM 3, Diesel Storage 1 - Horizontal Tank
Charleston, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	474.16	10.50	484.66

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	630 bbl Next Drill Tanks
City:	
State:	
Company:	
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	42.00
Diameter (ft):	10.75
Volume (gallons):	26,460.00
Turnovers:	0.00
Net Throughput(gal/yr):	110,376,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

630 bbl Next Drill Tanks - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Next Drill	All	56.67	51.31	62.04	55.00	0.0020	0.0014	0.0035	130.0000			67.16	
Distillate fuel oil no. 2						0.0058	0.0048	0.0070	130.0000	0.9477	0.8000	188.00	Option 1: VP50 = .0045 VP60 = .0065
Naphthalene						0.0021	0.0017	0.0027	128.2000	0.0224	0.0100	128.20	Option 2: A=7.3729, B=1968.36, C=222.61
Unidentified Components						0.0005	-0.0018	0.0001	130.0961	0.0300	0.1900	20.09	

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

630 bbl Next Drill Tanks - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	1.5583
Vapor Space Volume (cu ft):	2,428.0434
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0375
Vented Vapor Saturation Factor:	0.9994
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	2,428.0434
Tank Diameter (ft):	10.7500
Effective Diameter (ft):	23.9825
Vapor Space Outage (ft):	5.3750
Tank Shell Length (ft):	42.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Daily Avg. Liquid Surface Temp. (deg. R):	516.3441
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	514.6733
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0375
Daily Vapor Temperature Range (deg. R):	21.4567
Daily Vapor Pressure Range (psia):	0.0021
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0014
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0035
Daily Avg. Liquid Surface Temp. (deg R):	516.3441
Daily Min. Liquid Surface Temp. (deg R):	510.9799
Daily Max. Liquid Surface Temp. (deg R):	521.7082
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9994
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0020
Vapor Space Outage (ft):	5.3750
Working Losses (lb):	683.2800
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Annual Net Throughput (gal/yr.):	110,376,000.0000
Annual Turnovers:	0.0000
Turnover Factor:	1.0000
Tank Diameter (ft):	10.7500
Working Loss Product Factor:	1.0000
Total Losses (lb):	684.8383

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

630 bbl Next Drill Tanks - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Next Drill	683.28	1.56	684.84
Naphthalene	6.83	0.02	6.85
Distillate fuel oil no. 2	546.62	1.25	547.87
Unidentified Components	129.82	0.30	130.12

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	ND-001
City:	
State:	
Company:	
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	42.00
Diameter (ft):	9.33
Volume (gallons):	21,000.00
Turnovers:	5,256.00
Net Throughput(gal/yr):	110,376,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

ND-001 - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Next Drill	All	66.21	54.54	77.87	59.32	0.0020	0.0014	0.0035	130.0000			67.16	
Distillate fuel oil no. 2						0.0081	0.0054	0.0114	130.0000	0.6867	0.8000	188.00	Option 1: VP60 = .0065 VP70 = .009
Naphthalene						0.0033	0.0019	0.0053	128.2000	0.0147	0.0100	128.20	Option 2: A=7.3729, B=1968.36, C=222.61
Unidentified Components						0.0005	-0.0004	-0.0004	130.0961	0.2986	0.1900	36.48	

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

ND-001 - Horizontal Tank

Annual Emission Calcaulations

Standing Losses (lb):	2.6033
Vapor Space Volume (cu ft):	1,828.9541
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0847
Vented Vapor Saturation Factor:	0.9995
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,828.9541
Tank Diameter (ft):	9.3300
Effective Diameter (ft):	22.3424
Vapor Space Outage (ft):	4.6650
Tank Shell Length (ft):	42.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Daily Avg. Liquid Surface Temp. (deg. R):	525.8765
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9933
Tank Paint Solar Absorptance (Shell):	0.8900
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0847
Daily Vapor Temperature Range (deg. R):	46.6683
Daily Vapor Pressure Range (psia):	0.0021
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0014
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0035
Daily Avg. Liquid Surface Temp. (deg R):	525.8765
Daily Min. Liquid Surface Temp. (deg R):	514.2094
Daily Max. Liquid Surface Temp. (deg R):	537.5436
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9995
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0020
Vapor Space Outage (ft):	4.6650
Working Losses (lb):	117.7800
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Annual Net Throughput (gal/yr.):	110,376,000.0000
Annual Turnovers:	5,256.0000
Turnover Factor:	0.1724
Tank Diameter (ft):	9.3300
Working Loss Product Factor:	1.0000
Total Losses (lb):	120.3833

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

ND-001 - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Next Drill	117.78	2.60	120.38
Distillate fuel oil no. 2	94.22	2.08	96.31
Naphthalene	1.18	0.03	1.20
Unidentified Components	22.38	0.49	22.87

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Next Base 500 bbl
City:	
State:	
Company:	
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	42.00
Diameter (ft):	9.33
Volume (gallons):	21,000.00
Turnovers:	2,277.60
Net Throughput(gal/yr):	47,829,600.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Next Base 500 bbl - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Next Drill	All	66.21	54.54	77.87	59.32	0.0081	0.0054	0.0114	130.0000			188.00	
Distillate fuel oil no. 2						0.0081	0.0054	0.0114	130.0000	1.0000	0.9940	188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Next Base 500 bbl - Horizontal Tank

Annual Emission Calcaulations

Standing Losses (lb):	10.5611
Vapor Space Volume (cu ft):	1,828.9541
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0850
Vented Vapor Saturation Factor:	0.9980
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,828.9541
Tank Diameter (ft):	9.3300
Effective Diameter (ft):	22.3424
Vapor Space Outage (ft):	4.6650
Tank Shell Length (ft):	42.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Daily Avg. Liquid Surface Temp. (deg. R):	525.8765
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9933
Tank Paint Solar Absorptance (Shell):	0.8900
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0850
Daily Vapor Temperature Range (deg. R):	46.6683
Daily Vapor Pressure Range (psia):	0.0060
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0054
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0114
Daily Avg. Liquid Surface Temp. (deg R):	525.8765
Daily Min. Liquid Surface Temp. (deg R):	514.2094
Daily Max. Liquid Surface Temp. (deg R):	537.5436
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9980
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0081
Vapor Space Outage (ft):	4.6650
Working Losses (lb):	215.6544
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Annual Net Throughput (gal/yr.):	47,829,600.0000
Annual Turnovers:	2,277.6000
Turnover Factor:	0.1798
Tank Diameter (ft):	9.3300
Working Loss Product Factor:	1.0000
Total Losses (lb):	226.2155

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Next Base 500 bbl - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Next Drill	215.65	10.56	226.22
Distillate fuel oil no. 2	214.37	10.50	224.86

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	Next Base 500 bbl
City:	
State:	
Company:	
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	42.00
Diameter (ft):	9.33
Volume (gallons):	21,000.00
Turnovers:	424.14
Net Throughput(gal/yr):	8,907,028.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

Next Base 500 bbl - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Next Drill	All	66.21	54.54	77.87	59.32	0.0081	0.0054	0.0114	130.0000			188.00	
Distillate fuel oil no. 2						0.0081	0.0054	0.0114	130.0000	1.0000	0.9940	188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

Next Base 500 bbl - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	10.5611
Vapor Space Volume (cu ft):	1,828.9541
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0850
Vented Vapor Saturation Factor:	0.9980
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,828.9541
Tank Diameter (ft):	9.3300
Effective Diameter (ft):	22.3424
Vapor Space Outage (ft):	4.6650
Tank Shell Length (ft):	42.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Daily Avg. Liquid Surface Temp. (deg. R):	525.8765
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9933
Tank Paint Solar Absorptance (Shell):	0.8900
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0850
Daily Vapor Temperature Range (deg. R):	46.6683
Daily Vapor Pressure Range (psia):	0.0060
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0054
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0114
Daily Avg. Liquid Surface Temp. (deg R):	525.8765
Daily Min. Liquid Surface Temp. (deg R):	514.2094
Daily Max. Liquid Surface Temp. (deg R):	537.5436
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9980
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0081
Vapor Space Outage (ft):	4.6650
Working Losses (lb):	53.0137
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Annual Net Throughput (gal/yr.):	8,907,028.0000
Annual Turnovers:	424.1442
Turnover Factor:	0.2374
Tank Diameter (ft):	9.3300
Working Loss Product Factor:	1.0000
Total Losses (lb):	63.5748

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

Next Base 500 bbl - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Next Drill	53.01	10.56	63.57
Distillate fuel oil no. 2	52.70	10.50	63.20

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	ND-001
City:	
State:	
Company:	
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	42.00
Diameter (ft):	9.33
Volume (gallons):	21,000.00
Turnovers:	108.81
Net Throughput(gal/yr):	2,285,052.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

ND-001 - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Next Drill	All	66.21	54.54	77.87	59.32	0.0020	0.0014	0.0035	130.0000			67.16	
Distillate fuel oil no. 2						0.0081	0.0054	0.0114	130.0000	0.6867	0.8000	188.00	Option 1: VP60 = .0065 VP70 = .009
Naphthalene						0.0033	0.0019	0.0053	128.2000	0.0147	0.0100	128.20	Option 2: A=7.3729, B=1968.36, C=222.61
Unidentified Components						0.0005	-0.0004	-0.0004	130.0961	0.2986	0.1900	36.48	

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

ND-001 - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	2.6033
Vapor Space Volume (cu ft):	1,828.9541
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0847
Vented Vapor Saturation Factor:	0.9995
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,828.9541
Tank Diameter (ft):	9.3300
Effective Diameter (ft):	22.3424
Vapor Space Outage (ft):	4.6650
Tank Shell Length (ft):	42.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Daily Avg. Liquid Surface Temp. (deg. R):	525.8765
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9933
Tank Paint Solar Absorptance (Shell):	0.8900
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0847
Daily Vapor Temperature Range (deg. R):	46.6683
Daily Vapor Pressure Range (psia):	0.0021
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0014
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0035
Daily Avg. Liquid Surface Temp. (deg R):	525.8765
Daily Min. Liquid Surface Temp. (deg R):	514.2094
Daily Max. Liquid Surface Temp. (deg R):	537.5436
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9995
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0020
Vapor Space Outage (ft):	4.6650
Working Losses (lb):	6.2576
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Annual Net Throughput (gal/yr.):	2,285,052.0000
Annual Turnovers:	108.8120
Turnover Factor:	0.4424
Tank Diameter (ft):	9.3300
Working Loss Product Factor:	1.0000
Total Losses (lb):	8.8608

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

ND-001 - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Next Drill	6.26	2.60	8.86
Distillate fuel oil no. 2	5.01	2.08	7.09
Naphthalene	0.06	0.03	0.09
Unidentified Components	1.19	0.49	1.68

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	630 bbl Next Drill Tanks
City:	
State:	
Company:	
Type of Tank:	Horizontal Tank
Description:	

Tank Dimensions

Shell Length (ft):	42.00
Diameter (ft):	10.75
Volume (gallons):	26,460.00
Turnovers:	86.36
Net Throughput(gal/yr):	2,285,052.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	White/White
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

630 bbl Next Drill Tanks - Horizontal Tank

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Next Drill	All	56.67	51.31	62.04	55.00	0.0020	0.0014	0.0035	130.0000			67.16	
Distillate fuel oil no. 2						0.0058	0.0048	0.0070	130.0000	0.9477	0.8000	188.00	Option 1: VP50 = .0045 VP60 = .0065
Naphthalene						0.0021	0.0017	0.0027	128.2000	0.0224	0.0100	128.20	Option 2: A=7.3729, B=1968.36, C=222.61
Unidentified Components						0.0005	-0.0018	0.0001	130.0961	0.0300	0.1900	20.09	

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

630 bbl Next Drill Tanks - Horizontal Tank

Annual Emission Calcaulations	
Standing Losses (lb):	1.5583
Vapor Space Volume (cu ft):	2,428.0434
Vapor Density (lb/cu ft):	0.0000
Vapor Space Expansion Factor:	0.0375
Vented Vapor Saturation Factor:	0.9994
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	2,428.0434
Tank Diameter (ft):	10.7500
Effective Diameter (ft):	23.9825
Vapor Space Outage (ft):	5.3750
Tank Shell Length (ft):	42.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0000
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Daily Avg. Liquid Surface Temp. (deg. R):	516.3441
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	514.6733
Tank Paint Solar Absorptance (Shell):	0.1700
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0375
Daily Vapor Temperature Range (deg. R):	21.4567
Daily Vapor Pressure Range (psia):	0.0021
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0014
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0035
Daily Avg. Liquid Surface Temp. (deg R):	516.3441
Daily Min. Liquid Surface Temp. (deg R):	510.9799
Daily Max. Liquid Surface Temp. (deg R):	521.7082
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9994
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0020
Vapor Space Outage (ft):	5.3750
Working Losses (lb):	7.2716
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0020
Annual Net Throughput (gal/yr.):	2,285,052.0000
Annual Turnovers:	86.3587
Turnover Factor:	0.5141
Tank Diameter (ft):	10.7500
Working Loss Product Factor:	1.0000
Total Losses (lb):	8.8298

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

630 bbl Next Drill Tanks - Horizontal Tank

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Next Drill	7.27	1.56	8.83
Naphthalene	0.07	0.02	0.09
Distillate fuel oil no. 2	5.82	1.25	7.06
Unidentified Components	1.38	0.30	1.68

TANKS 4.0.9d
Emissions Report - Detail Format
Tank Indentification and Physical Characteristics

Identification

User Identification:	OBM 1 - OBM 3, Diesel Storage 11
City:	Charleston
State:	West Virginia
Company:	
Type of Tank:	Horizontal Tank
Description:	TANKS runs for OBM 1 - OBM 3, Diesel Storage 1

Tank Dimensions

Shell Length (ft):	42.00
Diameter (ft):	9.33
Volume (gallons):	21,000.00
Turnovers:	72.00
Net Throughput(gal/yr):	1,512,000.00
Is Tank Heated (y/n):	N
Is Tank Underground (y/n):	N

Paint Characteristics

Shell Color/Shade:	Red/Primer
Shell Condition	Good

Breather Vent Settings

Vacuum Settings (psig):	-0.03
Pressure Settings (psig)	0.03

Meterological Data used in Emissions Calculations: Charleston, West Virginia (Avg Atmospheric Pressure = 14.25 psia)

TANKS 4.0.9d
Emissions Report - Detail Format
Liquid Contents of Storage Tank

OBM 1 - OBM 3, Diesel Storage 11 - Horizontal Tank
Charleston, West Virginia

Mixture/Component	Month	Daily Liquid Surf. Temperature (deg F) Avg.	Min.	Max.	Liquid Bulk Temp (deg F)	Vapor Pressure (psia) Avg.	Min.	Max.	Vapor Mol. Weight.	Liquid Mass Fract.	Vapor Mass Fract.	Mol. Weight	Basis for Vapor Pressure Calculations
Distillate fuel oil no. 2	All	66.21	54.54	77.87	59.32	0.0081	0.0054	0.0114	130.0000			188.00	Option 1: VP60 = .0065 VP70 = .009

TANKS 4.0.9d
Emissions Report - Detail Format
Detail Calculations (AP-42)

OBM 1 - OBM 3, Diesel Storage 11 - Horizontal Tank
Charleston, West Virginia

Annual Emission Calcaulations	
Standing Losses (lb):	10.4978
Vapor Space Volume (cu ft):	1,828.9541
Vapor Density (lb/cu ft):	0.0002
Vapor Space Expansion Factor:	0.0849
Vented Vapor Saturation Factor:	0.9980
Tank Vapor Space Volume:	
Vapor Space Volume (cu ft):	1,828.9541
Tank Diameter (ft):	9.3300
Effective Diameter (ft):	22.3424
Vapor Space Outage (ft):	4.6650
Tank Shell Length (ft):	42.0000
Vapor Density	
Vapor Density (lb/cu ft):	0.0002
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Daily Avg. Liquid Surface Temp. (deg. R):	525.8765
Daily Average Ambient Temp. (deg. F):	54.9833
Ideal Gas Constant R (psia cuft / (lb-mol-deg R)):	10.731
Liquid Bulk Temperature (deg. R):	518.9933
Tank Paint Solar Absorptance (Shell):	0.8900
Daily Total Solar Insulation Factor (Btu/sqft day):	1,250.5726
Vapor Space Expansion Factor	
Vapor Space Expansion Factor:	0.0849
Daily Vapor Temperature Range (deg. R):	46.6683
Daily Vapor Pressure Range (psia):	0.0060
Breather Vent Press. Setting Range(psia):	0.0600
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Vapor Pressure at Daily Minimum Liquid Surface Temperature (psia):	0.0054
Vapor Pressure at Daily Maximum Liquid Surface Temperature (psia):	0.0114
Daily Avg. Liquid Surface Temp. (deg R):	525.8765
Daily Min. Liquid Surface Temp. (deg R):	514.2094
Daily Max. Liquid Surface Temp. (deg R):	537.5436
Daily Ambient Temp. Range (deg. R):	21.5333
Vented Vapor Saturation Factor	
Vented Vapor Saturation Factor:	0.9980
Vapor Pressure at Daily Average Liquid: Surface Temperature (psia):	0.0081
Vapor Space Outage (ft):	4.6650
Working Losses (lb):	21.9809
Vapor Molecular Weight (lb/lb-mole):	130.0000
Vapor Pressure at Daily Average Liquid Surface Temperature (psia):	0.0081
Annual Net Throughput (gal/yr.):	1,512,000.0000
Annual Turnovers:	72.0000
Turnover Factor:	0.5833
Tank Diameter (ft):	9.3300
Working Loss Product Factor:	1.0000
Total Losses (lb):	32.4787

TANKS 4.0.9d
Emissions Report - Detail Format
Individual Tank Emission Totals

Emissions Report for: Annual

OBM 1 - OBM 3, Diesel Storage 11 - Horizontal Tank
Charleston, West Virginia

	Losses(lbs)		
Components	Working Loss	Breathing Loss	Total Emissions
Distillate fuel oil no. 2	21.98	10.50	32.48

west virginia department of environmental protection

Division of Air Quality
601 57th Street SE
Charleston, WV 25304
Phone 304/926-0475 • FAX: 304/926-0479

Earl Ray Tomblin, Governor
Randy C. Huffman, Cabinet Secretary
www.dep.wv.gov

December 9, 2015

James Kleinsorge
Baker Hughes Oilfield Operations, Inc.
2226 Philippi Pike
Clarksburg, WV 26301

Re: Permit Applicability Determination
Baker Hughes Oilfield Operations, Inc.
Clarksburg Drilling Fluids
Determination No. PD15-095
Plant ID No. 033-00260

Dear Mr. Kleinsorge,

Your Permit Determination Form (PDF) was received by this Division on November 10, 2015, and assigned to the writer for review. Upon initial review of said PDF, it was determined that the PDF as submitted was incomplete. An attempt was made to obtain the incomplete information, but no response was received from Baker Hughes. Therefore, no decision can be made based on the following items:

1. Haul road emission calculations were not submitted.
2. Engine manufacturer specification sheets with emission factors were not submitted.
3. The loading rack and tank throughputs do not match.

Please resubmit another PDF when you have collected all pertinent information before the anticipated installation date. Should you have any questions, please contact the undersigned engineer at (304) 926-0499 ext. 1223.

Sincerely,

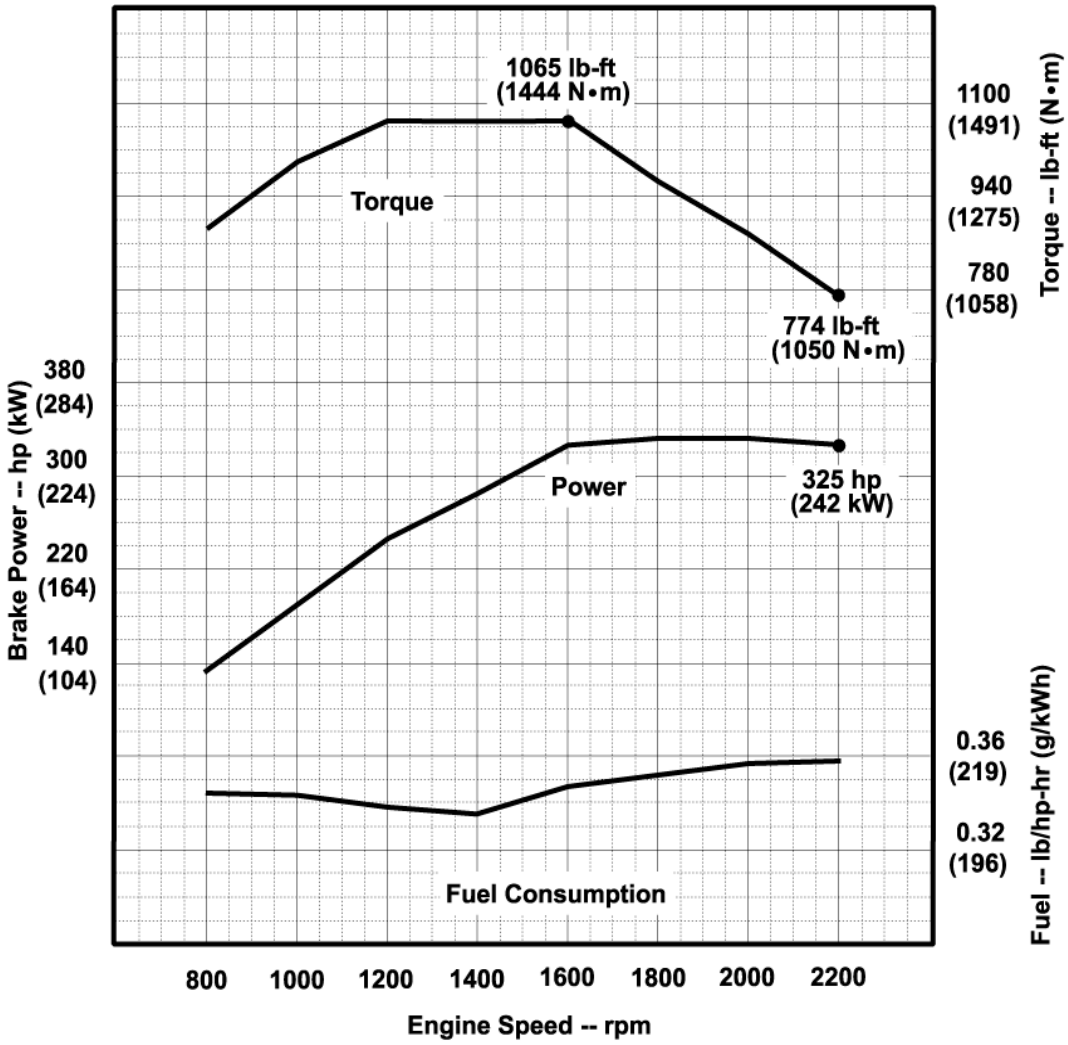
Jerry Williams, P.E.
Engineer

c: Joshua Morrissette

ENGINE PERFORMANCE CURVE

Rating: Gross Power
Application: Continuous
Power Bulge - 2%
Torque Rise - 38%

PowerTech™ PSX 9.0L Engine
Model: 6090HFC95
JD Electronic Control
325 hp @ 2200 rpm
241 kW @ 2200 rpm
[See Option Code Table]



STANDARD CONDITIONS

Air Intake Restriction.....12 in.H_2O (3 kPa)
Exhaust Back Pressure.....60 in.H_2O (15 kPa)

Gross power guaranteed within + or - 5% at SAE J1995 and ISO 3046 conditions:
- 77 °F (25 °C) air inlet temperature
- 29.31 in.Hg (99 kPa) barometer
- 104 °F (40 °C) fuel inlet temperature
- 0.853 fuel specific gravity @ 60 °F (15.5 °C)

Conversion factors:
- Power: kW = hp x 0.746
- Fuel: 1 gal = 7.1 lb, 1 L = 0.85kg
- Torque: N·m = lb-ft x 1.356

All values are from currently available data and are subject to change without notice.

Notes:
This Performance Curve provides installation requirements necessary for the engine to emit at its certified emission levels. For additional information necessary to meet applicable regulatory requirements, refer to the John Deere Emissions-related Installation Instructions: https://jdpower.deere.com/psdistrib/engapp/App_Guidelines/AG01.pdf.

Designed/Calibrated to meet:	Certified by:
• CARB • EPA Interim Tier 4 • EU Stage III B Ref: Engine Emission Label	7 February 2011

Performance Curve: 6090HFC95_K

Engine Installation Criteria

General Data

Model			6090HFC95	
Number of Cylinders			6	
Bore	118.4	mm	4.7	in.
Stroke	136	mm	5.4	in.
Displacement	9.0	L	549	$in.^3$
Compression Ratio			16.0 : 1	
Valves per Cylinder, Intake/Exhaust			2 / 2	
Firing Order			1-5-3-6-2-4	
Combustion System			HPCR	
Engine Type			In-line, 4-cycle	
Aspiration			Turbocharged and air-to-air aftercooled	
Engine Crankcase Vent System			Open	

Physical Data

Length	1266.6	mm	49.9	in.
Width	841.7	mm	33.1	in.
Height	1344.0	mm	52.9	in.
Weight, with oil &no coolant (Includes engine, flywheel housing, flywheel &electrics)	1096.8	kg	2418	lb
Center of Gravity Location, X-axis From Rear Face of Block	458.7	mm	18.1	in.
Center of Gravity Location, Y-axis Right of Crankshaft		mm		
Center of Gravity Location, Z-axis Above Crankshaft	184.2	mm	7.3	in.
Max. Bending Moment about Main Bearings Front and Rear	550	N·m	406	lb-ft
Max. Allowable Static Bending Moment At Rear Face of Flywheel Housing with 5-G Load	814	N·m	600	lb-ft
Thrust Bearing Load Limit Forward, Intermittent	2932	N	659	lb
Thrust Bearing Load Limit Forward, Continuous	1933	N	435	lb
Thrust Bearing Load Limit Rearward, Intermittent	139	N	31	lb
Thrust Bearing Load Limit Rearward, Continuous	899	N	202	lb
Max. Continuous Damper Temp	200	°C	392	°F
Max. ECU Vibration, All Axis			6.00	gRMS
Max. Torsional Vibration, Front of Crank			0.29	DDA
Max. Engine Torsional Vibration in Overspeed			0.37	DDA

Electrical System

Min. Instantaneous Cranking			50	rpm
Min. Steady State Cranking			120	rpm
Starter Rolling Current, 12V @32 °F (0 °C)			920	amps
Starter Rolling Current, 24V @32 °F (0 °C)			600	amps
Starter Rolling Current, 12V @-22 °F (-30 °C)			1300	amps
Starter Rolling Current, 24V @-22 °F (-30 °C)			700	amps
Min. Voltage at ECU during Cranking, 12V			6	volts
Min. Voltage at ECU during Cranking, 24V			10	volts
Max. Voltage Drop, Battery to Starter			0.8	volts
Max. Allowable Start Circuit Resistance, 12V			0.0012	Ohm
Max. Allowable Start Circuit Resistance, 24V			0.002	Ohm
Max. ECU Temperature	105	°C	221	°F
Max. VTG Actuator Surface Temp	180	°C	356	°F
Max. Air Throttle Electrical Actuator Temperature	125	°C	257	°F
Max. Harness Temperature	125	°C	257	°F
Max. Alternator Temperature	105	°C	221	°F
Max. Starter Temperature	120	°C	248	°F
Max. Temperature, All Other Electronics	125	°C	257	°F

Performance Curve: 6090HFC95_K

Engine Installation Criteria

Charge Air Cooling System

Air-to-Air Heat Rejection	48	kW	2732	BTU/min
Intake Manifold Pressure	268.5	kPa	38.9	psi
Compressor Discharge Temperature @77°F(25°C) Ambient Air	239	°C	462	°F
Compressor Discharge Temperature @117°F(47°C) 80 kPa Barametric pressure	279	°C	534	°F
Max. Temperature Out of Charge Air Cooler @All Ambient Conditions	88	°C	190	°F
Intake Manifold Temperature at which Power De-rate Occurs	88	°C	190	°F
Intake Manifold Temperature at which Severe Power De-rate Occurs	89.5	°C	193.1	°F
Max. CAC System Volume	27	Liter	29	quart
Max. Pressure Drop through CAC	16	kPa	64.0	in. H_2O
Min. Pressure Drop through CAC	8	kPa	32.0	in. H_2O
Max. Temperature Out of Charge Air Cooler @77°F (25°C) Ambient Air	52	°C	126	°F
Min. Temperature Out of Charge Air Cooler @77°F (25°C) Ambient Air	39	°C	102	°F
Max. Bending Moment on Compressor Outlet	6	N·m	4	lb-ft
Max. Shear on Compressor Outlet	4	kg	9	lb

Cooling System

Engine Heat Rejection	162	kW	9221	BTU/min
Coolant Flow @10 kPa External Restriction	480	L/min	127	gal/min
Coolant Flow @40 kPa External Restriction	438	L/min	116	gal/min
Max. Auxiliary Coolant Flow	30	L/min	8	gal/min
Thermostat Start to Open	85	°C	185	°F
Thermostat Fully Open	95	°C	203	°F
Engine Coolant Capacity	17	Liter	18.0	quart
Min. Coolant Fill Rate	12	L/min	3.2	gal/min
Max. Water Pump Inlet Pressure	235	kPaa	34	psia
Min. Pump Inlet Pressure @203°F (95°C) Coolant	118	kPaa	17	psia
Min. Pump Inlet Pressure @Max. Top Tank Temperature	172	kPaa	25	psia
Min. External Coolant Restriction	15	kPa	2	psi
Max. External Coolant Restriction	60	kPa	9	psi
Max. Top Tank Temperature	113	°C	235	°F
Max. Top Tank Temperature 95% of Operating Hours	103	°C	217	°F
Min. Limiting Ambient Temperature	47	°C	117	°F

Exhaust System

Exhaust Flow	44	m^3/min	1554	$ft.^3$/min
Exhaust Temperature	434	°C	813	°F
Max. Allowable Exhaust Restriction	17	kPa	68	in. H_2O
Max. Bending Moment on Turbo Outlet	7	N·m	5.2	lb-ft
Max. Shear on Turbine Outlet	11	kg	24	lb
Exhaust Filter Size			7	
Exhaust Filter Pressure Drop (Clean)	15	kPa	60	in. H_2O
Min. Mixing Length, Outlet to Exhaust Filter	500	mm	20	in.
Max. Bending Moment on Exhaust Filter Inlet	180	N·m	133	lb-ft
Max. Bending Moment on Exhaust Filter Outlet	180	N·m	133	lb-ft
Max. Exhaust Leakage Rate, Engine to Exhaust Filter @30kPa	5	L/min	1.3	gal/min
Max. Temperature Drop, Engine to Exhaust Filter	30	°C	86	°F

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Engine Installation Criteria

Fuel System

ECU Description	L21 Controller			
Fuel Injection Pump	Denso HP4			
Governor Type	Electronic			
Total Fuel Flow	210	kg/hr	463	lb/hr
Fuel Consumption	68	kg/hr	149.9	lb/hr
Fuel Temperature Rise, Inlet to Return	58.7	Δ°C	106	Δ°F
Min. Fuel Inlet Pressure	-30	kPa	-120	in. H_2O
Max. Fuel Inlet Pressure	20	kPa	80	in. H_2O
Max. Fuel Return Pressure	20	kPa	80	in. H_2O
Min. Fuel Return Pressure	0	kPa	0	in. H_2O
Max. Fuel Inlet Temperature	75	°C	167	°F
Fuel Filter @98% Efficiency			2	mic

Lubrication System

Oil Pressure at Rated Speed	300	kPa	44	psi
Oil Pressure at Low Idle	100	kPa	15	psi
Max. In-Pan Oil Temperature	138	°C	280	°F
Max. Crankcase Pressure	2	kPa	8	in. H_2O

Air Intake System

Engine Air Flow	22	m^3/min	777	$ft.^3$/min
Air Mass Flow	1504.6	kg/hr	3317	lb/hr
Maximum Allowable Temperature Rise, Ambient Air to Engine Inlet	8	Δ°C	15	Δ°F
Max. Air Intake Restriction, Clean Air Cleaner	3.75	kPa	15.0	in. H_2O
Max. Air Intake Restriction, Dirty Air Cleaner	6.25	kPa	25.0	in. H_2O
Air Cleaner Efficiency			99.9	%

Performance Data

Rated Power	241	kW	325	HP
Rated Speed			2200	rpm
Max. Fast Idle Speed			2400	rpm
Breakaway Speed			2250	rpm
Power Bulge Speed			2000	rpm
Peak Torque Speed			1600	rpm
Low Idle Speed			800	rpm
Rated Torque	1050	N·m	774	lb-ft
Peak Torque	1444	N·m	1065	lb-ft
Torque Rise			38	%
BMEP, Rated	1891	kPa	274	psi
BMEP, Peak Torque	2311	kPa	335	psi
Altitude Capability	2783	m	9129	ft
Friction Power @Rated Speed	37.5	kW	50	HP
Air:Fuel Ratio			21.3 : 1	
Noise @1 m		dB(A)		
Power Bulge			2	%

Engine Speed	Power		Torque		BSFC	
rpm	kW	hp	N·M	lb-ft	g/kWh	lb/hp-hr
2200	242	325	1050	774	219	0.359
2100	245	329	1116	823	218	0.358
2000	248	333	1182	872	218	0.358
1900	248	333	1247	920	216	0.354
1800	248	333	1313	968	214	0.351
1700	246	330	1379	1017	212	0.348
1600	242	325	1444	1065	212	0.348
1500	227	304	1444	1065	210	0.344
1400	212	284	1444	1065	205	0.336
1300	197	264	1444	1065	205	0.336
1200	181	243	1444	1065	207	0.339
1100	166	223	1444	1065	208	0.341
1000	142	190	1360	1003	209	0.343
900	120	161	1275	940	206	0.338
800	101	135	1200	885	210	0.344

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