

# SAFETY DATA SHEET

## AS-7 ANTI-SLUDGING AGENT

**Product Trade Name:****Revision Date:** 27-Apr-2015**Revision Number:** 22**1. Identification****1.1. Product Identifier**

**Product Trade Name:** AS-7 ANTI-SLUDGING AGENT  
**Synonyms:** None  
**Chemical Family:** Blend  
**Internal ID Code** HM000080

**1.2 Recommended use and restrictions on use**

**Application:** Anti-sludging Agent  
**Uses Advised Against** No information available

**1.3 Manufacturer's Name and Contact Details**

**Manufacturer/Supplier** Halliburton Energy Services  
P.O. Box 1431  
Duncan, Oklahoma 73536-0431  
Emergency Telephone: (281) 575-5000

**Prepared By** Chemical Stewardship  
Telephone: 1-580-251-4335  
e-mail: fdunexchem@halliburton.com

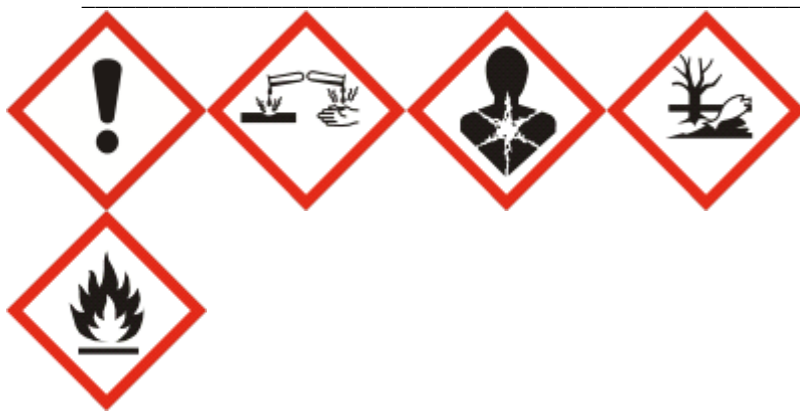
**1.4. Emergency telephone number**

**Emergency Telephone Number** (281) 575-5000

**2. Hazard(s) Identification****2.1 Classification in accordance with paragraph (d) of §1910.1200**

Acute Oral Toxicity	Category 4 - H302
Skin Corrosion / Irritation	Category 2 - H315
Serious Eye Damage / Eye Irritation	Category 1 - H318
Reproductive Toxicity	Category 1A - H360
Specific Target Organ Toxicity - (Single Exposure)	Category 1 - H370
Acute Aquatic Toxicity	Acute 1 - H400
Chronic Aquatic Toxicity	Chronic 3 - H412
Flammable liquids.	Category 3 - H226

**2.2. Label Elements****Hazard Pictograms**

**Signal Word**

Danger

**Hazard Statements**

H226 - Flammable liquid and vapor  
H302 - Harmful if swallowed  
H315 - Causes skin irritation  
H318 - Causes serious eye damage  
H360 - May damage fertility or the unborn child  
H370 - Causes damage to organs  
H400 - Very toxic to aquatic life  
H412 - Harmful to aquatic life with long lasting effects

**Precautionary Statements****Prevention**

P201 - Obtain special instructions before use  
P202 - Do not handle until all safety precautions have been read and understood  
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking  
P233 - Keep container tightly closed  
P240 - Ground/Bond container and receiving equipment  
P241 - Use explosion-proof electrical/ventilating/lighting/equipment  
P243 - Take precautionary measures against static discharge  
P260 - Do not breathe dust/fume/gas/mist/vapors/spray  
P242 - Use only non-sparking tools  
P264 - Wash face, hands and any exposed skin thoroughly after handling  
P270 - Do not eat, drink or smoke when using this product  
P273 - Avoid release to the environment  
P280 - Wear protective gloves/eye protection/face protection

**Response**

P301+ P312 - IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell  
P330 - Rinse mouth  
P302 + P352 - IF ON SKIN: Wash with plenty of soap and water  
P332 + P313 - If skin irritation occurs: Get medical advice/attention  
P362 - Take off contaminated clothing and wash before reuse  
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing  
P310 - Immediately call a POISON CENTER or doctor/physician  
P307 + P311 - IF exposed: Call a POISON CENTER or doctor/physician  
P391 - Collect spillage  
P370 + P378 - In case of fire: Use water spray for extinction

**Storage**

P403 + P235 - Store in a well-ventilated place. Keep cool  
P405 - Store locked up

**Disposal**

P501 - Dispose of contents/container in accordance with local/regional/national/international regulations

**Contains****Substances**

Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)  
 Ethoxylated Alcohol  
 Morpholine  
 Methanol

**CAS Number**

12068-08-5  
 Proprietary  
 110-91-8  
 67-56-1

**2.3 Hazards not otherwise classified**

None known

**3. Composition/information on Ingredients**

Substances	CAS Number	PERCENT (w/w)	GHS Classification - US
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	30 - 60%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 2 (H401) Aquatic Chronic 3 (H412)
Ethoxylated Alcohol	Proprietary	30 - 60%	Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Corr. 1 (H318) Aquatic Acute 1 (H400) Aquatic Chronic 3 (H412)
Morpholine	110-91-8	1 - 5%	Acute Tox. 4 (H302) Acute Tox. 3 (H311) Acute Tox. 3 (H331) Skin Corr. 1 (H314) Eye Corr. 1 (H318) STOT SE 3 (H335) Aquatic Acute 3 (H402) Flam. Liq. 3 (H226)
Methanol	67-56-1	5 - 10%	Acute Tox. 3 (H301) Acute Tox. 3 (H311) Acute Tox. 3 (H331) Repr. 1 (H360) STOT SE 1 (H370) Flam. Liq. 2 (H225)

The exact percentage (concentration) of the composition has been withheld as proprietary.

**4. First-Aid Measures****4.1. Description of first aid measures****Inhalation**

If inhaled, move victim to fresh air and seek medical attention.

**Eyes**

In case of contact, or suspected contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention immediately after flushing.

**Skin**

In case of contact, immediately flush skin with plenty of soap and water for at least 15 minutes. Get medical attention. Remove contaminated clothing and launder before reuse.

**Ingestion**

Do NOT induce vomiting. Give nothing by mouth. Obtain immediate medical attention.

**4.2 Most important symptoms/effects, acute and delayed**

Causes severe eye irritation which may damage tissue. Causes skin irritation. Harmful if swallowed. May cause blindness. Potential reproductive hazard. May cause birth defects. May cause damage to internal organs.

**4.3. Indication of any immediate medical attention and special treatment needed**

Notes to Physician

Treat symptomatically.

**5. Fire-fighting measures****5.1. Extinguishing media****Suitable Extinguishing Media**

Water fog, carbon dioxide, foam, dry chemical.

**Extinguishing media which must not be used for safety reasons**

None known.

**5.2 Specific hazards arising from the substance or mixture****Special Exposure Hazards**

May be ignited by heat, sparks or flames. Use water spray to cool fire exposed surfaces. Closed containers may explode in fire. Decomposition in fire may produce toxic gases.

**5.3 Special protective equipment and precautions for fire-fighters****Special Protective Equipment for Fire-Fighters**

Full protective clothing and approved self-contained breathing apparatus required for fire fighting personnel.

**6. Accidental release measures****6.1. Personal precautions, protective equipment and emergency procedures**

Use appropriate protective equipment. Wear self-contained breathing apparatus in enclosed areas.

See Section 8 for additional information

**6.2. Environmental precautions**

Prevent from entering sewers, waterways, or low areas.

**6.3. Methods and material for containment and cleaning up**

Isolate spill and stop leak where safe. Remove ignition sources and work with non-sparking tools. Contain spill with sand or other inert materials. Scoop up and remove.

**7. Handling and storage****7.1. Precautions for Safe Handling****Handling Precautions**

Avoid contact with eyes, skin, or clothing. Avoid breathing vapors. Wash hands after use. Launder contaminated clothing before reuse. Ground and bond containers when transferring from one container to another.

**Hygiene Measures**

Handle in accordance with good industrial hygiene and safety practice.

**7.2. Conditions for safe storage, including any incompatibilities****Storage Information**

Store away from oxidizers. Store in a cool well ventilated area. Keep container closed when not in use. Product has a shelf life of 60 months.

**8. Exposure Controls/Personal Protection****8.1 Occupational Exposure Limits**

Substances	CAS Number	OSHA PEL-TWA	ACGIH TLV-TWA
------------	------------	--------------	---------------

Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	Not applicable	Not applicable
Ethoxylated Alcohol	Proprietary	Not applicable	Not applicable
Morpholine	110-91-8	20 ppm Skin	TWA: 20 ppm Skin
Methanol	67-56-1	TWA: 200 ppm	TWA: 200 ppm STEL: 250 ppm Skin

## 8.2 Appropriate engineering controls

### Engineering Controls

Use in a well ventilated area. Local exhaust ventilation should be used in areas without good cross ventilation.

## 8.3 Individual protection measures, such as personal protective equipment

### Personal Protective Equipment

If engineering controls and work practices cannot prevent excessive exposures, the selection and proper use of personal protective equipment should be determined by an industrial hygienist or other qualified professional based on the specific application of this product.

### Respiratory Protection

If engineering controls and work practices cannot keep exposure below occupational exposure limits or if exposure is unknown, wear a NIOSH certified, European Standard EN 149, AS/NZS 1715:2009, or equivalent respirator when using this product. Selection of and instruction on using all personal protective equipment, including respirators, should be performed by an Industrial Hygienist or other qualified professional.

Positive pressure self-contained breathing apparatus if methanol is released.

### Hand Protection

Chemical-resistant protective gloves (EN 374) Suitable materials for short-term contact or splashes (recommended: at least protection index 2, corresponding to > 30 minutes permeation time as per EN 374): Nitrile gloves. ( $\geq 0.4$  mm thickness) This information is based on literature references and on information provided by glove manufacturers, or is derived by analogy with similar substances. Please note that in practice the working life of chemical-resistant protective gloves may be considerably shorter than the permeation time determined in accordance with EN 374 as a result of the many influencing factors (e.g. temperature). If signs of wear and tear are noticed then the gloves should be replaced. Manufacturer's directions for use should be observed because of great diversity of types.

### Skin Protection

Rubber apron.

### Eye Protection

Chemical goggles; also wear a face shield if splashing hazard exists.

### Other Precautions

Eyewash fountains and safety showers must be easily accessible.

## 9. Physical and Chemical Properties

### 9.1. Information on basic physical and chemical properties

**Physical State:** Liquid

**Color:**

Clear amber

**Odor:** Alcohol

**Odor**

No information available

**Threshold:**

Property

Values

Remarks/ - Method

**pH:**

7.1

**Freezing Point/Range**

No information available.

**Melting Point/Range**

No data available

**Boiling Point/Range**

No data available

**Flash Point**

32 °C / 90 °F PMCC

**Flammability (solid, gas)**

No data available

upper flammability limit

36

lower flammability limit	%
Evaporation rate	No data available
Vapor Pressure	190
Vapor Density	No data available
Specific Gravity	1.04
Water Solubility	Dispersable
Solubility in other solvents	No data available
Partition coefficient: n-octanol/water	0.61
Autoignition Temperature	No data available
Decomposition Temperature	No data available
Viscosity	No data available
Explosive Properties	No information available
Oxidizing Properties	No information available

**9.2. Other information**

VOC Content (%)	No data available
-----------------	-------------------

**10. Stability and Reactivity****10.1. Reactivity**

Not expected to be reactive.

**10.2. Chemical Stability**

Stable

**10.3. Possibility of Hazardous Reactions**

Will Not Occur

**10.4. Conditions to Avoid**

Keep away from heat, sparks and flame.

**10.5. Incompatible Materials**

Strong oxidizers.

**10.6. Hazardous Decomposition Products**

Oxides of nitrogen. Oxides of sulfur. Carbon monoxide and carbon dioxide.

**11. Toxicological Information****11.1 Information on likely routes of exposure**

**Principle Route of Exposure** Eye or skin contact, inhalation. Ingestion.

**11.2 Symptoms related to the physical, chemical and toxicological characteristics****Acute Toxicity****Inhalation**

May cause respiratory irritation. May cause central nervous system depression including headache, dizziness, drowsiness, incoordination, slowed reaction time, slurred speech, giddiness and unconsciousness.

**Eye Contact**

Causes severe eye irritation. May cause eye burns.

**Skin Contact**

Causes moderate skin irritation.

**Ingestion**

Causes burns of the mouth, throat and stomach. May be fatal or cause blindness if swallowed. May cause central nervous system depression including headache, dizziness, drowsiness, muscular weakness, incoordination, slowed reaction time, fatigue blurred vision, slurred speech, giddiness, tremors and convulsions.

**Chronic Effects/Carcinogenicity** Prolonged or repeated exposure may cause eye, blood, lung, liver, kidney, heart, central nervous system and spleen damage. May contain ethylene oxide in the headspace of the drum. Ethylene oxide is a cancer and reproductive hazard.

### 11.3 Toxicity data

#### Toxicology data for the components

Substances	CAS Number	LD50 Oral	LD50 Dermal	LC50 Inhalation
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	1080 mg/kg (Rat) (similar substance)	> 2000 mg/kg (Rat) (similar substance)	> 0.31 mg/L (Rat) 4h (similar substance)
Ethoxylated Alcohol	Proprietary	No data available	No data available	No data available
Morpholine	110-91-8	1050 mg/kg (Rat) 1600 mg/kg (Rat)	310 mg/kg (Rabbit) 500 mg/kg (Rabbit)	7.8 mg/L (Rat) 4h
Methanol	67-56-1	> 1187 - 2769 mg/kg (Rat) 3000 mg/kg (Monkey) 300 mg/kg (Human)	15800 mg/kg (Rabbit) 393 mg/kg (Primate) 1000 mg/kg (Human)	87.5 mg/L (Rat) 6h 128.2 mg/L (Rat) 4h 83.2 mg/L (Rat) 4h 64000 mg/L (Rat) 4h 10 mg/L (Human)

Substances	CAS Number	Skin corrosion/irritation
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	Skin, rabbit: Causes moderate skin irritation. (similar substances)
Ethoxylated Alcohol		May cause moderate skin irritation.
Morpholine	110-91-8	Skin, rabbit: Extremely corrosive and destructive to tissue
Methanol	67-56-1	Non-irritating to the skin (Rabbit)

Substances	CAS Number	Eye damage/irritation
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	Eye, rabbit: Causes severe eye irritation which may damage tissue. (similar substances)
Ethoxylated Alcohol		May cause severe eye irritation.
Morpholine	110-91-8	Eye, rabbit: Corrosive to eyes Causes severe eye irritation. Will damage tissue.
Methanol	67-56-1	Non-irritating to the eye (Rabbit)

Substances	CAS Number	Skin Sensitization
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Ethoxylated Alcohol		Did not cause sensitization on laboratory animals (guinea pig) (similar substances)
Morpholine	110-91-8	Did not cause sensitization on laboratory animals (guinea pig)
Methanol	67-56-1	Did not cause sensitization on laboratory animals (guinea pig)

Substances	CAS Number	Respiratory Sensitization
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	No information available
Ethoxylated Alcohol		No information available
Morpholine	110-91-8	No information available
Methanol	67-56-1	No information available

Substances	CAS Number	Mutagenic Effects
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	In vitro tests did not show mutagenic effects In vivo tests did not show mutagenic effects. (similar substances)
Ethoxylated Alcohol		In vitro tests did not show mutagenic effects In vivo tests did not show mutagenic effects. (similar substances)
Morpholine	110-91-8	In vitro tests did not show mutagenic effects In vivo tests did not show mutagenic effects.
Methanol	67-56-1	In vitro tests did not show mutagenic effects In vivo tests did not show mutagenic effects.

Substances	CAS Number	Carcinogenic Effects
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	Did not show carcinogenic effects in animal experiments (similar substances)
Ethoxylated Alcohol		Did not show carcinogenic effects in animal experiments (similar substances)
Morpholine	110-91-8	Did not show carcinogenic effects in animal experiments
Methanol	67-56-1	Did not show carcinogenic effects in animal experiments

Substances	CAS Number	Reproductive toxicity
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	Animal testing did not show any effects on fertility. Did not show teratogenic effects in animal experiments. (similar substances)
Ethoxylated Alcohol		Animal testing did not show any effects on fertility. (similar substances)
Morpholine	110-91-8	Did not show teratogenic effects in animal experiments. Animal testing did not show any effects on fertility. (similar substances)
Methanol	67-56-1	Fetotoxic and teratogenic effects observed in experimental animals at concentrations that did not produce maternal toxicity.

Substances	CAS Number	STOT - single exposure
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	No data of sufficient quality are available.
Ethoxylated Alcohol		No data of sufficient quality are available.
Morpholine	110-91-8	May cause respiratory irritation.
Methanol	67-56-1	May cause disorder and damage to the Central Nervous System (CNS) EYES

Substances	CAS Number	STOT - repeated exposure
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Ethoxylated Alcohol		No significant toxicity observed in animal studies at concentration requiring classification. (similar substances)
Morpholine	110-91-8	No significant toxicity observed in animal studies at concentration requiring classification.
Methanol	67-56-1	No significant toxicity observed in animal studies at concentration requiring classification.

Substances	CAS Number	Aspiration hazard
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	Not applicable
Ethoxylated Alcohol		No information available
Morpholine	110-91-8	Not applicable
Methanol	67-56-1	Not applicable

## 12. Ecological Information

### 12.1. Toxicity

#### Ecotoxicity Effects

#### Product Ecotoxicity Data

No data available

#### Substance Ecotoxicity Data

Substances	CAS Number	Toxicity to Algae	Toxicity to Fish	Toxicity to Microorganisms	Toxicity to Invertebrates
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	LC50 (96h) 29 mg/L (Selenastrum capricornutum) NOEC (4d) 0.3 mg/L (Microcystis aeruginosa)	LC50 (96h) 1.67 mg/L (Lepomis macrochirus) NOEC (28d) 1 mg/L (Lepomis macrochirus)	No information available	EC50 (48h) 1.62 mg/L (Daphnia magna) NOEC (21d) 1.18 mg/L (Daphnia magna)



Ethoxylated Alcohol	Proprietary	No information available	No information available	No information available	No information available
Morpholine	110-91-8	EC50 (96h) 28 mg/L (Pseudokirchneriella subcapitata)	LC50 (96h) 83 mg/L (Pimephales promelas) LC50 (96h) 180 mg/L (Oncorhynchus mykiss) LC50 (96h) 240 mg/L (Oncorhynchus mykiss) LC50 (96h) 380 mg/L (Oncorhynchus mykiss)	EC20 (30min) >1000 mg/L (Activated sludge, industrial)	EC50 (48h) 45 mg/L (Daphnia magna) EC50 (48h) 207 mg/L (Daphnia magna)
Methanol	67-56-1	EC50 (96h) 22000 mg/L (Pseudokirchneriella subcapitata, Growth rate)	LC50 28200 mg/L (Pimephales promelas) LC50 (96h) 12700 – 15400 mg/L (Lepomis macrochirus)	IC50 (3h) > 1000 mg/L (activated sludge)	EC50 (96h) 18260 mg/L (Daphnia magna) NOEC (21d) 122 mg/L (Daphnia magna, Reproduction)

## 12.2. Persistence and degradability

Substances	CAS Number	Persistence and Degradability
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	Readily biodegradable
Ethoxylated Alcohol	Proprietary	No information available
Morpholine	110-91-8	Readily biodegradable
Methanol	67-56-1	(95-97% @ 20d)

## 12.3. Bioaccumulative potential

Substances	CAS Number	Log Pow
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	12068-08-5	No information available
Ethoxylated Alcohol	Proprietary	No information available
Morpholine	110-91-8	-0.86
Methanol	67-56-1	-0.77 BCF = 1.0 – 4.5 (Cyprinus carpio) BCF < 10 (Leuciscus idus melanotus)

## 12.4. Mobility in soil

Substances	Mobility
Benzenesulfonic acid, dodecyl-, compd. with morpholine (1:1)	No information available
Ethoxylated Alcohol	No information available
Morpholine	No information available
Methanol	KOC = 0.13 - 0.61

## 12.5 Other adverse effects

No information available

## 13. Disposal Considerations

### 13.1. Waste treatment methods

**Disposal Method** Disposal should be made in accordance with federal, state, and local regulations.  
**Contaminated Packaging** Follow all applicable national or local regulations.

## 14. Transport Information

### US DOT

**UN Number:** UN2924  
**UN Proper Shipping Name:** Flammable Liquid, Corrosive, N.O.S. (Contains Methanol, Amine Salt)  
**Transport Hazard Class(es):** 3 (8)

**Packing Group:** III  
**Environmental Hazards:** Marine Pollutant  
**NAERG:** NAERG 132

**US DOT Bulk**  
**DOT (Bulk)** Not applicable

**Canadian TDG**  
**UN Number:** UN2924  
**UN Proper Shipping Name:** Flammable Liquid, Corrosive, N.O.S. (Contains Methanol, Amine Salt)  
**Transport Hazard Class(es):** 3 (8)  
**Packing Group:** III  
**Environmental Hazards:** Marine Pollutant

**IMDG/IMO**  
**UN Number:** UN2924  
**UN Proper Shipping Name:** Flammable Liquid, Corrosive, N.O.S. (Contains Methanol, Amine Salt)  
**Transport Hazard Class(es):** 3 (8)  
**Packing Group:** III  
**Environmental Hazards:** Marine Pollutant  
**EMS:** EmS F-E, S-C

**IATA/ICAO**  
**UN Number:** UN2924  
**UN Proper Shipping Name:** Flammable Liquid, Corrosive, N.O.S. (Contains Methanol, Amine Salt)  
**Transport Hazard Class(es):** 3 (8)  
**Packing Group:** III  
**Environmental Hazards:** Marine Pollutant

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:** Not applicable  
**Special Precautions for User:** None

## 15. Regulatory Information

### US Regulations

**US TSCA Inventory** All components listed on inventory or are exempt.

**EPA SARA Title III Extremely Hazardous Substances** Not applicable

**EPA SARA (311,312) Hazard Class** Acute Health Hazard  
Chronic Health Hazard  
Fire Hazard

**EPA SARA (313) Chemicals** This product contains toxic chemical(s) listed below which is(are) subject to the reporting requirements of Section 313 of Title III of SARA and 40 CFR Part 372: Methanol//67-56-1

**EPA CERCLA/Superfund Reportable Spill Quantity** EPA Reportable Spill Quantity is 8325 Gallons based on Methanol (CAS: 67-56-1).

<b>EPA RCRA Hazardous Waste Classification</b>	If product becomes a waste, it does meet the criteria of a hazardous waste as defined by the US EPA, because of:  Ignitability D001
<b>California Proposition 65</b>	The California Proposition 65 regulations apply to this product.
<b>MA Right-to-Know Law</b>	One or more components listed.
<b>NJ Right-to-Know Law</b>	One or more components listed.
<b>PA Right-to-Know Law</b>	One or more components listed.
<b>Canadian Regulations</b>	
<b>Canadian DSL Inventory</b>	All components listed on inventory or are exempt.

## 16. Other information

### Preparation Information

#### Prepared By

Chemical Stewardship  
Telephone: 1-580-251-4335  
e-mail: fdunexchem@halliburton.com

#### Revision Date:

27-Apr-2015

#### Reason for Revision

SDS sections updated: 2

### **Additional information**

For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Stewardship at 1-580-251-4335.

---

**Key or legend to abbreviations and acronyms**

bw – body weight  
CAS – Chemical Abstracts Service  
EC50 – Effective Concentration 50%  
ErC50 – Effective Concentration growth rate 50%  
LC50 – Lethal Concentration 50%  
LD50 – Lethal Dose 50%  
LL50 – Lethal Loading 50%  
mg/kg – milligram/kilogram  
mg/L – milligram/liter  
NIOSH – National Institute for Occupational Safety and Health  
NTP – National Toxicology Program  
OEL – Occupational Exposure Limit  
PEL – Permissible Exposure Limit  
ppm – parts per million  
STEL – Short Term Exposure Limit  
TWA – Time-Weighted Average  
UN – United Nations  
h - hour  
mg/m<sup>3</sup> - milligram/cubic meter  
mm - millimeter  
mmHg - millimeter mercury  
w/w - weight/weight  
d - day

**Key literature references and sources for data**

[www.ChemADVISOR.com/](http://www.ChemADVISOR.com/)

**Disclaimer Statement**

This information is furnished without warranty, expressed or implied, as to accuracy or completeness. The information is obtained from various sources including the manufacturer and other third party sources. The information may not be valid under all conditions nor if this material is used in combination with other materials or in any process. Final determination of suitability of any material is the sole responsibility of the user.

**End of Safety Data Sheet**