

## Excerpts from Material Safety Data Sheets for Fracturing Products (last updated on 4 Aug 2012)

Source: [Appendix I](#) of Hydrogeological Risk Assessment of Hydraulic Fracturing for Gas Recovery in Taranaki Region, Taranaki Regional Council, May 2012

	Product	Hazardous Classification 2001	Land Transport Rule classification 2005	Ingredient / CAS No.	Solubility (water)	Toxicity	Ecological information	Page (In appendix)
1	BF-7L  (buffer) NZ	HSNO Hazardous 6.1E, 6.3A, 6.4A	Dangerous DG Class 8	Potassium carbonate (584-08-7) 40-50% Water (remainder)	Soluble	Corrosive LD50 (ingestion): 100 mg/kg (wild bird) TCLo (inhalation): 43 mg/m <sup>3</sup> /17 weeks (rat) May evolve toxic gases when heated to decomposition.	If released to waterways, alkaline products may change the pH of waterway. May leach to groundwater with toxic effects on aquatic life.	p.2
2	Clay Master-5C  (clay control) NZ	HSNO Hazardous 6.3A, 6.4A, 9.1D	Dangerous DG Class 9	1,2-Ethanediaminium,N1, N2-BIS[2-[BIS(2-Hydroxyethyl)Methylammonio]Ethyl]-N1, N2-BIS(2-hydroxyethyl)- (138879-94-4) 30-60% Non hazardous ingredients (remainder)	Soluble	Low toxicity – irritant. No LD50 data  May evolve toxic gases (carbon/nitrogen oxides, amines, ammonia, hydrocarbons) when heated to decomposition.	Limited ecotoxicity data. Ensure appropriate measures are taken to prevent this product from entering the environment. Skeletonema costatum: EC50 (72h) = 4671.5 mg/L Acartia tonsa: LC50(48 h) = 30.38 mg/L Scophthalmus maximus, LC50 (96 h) = 42.33 mg/L Corophium volutator, LC50 (240 h) = 1349.6 mg/L	p.7
3	Ammonium persulfate  (oxidizer & bleacher) NZ	Hazard Alert Code: <b>Moderate</b>	Dangerous (according to NDHSC Criteria and ADG Code) Oxidizing agent	Ammonium persulfate (7727-54-0) >98% Oxygen and ozone (remaining)	Decompose slowly in water to produce oxygen, ozone	No LD50 data  Harmful if swallowed, irritating to eyes, respiratory system and skin.  Instability with prolonged exposure to heat.	Dispose of as hazardous waste	p.12
4	GBW-12CD  (enzyme) NZ	HSNO Hazardous 6.5A	Not classified as dangerous goods	Hemicellulase enzyme concentrate (9025-56-3) 100%	Soluble	Low to <b>moderate</b> – irritant. No LD50 data May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.	No known ecological damage	p.20
5	GBW-41L  (frac gel breaker) NZ	HSNO Hazardous 5.1.1C, 6.1E, 6.3A, 6.9B, 8.3A, 9.1D	Dangerous DG Class 5.1 (oxidizing)	Hydrogen peroxide (7722-84-1) 5-15% Water (remainder)	Soluble	Irritant. <b>Moderate</b> toxicity when ingested. May evolve toxic gases when heated. LCLo (inhalation): 227 ppm (mouse)	Limited ecotoxicity data. Ensure appropriate measures are taken to prevent this product from entering the environment.	p.24

						LD50 (ingestion): 2000 mg/kg (mouse) LD50 (skin): 1200 mg/kg (mouse)		
6	GLFC-5  (gellant - water) NZ	HSNO Hazardous 6.1E, 6.3B, 6.5A, 6.5B, 9.1D	Not classified as dangerous goods	C9 TO C21 Alkanes, linear and branched (90622-53-0) 45-50% Guar Gum (9000-30-0) 45- 50%	Insoluble	Low to <b>moderate</b> toxicity – irritant. Guar gum: LD50 (ingestion): 6000 mg/kg (hamster) May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.	Aliphatic hydrocarbons behave differently in the environment depending on their size.	p.29
7	GS-1A  (gel stabilizer) NZ	Not classified as hazardous	Not classified as dangerous goods	Sodium thiosulphate (7772- 98-7) 100%	Solubility 30%	Low toxicity. May evolve toxic gases if heated strongly. Thermal decomposition >300C may evolve Sulphur oxides.	Limited ecotoxicity data. Ensure appropriate measures are taken to prevent this product from entering the environment.	p.34
8	High Perm Crb  (breaker-water / water treatment) NZ	HSNO Hazardous 5.1.1C, 6.1D (oral), 6.3A, 6.4A, 6.5A, 6.5B, 9.1D, 9.3C	Dangerous DG Class 5.1 (oxidizing)	Ammonium persulphate (7727-54-0) >60% Quartz (148080-60-7) 10- 15%	Slightly soluble	<b>Moderate</b> toxicity – slightly corrosive May evolve toxic gases (sulphur oxides when heated to decomposition or in the presence of moisture. Ammonium persulphate: LD50 (ingestion): 689 mg/kg (rat) Quartz: LCLo (inhalation): 300 ug/m3/10 years (human)	Limited ecotoxicity data. Ensure appropriate measures are taken to prevent this product from entering the environment.	p.38
9	Inflo-150  (surface tension) NZ	HSNO Hazardous 3.1D, 6.1D, 6.4A, 6.9A (single exposure), 9.3C	Not classified as dangerous goods	Ethylene glycol (107-21-1) 10-30% Methanol (67-56-1) 5-10% Oxylalkylated alcohols (Not available) 10-30% Fatty alcohol (Not available), Oxylalkylated alkanolamines (Not available), Silicones (Not available), Surfactants (Not available)	Soluble	<b>Moderate</b> toxicity – irritant May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition. Ethylene glycol: LDLo(ingestion): 398 mg/kg (human) TCLo (inhalation): 10,000 mg/m3 (human - cough) Methanol: LDLo (ingestion): 143 mg/kg (human) TCLo (inhalation): 300 ppm human (visual effects)	Limited ecotoxicity data. Ensure appropriate measures are taken to prevent this product from entering the environment.  Prevent contamination of drains and waterways as aquatic life may be threatened and environmental damage may result.	p.44
10	Magnacide 575 Microbiocide  (biocide) NZ	HSNO Hazardous 6.1C, 6.5B, 8.2C, 8.3A, 9.1A, 9.3B	Dangerous DG Class 6.1 (toxic liquid)	Tetrakis(hydroxymethyl) Phosphonium sulphate (55566-30-8) >60%	Soluble	Slightly corrosive – irritant May evolve toxic gases when strongly heated. LD50 (ingestion): 248 mg/kg (rat) TDLo (ingestion): 650 mg/kg/13 weeks-intermittent (rat)	Limited ecotoxicity data. Ensure appropriate measures are taken to prevent this product from entering the environment.	p.49

11	Scaletrol 720  (scale inhibitor) NZ	HSNO Hazardous 6.1E (oral), 6.4A, 6.9A (single exposure)	Dangerous DG Class 9	Ethylene glycol (107-21-1) <45% Diethylene glycol (111-46- 6) <5%	Soluble	<b>Moderate</b> toxicity May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition. Vapour may form explosive mixtures with air. Ethylene glycol: LD50 (ingestion): 1650 mg/kg (cat) LDLo (ingestion): 398 mg/kg (human) TCLo (inhalation): 10,000 mg/m3 (human - cough) Diethylene glycol: LD50 (ingestion): 3300 mg/kg (cat) LDLo (ingestion): 1000 mg/kg (human) TDLo (ingestion): 2400 mg/kg (child)	Ethylene glycol will mainly exist in the vapour phase in the ambient atmosphere where it will be degraded by reaction with hydroxyl radicals. Expected to be very highly mobile in soil. Not anticipated to volatilise from moist soil or water surfaces. Biodegradation in both soil and water is expected to be a major fate process. Not expected to bioconcentrate in aquatic organisms.  Prevent contamination of drains and waterways as aquatic life may be threatened and environmental damage may result.	p.54
12	XLW-56  (Crosslinking agent) NZ	HSNO Hazardous 6.1E, 6.3A, 6.4A	Not classified as dangerous goods	Glyoxal (107-22-2) 10-30% Sodium hydroxide (1310- 73-2) 1-5% D-sorbitol (50-70-4) 5-10% Sodium tetraborate anhydrous (1330-43-4) 5- 10% Non hazardous ingredients (remainder)	Soluble	<b>Moderate</b> toxicity May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition. Glyoxal: LD50 (ingestion): 200 mg/kg (rat) Sodium hydroxide: LDLo (ingestion): 1.57 mg/kg (human) D-sorbitol: TDLo (ingestion): 1700 mg/kg/day (woman) Sodium tetraborate anhydrous: TDLo (ingestion): 16750 µg/kg (rat-30 days prior to mating)	Limited ecotoxicity data. Ensure appropriate measures are taken to prevent this product from entering the environment.  Prevent contamination of drains and waterways as aquatic life may be threatened and environmental damage may result.	p.60
13	Clay-trol  (shale stabilizer) USA	Not hazardous according to OSHA 29 CFR 1910 1200 (USA)	Not regulated as dangerous goods	<b>Not provided.</b> No ingredients hazardous. Not considered to be a carcinogen by IARC, ACGIH, NTP or OSHA	Soluble	Not available  Hazardous decomposition products: gaseous Nitrogen oxides, Carbon monoxide, Carbon dioxide, and/or hydrocarbons.	Not expected to be harmful to aquatic life	p.65
14	XLFC-1B  (gelling agent) NZ	HSNO Hazardous 3.1D, 6.1E, 6.3B, 9.1B	Not classified as dangerous goods	Diesel fuel No.2 (68476-34- 6) 40-45% Guar gum (9000-30-0) 40- 45%	Soluble	<b>Moderate</b> toxicity – irritant. Diesel: LD50(ingestión): 5-15g/kg diesel oil Guar gum: LD50(ingestion): 6000mg/kg (hamster) May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.	Toxic to most fish at 2-100 ppm. May cause long-term adverse effects in the aquatic environment. If released to soil, diesel fuel will strongly adsorb. It may biodegrade in water and soil or volatilise from water (half-life of ~5 hrs) and moist soil surfaces. In water adsorption to sediment should be important. If	p.69

						Vapour may form explosive mixtures with air.	released to the atmosphere, will degrade in vapour phase by reaction with hydroxyle radicals (half-life ~1 Day)>	
15	X-CIDE 102  (biocide) NZ	HSNO Hazardous 6.1A, 6.5A, 6.5B, 6.9B (single exposure), 8.2B, 8.3A, 9.1D, 9.2B, 9.3B	Dangerous DG Class 6.1 (toxic, corrosive)	<b>Glutaraldehyde</b> (111-30-8) 10-25% Water (remainder)	Soluble	Corrosive-toxic. May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition. Glutaraldehyde: LC50 (inhalation): 480 mg/m <sup>3</sup> /4 hours (rat) TDLo (ingestion): 875 mg/kg (rat, male – reproductive effects)	Glutaraldehyde hydrolyses slowly (half life 100-500 days, depending on pH). May photodegrade. May biodegrade only if present below levels toxic to bacteria (<10 mg/L). Not anticipated to bioaccumulate. Toxic to fish, birds and bacteria. <b>If released to soil, may metabolise and is expected to leach to groundwater.</b>	p.74
16	Wax-chek 5222  (Paraffin inhibitor) NZ	HSNO Hazardous 3.1C, 6.1E (oral), 6.3B, 6.4A, 6.7B,6.8B, 6.9B (single exposure), 9.1B	Dangerous DG Class 3 (flammable liquid)	Distillates (petroleum), hydrotreated light (64742-47-8) <75% <b>Ethyl benzene</b> (100-41-4) < 10% Naphthalene (91-20-3) <5% Solvent naphtha (petroleum) heavy aromatic (647-42-94-5) <5% <b>Xylene</b> (1330-20-7) <5% 1,2,4- Trimethylbenzne (95-63-6) <1% Olefin/maleic ester (68188-50-1) <25%	Not	<b>Moderate</b> toxicity – irritant. May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition. Ethyl benzene: TCLo (inhalation): 100 ppm/7hours (human) Naphthalene: <b>Possibly carcinogenic</b> to humans. LDLo (ingestion): 100 mg/kg (child) TCLo (inhalation): 250 mg/m <sup>3</sup> (human) Solvent naphtha: LDLo (ingestion): 5ml/kg (rat) Xylene: LCLo (inhalation): 10000 ppm/6hrs (man) LDLo (ingestion): 50 mg/kg (human) 1,2,4- Trimethylbenzene: LC50 (inhalation): 18g/m <sup>3</sup> /4hrs (rat) LD50 (ingestion): 5g/kg (rat)	Aliphatic hydrocarbons behave differently in the environment depending on their size.  Prevent contamination of drains and waterways as aquatic life may be threatened and environmental damage may result.	p.80
17	US-40  (solvent) NZ	HSNO Hazardous 3.1D, 6.1C, 6.3B, 6.4A, 9.3B	Not classified as dangerous goods	<b>Ethylene glycol monobutyle ether</b> (111-76-2) >99%	Soluble	<b>Moderate</b> toxicity – irritant. May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.  TCLo (inhalation): 100 ppm (human) TDLo (ingestion): 7813uL/kg (woman)	Vapour phase glycols are expected to degrade fairly rapidly by reaction with hydroxyl radicals (eg half-life 32 hours for propylene glycol). Removal from air by rainfall is possible. In water, should degrade relatively rapidly via biodegradation. If released to soil, relatively rapid biodegradation	p.86

							should also occur. <b>Leaching to groundwater may occur.</b> Prevent contamination of drains and waterways as aquatic life may be threatened and environmental damage may result.	
18	Sodium bicarbonate (buffer) NZ	Not classified as hazardous	Not classified as dangerous goods	Sodium bicarbonate 100%	Soluble	Low toxicity May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.	Not anticipated to cause adverse effects if released in small quantities. Not expected to bioaccumulate.	p.91
19	Saraline 185V  (solvent) NZ	HSNO Hazardous 3.1D, 6.1E, 6.3B	Not classified as dangerous goods	C9 to C21 Alkanes linear and branched (90622-53-O) >60%	Soluble	Low to <b>moderate</b> toxicity – irritant. No LD50 data. May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.	Aliphatic hydrocarbons behave differently in the environment depending on their size.	p.95
20	PSA-2L  (component) NZ	Not classified as hazardous	Not classified as dangerous goods	Polyoxiethylene (6) alkyl (13) ether (24938-91-8) 100%	Soluble	Low toxicity – irritant No LD50 data. May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.	Limited ecotoxicity data. Ensure appropriate measures are taken to prevent this product from entering the environment. Prevent contamination of drains and waterways as aquatic life may be threatened and environmental damage may result.	p.99
21	PSA-1  (component) NZ	Not classified as hazardous	Not classified as dangerous goods	Cristobalite <1% Quartz <1% Organophilic clay >60%	Not	Low toxicity Cristobalite: Confirmed human <b>carcinogen</b> (IARC Group 1) Quartz: LCLo (inhalation): 300 ug/m3/10 years (human) May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.	Not anticipated to cause adverse effects if released in small quantities. Not expected to bioaccumulate.	p.103
22	GW-3  (emulsifier) NZ	Not classified as hazardous	Not classified as dangerous goods	Guar gum >99%	Soluble	Low toxicity LD50 (ingestion): 6000 mg/kg (hamster) May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition.	Not anticipated to cause adverse effects if released in small quantities. Not expected to bioaccumulate.	p.107
23	GBW-12CD (enzyme) NZ	HSNO Hazardous 6.5A	Not classified as dangerous goods	Hemicellulase enzyme concentrate (9025-56-3) 100%	Soluble	Missing pages...	Missing pages...	p.111
24	CXB-6	HSNO Hazardous 3.1C, 6.1D (oral),	Dangerous DG Class 3	Triethanolamine (102-71-6) 30-80%	Soluble	<b>Moderate</b> toxicity – irritant. Triethanolamine:	If released to the atmosphere methanol degrades via reaction	p.112

	(crosslinking agent) NZ	6.3B, 6.4A, 6.8B, 6.9A (single exposure), 9.1D, 9.2D, 9.3C		Methanol (67-56-1) 15-40% Boric acid (10043-35-3) 10- 30% Ethylene glycol (107-21-1) 7-13%		TDLo (ingestion): 16 g/kg/64 weeks (mouse-cancer) Methanol: LDLo (ingestion): 143 mg/kg (human) Boric acid: LDLo (ingestion): 200 mg/kg (woman) TDLo (ingestion): 45 g/kg (90 days pregnant rat – reproductive effects) Ethylene glycol: LDLo (ingestion): 398 mg/kg (human) May evolve toxic gases (carbon oxides, hydrocarbons) when heated to decomposition. Vapour may form explosive mixtures with air.	with photochemically produced hydroxyl radicals. It is expected to biodegrade in both soil and water. If spilt on soil it is expected to be susceptible to significant leaching, as well rapid evaporation from dry surfaces is likely to occur. Chronic aquatic toxicity possible above 32 ppm.	
25	Ceramic Proppant NZ	Not classified as hazardous	Not classified as dangerous goods	Quartz <1% Aluminium oxide 30-70% Kyanite 30-70%	Not	Low toxicity – irritant.	Not anticipated to cause any adverse effects to plants or animals.	p.119
26	GO-64  (oil gelling agent) USA	Hazardous: Corrosive  Hazard class: 8 UN/NA number: UN3265	Corrosive liquid, acidic, organic, n.o.s. (contains phosphate esters)	Alkyl ortho phosphate ester (CAS # Trade Secret) % (Trade Secret)	Not	Not listed as carcinogenic – IARC, NTP or OSHA Teratogenicity, mutagenicity: No effects listed. LD(50) N.E.; LC(50) N.E. Hazardous decomposition products: Oxides of carbon & phosphorus.	SARA Title III Section 311/312: Immediate Section 313: Contains Toxic Chemicals (1% or greater) = Glycol ethers 8%	p.123
27	XLO-5 (crosslinker for gelled oil system)  USA	Hazardous: Corrosive  Hazard class: 8 UN/NA number: UN3264	Corrosive liquid, acidic, organic, n.o.s. (contains ferric sulfate)	Ferric sulphate (CAS# Trade Secret) % (Trade Secret)	Soluble	Not listed as carcinogenic – IARC, NTP or OSHA Teratogenicity, mutagenicity: No effects listed. LD(50) N.E.; LC(50) N.E. Hazardous decomposition products: Oxides of carbon, nitrogen & sulphur.	SARA Title III Section 311/312: Immediate Section 313: Does not contain ingredients (at a level of 1% or greater) on the List of Toxic Chemicals	p.127
28	NE-110W (non-emulsifier for stimulation treatment)  Singapore	HMIS Hazard Index Health: 2 Flammability: 3 Reactivity: 0  Hazard Class: 8 UN 2920	Corrosive liquids, flammable, n.o.s. (contains sulphuric acid & methyl isobutyle carbinol)	Aromatic hydrocarbon mixture (64741-67-9) % Proprietary Flammable Naphthalene sulfonic acid bis(1-methylethyl) compound with cyclohexanamine (68425- 61-6) % Proprietary Corrosive Methyl isobutyle carbinol (108-11-2) % Proprietary Flammable, irritant	Dispersible	Not listed as carcinogenic – IARC, NTP or OSHA Teratogenicity, mutagenicity: No effects listed. LD(50) No effects listed. LC(50) No effects listed.  Hazardous decomposition products: Oxides of carbon, nitrogen & sulphur.	SARA Title III Section 302/304: Contains the following ingredients listed as an <b>Extremely Hazardous</b> Substance: Sulfuric acid (CAS# 1664-93-9) Section 311/312: Immediate, Delayed, Fire Section 313: Contains ingredients (at a level of 1% or greater) on the List of Toxic Chemicals:	p.131

				Naphthalene (91-20-3) % <7 Flammable, toxic Isopropano (67-63-0) % Proprietary Flammable, irritant Sulfuric acid (7664-93-9) % <3 Corrosive			Naphthalene (CAS# 91-20-30) 7%	
29	GBO-9L  (gelled oil breaker)  USA	HMIS Hazard Index Health: 1 Flammability: 2 Reactivity: 0	Combustible liquid, n.o.s. (contains diesel)	Magnesium oxide (1309-48-4) 65-70% Irritant Diesel fuel (CAS# N.E.) 30-35% Combustible Crystalline silica (N.E.) <1% Irritant Methanol (67-56-1) <1% Flammable	Slightly soluble	Teratogenicity, mutagenicity: No effects listed. LD(50) Disel 7.65 g/kg (oral-rat) LC(50) N.E. Hazardous decomposition products: Oxides of carbon & sulphur.	SARA TITLE III SECTION 302/304 This product does not contain ingredients listed as an Extremely Hazardous Substance. SECTION 311/312 Immediate, Fire SECTION 313 This product does not contain ingredients (at a level of 1% or greater) on the List of Toxic Chemicals.	p.136
30	Methanol  (solvent)  Canada	NFPA (National fire protection assoc.) Hazard index: Health: 1 Flammability: 3 Reactivity: 0	Dangerous Class 3(6.1), UN1230, P.G. II Limited quantity: ≤1litres	Methanol (67-56-1) 99-100%	Completely soluble	Reproductive toxicity: Reported to cause birth defects in rats exposed to 20,000 ppm  LD50: 5628 mg/kg (oral/rat) LC50: 64000 ppm (inhalation/rat)  Hazardous Combustion Products: Toxic gases and vapours; oxides of carbon and formaldehyde.	Methanol in fresh or salt water may have serious effects of aquatic life. A study on methanol's toxic effects on sewage sludge bacteria reported little effect on digestion at 0.1% while 0.5% methanol retarded digestion. Methanol will be broken down into CO2 and water. Biodegrades easily in water.	p.141
31	Halliburton 20/40 Carbo Lite (ceramic propping agent) Australia	HSNO Hazardous 6.4A, 6.9B Hazard Alert Code: Low	Not regulated as dangerous goods for transport.	Mullite (1302-93-8) 11-30% Cristobalite (14464-46-1) 1-10% No other ingredient information disclosed	Insoluble	Toxicity data not available  Cristobalite a confirmed <b>carcinogen</b> .	No data available	p.148
32	Halliburton BE-3 Bactericide (DBNPA containing biocide)  Australia	HSNO Hazardous 6.1B, 6.1D, 6.5A, 6.5B, 6.8B, 6.9, 8.2C, 8.3A, 9.1A, 9.3C. Hazard Alert Code: <b>High</b>	Toxic liquid, organic, n.o.s.	Propylene glycol (57-55-6) >60% <b>2,2-dibromo-3-nitrilopropionamide</b> (10222-01-2) 11-30%	Miscible	No data	2,2-dibromo-3-nitrilopropionamide: 48 hr EC50 (0.74) mg/L American oyster Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. This material and its container must be disposed of as hazardous waste. Avoid release to the environment.	p.155
33	Halliburton BE-5 Microbiocide	HSNO Hazardous 6.1D, 6.5B, 6.7A,	Corrosive solid, Toxic, n.o.s.	Silica amorphous, diatomaceous earth	Partly miscible	Silica dust, crystalline, in the form of quartz or cristobalite –	Toxic to aquatic organisms, may cause long-term adverse effects in	p.164

	(broad spectrum microbiocide used in fracturing)  Australia	6.9B, 8.1A, 8.2B, 8.3A, 9.1D. Hazard Alert Code: <b>Extreme</b>		(61790-53-2) 31-60% 5- chloro- 2- methyl- 4- isothiazolin- 3- one (26172-55-4) 1-10% 2- methyl- 4- isothiazolin- 3- one (2682-20-4) 1-10% silica crystalline – quartz (14808-60-7) 1-10% magnesium chloride (7786-30-3) 1-10% No other ingredient information disclosed		<b>Carcinogen</b> Group 1 (Intn' Agency for Research on Cancer, IARC)  Decomposition may produce toxic fumes of: carbon dioxide (CO <sub>2</sub> ), hydrogen chloride, phosgene, nitrogen oxides (NO <sub>x</sub> ), sulfur oxides (SO <sub>x</sub> ), metal oxides, other pyrolysis products typical of burning organic material. May emit corrosive fumes.	<b>the aquatic environment.</b> This material and its container must be disposed of as hazardous waste. Avoid release to the environment.	
34	Halliburton CL-28M (cross linker)  Australia	Not classified as hazardous	Not regulated as dangerous goods for transport.	Borate salts 31-60%	Miscible	No data	No data	p.174
35	Halliburton CLA-STA XP Additive  (clay stabilizer)  USA	HSNO Hazardous 6.1D, 6.3A, 6.9, 8.3A, 9.1B Hazard Alert Code: <b>High</b>	Not regulated as dangerous goods for transport	polyepichlorohydrin, trimethylamine quaternized (51838-31-4, 37229-18-8) 30-60%	Miscible	No LD50 or TDLo data.  Combustion products include: carbon dioxide (CO <sub>2</sub> ), nitrogen oxides (NO <sub>x</sub> ), other pyrolysis products typical of burning organic material. May emit poisonous and/or corrosive fumes.	<b>Toxic to aquatic organisms with long lasting effects.</b>  No data	p.180
36	Halliburton Clayfix-II Material  (additive) USA	HSNO Hazardous 6.1C, 6.3A, 6.9, 8.3A, 9.1A, 9.3B Hazard Alert Code: <b>High</b>	Toxic liquid, organic, n.o.s.	Tetramethylammonium chloride (75-57-0) 30-60%	Miscible	Data not available.  On combustion, may emit toxic fumes of carbon monoxide (CO). Combustion products include: carbon dioxide (CO <sub>2</sub> ), hydrogen chloride, phosgene, nitrogen oxides (NO <sub>x</sub> ), other pyrolysis products typical of burning organic material. May emit poisonous fumes.	<b>Very toxic to aquatic organisms.</b> This material and its container must be disposed of as hazardous waste. Avoid release to the environment.	p.187
37	Halliburton HYG-3 (buffer) Australia	HSNO Hazardous 6.3B, 6.4A Hazard Alert Code: <b>Moderate</b>	Not regulated as dangerous goods for transport	Fumaric acid (110-17-8) >60% <b>No other ingredients disclosed</b> by manufacturer.	Soluble	No data. Combustion products include: carbon dioxide (CO <sub>2</sub> ), other pyrolysis products typical of burning organic material. May emit poisonous / corrosive fumes. Irritating fumes of maleic anhydride may form in fires.	No data	p.195
38	Halliburton K-34 (sodium bicarbonate buffer)	HSNO Hazardous 6.3B, 6.4A, 6.9. Hazard Alert	Not regulated as dangerous goods for	Sodium bicarbonate (144-55-8) 60-100%	Miscible	No LD50 or TLo data. Combustion products include: carbon monoxide (CO), carbon dioxide	No data	p.203



	USA	Code: <b>Moderate</b>	transport			(CO <sub>2</sub> ), other pyrolysis products typical of burning organic material. May emit corrosive fumes.		
39	Halliburton K-38 Part Number 516.00053  (was HLX-W291", "pH buffer) Australia	HSNO Hazardous 6.1D, 6.3A, 6.4A, 6.8A, 6.9. Hazard Alert Code: <b>High</b>	Not regulated as dangerous goods for transport	Sodium borate anhydrous (1330-43-4) >60% <b>No other ingredient information disclosed.</b>	Soluble	No data  Decomposition may produce toxic fumes of: caustic compounds.	No data	p.210
40	Halliburton Losurf 357 Surfactant  (Part Number 516.00369) Australia	HSNO Hazardous 3.1B, 6.1E, 6.4A, 6.9. Hazard Alert Code: <b>High</b>	Flammable liquid	Isopropanol (67-63-0) 31-60% <b>No other ingredient information disclosed</b>	Miscible	Data not available Isopropyl alcohol: <b>Carcinogen</b> Group 3 Isopropyl alcohol manufacture using strong acids: <b>Carcinogen</b> Group 1 (IARC)	This material and its container must be disposed of as hazardous waste.  Persistence in air: Medium	p.217
41	Halliburton MO-67  (additive) Australia	HSNO Hazardous 6.1D (oral), 6.1E (dermal), 8.1A, 8.2B, 8.3A, 9.1D (fish), 9.1D (crustacean). Hazard Alert Code: <b>Extreme</b>	Corrosive	Sodium hydroxide (1310-73-2) 10-30% Water >60%	Miscible	No LD50 or TClO data.  Decomposition may produce toxic fumes of: nitrogen oxides (NO <sub>x</sub> ).	This material and its container must be disposed of as hazardous waste.	p.225
42	Halliburton NF-3 Part No.516.00516  (NF 3 cementing defoamer) Australia	HSNO Hazardous 6.3B, 6.4A. Hazard Alert Code: <b>Moderate</b>	Not regulated as dangerous goods for transport	Polyoxylated alcohols (proprietary) CAS # not provided >60% Dipropylene glycol (25265-71-8) 31-60% No other ingredient information disclosed.	Immiscible	No data  On combustion, may emit toxic fumes of carbon monoxide (CO).	No data	p.233
43	Halliburton Optiflo-III Delayed Release Breaker (AMMONIUM PERSULPHATE) USA	HSNO Hazardous 5.1.1C, 6.1D, 6.3A, 6.4A, 6.5A, 6.5B, 6.7A, 6.9, 6.9B, 9.3C. Hazard Alert Code: <b>High</b>	Oxidizing agent	Ammonium persulfate (7727-54-0) >60% Silica crystalline – quartz (14808-60-7) 10-30%	Partly miscible	Silica dust, crystalline, in the form of quartz or cristobalite – <b>Carcinogen</b> Group 1 (IARC) Decomposition may produce toxic fumes of: nitrogen oxides (NO <sub>x</sub> ), sulfur oxides (SO <sub>x</sub> ), silicon dioxide (SiO <sub>2</sub> ).	No data  This material and its container must be disposed of as hazardous waste.	p.240
44	Halliburton SSO-21  (foaming agent) Australia	HSNO Hazardous 3.1C, <b>6.1B</b> , 6.1C, 6.3A, 6.4A, 6.8A, 6.9, 6.9A, 9.3C, 9.1C. Hazard Alert Code: <b>High</b>	FLAMMABLE LIQUID, N.O.S.(contains methanol)	Oxyalkylated alkyl phenol (CAS # not provided) 30-60% <b>Ethylene glycol monobutyl ether</b> (111-76-2) 10-30% Methanol (67-56-1) 10-30% Diethylene glycol (111-46-	Miscible	Data not available  2- Butoxyethanol: <b>Carcinogen</b> Group 3 (IARC)	Methanol 96 hr LC50 (100) mg/L Fathead minnow Fish.  This material and its container must be disposed of as hazardous waste.	p.250

				6) 1-5%				
45	Halliburton WG-11 Gelling Agent  Australia	HSNO Hazardous 6.4A, 6.9. Hazard Alert Code: <b>Moderate</b>	Not regulated as dangerous goods for transport	guar gum derivative (CAS # <b>not provided</b> ) 60-100%	Miscible	No data  Combustion products include: carbon monoxide (CO), carbon dioxide (CO2), other pyrolysis products typical of burning organic material. May emit corrosive fumes.	No data	p.259
46	Halliburton WLC-4 Fluid Loss Additive (was FDP-S368, Part Number 516.00194) Australia	HSNO Hazardous 6.3B Hazard Alert Code: Low	Not regulated as dangerous goods for transport.  Heating may cause expansion or decomposition leading to violent rupture of containers.	Starch (9005-25-8) >60% No other ingredient information <b>disclosed</b>	Miscible	No data  On combustion, may emit toxic fumes of carbon monoxide (CO).	No data	p.266
	<b>BELOW ARE PRODUCTS ADDED TO THE May 2012 report</b>							
47	Halliburton WG-19 GELLING AGENT Australia	MSDS does not have HSNO classes. Below are from EPA/CCID: Monoethanolamine: 3.1D, 6.1D, 8.1A, 8.2C, 8.3A, 9.1D, 9.3C Guar gum: 6.3B, 6.5A, 6.5B, 9.1D		Monoethanolamine (141-43-5) < 1.5% Guar gum (9000-30-0) 60 - 100%				p.275
48	Halliburton WG-11 GEL WITH 10% MUSOL UK	MSDS does not have HSNO classes. Below are from EPA/CCID: 3.1D, 6.1D, 6.1E, 6.3B, 6.4A, 9.3C	Flammable	<b>Ethylene glycol monobutyl ether</b> (111-76-2) 10-30%		Not determined CCID says: Acutely toxic, harmful to terrestrial vertebrates	Not determined	p.281
49	Halliburton WAC-12L ADDITIVE Australia	MSDS does not have HSNO classes. Below are from EPA/CCID: Ethyl benzene: 3.1B, 6.1D, 6.1E, 6.3B, 6.4A, 6.7B,	Flammable liquid	<b>Ethyl benzene</b> (100-41-4) 1-5% <b>Xylene</b> (1330-20-7) 10-30% 1,2,4 Trimethylbenzene (95-63-6) 10-30% Light aromatic solvent (64742-95-6) 30-60%		<b>Carcinogenic</b> , acute toxicity, reproductive toxicity, target organ (liver and kidney) systemic toxicity. Ecotoxic to terrestrial vertebrate. Toxic to aquatic organisms (acute and chronic).	Resistant. Prevent from entering sewers, waterways, or low areas.	p.287

		<p>6.8B (Suspected human reproductive or developmental toxicants), 6.9B, 9.1D, 9.2D, Xylene: all of the above except 6.3B, 6.7B, 9.2D but add 3.1C, 6.3A, 9.3C</p> <p>Trimethylbenzene : 3.1C, 6.1D, 6.1E, 6.3B, 6.4A, 6.9B, 9.1B</p> <p>Light aromatic solvente (aka petroleum) is not in CCID but in NZloC as approved.</p>						
50	Halliburton NF-5 (defoamer) UK	<p>MSDS does not have HSNO classes. Below are from EPA/CCID:</p> <p>Rape oil: 9.1D slightly harmful to aquatic env.</p> <p>Polypropylene glycol: 6.1D, 6.4A, 9.3C</p> <p>Aluminum stearate not in CCID but listed as approved in NZloC</p>		<p>Rape oil (8002-13-9) 60-100%</p> <p>Polypropylene glycol (25322-69-4) 5-10%</p> <p>Aluminum stearate (637-12-7) 1-5%</p>				p. 293
51	Halliburton LOSURF-357 SURFACTANT		Flammable liquid	Isopropanol (67-63-0) 30-60%		<p>May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed. May be absorbed through the skin. Repeated</p>		p.301

						overexposure may cause liver and kidney effects.		
52	Halliburton LOSURF-300 NONIONIC SURFACTANT		Flammable liquid	Isopropanol (67-63-0) 30-60% Light aromatic solvent (64742-95-6) 1-030% Ethoxylated nonylphenol 5-10%		R10 Flammable. R40 Limited evidence of a carcinogenic effect. R23/24/25 Toxic by inhalation, by contact with skin, and if swallowed. R39/23/24/25 Toxic: danger of very serious irreversible effects through inhalation, in contact with skin, and if swallowed.  May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed.		p.307
53	Halliburton K-34			Sodium bicarbonate (144-55-8) 60-100%				313
54	Halliburton HYG-3			Fumaric acid (110-17-8) 60-100%		May cause eye and respiratory irritation.		319
55	Halliburton SP Breaker			Sodium persulfate (7775-27-1) 60-100%		May cause allergic skin and respiratory reaction. May cause eye irritation. Oxidiser.	Not determined	325
56	Halliburton FR-20		solid	Acrylamide copolymer (9003-05-8) 60-100%		May cause eye, skin, and respiratory irritation	Not determined Bury in a licensed landfill according to federal, state, and local regulations	331
57	Halliburton BC-140		liquid	Monoethanolamine borate (26038-87-9) 30-60% Ethylene glycol (107-21-1) 10-30%		May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed. May cause birth defects. Repeated overexposure may cause liver and kidney effects	Not determined. Disposal should be made in accordance with federal, state, and local regulations	337
58	Halliburton KCL Potassium Chloride		solid	Potassium chloride (7447-40-7) 60-100%		May cause eye, skin, and respiratory irritation	Not determined. Bury in a licensed landfill according to federal, state, and local regulations	343
59	Halliburton GBW-30 Breaker		solid	Cellulase enzyme 5-10% - no cas number or other ingredients??		May cause eye and respiratory irritation. May cause allergic respiratory reaction. Airborne dust may be explosive	Not determined. Bury in a licensed landfill according to federal, state, and local regulations	349
60	Halliburton FE-1A Acidizing composition		liquid	Acetic anhydride (108-24-7) 30-60% Acetic acid (64-19-7) 30-60%		May cause eye, skin, and respiratory burns. May be harmful if swallowed. Combustible.	Not determined. Disposal should be made in accordance with federal, state and local regulations	357

61	Halliburton Clayfix material			Ammonium chloride (12125-02-9) 60-100%		May cause eye, skin, and respiratory irritation. May be harmful if swallowed	Bury in a licensed landfill according to federal, state, and local regulations	365
62	Halliburton Clayfix-II material		liquid	Alkylated quaternary chloride – no cas number 30-60%		May cause eye, skin, and respiratory irritation. May be fatal if swallowed	Disposal should be made in accordance with federal, state, and local regulations	371
63	Du Pont CL-11 (cross linking agent)		Flammable liquid	TITANIUM, ISOPROPOXY(TRIETHANOLA MINATO)( 74665-17-1) 80% ISOPROPYL ALCOHOL (67-63-0) 20%			Aquatic Toxicity 96 Hour LC50, Fathead Minnows: 11,130 mg/l for Isopropanol. Treatment, storage, transportation, and disposal must be in accordance with applicable Federal, State/Provincial, and Local regulations. Recover nonusable free liquid and dispose of in approved and permitted incinerator. Do not flush to surface water or sanitary sewer system. This material may be a RCRA regulated hazardous waste upon disposal due to the ignitability characteristic.	377
64	Halliburton CAT-3 Activator			EDTA/Copper chelate 10-30% no cas number		May cause eye, skin, and respiratory irritation. May cause headache, dizziness, and other central nervous system effects. May be harmful if swallowed		385
65	Halliburton BE-5 microbiocide		Granular Corrosive solid, acidic, organic, N.O.S.	5-Chloro-2-methyl-4-isothiazolin-3-one (26172-55-4) 5-10% Magnesium nitrate (10377-60-3) 5-10% Crystalline silica, cristobalite (14464-46-1) - 01% Crystalline silica, quartz (14808-60-7) 0-1%		<b>CAUTION! - ACUTE HEALTH HAZARD</b> May cause eye and skin burns. May cause respiratory irritation. May be harmful if swallowed. May cause allergic skin reaction. Repeated overexposure may cause liver and kidney effects. <b>DANGER! - CHRONIC HEALTH HAZARD</b> Breathing crystalline silica can cause lung disease, including silicosis and lung cancer. Crystalline silica has also been associated with scleroderma and kidney disease.	Disposal should be made in accordance with federal, state, and local regulations	391
66	Halliburton BE-4 Bactericide	GHS Classification Acute Toxicity	liquid	hexahydro-1,3,5-tris(hydroxyethyl)triazine		Formaldehyde Is carcinogenic		399

		(Oral) Category 4 Eye Irritation Category 2A Respiratory Sensitizer Category 1 Skin Sensitizer Category 1		(4719-04-4) >60% formaldehyde (50-00-0)				
67	BC-140 USA		liquid	ETHYLENE GLYCOL (107-21-1) 11-30% MONOETHANOLAMINE (141-43-5) 1-10%				411

**HSNO categories:** 1-5, 8.1A Physical Hazards (explosive, flammable, oxidizing, corrosive to metal ...); 6, 8.2, 8.3 Health Hazards (acute toxicity, skin corrosion / irritation, germ cell mutagenicity, carcinogen, reproductive toxicity, specific target organ systemic toxicity ...); 9.1-9.4 Environmental Hazards (aquatic toxicity, ecotoxic to soil environment / terrestrial vertebrates / invertebrates ...)

**Median lethal dose, LD<sub>50</sub>** (abbreviation for "Lethal Dose, 50%"), **LC<sub>50</sub>** (Lethal Concentration, 50%) or **LCt<sub>50</sub>** (Lethal Concentration & Time) of a [toxin](#), [radiation](#), or [pathogen](#) is the [dose](#) required to kill half the members of a tested population after a specified test duration.

**Lowest published toxic dose (Toxic Dose Low, TD<sub>Lo</sub>)** is the lowest [dosage](#) per unit of bodyweight (typically stated in [milligrams](#) per [kilogram](#)) of a [substance](#) known to have produced signs of [toxicity](#) in a particular [animal species](#).

**LD<sub>Lo</sub> (Lethal Dose Low)** is the lowest [dosage](#) per unit of bodyweight (typically stated in [milligrams](#) per [kilogram](#)) of a [substance](#) known to have resulted in [fatality](#) in a particular [animal species](#).

**SARA Title III: The Emergency Planning and Community Right-to-Know Act** has four major components:

- Emergency planning (Sections 302 & 303); Emergency release notification (Section 304); Hazardous chemical inventory (Sections 311 & 312); Toxic chemical release inventory (Section 313)