fracking inquiry

From: JA_AK Raynor [redacted]
Sent: Wednesday, 7 February 2018 9:41 PM
To: fracking inquiry
Subject: Electronic Copy of Submission to Enquiry at Katherine
Attachments: Final Submission.doc

Good Evening,

Please find attached the electronic copy of my verbal submission from today at Katherine as you requested.
Please note I found one error in my figures - the Economics Chapter should have been $38m/year not $3.8m/year.
This however does nothing to change my point especially when you look at all the different tax credits these companies have.

Regards,

Annette Raynor (Mrs)

Final Submission – Annette Raynor

Good Afternoon

Let me start by saying how disappointed I am with this report. I was hoping the community would be heard. However if I accept ALL your figures in this report as "FACTS", (which I don't), but the sake of the argument say I do..... Well I could still drive a road train thru this report. The facts and figures do NOT stack up.

In front of me are all the reports relating to your Final Draft Report.

1. Your Final Draft Report
2. CSRIO Report on Well Life Cycle and Well Integrity
3. ACIL Allen Economic Report
4. Coffey's Social Licence Report, which is in 3 separate reports

I have read them all.

Lets start with a Thank You to the Panel for the recommendations in Chapter 14 (Regulatory Reform) and Chapter 15 (Environmental Baseline Data).

We all know that the NT badly needs this, however it is already being watered down and as I said the first time I sat in front of you it will not be enforced. So I will not repeat myself.

As far as Chapter 11 goes – as I am not Aboriginal I will leave this to the Aboriginals themselves to respond to. This is to ensure you cannot accuse me of giving any misleading or spreading any misinformation to you, the Panel.

Chapter 9 (Greenhouse Gas Emissions) – Well this chapter did my head in. But if its like all the other chapters, which I do understand, then the figures are made up. The only thing I will state is a comment on the statement you make on Page 203, "that there is no evidence the bubbling Condamine River is due to CSG activities" – Its a good thing that no baseline data was done prior to CSG activities to prove this, isn't it.

Chapter 8 (Land) – On Page 169 you state that between 1,000 and 1,500m squared, will be used for the Well Pad Development ONLY. You make this sound insignificant. But this is for each Well Pad so lets put this into prospective.

I have here examples of what is approximately 1km squared and this insignificant amount of land is the size of –

1. Sydney Olympic Park (Wetlands & Waterways) or
2. Belmont Golf Club at Lake Macquarie or
3. Peng Chau Island in Hong Kong or
4. The Old City of Jerusalem

This is per Well Pad.

Yet on Pages 316 & 325 for the Breeze scenario you state for the total land use under this scenario it is only approximately 67km squared. Well this is approximately the size of –

1. Norfolk Island & Macau combined or

2. Slightly bigger than Bermuda

And yet again on Page 327 you re-iterate, and I quote “Land area used by industry is very small under all development scenario’s”.

Once again you say this is acceptable.

Now I know the NT is big and we have a small population, in the scheme of things, and most of the population lives in Darwin – but this is not acceptable.

The only other comment for this section is – you talk about the Landscape Amenity (Pages 187 to 190) and how this small area will not affect our landscape. Small area is firstly an understatement, but I would suggest the Panel take a drive across the Barkly Highway at night – it is already ‘flaring’ it is already affecting our spectacular unspoiled landscape. Once again I state this is not acceptable.

Only 4 more chapters to go –

Chapter 7 – Water

Using your figures and applying it to the PFAS issue Katherine is now dealing with, the best case scenario is –

1. The Katherine river was only contaminated, when we all found out in 2016. And not before.
2. Working backwards, using your figures this took 16 years to get from RAAF Base Tindal to the River – 1,000m per year.
3. Therefore PFAS reached the Tindal aquifer in the year 2000.
4. This means then that it took 12 years to contaminate or seep down to the aquifer. (Tindal opened in 1988)

Now this would correspond with your figures on Page 140 – stating any spill would take 10 years to reach the ground water.
However is contradicts what you state on Pages 114 and 137 stating it would only travel meters per year and would take decades for the water to travel 100m.

Now FPAS is only one chemical – not a multitude of chemicals mixed together put under pressure and then mixed with other Natural occurring ‘nasties’. But I will come back to this.

Your matrix, even if I believe that the possibility is extremely low of contamination occurring, the consequence must be extremely high. (Unless you have learnt to live without water). Therefore the overall outcome must be at least Medium.
You have found 20 water related risks. It will only take one to have serious consequences. Even with regulations in place - this is not good enough – this is not acceptable.

Jumping now to Chapter 10 (Public Health) – you found a low likelihood and a low-medium consequence (Page 231) of affecting any of us. Well this ties into the water issue nicely so lets go back to the chemicals used and the other Natural occurring “nasties”.

I have here the list of chemicals used in Fracking –

1. From your website
2. From Origin and Santos Websites

Lets look at just some of these a little closer.
I have here, not all, but some, of these chemicals MSDS sheets.

1. (all the side tabs) – All except one of these state "Do NOT allow the product to enter waterways, drains and sewers OR Do NOT discharge into drains/surface water/ground water"
2. (top tabs) – These state "Must be transported under dangerous goods transport regulations"
3. (all double side tabs) – These all state "If the product does enter a waterway, you must advise the Environmental Protection Authority"
4. (3 side tabs) – This one states "Runoff from dilution water may be toxic and/or corrosive and pollute waterways. Do NOT allow this product to enter waterways drains and sewers"

Now these are for each individual chemical. There is NO MSDS sheet for the combined or combination of these chemicals, let alone the mixture of chemicals that include the Natural occurring "nasties" in the ground that is being brought to the surface.

Once again I ask the Panel to look at the big picture. This is NOT one chemical, one well, being "Fracked" once. This is multiple chemicals, multiple wells, being "Fracked" multiple times.

And once again you say this acceptable.

But before I go any further lets lets look at what that word "Acceptable" actually means –

I have the research from numerous dictionaries, which all say the same thing.

1. Barely passable
2. 65%
3. Satisfactory

Now I do not want my doctor to be acceptable under this definition, nor do I want the pilot in an aircraft I am in to be acceptable. You may be able to live with this but I will not. Acceptable is not good enough.

Social Impacts – Chapter 12 – where do I start?

You state that this chapter will be updated when Coffey completed there report. This has now been released, in 3 reports. Two of these reports deal with setting up a framework for Social Licence in the NT and the other report is supposedly the "Beetaloo Sub-Basin Social Licence Case Study". This is the area I will continue with –

1. Most of the information in this document – any school age child could have 'googled' and presented.
2. Pages 6 and 9 both state that there were 2 rounds of the community consultations – NOT TRUE.

3. Page 10 states that the Katherine Town Council was consulted – when I questioned the Katherine Town Council on 23 Jan 18 the Mayor denied being spoken to and the CEO could not recall.
4. Page xvii – Conclusion – This report states the "Concerns about water resources are heightened by the PFAS contamination in and around RAAF Base Tindal near Katherine and incorrect assumptions about water management based on CSG in QLD" – NOT True but this is the only issue of any kind in this document that could even remotely be attributed to the 1 consultation in Katherine.

Last time I sat in front of you I went into this subject in depth. This report or the Coffey's report does not take anything previously stated to you into account.

However as far as your report goes I question why in BOLD, on Page 280 you would highlight FIFO Activists?

After all you mention more than once –

1. Misinformation
2. To Create Fear
3. Lacking Understanding of Basic Technical Facts
4. Confusing CSG and Shale
5. Not Locals

I thought this was a "Scientific" Report, but it seems it is only a "Scientific" fact if it comes from –

1. A Gas Company
2. A Government Department who's primarily job is the Industry
3. A Consultant Company who has never said anything against the Gas Industry
4. Or a Person/Company who has been paid, in some way, by the Gas Industry. (and in some instances is so behind the Companies because its so good – they are selling there places and moving).

Everyone else who has presented or spoken – knows nothing.

Finally on this subject I know of at least 2 complaints that were lodged to you, the Panel, on the second attempt of the Social Licence Consultations and neither have been responded to or addressed. As such if you believe this whole section can be taken seriously, is highly questionable. This does not just bring into doubt this section, but your whole report.

Moving on – the last Chapter I will say anything about – Economic Impacts – Chapter 13

I have used your or ACIL Allen figures, and taken them as "Facts", and even by doing this, once again I am driving the road train thru the "Misinformation" contained in this section.

Lets look at only the "Breeze" scenario and use the figures in the table on Page 315 & 316.

Now just looking at these figures this all looks and sounds wonderful. But lets look a little deeper.

Increased Employment – according to this we can expect 2,145 extra jobs over the 25years at an average of 82/year. But the rest of Australia loses that amount of jobs. MMMM I wonder

where they went. You admit on Page 323 that FIFO workers will be “significant” and therefore will take most of these jobs.

The other figures that are interesting are –

1. Income Tax - $6.2m/year
2. Other Federal & State Tax - $3.8m/year & $5.9m/year = Total $9.7m/year
3. GST - $14.3m/year
4. Payroll Tax – $2.9m/year
5. Royalties – $11.9m/year

Like I said this looks good, but I have here the ATO tax information for 2013/14, 2014/15 & 2015/16. I also have Origin’s and Santo’s own report for 2014, 2015 & 2016. And shock horror – NO tax was paid to the Australian Government in 2015 or 2016. In 2014 Origin did pay some tax.

Due to the time fastly running out lets have a very quick look at only the 2016 report.

1. Both paid NO income tax
2. Both paid NO Petroleum Resource Rent Tax
3. Both paid NO Goods & Services Tax

In fact both received tax refunds.
But lets look at the tax they did pay –

1. Fringe Benefits tax – Origin $4m, Santo $5.04m
2. Payroll Tax – Origin $45m Santos $2.78m
3. Royalties – Origin $6m Santos $30.26m

Now these figures are for all of Australia and not just one state. So using these figures alone and presuming all the other Companies are very similar we can say goodbye to the extra –

1. $6.2m/year in Income Tax
2. Atleast some, if not all of the Other Tax ($9.7m/year) and
3. $14.3m/year in GST

This leaves us with, maybe the FBT.

Now the Payroll tax –
This amount is approx 12% more than Santo’s total or approx 6% more than Origin totals for all of Australia – not just for the NT.
Now admitly this $2.9m/year would be spread over all Companies and not just Origin and Santos.
But due to how the payroll tax is worked out this figure is mind blowing.

1. The NT only received 5.5% of the total allowable taxable wages that are paid in the NT only.
2. To receive this amount of money we would need 19 Companies paying $2.7m in allowable taxable wages in the NT only, but also having taxable wages in other states at or over $10.4m/year.

Now this is absurd when you truly look at it. But this, YOU say, is a “FACT”.

Finally lets look at the Royalties –

1. This is approx 39% of what Santos pays now OR

2. Approx 199% more than what Origin pays now

Once again this is Australia wide. Once again I understand it will be all Companies spreading the load, but really – what shower or rain did you come down in to buy this. These figures do NOT stack up.

NO GST, NO income tax, NO resources tax – Actually receiving a refund and you expect us to believe these figures.

I am truly disgusted with this report and the fact that you believe we would all buy this without question is even more disgusting. I would hope you relook honestly at the figures and the issues presented to you.

represents 1 km^2 on the surface of the earth.

In each case, the grid lines enclose one square kilometre.

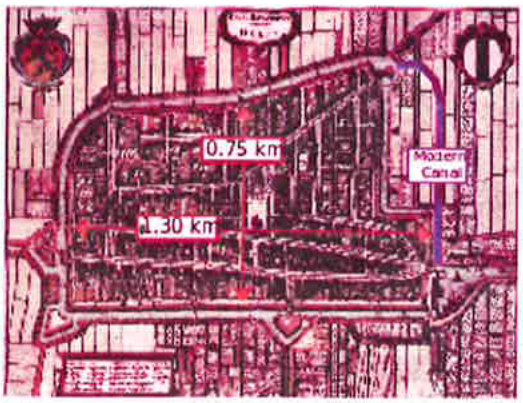
Part of an Ordnance Survey map, published 1952. The grid lines are at one kilometre intervals giving each square an area of one square kilometre. The map shows that the area of the island is about two square kilometres.

Medieval city centres

The area enclosed by the walls of many European medieval cities were about one square kilometre. These walls are often either still standing or the route they followed is still clearly visible, such as in Brussels, where the wall has been replaced by a ring road, or in Frankfurt, where the wall has been replaced by gardens. The approximate area of the old walled cities can often be worked out by fitting the course of the wall to a rectangle or an oval (ellipse). Examples include

- Delft, Netherlands (See map alongside) 52°0′54″N 4°21′34″E

  The walled city of Delft was approximately rectangular.
  - The approximate length of rectangle was about 1.30 kilometres (0.81 mi).[5]
  - The approximate width of the rectangle was about 0.75 kilometres (0.47 mi).[5]
  - A perfect rectangle with these measurements has an area of 1.30×0.75 = 0.9 km^2



Map of Delft, Netherlands dated 1659. The walls enclosed an area of about 1 square kilometre

- Lucca (Italy) 43°50′38″N 10°30′2″E

  The medieval city is roughly rectangular with rounded north-east and north-west corners.
  - The maximum distance from east to west is 1.36 kilometres (0.85 mi).[5]
  - The maximum distance from north to south is 0.80 kilometres (0.50 mi).[5]
  - A perfect rectangle of these dimensions would be 1.36×0.80 = 1.088 km^2.

- Brugge (Belgium) 51°12′39″N 3°13′28″E

  The medieval city of Brugge, a major centre in Flanders, was roughly oval or elliptical in shape with the longer or semi-major axis running north and south.
  - The maximum distance from north to south (semi-major axis) is 2.53 kilometres (1.57 mi).[5]
  - The maximum distance from east to west (semi-minor axis) is 1.81 kilometres (1.12 mi).[5]
  - A perfect ellipse of these dimensions would be 2.53 × 1.81 × (π/4) = 3.597 km^2.

- Chester United Kingdom 53°12′1″N 2°52′45″W

  Chester is one of the smaller English cities that has a near-intact city wall.[6]
  - The distance from Northgate to Watergate is about 855 metres.[5]
  - The distance from Eastgate to Westgate is about 589 metres.[5]
  - A perfect rectangle of these dimensions would be (855/1000) × (589/1000) = 0.504 km^2.

Parks

Parks come in all sizes; a few are almost exactly one square kilometre in area. Here are some examples:

- Riverside Country Park, UK.[7]
- Brierley Forest Park, UK.[8]
- Rio de Los Angeles State Park, California, USA [9]
- Jones County Central Park, Iowa, USA.[10]
- Kiest Park, Dallas, Texas, USA [11]
- Hole-in-the-Wall Park & Campground, Grand Manan Island, Bay of Fundy, New Brunswick, Canada [12]
- Downing Provincial Park, British Columbia, Canada [13]
- Citadel Park, Poznan, Poland [14]
- Sydney Olympic Park, Sydney, Australia, contains 1 square kilometre of wetlands and waterways.[15]

Golf courses

Using the figures published by golf course architects Crafter and Mogford, a course should have a fairway width of 120 metres and 40 metres clear beyond the hole. Assuming a 6,000 metres (6,600 yd) 18-hole course, an area of 80 hectares (0.8 square kilometre) needs to be allocated for the course itself.[16][Note 1] Examples of golf courses that are about one square kilometre include:

- Manchester Golf Club, UK [17]
- Northop Country Park, Wales, UK [17]
- The Trophy Club, Lebanon, Indiana, US [18]
- Qingdao International Country Golf Course, Qingdao, Shandong, China
- Arabian Ranches Golf Club, Dubai [19]
- Sharm el Sheikh Golf Courses: Sharm el Sheikh, South Sinai, Egypt [20]
- Belmont Golf Club, Lake Macquarie, NSW, Australia [21]

Other areas of one square kilometre or thereabouts

- The Old City of Jerusalem is almost 1 square kilometre in area.[22]
- Milton Science Park, Oxfordshire, UK.[23]
- Mielec Industrial Park, Mielec, Poland [24]
- The Guildford Campus of Guildford Grammar School, South Guildford, Western Australia[25]
- Sardar Vallabhbhai National Institute of Technology (SVNIT), Surat, India [26]
- Île aux Cerfs Island, near the east coast of Mauritius.[27]
- Peng Chau Island, Hong Kong[28]

See also

- Conversion of units
- SI prefix for the precise meaning of the prefix "k"
- Square Kilometre Array, a proposed radio telescope in South Africa or Australia, which is intended to have a collecting area of approximately 1 km^2

Notes

1. Assume that each hole requires (6000÷18 + 40) = 373 metres in length. The area needed is (18 × 373 × 120 ÷ 10,000) = 80.64 ha (1 hectare = 10,000 square metres).

References

Get Convenience property report for Unnamed Road, South Australia 5724, Australia

Geography > Area > Land: **Countries Compared**

DEFINITION: Total land area in square kilometres.

Totals Per Capita Select year

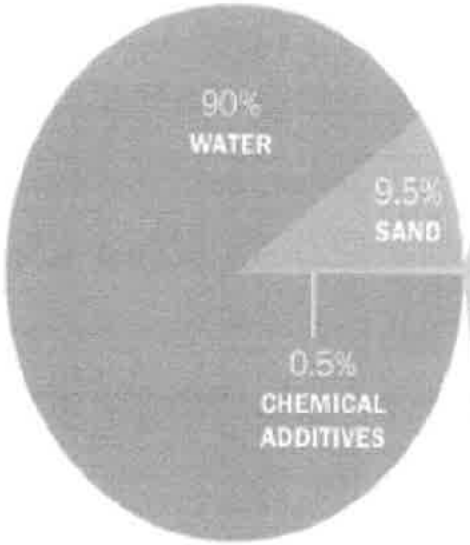
Group Totals

#	COUNTRY	AMOUNT	DATE	GRAPH	HISTORY
1	Russia	17 million sq km	2008		
2	Antarctica	14 million sq km	2008		
3	China	9.33 million sq km	2008		
4	United States	9.16 million sq km	2008		
5	Canada	9.09 million sq km	2008		
6	Brazil	8.46 million sq km	2008		

#	COUNTRY	AMOUNT	DATE	GRAPH	HISTORY
211	Wallis and Futuna	274 sq km	2008		
212	Cayman Islands	262 sq km	2008		
213	Saint Kitts and Nevis	261 sq km	2008		
214	Niue	260 sq km	2008		
215	Saint Pierre and Miquelon	242 sq km	2008		
216	Cook Islands	236.7 sq km	2008		
217	American Samoa	199 sq km	2008		
218	Aruba	193 sq km	2008		
219	Marshall Islands	181.3 sq km	2008		
220	Liechtenstein	160 sq km	2008		
221	British Virgin Islands	153 sq km	2008		
222	Christmas Island	135 sq km	2008		
223	Jersey	116 sq km	2008		
=224	Anguilla	102 sq km	2008		
=224	Montserrat	102 sq km	2008		
226	Guernsey	78 sq km	2011		
227	San Marino	61.2 sq km	2008		
228	British Indian Ocean Territory	60 sq km	2006		
229	Saint Martin	54.4 sq km	2011		
230	Bermuda	53.3 sq km	2008		
231	Bouvet Island	49 sq km	2008		
232	Pitcairn Islands	47 sq km	2011		
233	Norfolk Island	34.6 sq km	2008		
234	Macau	28.2 sq km	2008		

#	COUNTRY	AMOUNT	DATE	GRAPH	HISTORY
235	Europa Island	28 sq km	2006		
236	Tuvalu	26 sq km	2008		
237	Nauru	21 sq km	2008		
238	Cocos (Keeling) Islands	14 sq km	2008		
239	Palmyra Atoll	11.9 sq km	2006		
240	Tokelau	10 sq km	2008		
=241	Wake Island	6.5 sq km	2008		
=241	Gibraltar	6.5 sq km	2008		
243	Midway Islands	6.2 sq km	2006		
244	Clipperton Island	6 sq km	2008		
245	Navassa Island	5.4 sq km	2008		
=246	Ashmore and Cartier Islands	5 sq km	2008		
=246	Glorioso Islands	5 sq km	2006		
248	Jarvis Island	4.5 sq km	2006		
249	Juan de Nova Island	4.4 sq km	2006		
250	Johnston Atoll	2.63 sq km	2006		
251	Monaco	1.95 sq km	2008		
252	Howland Island	1.6 sq km	2006		
253	Baker Island	1.4 sq km	2006		
=254	Kingman Reef	1 sq km	2006		
=254	Tromelin Island	1 sq km	2006		
256	Holy See (Vatican City)	0.44 sq km	2008		
257	Bassas da India	0.2 sq km	2006		

< 1/1 > All



Note: BTEX additives are banned in the NT

Compound	Purpose	Common application	
Acids	Helps dissolve minerals and initiate fissure in rock (pre-fracture)	Swimming pool cleaner	
Sodium Chloride	Allows a delayed breakdown of the gel polymer chains	Table salt	
Polyacrylamide	Minimizes the friction between fluid and pipe	Water treatment, soil conditioner	
Ethylene Glycol	Prevents scale deposits in the pipe	Automotive anti-freeze, deicing agent, household cleaners	
Borate Salts	Maintains fluid viscosity as temperature increases	Laundry detergent, hand soap, cosmetics	
Sodium/Potassium Carbonate	Maintains effectiveness of other components, such as crosslinkers	Washing soda, detergent, soap, water softener, glass, ceramics	
Glutaraldehyde	Eliminates bacteria in the water	Disinfectant, sterilization of medical and dental equipment	
Guar Gum	Thickens the water to suspend the sand	Thickener in cosmetics, baked goods, ice cream, toothpaste, sauces	
Citric Acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice	
Isopropanol	Used to increase the viscosity of the fracture fluid	Glass cleaner, antiperspirant, hair coloring	

Source: DOE, GWPC, Modern Gas Shale Development in the United States: A Primer (2009)

Chemicals used in hydraulic fracturing

Water and proppant make up around 99.5% of the hydraulic fracturing fluid. Added chemicals make up the other 0.5%. The following chemicals are commonly added to the water to perform the following functions (see Figure 6 below):

a gelling agent, such as guar gum, is used to create a gel to suspend the proppant in the water and transport the proppant through the fracture;

a gel breaker, such as ammonium persulfate (used in hair bleach), that reduces the viscosity or thickness of the hydraulic fracturing gels so that they can transmit water, and gas surfactants, such as ethanol, together with a cleaning agent, in order to allow high pump rates and reduce pressure;

a bactericide or disinfectant, such as sodium hypochlorite (pool chlorine) and sodium hydroxide (used to make soap), to control bacteria growth in the well that contaminates the gas and restricts gas flow; and

acids and alkalis, such as acetic acid (vinegar) and sodium carbonate (washing soda), to assist in the initiation of the fracture and improve fluid flow in the rocks.
Toxic BTEX chemical additives (benzene, toluene, ethylbenzene and xylenes) are banned in the Northern Territory for use in the extraction of unconventional gas.

TAKEN FOR INQUIRY WEBSITE

Material Data Safety Sheets

- Baker Hughes MSDS -M275
- BJ Services MSDS - Boric Acid 3.6%
- BJ Services MSDS - CLAYMASTER 5C
- BJ Services MSDS - CLAYTREAT 3C
- BJ Services MSDS - GBW-12CD
- BJ Services MSDS - GBW-18
- BJ Services MSDS - GLFC-5
- BJ Services MSDS - GW-3
- BJ Services MSDS - MAGNACIDE 575 MICROBIOCIDE
- BJ Services MSDS - Sodium Hydroxide 10%
- BJ Services MSDS - Sodium Hypochlorite
- BJ Services MSDS - XLW-10
- BJ Services MSDS - XLW-32
- Halliburton MSDS - Acetic Acid 60
- Halliburton MSDS - BC 140C
- Halliburton MSDS - BE7
- Halliburton MSDS - BE-9
- Halliburton SDS CarbonNRT
- Halliburton MSDS - Caustic Soda 50
- Halliburton MSDS - CFT1000
- Halliburton MSDS - CFT1100
- Halliburton MSDS - CFT1200
- Halliburton MSDS - CFT1300
- Halliburton MSDS - CFT1400
- Halliburton MSDS - CFT1500
- Halliburton MSDS - CFT1600
- Halliburton MSDS - CFT1700
- Halliburton MSDS - CFT1800
- Halliburton MSDS - CFT1900
- Halliburton MSDS - CFT2000
- Halliburton MSDS - CFT2100
- Halliburton MSDS - CFT2200
- Halliburton MSDS - CFT2400
- Halliburton MSDS - CFT2500
- Halliburton MSDS - Choline Chloride Clay Control
- Halliburton MSDS - CLA-STA XP Additive
- Halliburton MSDS - Clayfix II Plus
- Halliburton MSDS - CLBCREAU81
- Halliburton MSDS - CLBEAU196
- Halliburton MSDS - CLLAU301
- Halliburton MSDS - CLSAU352
- Halliburton MSDS - CLWGAU421
- Halliburton MSDS - DCA-11001
- Halliburton MSDS - DCA-13002
- Halliburton MSDS - DCA-19001

- Halliburton MSDS - DCA-19002
- Halliburton MSDS - DCA-25003
- Halliburton MSDS - FDP-S1088-13_Surfactant
- Halliburton MSDS - GasPerm 1100
- Halliburton MSDS - GBW-30 Breaker
- Halliburton MSDS - HC-2A
- Halliburton MSDS - HpH Breaker
- Halliburton MSDS - Hydrochloric Acid
- Halliburton MSDS - Sand Common White
- Halliburton MSDS - Sand Premium Brown
- Halliburton MSDS - Sodium Fluorescein Powder
- Halliburton MSDS - THPS 75%
- Halliburton MSDS - WG-36
- Schlumberger MSDS - Aluminium Sulphate Powder
- Schlumberger MSDS - Biocide BPA68915
- Schlumberger MSDS - Clear FRAC LT J551A
- Schlumberger MSDS - F104
- Schlumberger MSDS - Formation Cleaning Solution M091
- Schlumberger MSDS - HCL 32%
- Schlumberger MSDS - J218
- Schlumberger MSDS - J479
- Schlumberger MSDS - J494
- Schlumberger MSDS - J567
- Schlumberger MSDS - J580
- Schlumberger MSDS - J588
- Schlumberger MSDS - J589
- Schlumberger MSDS - J590
- Schlumberger MSDS - J597
- Schlumberger MSDS - L010
- Schlumberger MSDS - L064
- Schlumberger MSDS - L071
- Schlumberger SDS - J625C
- Schlumberger SDS - J479
- Schlumberger SDS - J610
- Schlumberger SDS - J318
- Schlumberger SDS - J218
- Schlumberger SDS - L071

FACT SHEET

HYDRAULIC FRACTURE STIMULATION

				COMMON USE	RANGE OF VOLUMES IN FRAC FLUID	
GROUP/ FUNCTION	CAS NUMBER	CHEMICAL TYPE OR NAME	COMMONLY FOUND/USED IN HOUSEHOLD PRODUCTS	% VOLUME OF CHEMICAL IN HOUSEHOLD ITEMS	GROUP % BY VOLUME (AVERAGE)	% VOLUME RANGE OF CHEMICAL IN FRAC FLUID
Sand (Proppant)/ Water	7732-18-5	Water	Irrigation, drinking, bathing, cooking	1 to 100%	98.79% to 99.9%	88% to 97.6%
	14808-60-7	Silicon Dioxide (quartz/sand)	Hand cleaner, arts and crafts, glass	1 to 100%		2.37 to 12%
Water Conditioning (Microbial/pH Control)	7681-52-9	Sodium Hypochlorite	Disinfectant, bleaching agent, cleaners, cleaning of milking equipment, water treatment, medical use, mildew remover, anti-bacterial cleanser	0.1% to 20%		0.01% to 0.02%
	1310-73-2	Sodium Hydroxide (caustic soda)	Food preparation, soaps, detergents, toothpaste, aftershave, face mask, teeth whitening strips, eau de cologne, body wash, face cleaning pad, hair remover, cocoa processing	0.1% to 5%		0.002% to 0.1%
	497-19-8	Sodium Carbonate	Household and laundry/dishwasher cleaners, toothpaste, fish aquarium, hair care, spa water clarifier	0.5% to 85%	0.075% to 0.1%	0.0% to 0.025%
	144-55-8	Sodium Bicarbonate	Baking powder, cakes, household cleaners, vegetable cleaner, toothpaste, fish aquarium, baby powder, deodoriser	1% to 100%		0.0% to 0.006%
	64-19-7	Acetic Acid	Vinegar, food preparation and manufacturing, salad dressings, pickled onions, relishes and spreads, household cleaning products	1% to 5%		0% to 0.1%
Clay Management	7447-40-7	Potassium Chloride	Table salt substitute, medical use, hair products, pet supplements, african violet food	0.5% to 40%	0.0% to 0.91%	0.0% to 0.91%
Gel/Viscosity Management	6410-41-9	CI Pigment Red 5	Food colouring, colour pigment in cosmetics, soaps ink, paint	0.01% to 30%	0.0% to 0.25%	0.0% to 0.00009%
	100-43-52-4	Calcium Chloride	Detergents, cosmetics, deodorant, pet products, desiccant, food additive, sports drinks, pickles	0.1% to 90%		0.0% to 0.0002%
	Natural Mixture	Walnut Husk	Hair dye, polishing material, exfoliate in facial and body scrubs, aquarium and aquaculture	3% to 50%		0.0% to 0.006%
	9000-30-0	Guar Gum	Cosmetics, baked goods, ice cream, toothpaste, sauces, salad dressing, substitute for wheat intolerant people to use instead of flour, cattle food, and medical use	0.5% to 20%		0.0% to 0.2%
	14808-60-7	Silica	Hand cleaner, arts and crafts, glass	1% to 100%		0.0% to 002%
	9025-56-3	Hemicellulase Enzyme	Wine additive, soybean paste, fibre additive, commercial baking and food processing, farm feed additive	0.1% to 25%		0.0% to 0.0005%
	26038-87-9	MEA Borate	Cosmetics, hair texturiser, hairspray, antiseptic, laundry detergent	0.1% to 5%		0.0% to 0.1%
	Proprietary Information	Acrylic Resin	Disinfectant cleaner, FDA approved colourant, paint, food packaging, medicinal chemistry	<0.01% to 2%		0.0% to 0.002%
	7647-14-5	Sodium Chloride	Food production, table salt, food additive, detergents, hair products, water softener and medical saline drips	0.03% to 99%		0.0% to 0.004%
	Proprietary Information	Enzyme	Laundry detergent, laundry stain remover, silverware cleaner, agricultural feeds, instant coffee production	~0.1%		0.0% to 0.0002%
	7772-98-7	Sodium Thiosulfate	Personal care, food production, home aquarium health/commercial aquaculture, medical use for over 100 years	0.1% to 30%		0.0% to 0.04%

Source: APLNG Website

TESTING, MONITORING AND COMMUNICATIONS

Prior to commencing any fraccing activity, we undertake comprehensive testing and monitoring activities, in line with our policies and procedures, and government regulation.

Water bores adjacent to a proposed fracced well site are baseline tested prior to any activity. Once fraccing has been completed, samples from the water bores and samples of water produced from the well are tested on a regular basis.

Where fraccing is required we discuss all proposed activities with neighbouring landholders before any work takes place. Once the activity is completed, we provide a report to the landholder and the regulator within 10 days, with a comprehensive final report provided to the regulator two months later.

FACT SHEET
HYDRAULIC FRACTURE STIMULATION

Hydraulic fracture stimulation (fracing) technology is used to improve the flow of gas from coal seams. Fracing increases well productivity, which means that fewer wells are required to extract gas.

Origin's fracing activity occurs in coal seam gas (CSG) field development activities associated with our role as upstream operator for Australia Pacific LNG's CSG to LNG operations in Queensland.

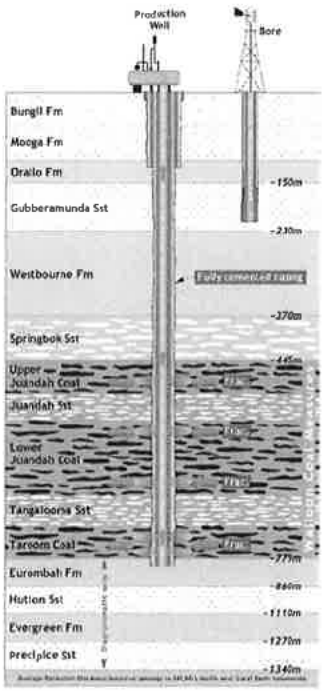
Most of our current CSG production is in high flow areas where fracing is not currently required.

The use of fracing technology in Queensland is well established and subject to comprehensive regulation. The Queensland Government regulates this process and the additives used in fracing fluids, and we comply with these diligently.

Fracing technology involves pumping a fluid under pressure down the wells and into the target coal seams.

The fluid is a mixture of predominantly water, sand and a small volume of common chemical additives (approximately between 0.1 and 1.2 per cent).

The pressure creates fractures in the rock and widens existing rock fractures which help to create better pathways for gas to flow. The additives help to keep the sand in suspension. When the fluid is removed, most of the sand remains to help keep the fractures open. The resulting fractures are approximately 1 to 20 millimetres wide.



FRAC FLUIDS AND ADDITIVES

All additives used in fracing fluid are found in a typical household in items such as food and cleaning products.

We do not use BTEX (benzene, toluene, ethylbenzene and xylene) in our fracing fluids. BTEX is not present in any of the chemical additives that we use.

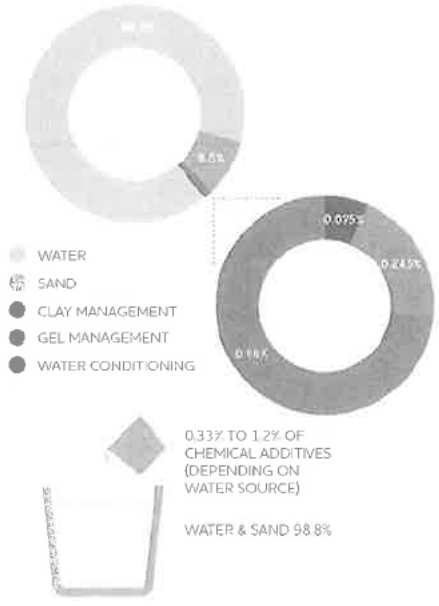
The particular combination of additives can influence characteristics of the fracing fluid, such as viscosity or thickness, and pH. These fracing fluid characteristics can be varied to suit the specific formation and the water in the coal seams.

A low viscosity, or low thickness, fracing fluid consists of treated water, sand and additives such as acetic acid (vinegar), calcium chloride (found in sports drinks) and guar (found in ice cream). These additives make up approximately 0.1 per cent of the total volume of the fracing fluid.

A higher viscosity, or thicker, fracing fluid – known as a gel fracing fluid (pictured at right) – has an additive content ranging from around 0.33 per cent to 1.2 per cent, depending on whether fresh water or produced water from the coal seam is used.

Our fracing fluids are sampled and tested before use by National Association of Testing Authorities (NATA) certified laboratories prior to use, to ensure compliance with regulatory requirements. All results are made available to the Queensland Government.

A list of chemicals is shown below, together with each component's unique CAS (Chemical Abstracts Service) registry number. Also shown are their use and percentage range in common household products, and their corresponding percentage range in fracing fluids.



Composition of Gel Frac Fluid
Source: APLNG Website

1. IDENTIFICATION

Product Name	**Glutaraldehyde, Solution 50%**
Other Names	No Data Available
Uses	For industrial use ONLY.
Chemical Family	No Data Available
Chemical Formula	Unspecified
Chemical Name	Pentanedial, Solution 50%
Product Description	Low Methanol.

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) 6

Globally Harmonised System

Hazard Classification		Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)	
Hazard Categories		Acute Toxicity (Oral) - Category 3 Acute Toxicity (Inhalation) - Category 3 Skin Corrosion/Irritation - Category 1B Sensitisation (Respiratory) - Category 1 Sensitisation (Skin) - Category 1 Acute Hazard To The Aquatic Environment - Category 1	
Pictograms			
Signal Word		Danger	
Hazard Statements		**H301**	Toxic if swallowed.
		H331	Toxic if inhaled.
		H314	Causes severe skin burns and eye damage.
		H317	May cause an allergic skin reaction.
		H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
		H400	Very toxic to aquatic life.
Precautionary Statements	Prevention	**P260**	Do not breathe fume/mist/vapours/spray.
		P280	Wear protective gloves/protective clothing/eye protection/face protection.
		P285	In case of inadequate ventilation wear respiratory protection.
		P273	Avoid release to the environment.
		P270	Do not eat, drink or smoke when using this product.
		P271	Use only outdoors or in a well-ventilated area.
		P272	Contaminated work clothing should not be allowed out of the workplace.
	Response	**P303 + P361 + P353**	IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
		P310	Immediately call a POISON CENTER or doctor/physician.
		P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
		P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
		P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
		P363	Wash contaminated clothing before reuse.
		P391	Collect spillage.
	Storage	**P403 + P233**	Store in a well-ventilated place. Keep container tightly closed.
		P405	Store locked up.
	Disposal	**P501**	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications	Health Hazards	**6.1B**	Substances that are acutely toxic - Fatal
		6.5A	Substances that are respiratory sensitisers
		6.5B	Substances that are contact sensitisers
		6.9B	Substances that are harmful to human target organs or systems
		8.2B	Substances that are corrosive to dermal tissue UN PGII
		8.3A	Substances that are corrosive to ocular tissue
	Environmental Hazards	**9.1A**	Substances that are very ecotoxic in the aquatic environment
		9.2A	Substances that are very ecotoxic in the soil environment
		9.3A	Substances that are very ecotoxic to terrestrial vertebrates

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Glutaraldehyde	C5H8O2	111-30-8	>=50 %
Water	H2O	7732-18-5	<=49 %
Methanol	No Data Available	67-56-1	<=1 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	DO NOT induce vomiting. Urgently call a Poison Centre or doctor/physician. DO NOT give anything to drink. Oral toxicity of Glutaraldehyde increases with dilution - drinking water can increase the toxicity.
Eye	Immediately flush eyes with copious amounts of water for at least 15 minutes, lifting the upper and lower eyelids. Seek medical attention - ophthalmologist recommended.
Skin	Immediately flush skin with copious amounts of water for at least 15 minutes. Seek medical attention immediately. Wash clothing before reuse. Destroy contaminated shoes.
Inhaled	Seek medical attention immediately. Remove to fresh air. If breathing is difficult, administer oxygen. Do NOT use mouth-to-mouth resuscitation. If breathing has ceased apply artificial respiration by use of oxygen and suitable mechanical device such as a bag and a mask.
Advice to Doctor	Treat symptomatically and supportively.
Medical Conditions Aggravated by Exposure	May cause an allergic skin reaction. May cause allergy or asthma symptoms or breathing difficulties if inhaled.

5. FIRE FIGHTING MEASURES

General Measures	If safe to do so, move undamaged containers from fire area. Cool containers with flooding quantities of water until well after fire is out.
Flammability Conditions	Non-flammable. After the water evaporates, the remaining material will burn.
Extinguishing Media	For large fires, use alcohol-type or all purpose type foam, applied using manufacturer's recommended technique. For small fires, use CO2 or dry chemical media.
Hazardous Products of Combustion	Carbon monoxide, Carbon dioxide.
Special Fire Fighting Instructions	Runoff from fire control water may be toxic and/or corrosive and pollute waterways.
Personal Protective Equipment	Use self-contained breathing apparatus and protective clothing. Fully-encapsulating, gas-tight suits should be worn

	for maximum protection. Structural firefighter's uniform is NOT effective for these materials.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	2X

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Clean up spills immediately. Ventilate enclosed spaces before entering. ELIMINATE all ignition sources (no smoking, flares, sparks or flames). Do not touch or walk through spilled material. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
Clean Up Procedures	Absorb spill using absorbent, non-combustible material such as sand, earth or vermiculite. Dispose in accordance with current laws and regulations.
Containment	Stop leak if safe to do so – Prevent entry into waterways, drains or confined areas.
Environmental Precautionary Measures	Runoff from dilution water may be toxic and/or corrosive and pollute waterways. Avoid runoff into drains and waterways.
Evacuation Criteria	Spill or leak area should be isolated immediately. Keep unauthorised personnel away. Keep upwind and to higher ground.
Personal Precautionary Measures	Use personal protective equipment (see Section 8).

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Use only outdoors or with adequate ventilation. In case of inadequate ventilation, wear respiratory protection. Avoid breathing vapour. Avoid contact with eyes, skin and clothing. Avoid release to the environment.
Storage	Keep containers tightly closed when not in use. Store in a cool, dry, well-ventilated area away from strong oxidising agents, acids and bases. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Refrigeration recommended.
Container	Store only in original container as approved by the manufacturer. Container must be corrosive resistant with resistant inner liner.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	Safe Work Australia Exposure Standard for Glutaraldehyde (CAS No. 111-30-8): TWA = 0.1 ppm or 0.41 mg/m3 (Peak limitation). This substance may induce acute effects after relatively brief exposure to high concentrations and so the exposure standard represents a maximum or peak concentration to which workers may be exposed.
Exposure Limits	No Data Available
Biological Limits	No information available.
Engineering Measures	Use local exhaust ventilation or other engineering controls to maintain airborne levels below recommended exposure limits. Adequate ventilation must be provided to keep the vapour concentration in work areas as low as possible.
Personal Protection Equipment	RESPIRATOR: Wear an approved respirator where vapours are generated and engineering controls are inadequate (AS 1715/1716). EYES: Wear chemical safety goggles. Wash contaminated goggles before reuse (AS 1336/1337). HANDS: Wear rubber gloves when handling (AS 2161). CLOTHING: Chemical-resistant coveralls and safety footwear (AS 3765/2210).
Work Hygienic Practices	Wash hands and other exposed areas of skin thoroughly with soap and water after handling. Remove contaminated clothing and wash before reuse. Avoid contact with eyes, skin and clothing. Avoid breathing vapour. The use of appropriate respiratory protection may be required.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Liquid
Odour	No information available.
Colour	Transparent/colourless - light yellow
pH	3.1 - 4.5
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	~100.5 °C @ 1013 hpa
Melting Point	No Data Available
Freezing Point	-21 °C
Solubility	Soluble
Specific Gravity	1.126 - 1.135
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	Assay: 50 - 51.5%
Potential for Dust Explosion	Not applicable.
Fast or Intensely Burning Characteristics	No information available.
Flame Propagation or Burning Rate of Solid Materials	No information available.
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No information available.
Properties That May Initiate or Contribute to Fire Intensity	No information available.
Reactions That Release Gases or Vapours	No information available.
Release of Invisible Flammable Vapours and Gases	No information available.

10. STABILITY AND REACTIVITY

Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

1. IDENTIFICATION

Product Name	**Polyacrylamide, Powder**
Other Names	Magnafloc LT20
Uses	Flocculation agent.
Chemical Family	No Data Available
Chemical Formula	Unspecified
Chemical Name	Polyacrylamide
Product Description	Polyacrylamide, non-ionic.

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) Not Scheduled

Globally Harmonised System

Hazard Classification	NOT hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)
Signal Word	None

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Polyacrylamide	Unspecified	9003-05-8	100 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	If swallowed: Rinse mouth, then drink plenty of water. Do NOT induce vomiting. Keep victim warm and quiet – Obtain immediate medical care. Never give anything by mouth to an unconscious person.
Eye	Eye contact: Promptly flush eyes with running water for several minutes, holding eyelids open and occasionally lifting the upper and lower lids. Remove contact lenses if present and easy to do. Continue rinsing for at least 15 minutes. If eye irritation persists, get medical advice/attention.
Skin	Skin contact: Remove material from skin promptly. Flush skin with running water for several minutes - Wash with plenty of soap and water. Take off contaminated clothing and wash before reuse. If skin irritation occurs, get medical advice/attention.
Inhaled	If inhaled: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Call a Poison Centre or doctor/physician if experiencing respiratory symptoms or if you feel unwell.
Advice to Doctor	Treat according to symptoms (decontamination, vital functions), no known specific antidote.
Medical Conditions Aggravated by Exposure	No information available.

5. FIRE FIGHTING MEASURES

General Measures	If safe to do so, move undamaged containers from fire area. Cool containers with water spray until well after fire is out. Very slippery when wet - If water is used, restrict pedestrian and vehicular traffic in areas where slip hazard may exist.
Flammability Conditions	Not flammable. The product does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.
Extinguishing Media	In case of fire: Use dry powder or foam for extinction. Do NOT use water jet.
Fire and Explosion Hazard	Dusty conditions may ignite explosively in the presence of an ignition source causing flash fire.
Hazardous Products of Combustion	The following substances/groups of substances can be released in case of fire: Carbon oxides, Nitrogen oxides.
Special Fire Fighting Instructions	Contaminated extinguishing water must be disposed of in accordance with official regulations.
Personal Protective Equipment	Wear self-contained breathing apparatus.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available

Upper Explosion Limit	No Data Available
Auto Ignition Temperature	>390 °C
Hazchem Code	No Data Available

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Ensure adequate ventilation. Avoid raising dust. ELIMINATE all ignition sources (no smoking, flares, sparks or flames). Do not touch or walk through spilled material - Forms slippery surfaces with water. Avoid breathing dust.
Clean Up Procedures	Avoid dispersal of dust in the air - Do NOT clear dusty surfaces with compressed air. Use clean, non-sparking tools to collect material and place it into suitable containers for later disposal (see SECTION 13).
Containment	Stop leak if safe to do so – Prevent entry into waterways, drains or confined areas. For large amounts: Contain with dust-binding material.
Decontamination	Spillages and decontamination runoff should be prevented from entering drains and watercourses.
Environmental Precautionary Measures	Do not discharge into drains/surface waters/groundwater.
Evacuation Criteria	Spill or leak area should be isolated immediately. Keep unauthorised personnel away.
Personal Precautionary Measures	Use personal protective clothing (see SECTION 8).

7. HANDLING AND STORAGE

Handling	Handle in accordance with good industrial hygiene and safety practice. Ensure adequate ventilation. Avoid dust formation - Dust in sufficient concentration can result in an explosive mixture in air. Eliminate open flame and other sources of ignition. Routine housekeeping should be instituted to ensure that dusts do not accumulate on surfaces. Dry powders can build static electricity charges when subjected to the friction of transfer and mixing operations. Provide adequate precautions, such as electrical grounding and bonding, or inert atmospheres. Avoid breathing dust. Use personal protective clothing (see SECTION 8).
Storage	Store in a cool, dry and well-ventilated place. Avoid damp, wet or humid conditions, temperature extremes and ignition sources. Keep away from strong acids, strong bases and strong oxidising agents.
Container	Store in unopened original containers.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	No specific exposure standards are available for this product. For dusts from solid substances without specific occupational exposure standards: - Safe Work Australia Exposure Standard (Nuisance dusts): 8 hr TWA = 10 mg/m3 (measured as inhalable dust). - New Zealand WES (Particulates not otherwise classified): TWA = 10 mg/m3 (total); TWA = 3 mg/m3 (respirable). - OSHA PEL (Particulates not otherwise regulated): TWA = 15 mg/m3 (total); TWA = 5 mg/m3 (respirable).
Exposure Limits	No Data Available
Biological Limits	No information available.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	Respiratory protection: In case of inadequate ventilation, wear respiratory protection. Recommended (for lower concentrations or short-term effect): Particle filter with medium efficiency for solid and liquid particles. Eye/face protection: Wear appropriate eye protection to avoid eye contact. Recommended: Safety glasses with side-shields. Hand protection: Wear chemical-resistant protective gloves. Recommended materials (also with prolonged, direct contact): Nitrile rubber (0.4 mm), Chloroprene rubber (0.5 mm), Polyvinyl chloride (0.7 mm); corresponding <480 minutes permeation time. Skin/body protection: Wear appropriate personal protective clothing to avoid skin contact. Recommended: Closed work clothing.
Special Hazards Precaustions	It is recommended that all dust control equipment (such as local exhaust ventilation and material transport systems) involved in handling this product contain explosion relief vents, an explosion suppression system or an oxygen

	deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area. Use only appropriately classified electrical equipment.
Work Hygienic Practices	Do not eat, drink or smoke when using this product. Hands and face should be washed before breaks and at the end of the shift. Take off immediately all contaminated clothing. Wash contaminated clothing before reuse.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	Powder
Odour	Odourless
Colour	Off-white
pH	5 - 9
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	No Data Available
Melting Point	No Data Available
Freezing Point	No Data Available
Solubility	Forms a viscous solution in water
Specific Gravity	No Data Available
Flash Point	No Data Available
Auto Ignition Temp	>390 °C
Evaporation Rate	No Data Available
Bulk Density	approx. 750 kg/m3
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	No Data Available
Potential for Dust Explosion	The product is not a dust explosion risk as supplied; however the build-up of fine dust can lead to a risk of dust explosions.
Fast or Intensely Burning Characteristics	No information available.
Flame Propagation or Burning Rate of Solid Materials	No information available.
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No information available.
Properties That May Initiate or Contribute to Fire Intensity	Not flammable. The product does not burn readily but as with many organic powders, flammable dust clouds may be formed in air.
Reactions That Release Gases or Vapours	The following substances/groups of substances can be released in case of fire: Carbon oxides, Nitrogen oxides.

Release of Invisible Flammable Vapours and Gases	No information available.

10. STABILITY AND REACTIVITY

Chemical Stability	The product is stable if stored and handled as prescribed/indicated.
Conditions to Avoid	Avoid extreme temperatures. Avoid dust formation. Avoid electrostatic discharge. Avoid sources of ignition.
Materials to Avoid	Incompatible/reactive with strong acids, strong bases and strong oxidising agents.
Hazardous Decomposition Products	The following substances/groups of substances can be released in case of fire: Carbon oxides, Nitrogen oxides. No hazardous decomposition products if stored and handled as prescribed/indicated.
Hazardous Polymerisation	No information available.

11. TOXICOLOGICAL INFORMATION

General Information	Acute toxicity: No known acute effects. Skin corrosion/irritation: Not irritating to skin (Rabbit) [OECD Guideline 404]. Prolonged contact with the product can result in skin irritation. Eye damage/irritation: Not irritating to eyes (Rabbit). May cause some eye irritation which should cease after removal of the product. Respiratory/skin sensitisation: Non-sensitising. Based on available data, the classification criteria are not met. Germ cell mutagenicity: Based on the ingredients, there is no suspicion of a mutagenic effect. Carcinogenicity: No indication of a carcinogenic effect. Reproductive toxicity: Based on the ingredients, there is no suspicion of a toxic effect on reproduction. STOT - single exposure: May cause some irritation to the respiratory system if dust is inhaled. STOT - repeated exposure: Based on our experience and the information available, no adverse health effects are expected if handled as recommended with suitable precautions for designated uses (The product has not been tested. The statement has been derived from the properties of the individual components). Aspiration toxicity: No aspiration hazard expected.
Acute	
Ingestion	Acute toxicity (Oral): - LD50, Rat: >2,000 mg/kg [OECD Guideline 401].
Carcinogen Category	None

12. ECOLOGICAL INFORMATION

Ecotoxicity	- LC50, Fish (Brachydanio rerio): 4,220 mg/L (96 h) [OECD 203]. - EC50, Aquatic invertebrates (Daphnia magna): 1,733 mg/L (48 h) [OECD Guideline 202]. - EC50, Aquatic plants (Chlorella vulgaris): 5,235 mg/L (72 h) [OECD Guideline 201]. - EC50, Microorganisms/effects on activated sludge (Pseudomonas putida): 5,914 mg/L (24 h). - The product has not been tested. The statements on ecotoxicity have been derived from products of a similar structure and composition.
Persistence/Degradability	Not readily biodegradable (by OECD criteria).
Mobility	Mobility in soil: Adsorption to solid soil phase is expected.
Environmental Fate	Do not discharge into drains/surface waters/groundwater.
Bioaccumulation Potential	Based on its structural properties, the polymer is not biologically available. Accumulation in organisms is not to be expected.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

Dispose of contents/container in accordance with local/regional/national regulations.

General Information

Special Precautions for Land Fill Contaminated packaging: Packs that cannot be cleaned should be disposed of in the same manner as the contents. Uncontaminated packaging can be reused.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	Polyacrylamide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (Malaysia)
ADR Code

Proper Shipping Name	Polyacrylamide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	Polyacrylamide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	Polyacrylamide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available

Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	Polyacrylamide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
EMS	No Data Available
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	Polyacrylamide
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	Not Scheduled

National/Regional Inventories

Australia (AICS)	Listed
Canada (DSL)	Not Determined
Canada (NDSL)	Not Determined
China (IECSC)	Not Determined
Europe (EINECS)	Not Determined
Europe (REACh)	Not Determined

Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Not Determined
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Listed

16. OTHER INFORMATION

Related Product Codes	FLOACA0100, FLOACA0101, FLOACA1900, FLOACA1960
Revision	3
Revision Date	15 Jun 2017
Key/Legend	**<** Less Than **>** Greater Than **AICS** Australian Inventory of Chemical Substances **atm** Atmosphere **CAS** Chemical Abstracts Service (Registry Number) **cm²** Square Centimetres **CO2** Carbon Dioxide **COD** Chemical Oxygen Demand **deg C (°C)** Degrees Celcius **EPA (New Zealand)** Environmental Protection Authority of New Zealand **deg F (°F)** Degrees Farenheit **g** Grams **g/cm³** Grams per Cubic Centimetre **g/l** Grams per Litre **HSNO** Hazardous Substance and New Organism **IDLH** Immediately Dangerous to Life and Health **immiscible** Liquids are insoluable in each other. **inHg** Inch of Mercury **inH2O** Inch of Water **K** Kelvin **kg** Kilogram **kg/m³** Kilograms per Cubic Metre **lb** Pound **LC50** LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. **LD50** LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. **ltr** or **L** Litre **m³** Cubic Metre **mbar** Millibar **mg** Milligram **mg/24H** Milligrams per 24 Hours **mg/kg** Milligrams per Kilogram **mg/m³** Milligrams per Cubic Metre **Misc** or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present. **mm** Millimetre **mmH2O** Millimetres of Water **mPa.s** Millipascals per Second **N/A** Not Applicable **NIOSH** National Institute for Occupational Safety and Health **NOHSC** National Occupational Heath and Safety Commission **OECD** Organisation for Economic Co-operation and Development

Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

1. IDENTIFICATION

Product Name	**Caustic Soda/Caustic Potash Blend**
Other Names	No Data Available
Uses	Freezing point suppressant.
Chemical Family	No Data Available
Chemical Formula	No Data Available
Chemical Name	Caustic Soda/Caustic Potash Blend
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

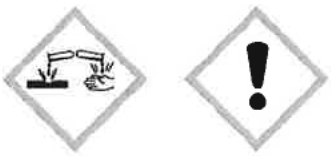
For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) 6

Globally Harmonised System

Hazard Classification		Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)	
Hazard Categories		Corrosive to Metals - Category 1 Acute Toxicity (Oral) - Category 4 Skin Corrosion/Irritation - Category 1A Serious Eye Damage/Irritation - Category 1	
Pictograms			
Signal Word		Danger	
Hazard Statements		**H290**	May be corrosive to metals.
		H302	Harmful if swallowed.
		H314	Causes severe skin burns and eye damage.
		H318	Causes serious eye damage.
Precautionary Statements	Prevention	**P234**	Keep only in original container.
		P264	Wash exposed skin thoroughly after handling.
		P280	Wear protective gloves/protective clothing/eye protection/face protection.
	Response	**P301 + P330 + P331**	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
		P303 + P361 + P353	IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
		P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
		P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
		P312	Call a POISON CENTER or doctor/physician if you feel unwell.
		P390	Absorb spillage to prevent material damage.
	Storage	**P405**	Store locked up.
	Disposal	**P501**	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)

Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)

Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications	Health Hazards	**6.1D**	Substances that are acutely toxic - Harmful
		8.1A	Substances that are corrosive to metals
		8.2A	Substances that are corrosive to dermal tissue UN PGI
		8.3A	Substances that are corrosive to ocular tissue
	Environmental Hazards	**9.1D**	Substances that are slightly harmful to the aquatic environment or are otherwise designed for biocidal action
		9.3C	Substances that are harmful to terrestrial vertebrates

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
	H2O	7732-18-5	53.8 %
Sodium Hydroxide	NaOH	1310-73-2	41.4 %
Potassium Hydroxide	KOH	1310-58-3	4.8 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	Rinse mouth. Do NOT induce vomiting. If within a few minutes after ingestion, one small glass of water may be given to drink. Refer immediately for medical attention.
Eye	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.
Skin	Remove contaminated clothes. Rinse skin with plenty of water or shower for at least 15 minutes. Refer immediately for medical attention.
Inhaled	Fresh air, rest. Refer immediately for medical attention. Move victim to fresh air. Call emergency medical service. Give artificial respiration if victim is not breathing. Do not use mouth-to-mouth methods if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Administer oxygen if breathing is difficult. Consult a doctor or call POISON CONTROL centre. Take the product container or safety data sheet with you.
Advice to Doctor	Indication of immediate medical attention and special treatment needed : Give artificial respiration if victim is not breathing but not mouth to mouth. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. Obtain immediate medical attention.
Medical Conditions Aggravated by Exposure	Serious local effects by all routes of exposure- inhalation, ingestion, skin and/or eye contact. Acute toxicity, irritation eyes, skin, respiratory system; cough, sneezing; eye, skin burns; vomiting, diarrhoea.

5. FIRE FIGHTING MEASURES

General Measures	If safe to do so, remove containers from the path of fire.
Flammability Conditions	No Data Available
Extinguishing Media	In case of fire in the surroundings, use appropriate extinguishing media. Extinguish fire using agent suitable for type of surrounding fire. (Material itself does not burn or burns with difficulty.) Use water in flooding quantities as fog. Apply water from as far a distance as possible. Use "alcohol" foam, dry chemical or carbon dioxide. Keep run-off water out of sewers and water sources.
Fire and Explosion Hazard	Non-combustible liquid. Not considered to be a fire hazard or an explosion hazard.
Hazardous Products of Combustion	Hazardous decomposition products may include noxious and toxic fumes of carbon monoxide and carbon dioxide.
Special Fire Fighting Instructions	Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves) or chemical splash suit. Please note: Structural fire fighters uniform will provide limited protection.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	2X

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Hazards from spills and leaks should be minimized by an adequate supply of water for washing-down. Adequate ventilation should be provided in areas where caustic soda mist or dust is present. For the protection of the eyes, safety goggles should be worn, as well as face shields, if complete face protection is necessary. Eyewash fountains and safety showers must be available at any location where eye and/or skin contact can occur. Protection against mist or dust of this compound can be provided by filter or dust-type respiratory protective equipment. Safety shoes are recommended.
Clean Up Procedures	Personal protection: chemical protection suit including self-contained breathing apparatus. Do NOT let this chemical enter the environment. Sweep spilled substance into covered plastic containers. Carefully collect remainder. Then store and dispose of according to local regulations.
Containment	Stop leak if safe to do so.
Environmental Precautionary Measures	The most favorable course of action is to use an alternative chemical product with less inherent propensity for occupational harm/injury/toxicity or environmental contamination. Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in soil or water; effects on animal and plant life; and conformance with environmental and public health regulations
Evacuation Criteria	Evacuate all unnecessary personnel.
Personal Precautionary Measures	Personnel involved in the clean up should wear full protective clothing as listed in section 8.

7. HANDLING AND STORAGE

Handling	Plastics and plastic-lined steel are now available as construction materials. Mild steel is adequate for almost all caustic-handling applications. Keep container closed when not in use. Exercise great care in handling potassium hydroxide, as it rapidly destroys tissue. Do not handle with bare hand. Wash hands thoroughly after any skin contact. Avoid inhalation or contact with eye and skin. Do not ingest.
Storage	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Protect from direct sunlight, moisture and static discharges. Do NOT allow material to dry out. Avoid heat, freezing and ultra- violet light. Keep away from food, drink, and animal feeding stuffs. This product has a UN classification of 3266 and a Dangerous Goods Class 8 (Corrosive) according to The Australian Code for the Transport of Dangerous goods By Road and Rail.
Container	Store only in original packaging as approved by manufacturer.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	Safe Work Australia, TWA : Sodium Hydroxide, 2 Peak limitation, 2 mg/m3, 8 hours Potassium Hydroxide, 2 Peak limitation, 2 mg/m3, 8 hours Sodium Hydroxide, 2mg/m^3 (ceiling value) Potassium Hydroxide, 2mg/m^3 (ceiling value)
Exposure Limits	No Data Available
Biological Limits	No information available on biological limit values for this product.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Adequate ventilation should be provided so that exposure limits are not exceeded.
Personal Protection Equipment	RESPIRATOR: Wear a positive-pressure,self-contained breathing apparatus for planned entry into unknown concentrations or in case of emergency (AS1715/1716). EYES: Safety glasses with side shields (AS1336/1337). HANDS: Wear impervious protective gloves (AS2161). CLOTHING: Flame-retardant coveralls and anti-static footwear (AS3765/2210).
Work Hygienic Practices	No Data Available

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Clear solution
Odour	No specific odour
Colour	Colourless
pH	13.0 - 14.0
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	No Data Available
Melting Point	No Data Available
Freezing Point	No Data Available
Solubility	Soluble
Specific Gravity	No Data Available
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	1.48-1.49
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	No Data Available
Potential for Dust Explosion	No Data Available
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

Soluble in water. Dissolution can liberate enough heat to cause steaming and spattering and ignite adjacent

Chemical Stability	combustible material Slowly absorbs carbon dioxide from the air to give solid products as crusts or precipitates. Water soluble. Dilution with water liberates heat, possibly enough to cause local boiling and spattering. Generates considerable heat when solution is mixed with acid. Acids, water, metals (when wet), halogenated hydrocarbons, maleic anhydride [Note: Heat is generated if KOH comes in contact with water & carbon dioxide from the air].
Conditions to Avoid	Avoid excessive heat, direct sunlight, moisture, static discharges and high temperatures
Materials to Avoid	Incompatible with strong oxidising agents, bases, mineral acids and sources of ignition.
Hazardous Decomposition Products	No Data Available
Hazardous Polymerisation	Hazardous Polymerisation will not occur.

11. TOXICOLOGICAL INFORMATION

General Information	Sodium Hydroxide: LD50 Oral (Rat), 140-340 mg/kg Sodium Hydroxide: LC50 inhalation (Mouse), 39,000 mg/m3/4 hrs. Potassium Hydroxide: LD50 Oral (Rat), 265 mg/kg Caustic Blend : Not known to be a skin sensitizer. There is no risk for developmental toxicity and no risk for toxicity to reproduction. Both in vitro and in vivo genetic toxicity tests indicated no evidence for a mutagenic activity. No confirmed data available on carcinogenicity. STOT- single exposure and repeated exposure not known. Potassium Hydroxide : Not known to be a skin sensitizer. No evidence for a mutagenic activity. No risk for reproductive toxicity is expected. There is no evidence KOH to be carcinogenic in exposure situations that are relevant for man. STOT- single exposure and repeated exposure not known.
EyeIrritant	The substance is very corrosive to the eyes.
SkinIrritant	Caustic Blend : The substance is corrosive to the skin. Repeated or prolonged contact with skin may cause dermatitis. When caustic soda comes into contact with the skin it does not usually cause immediate pain, but it does start to cause immediate damage. Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed.Effects of contact may be delayed.
Ingestion	Corrosive on ingestion. Caustic dusts are irritating to the upper respiratory system. Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. Corrosive on ingestion. Swallowing caustic alkalis /potassium hydroxide/ causes immediate burning pain in the mouth, throat, and stomach, and the lining membranes become swollen and detached. Vomiting and purging may occur.
Inhalation	The substance is corrosive to the respiratory tract. Prolonged exposure to high concentrations may cause discomfort and ulceration of nasal passages. Effects of contact or inhalation may be delayed.
Carcinogen Category	No Data Available

12. ECOLOGICAL INFORMATION

Ecotoxicity	Sodium Hydroxide : LC50; freshwater, static, Carassius auratus (Goldfish), 160 mg/L for 24 hrs. Potassium Hydroxide :LC50, Carassius auratus (Goldfish), 224 mg/L for 24 hrs.
Persistence/Degradability	Sodium Hydroxide : Sodium persists indefinitely in the environment. The hydroxyl ion can be neutralized by acids, it can form complexes or it can be precipitated. Biological oxygen demand: None. Potassium Hydroxide : Biodegradation and Photodegredation: Not available.
Mobility	Sodium Hydroxide : The high water solubility and low vapour pressure indicate that NaOH will be found predominantly in water. In soil, mobility depends directly on the importance of the liquid phase of the soil and the possibility to form metal hydroxo-complexes with metal solid species. Potassium Hydroxide : The high water solubility and low vapour pressure indicate that KOH will be found predominantly in the aquatic environment. KOH is present in the environment as potassium and hydroxyl ions, which implies that it will not adsorb on particulate matter or surfaces and will not accumulate in living tissues.
Environmental Fate	Adverse effects on the aquatic environment are not expected due to production or use of NaOH.
Bioaccumulation Potential	Sodium Hydroxide : Considering its high water solubility, NaOH is not expected to bioconcentrate in organisms. Potassium Hydroxide : Not applicable.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice. Incinerate at an approved site following all local regulations. This material may be suitable for approved landfill.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	Corrosive Liquid, Basic, Inorganic NOS (Sodium hydroxide, Potassium hydroxide)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	3266
Hazchem	2X
Pack Group	II
Special Provision	274

Land Transport (Malaysia)
ADR

Proper Shipping Name	Corrosive Liquid, Basic, Inorganic NOS (Sodium hydroxide, Potassium hydroxide)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	3266
Hazchem	2X
Pack Group	II
Special Provision	274

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	Corrosive Liquid, Basic, Inorganic NOS (Sodium hydroxide, Potassium hydroxide)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	3266
Hazchem	2X
Pack Group	II
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	Corrosive Liquid, Basic, Inorganic NOS (Sodium hydroxide, Potassium hydroxide)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
ERG	154 Substances - Toxic and/or Corrosive (Non-Combustible)
UN Number	3266

Hazchem	2X
Pack Group	II
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	Corrosive Liquid, Basic, Inorganic NOS (Sodium hydroxide, Potassium hydroxide)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
UN Number	3266
Hazchem	2X
Pack Group	II
Special Provision	274
EMS	F-A, S-B
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	Corrosive Liquid, Basic, Inorganic NOS (Sodium hydroxide, Potassium hydroxide)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
UN Number	3266
Hazchem	2X
Pack Group	II
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	6

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	HSR001547

National/Regional Inventories

Australia (AICS)	Not Listed
Canada (DSL)	Not Determined
Canada (NDSL)	Not Determined

China (IECSC)	Not Determined
Europe (EINECS)	Not Determined
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Not Determined
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Not Determined

16. OTHER INFORMATION

Related Product Codes	CAUSOD0100, CAUSOD0101, CAUSOD0105
Revision	1
Revision Date	01 Jan 2016
Reason for Issue	New SDS
Key/Legend	**<** Less Than **>** Greater Than **AICS** Australian Inventory of Chemical Substances **atm** Atmosphere **CAS** Chemical Abstracts Service (Registry Number) **cm²** Square Centimetres **CO2** Carbon Dioxide **COD** Chemical Oxygen Demand **deg C (°C)** Degrees Celcius **EPA (New Zealand)** Environmental Protection Authority of New Zealand **deg F (°F)** Degrees Farenheit **g** Grams **g/cm³** Grams per Cubic Centimetre **g/l** Grams per Litre **HSNO** Hazardous Substance and New Organism **IDLH** Immediately Dangerous to Life and Health **immiscible** Liquids are insoluable in each other. **inHg** Inch of Mercury **inH2O** Inch of Water **K** Kelvin **kg** Kilogram **kg/m³** Kilograms per Cubic Metre **lb** Pound **LC50** LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. **LD50** LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. **ltr** or **L** Litre **m³** Cubic Metre **mbar** Millibar **mg** Milligram **mg/24H** Milligrams per 24 Hours **mg/kg** Milligrams per Kilogram **mg/m³** Milligrams per Cubic Metre

Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH2O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Heath and Safety Commission
OECD Organisation for Economic Co-operation and Development
Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

1. IDENTIFICATION

Product Name	**Glutaraldehyde 50% Solution**
Other Names	No Data Available
Uses	Laboratory chemicals, manufacture of substances.
Chemical Family	No Data Available
Chemical Formula	C5H8O2
Chemical Name	Glutaraldehyde 50% Solution
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) 6

Globally Harmonised System

Hazard Classification		Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)	
Hazard Categories		Acute Toxicity (Inhalation) - Category 3 Acute Toxicity (Oral) - Category 3 Skin Corrosion/Irritation - Category 1B Sensitisation (Respiratory) - Category 1 Acute Hazard To The Aquatic Environment - Category 1 Sensitisation (Skin) - Category 1 Serious Eye Damage/Irritation - Category 1 Long-term Hazard To The Aquatic Environment - Category 2	
Pictograms			
Signal Word		Danger	
Hazard Statements		**H301 + H331**	Toxic if swallowed or if inhaled.
		H314	Causes severe skin burns and eye damage.
		H317	May cause an allergic skin reaction.
		H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
		H400	Very toxic to aquatic life.
		H411	Toxic to aquatic life with long lasting effects.
Precautionary Statements	Prevention	**P260**	Do not breathe fume/gas/mist/vapours/spray.
		P270	Do not eat, drink or smoke when using this product.
		P271	Use only outdoors or in a well-ventilated area.
		P272	Contaminated work clothing should not be allowed out of the workplace.
		P273	Avoid release to the environment.
		P280	Wear protective gloves/protective clothing/eye protection/face protection and in case of inadequate ventilation wear respiratory protection.
	Response	**P301 + P310**	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
		P301 + P330 + P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
		P303 + P361 + P353	IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
		P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
		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.
		P321	Specific treatment (see First Aid Measures on Safety Data Sheet).
		P333 + P313	If skin irritation or rash occurs: Get medical advice/attention.
		P342 + P311	If experiencing respiratory symptoms: Call a POISON CENTER or doctor/physician.
		P363	Wash contaminated clothing before reuse.
		P391	Collect spillage.
		P391	Collect spillage.
	Storage	**P403 + P233**	Store in a well-ventilated place. Keep container tightly closed.
		P405	Store locked up.
	Disposal	**P501**	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications	Health Hazards	**6.5A**	Substances that are respiratory sensitisers
		6.5B	Substances that are contact sensitisers
		6.9B	Substances that are harmful to human target organs or systems
		8.2B	Substances that are corrosive to dermal tissue UN PGII
		8.3A	Substances that are corrosive to ocular tissue
		6.1B	Substances that are acutely toxic - Fatal
		6.1C	Substances that are acutely toxic- Toxic
	Environmental Hazards	**9.1A**	Substances that are very ecotoxic in the aquatic environment
		9.2A	Substances that are very ecotoxic in the soil environment
		9.3A	Substances that are very ecotoxic to terrestrial vertebrates

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Glutaraldehyde	No Data Available	111-30-8	50.00 %
Other ingredients determined not to be hazardous, including water	No Data Available		to 100 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	DO NOT INDUCE VOMITING. Get immediate medical attention. If vomiting occurs naturally, guard against aspiration into lungs.
Eye	Get immediate medical attention. PROMPT ACTION IS ESSENTIAL IN CASE OF CONTACT. Immediately flush eye with water for at least 15 minutes while holding eyelids open.
Skin	Immediately flush with large amounts of water. Use soap if available. Remove contaminated clothing, including shoes, after flushing has begun. For a large splash, flood body under a shower. Get immediate medical attention. Contaminated clothing, shoes, and leather goods must be discarded or cleaned before reuse.
Inhaled	Remove to fresh air, treat symptomatically. If symptoms develop, seek medical advice.
Advice to Doctor	As mucosal damage may occur following oral exposure to glutaraldehyde solutions, dilution with limited amounts of fluid is usually appropriate, as long as there are no contraindications. If there are no contraindications, rinse mouth several times with cool water, then have the patient sip cool water to a maximum of 250 mL (for adults). Contraindications include respiratory distress, altered mental status, severe abdominal pain, nausea or vomiting, inability to swallow (or a refusal to drink) or the patient not protecting their own airway.
Medical Conditions Aggravated by Exposure	No information available on medical conditions aggravated by exposure to this product.

5. FIRE FIGHTING MEASURES

General Measures	Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk.
Flammability Conditions	Product is a combustible liquid.
Extinguishing Media	Water spray, alcohol resistant foam, dry chemical or carbon dioxide.
Fire and Explosion Hazard	This product would not be expected to burn unless all the water is boiled away. The remaining organics may be ignitable.
Hazardous Products of Combustion	May evolve oxides of carbon (COx) under fire conditions.
Special Fire Fighting Instructions	Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves) or chemical splash suit.
Flash Point	Not flammable
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	2X

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Shut off all possible sources of ignition. Avoid accidents, clean up immediately. Increase ventilation. Avoid walking through spilled product as it is slippery when spilled. Use clean, non-sparking tools and equipment. Avoid breathing vapours, mist or gas.
Clean Up Procedures	SMALL SPILLS: Soak up spill with absorbent material. Place residues in a suitable, covered, properly labelled container. Wash affected area. LARGE SPILLS: Contain liquid using absorbent material, by digging trenches or by diking. Reclaim into recovery or salvage drums or tank truck for proper disposal. Clean contaminated surfaces with water or aqueous cleaning agents. Wash site of spillage thoroughly with water. Dilute the glutaraldehyde to 5% or less with water. Add sodium bisulfite (2-3 parts by weight per part glutaraldehyde). This will typically reduce the glutaraldehyde concentration to 2 ppm or less in 5 minutes at room temperature. The remaining solution can be disposed of via appropriate means. Contact an approved waste hauler for disposal of contaminated recovered material. Dispose of material in compliance with regulations indicated in Section 13 (Disposal Considerations).
Containment	Stop leak if safe to do so.
Decontamination	Ventilate area and wash spill site after material pickup is complete.
Environmental Precautionary Measures	Do not allow product to reach drains, sewers or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Authority.
Evacuation Criteria	Evacuate all unnecessary personnel.
Personal Precautionary Measures	Personnel involved in the clean up should wear full protective clothing as listed in section 8.

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid contact with eyes, skin and clothing. Do not inhale product vapours. Avoid prolonged or repeated exposure. Use only in a well ventilated area. Containers which are opened must be carefully re-sealed and kept upright to prevent leakage.
Storage	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Recommended storage temperature: -20 deg C. This product has a UN classification of 3265 and a Dangerous Goods Class 8 (Corrosive) according to The Australian Code for the Transport of Dangerous goods By Road and Rail.
Container	Store in original packaging as approved by manufacturer. Do not pressurize, cut, weld, braze, solder, drill, grind or expose empty containers to heat, sparks or open flames.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	The following exposure standard has been established by The Australian Safety and Compensation Council (ASCC); Glutaraldehyde CAS number: 111-30-8 TWA = 0.1ppm Peak limitation (0.41mg/m3 peak limitation) Methanol CAS number: 67-65-1 TWA = 200ppm (262 mg/m3) STEL = 250ppm (328 mg/m3) NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. Peak limitation is a ceiling concentration which should not be exceeded over a measurement period which should be as short as possible but not exceeding 15 minutes. These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
Exposure Limits	No Data Available
Biological Limits	No information available on biological limit values for this product.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	RESPIRATOR: Wear an approved respirator if engineering controls are inadequate and vapours are generated (AS1715/1716). EYES: Chemical goggles or safety glasses with side shields (AS1336/1337). HANDS: Impervious gloves (AS2161). CLOTHING: Complete suit protecting against chemicals and safety footwear (AS3765/2210).
Work Hygienic Practices	Use good work and personal hygiene practices to avoid exposure. Keep an eye wash fountain available. Keep a safety shower available. If clothing is contaminated, remove clothing and thoroughly wash the affected area. Launder contaminated clothing before reuse. Always wash thoroughly after handling chemicals. When handling this product never eat, drink or smoke.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Liquid
Odour	Aldehyde
Colour	Clear, colourless
pH	3.1 - 4.5
Vapour Pressure	2.13 kPa (@ 20 °C)
Relative Vapour Density	3.46 Air = 1
Boiling Point	101 deg C @ 1.013hPa °C
Melting Point	-21 °C
Freezing Point	No Data Available
Solubility	Complete 20°C
Specific Gravity	1.11 - 1.14
Flash Point	Not flammable
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available

Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	21 cps (@ 20 °C)
Volatile Percent	54 % EPA method 24
VOC Volume	No Data Available
Additional Characteristics	No Data Available
Potential for Dust Explosion	Product is a liquid
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

General Information	Corrosive Liquid.
Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	Extremes of temperature.
Materials to Avoid	Contact with strong oxidizers (e.g. chlorine, peroxides, chromates, nitric acid, perchlorate, concentrated oxygen, permanganate) may generate heat, fires, explosions and/or toxic vapors. Strong Bases Strong acids: Contact with these may cause a heat-generating reaction which is not expected to be violent.
Hazardous Decomposition Products	Under fire conditions: Oxides of carbon.
Hazardous Polymerisation	Polymerization may occur, but is not expected to be violent.

11. TOXICOLOGICAL INFORMATION

General Information	Based on our hazard characterization, the potential human hazard is: High ACUTE ORAL TOXICITY : Species LD50 Tested Substance Rat 1.3 ml/Kg 50% Active Ingredient (Glutaraldehyde) Rat 1.2 ml/kg 45% Active Ingredient Rat 1.54 -1.87 ml/kg 25% Active Ingredient Rat 1.07 - 1.62 ml/kg 10% Active Ingredient ACUTE DERMAL TOXICITY : Species LD50 Tested Substance Rabbit 1.6-2.5 ml/kg 50% Active Ingredient (Glutaraldehyde) Rabbit 2.00 - 2.71 ml/kg 45% Active Ingredient Rabbit 8.0 - 12.8 ml/kg 25% Active Ingredient
EyeIrritant	At levels of 0.2% and below of glutaraldehyde, no eye irritation was noted. Levels above 0.2% of glutaraldehyde produced moderate to severe irritation and corneal injury.
Ingestion	Corrosive. Toxic if swallowed.
Inhalation	Corrosive. Toxic by inhalation. May cause sensitisation by inhalation. May cause allergy or asthma symptoms or breathing difficulties if inhaled.
SkinIrritant	At 10% or greater, glutaraldehyde solutions may cause moderate to severe irritation, with possible necrosis after prolonged contact.

Sensitisation	Levels of greater than 0.2% of glutaraldehyde produced allergic contact dermatitis in human studies. May cause sensitization by inhalation and skin contact.
Carcinogenicity	None of the substances in this product are listed as carcinogens by the International Agency for Research on Cancer (IARC), the National Toxicology Program (NTP) or the American Conference of Governmental Industrial Hygienists (ACGIH). Preliminary histopathological findings in the 24-month sacrifice of a combined oncogenicity/chronic study in Fischer 344 rats given glutaraldehyde in drinking water showed an increase in the incidence of the spontaneously occurring large granular cell lymphocytic leukemia (LGL) at all doses (50, 250, 1000 ppm) compared with the controls only for the female rats. Male rats had the same incidence as the controls at all levels of exposures. The significance of this observation to humans remains to be determined.
Mutagenicity	Mutagenicity in vitro tests of Chinese hamster ovary, sister chromatid exchange and unscheduled DNA synthesis did not produce dose-related responses. Oral doses of 30 and 60 mg/kg to mice showed no effect in the dominant lethal assay. In all five strains of Salmonella, with and without metabolic activation by S9 liver homogenate, no mutagenic response was noted.
Teratology	Doses of 25 and 50 mg/kg given by gavage to pregnant rats produced decreases in maternal body weight. There were no other indications of maternal toxicity nor was there evidence of fetotoxicity or external, visceral or skeletal abnormalities. Mice (CD-1 strain) given 100 mg/kg by gavage showed fetotoxicity as evidenced by decreased body weight. At lower doses, there was no evidence of fetotoxicity or skeletal abnormalities. No evidence of teratogenic effects were noted in either species.
Carcinogen Category	No Data Available

12. ECOLOGICAL INFORMATION

Ecotoxicity	Very toxic to aquatic organisms. Bacteria: Phytobacterium phosphoreum: EC50 = 76.0 m g /L ; 5 m in u te s ; Microtox test.
Persistence/Degradability	No information available on persistence/degradability for this product.
Mobility	Soluble in water.
Environmental Fate	Do NOT allow product to enter waterways, drains or sewers.
Bioaccumulation Potential	No information available on bioaccumulation for this product.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.(GLUTARALDEHYDE 50%)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	3265
Hazchem	2X
Pack Group	II
Special Provision	No Data Available

Land Transport (Malaysia)
ADR

Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.(GLUTARALDEHYDE 50%)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	3265
Hazchem	2X
Pack Group	II
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.(GLUTARALDEHYDE 50%)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
EPG	37 Toxic And/Or Corrosive Substances Non-Combustible
UN Number	3265
Hazchem	2X
Pack Group	II
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.(GLUTARALDEHYDE 50%)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
ERG	153 Substances - Toxic and/or Corrosive (Combustible)
UN Number	3265
Hazchem	2X
Pack Group	II
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.(GLUTARALDEHYDE 50%)
Class	8 Corrosive Substances
Subsidiary Risk(s)	No Data Available
UN Number	3265
Hazchem	2X
Pack Group	II
Special Provision	No Data Available
EMS	FA,SB
Marine Pollutant	Yes

Air Transport
IATA DGR

Proper Shipping Name	CORROSIVE LIQUID, ACIDIC, ORGANIC, N.O.S.(GLUTARALDEHYDE 50%)
Class	8 Corrosive Substances

Subsidiary Risk(s)	No Data Available
UN Number	3265
Hazchem	2X
Pack Group	II
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	6

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	HSR006394

National/Regional Inventories

Australia (AICS)	Listed
Canada (DSL)	Not Determined
Canada (NDSL)	Not Determined
China (IECSC)	Listed
Europe (EINECS)	Listed
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Not Determined
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Not Determined

16. OTHER INFORMATION

Related Product Codes	GLUTER5000, GLUTER5001, GLUTER5002, GLUTER6000, GLUTER6001, GLUTER7000, GLUTER7001, GLUTER8000, GLUTER6002, GLUTER8500, GLUTER8502, GLUTER9501, GLUTER9502, GLUTER4500, GLUTER4501, GLUTER4503
Revision	2
Revision Date	07 Jul 2013
Reason for Issue	Updated SDS
Key/Legend	**<** Less Than **>** Greater Than **AICS** Australian Inventory of Chemical Substances **atm** Atmosphere **CAS** Chemical Abstracts Service (Registry Number) **cm²** Square Centimetres **CO2** Carbon Dioxide **COD** Chemical Oxygen Demand **deg C (°C)** Degrees Celcius **EPA (New Zealand)** Environmental Protection Authority of New Zealand **deg F (°F)** Degrees Farenheit **g** Grams **g/cm³** Grams per Cubic Centimetre **g/l** Grams per Litre **HSNO** Hazardous Substance and New Organism **IDLH** Immediately Dangerous to Life and Health **immiscible** Liquids are insoluable in each other. **inHg** Inch of Mercury **inH2O** Inch of Water **K** Kelvin **kg** Kilogram **kg/m³** Kilograms per Cubic Metre **lb** Pound **LC50** LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. **LD50** LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. **ltr** or **L** Litre **m³** Cubic Metre **mbar** Millibar **mg** Milligram **mg/24H** Milligrams per 24 Hours **mg/kg** Milligrams per Kilogram **mg/m³** Milligrams per Cubic Metre **Misc** or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present. **mm** Millimetre **mmH2O** Millimetres of Water **mPa.s** Millipascals per Second **N/A** Not Applicable **NIOSH** National Institute for Occupational Safety and Health **NOHSC** National Occupational Heath and Safety Commission **OECD** Organisation for Economic Co-operation and Development **Oz** Ounce **PEL** Permissible Exposure Limit **Pa** Pascal **ppb** Parts per Billion **ppm** Parts per Million **ppm/2h** Parts per Million per 2 Hours **ppm/6h** Parts per Million per 6 Hours **psi** Pounds per Square Inch **R** Rankine **RCP** Reciprocal Calculation Procedure **STEL** Short Term Exposure Limit **TLV** Threshold Limit Value **tne** Tonne **TWA** Time Weighted Average **ug/24H** Micrograms per 24 Hours **UN** United Nations **wt** Weight

1. IDENTIFICATION

Product Name	**Sodium Hypochlorite Solution 10-30%**
Other Names	Clorox; HypochloriteSolution; Hypochlorous acid-sodium salt; Mixture - All components listed on AICS
Uses	Dairy, food and beverage industries: Sanitising processing equipment. Textile industry: Bleaching agent. Water treatment: Sanitising agent. Available chlorine = 10 - 15%.
Chemical Family	No Data Available
Chemical Formula	NaOCl
Chemical Name	Sodium Hypochlorite Solution 10-30%
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) 6

Globally Harmonised System

Hazard Classification		Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)	
Hazard Categories		Skin Corrosion/Irritation - Category 1B Serious Eye Damage/Irritation - Category 1 Acute Hazard To The Aquatic Environment - Category 1 Specific Target Organ Toxicity (Single Exposure) - Category 3	
Pictograms			
Signal Word		Danger	
Hazard Statements		**EUH031**	Contact with acids liberates toxic gas.
		H314	Causes severe skin burns and eye damage.
		H400	Very toxic to aquatic life.
Precautionary Statements	Prevention	**P260**	Do not breathe fume/gas/mist/vapours/spray.
		P273	Avoid release to the environment.
		P280	Wear protective gloves/protective clothing/eye protection.
	Response	**P301 + P330 + P331**	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
		P303 + P361 + P353	IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
		P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
		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.
		P321	Specific treatment (see First Aid Measures on Safety Data Sheet).
		P363	Wash contaminated clothing before reuse.
		P391	Collect spillage.
	Storage	**P405**	Store locked up.
	Disposal	**P501**	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Sodium Hypochlorite	ClHO.Na	7681-52-9	10.5 - 15.6 %
Sodium Hydroxide	HNaO	1310-73-2	0.7 - 2.0 %
Water	H2O	7732-18-5	Balance %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of water. Get medical aid immediately.
Eye	Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid immediately.
Skin	Get medical aid immediately. Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner, which limits further exposure.
Inhaled	Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. DO NOT use mouth-to-mouth respiration.
Advice to Doctor	Symptoms caused by exposure: Chlorine gas released from sodium hypochlorite causes irritation of respiratory system, consisting in coughing, difficult breathing, stomatitis, nausea and pulmonary edema. Contact with skin can cause skin irritation, followed by blisters and eczema (especially at 12% concentration). The eye contact causes serious damages of eyes. Ingestion of tens of grams of sodium hypochlorite solution (12% concentration) can cause mucous membrane burns, perforation of the esophagus and stomach, and laryngeal oedema. Medical Attention and Special Treatment: In case of eyes and face splashing , treat eyes firstly. Treat symptomatically and supportively.
Medical Conditions Aggravated by Exposure	No information available on medical conditions aggravated by exposure to this product.

5. FIRE FIGHTING MEASURES

General Measures	If safe to do so, remove containers from the path of fire.
Flammability Conditions	Not considered to be a fire hazard. Sodium hypochlorite itself does not burn, but poisonous gases are produced in fire.
Extinguishing Media	Suitable Extinguishing Media: Water. Use water spray to cool fire-exposed containers, to dilute liquid, and control vapour.
Fire and Explosion Hazard	Contact with combustible materials can cause explosions. Hazchem Code: 2X
Hazardous Products of Combustion	Emits toxic fumes of chlorine (hypochlorous acid and sodium chlorate) when heated to decomposition. The decomposition is an exothermal process.
Special Fire Fighting Instructions	Keep containers cool with water spray. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Wear appropriate protective clothing to prevent contact with skin and eyes. Wear a self- contained breathing apparatus (SCBA) to prevent contact with thermal decomposition products. Containers may explode when heated.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves) or chemical splash suit. Please note: Structural fire fighters uniform will provide limited protection.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	2X

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Emergency procedures, Evacuate the danger area or to consult an expert. Approach from upwind. Isolate the area. Wear self-contained breathing apparatus in confined spaces, in cases where the oxygen level is depleted, or in case of significant emissions. Prevent further leakage or spillage if safe to do so. Keep away from incompatible products.
Clean Up Procedures	Spills/Leaks: The spills can be neutralized using light reducing agents such as sodium sulphite sodium bisulphite or sodium thiosulphate. Do not use sulphates or bi-sulphate! Contain and recover when is possible. Stop leak if safe to do so.

Containment	
Decontamination	Special precautions: Do not use combustible materials, such as saw dust! Do not use sulphates or bisulphates for spill neutralizing!
Environmental Precautionary Measures	Do not allow product to reach drains, sewers or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Authority.
Evacuation Criteria	Evacuate all unnecessary personnel.
Personal Precautionary Measures	Personnel involved in the clean up should wear full protective clothing as listed in section 8.

7. HANDLING AND STORAGE

Handling	Protect against physical damage. Personnel which handling the product must wear protective equipment for hand, skin or eyes, and including protective breathing apparatus. Area should be well ventilated. Advice on general occupational hygiene: Avoid inhalation or ingestion and contact with skin and eyes. General occupational hygiene measures are required to ensure safe handling of the substance. Chemicals should be used only by those trained in handling potentially hazardous materials. The electrical equipment should be corrosion resistant.
Storage	Keep in tightly closed containers, store in a cool, dry, well ventilated area. Isolate from incompatible substances. The aqueous solutions are sensitive to light and air. Avoid storage for long period because the product degrades over time. The recommended storing temperature is 15-25 C. Storage at 15 C reduces the rate of decomposition. This product has a UN classification of 1791 and a Dangerous Goods Class 8 (Corrosive) according to The Australian Code for the Transport of Dangerous goods By Road and Rail.
Container	Materials used for storage tanks: • polyethylene; 5-7 years life time. The outdoor tanks will be UV proof. • glass fibre reinforced plastics – designed accordingly • steel rubber-lined (thickness of lining - ¾") • steel Halar lined (Halar is a copolymer 1:1 ethylene- chlorotrifluoroetylene) ; 3-6 years life time function of quality of lining application. • titanium – the best material used for tank construction but because the high price is used only for specific applications. Incompatible materials: reducing agents, combustible materials (wood, cellulose), organic materials, metals, acids. Materials to avoid: carbon steel, stainless steel, copper and its alloys, aluminium, unprotected metals.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	HSIS Airborne Exposure Limits: Chlorine: TWA 1 ppm (3 mg/m3 peak limitation) NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. Peak limitation is a ceiling concentration which should not be exceeded over a measurement period which should be as short as possible but not exceeding 15 minutes. These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
Exposure Limits	No Data Available
Biological Limits	No information available on biological limit values for this product.
Engineering Measures	These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
Personal Protection Equipment	RESPIRATOR: Self-contained breathing apparatus with full face-piece operated in the pressure demand. For emergencies or instances where exposure levels are not known, use a full face piece positive pressure, air supplied respirator. Warning! Air -purifying respirators do not protect workers in oxygen deficient atmospheres (AS1715/1716). EYES: Chemical splash goggles and/or face shield must be worn when possibility exist for eye contact due to splashing or spraying liquid or vapor (AS1336/1337). HANDS: Wear PVC, rubber or neoprene gloves. Glove thickness has to be of minimum 1.2 mm. Do not use leather gloves (AS2161). CLOTHING: Wear impervious protective clothing including boots, lab coat, apron or coveralls and safety footwear (AS3765/2210).
Work Hygienic Practices	Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use.x

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Liquid
Odour	Chlorine odour
Colour	Clear, colourless
pH	>12
Vapour Pressure	2500 Pa Pa (@ 20 °C)
Relative Vapour Density	No Data Available
Boiling Point	100 approx °C
Melting Point	No Data Available
Freezing Point	No Data Available
Solubility	Miscible in water
Specific Gravity	1.09 for 5.25% - 1.21 for 12.0%
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	-3.42 (calculated value)
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	2.6 mPas (@ 20 °C)
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	Specific density (water=1) 1.09 for 5.25%; 1.15 for 8.0%; 1.21for 12.0% Sodium hypochlorite solution is an aqueous mix of inorganic salts; therefore by heating of solution, water evaporates. At temperatures above 60C, the water evaporates with depositing of white crystals on the bottom of tank .For this reason the boiling point can not be determined
Potential for Dust Explosion	Product is a liquid.
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

1. IDENTIFICATION

Product Name	**Polyacrylamide - Liquid**
Other Names	Acrylamide; Acrylamide homopolyme; Acrylamide polymer; Polyacrylamide; Polyacrylamide resin; Polymers
Uses	Rheology modifier
Chemical Family	No Data Available
Chemical Formula	(C3H5NO)x
Chemical Name	Polyacrylamide - Liquid
Product Description	Cationic water-soluble polymer in emulsion.

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) Not scheduled

Globally Harmonised System

Hazard Classification	NOT hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)
Signal Word	None

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Cationic water	No Data Available	Proprietary	100.00 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	The product is not considered toxic based on studies on laboratory animals.
Eye	Rinse immediately with plenty of water for at least 15 minutes taking care to wash under the eyelids. If irritation persists, seek medical attention.
Skin	Remove contaminated clothing. Wash affected skin immediately with soap and plenty of water. If skin irritation or dermatitis commences or persists seek medical attention.
Inhaled	No hazards which require special first aid measures. Remove victim from exposure to fresh air.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient.
Medical Conditions Aggravated by Exposure	No information available on medical conditions aggravated by exposure to this product.

5. FIRE FIGHTING MEASURES

General Measures	If safe to do so, remove containers from the path of fire. Very slippery when wet. Spilled products is slippery underfoot.
Flammability Conditions	No Data Available
Extinguishing Media	In case of fire, appropriate extinguishing media include Foam, Carbon dioxide (CO2), Dry powder, Water, Water spray.
Fire and Explosion Hazard	Non-combustible liquid.
Hazardous Products of Combustion	Carbon oxides, nitrogen oxides.
Special Fire Fighting Instructions	Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves) or chemical splash suit.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available

Hazchem Code	No Data Available

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Eliminate all sources of ignition. Increase ventilation. Spilled product is extremely slippery underfoot. Use clean, non-sparking tools and equipment.
Clean Up Procedures	Soak up with inert absorbent material (e.g. sand, silica gel, acid binder, universal binder, sawdust). Scoop into marked containers for disposal as chemical waste. After cleaning flush away traces with water. Contain washed water and dispose of in accordance with local regulations.
Containment	Stop leak if safe to do so.
Environmental Precautionary Measures	Do not allow product to reach drains, sewers or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Authority.
Evacuation Criteria	Evacuate all unnecessary personnel.
Personal Precautionary Measures	Personnel involved in the clean up should wear full protective clothing as listed in section 8.

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid contact with eyes, skin and clothing. Do not eat, drink or smoke during work. Avoid formation of sprays or mists.
Storage	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Avoid extremes of temperature, especially frost and freezing conditions. Keep container tightly closed in a dry, cool and well-ventilated place.This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container	Store in original packaging as approved by manufacturer.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	No exposure standard has been established for this product by the Australian Safety and Compensation Council (ASCC). NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
Exposure Limits	No Data Available
Biological Limits	No information available on biological limit values for this product.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	RESPIRATOR: Suitable respiratory protection should be used if vapour may be inhaled (AS1715/1716). EYES: Tightly fitting safety goggles (chemical goggles). Do not wear contact lenses (AS1336/1337). HANDS: Chemical resistant protective gloves (EN 374) (AS2161). CLOTHING: Light-weight, long-sleeved clothing and safety boots (AS3765/2210).
Work Hygienic Practices	No Data Available

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Viscous Liquid
Odour	Aliphatic
Colour	Milky
pH	3 - 7 5 g/L
Vapour Pressure	0.13 (@ 20 °C)
Relative Vapour Density	No Data Available
Boiling Point	No Data Available
Melting Point	No Data Available
Freezing Point	No Data Available
Solubility	No Data Available
Specific Gravity	No Data Available
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	1.04
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	1000 mPa s - 3000 mPa s (@ 25 °C)
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	No Data Available
Potential for Dust Explosion	Product is a liquid.
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

General Information	Very slippery when wet.
Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	Avoid temperature extremes, especially frost and freezing conditions.

Materials to Avoid	Strong oxidizing agents, strong acids, strong bases.
Hazardous Decomposition Products	Thermal decomposition may produce. Hydrogen chloride gas. Nitrogen oxides (NOx). Carbon oxides (COx).
Hazardous Polymerisation	Hazardous polymerisation does not occur.

11. TOXICOLOGICAL INFORMATION

General Information	ACUTE ORAL TOXICITY (Rat): LD5/oral/rat >5000 mg/kg ACUTE DERMAL TOXICITY Rabbits tested - Non-toxic even at high dose levels ACUTE INHALATION TOXICITY Not expected to be toxic by inhalation EYE IRRITATION / CORROSION May cause eye irritation with susceptible persons SKIN IRRITATION / CORROSION May cause skin irritation with susceptible persons Prolonged skin contact may defat the skin and produce dermatitis.
SkinIrritant	Prolonged skin contact may deflate the skin and produce dermatitis. May cause skin irritation with susceptible persons.
EyeIrritant	May cause eye irritation with susceptible persons.
Carcinogen Category	No Data Available

12. ECOLOGICAL INFORMATION

Ecotoxicity	ACUTE TOXICITY TO FISH LC50/96hours > 10-100mg/l (OECD 203) (Based on the toxicity of the components using the conventional method) TOXICITY TO AQUATIC INVERTEBRATES EC(I)50/Daphnia m/48hours > 50mg/l (Based on the toxicity of the components using the conventional method) TOXICITY TO AQUATIC PLANTS Algal inhibition tests are not appropriate. The flocculation characteristics of the product interfere directly in the test medium preventing homogenous distribution which invalidates the test.
Persistence/Degradability	Hydrolysis: At natural pHs (>6) the polymer degrades due to hydrolysis to more than 70% in 28 days. The hydrolysis products are not harmful to aquatic organisms.
Mobility	No information available on mobility for this product.
Environmental Fate	Do NOT let product reach waterways, drains and sewers.
Bioaccumulation Potential	Hydrolysis: At natural pHs (>6) the polymer degrades due to hydrolysis to more than 70% in 28 days. The hydrolysis products are not harmful to aquatic organisms.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	If utilisation or recycling of the product is not possible, it should be disposed of in accordance with all local, state and federal regulations. Contaminated packaging should be emptied as far as possible and disposed of in the same manner as the substance/product. Clean packaging material should be subjected to waste management schemes (recovery recycling, reuse) according to local legislation.
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	POLYACRYLAMIDE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (Malaysia)
ADR

Proper Shipping Name	POLYACRYLAMIDE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	POLYACRYLAMIDE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	POLYACRYLAMIDE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	POLYACRYLAMIDE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available

Special Provision	No Data Available
EMS	No Data Available
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	POLYACRYLAMIDE
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	Not scheduled

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	Not Hazardous

National/Regional Inventories

Australia (AICS)	Not Listed
Canada (DSL)	Not Determined
Canada (NDSL)	Not Determined
China (IECSC)	Not Determined
Europe (EINECS)	Not Determined
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Not Determined
Philippines (PICCS)	Not Determined

Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Not Determined

16. OTHER INFORMATION

Related Product Codes	FLOACA1400, FLOACA1402, FLOACA1401, FLOACA8000, FLOACA1404, FLOACA1405, FLOACA8005
Revision	2
Revision Date	16 Jan 2016
Reason for Issue	SDS updated
Key/Legend	**<** Less Than **>** Greater Than **AICS** Australian Inventory of Chemical Substances **atm** Atmosphere **CAS** Chemical Abstracts Service (Registry Number) **cm²** Square Centimetres **CO2** Carbon Dioxide **COD** Chemical Oxygen Demand **deg C (°C)** Degrees Celcius **EPA (New Zealand)** Environmental Protection Authority of New Zealand **deg F (°F)** Degrees Farenheit **g** Grams **g/cm³** Grams per Cubic Centimetre **g/l** Grams per Litre **HSNO** Hazardous Substance and New Organism **IDLH** Immediately Dangerous to Life and Health **immiscible** Liquids are insoluable in each other. **inHg** Inch of Mercury **inH2O** Inch of Water **K** Kelvin **kg** Kilogram **kg/m³** Kilograms per Cubic Metre **lb** Pound **LC50** LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. **LD50** LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. **ltr** or **L** Litre **m³** Cubic Metre **mbar** Millibar **mg** Milligram **mg/24H** Milligrams per 24 Hours **mg/kg** Milligrams per Kilogram **mg/m³** Milligrams per Cubic Metre **Misc** or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present. **mm** Millimetre **mmH2O** Millimetres of Water **mPa.s** Millipascals per Second **N/A** Not Applicable **NIOSH** National Institute for Occupational Safety and Health **NOHSC** National Occupational Heath and Safety Commission **OECD** Organisation for Economic Co-operation and Development **Oz** Ounce **PEL** Permissible Exposure Limit **Pa** Pascal **ppb** Parts per Billion **ppm** Parts per Million **ppm/2h** Parts per Million per 2 Hours **ppm/6h** Parts per Million per 6 Hours **psi** Pounds per Square Inch

R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

1. IDENTIFICATION

Product Name	**Guar Gum**
Other Names	Cyamopsis Gum; Guar Flour; Guar Gum (Cyamopsis Tetragonolobus); Guaran; Gum Cyanopsis
Uses	Food/Industrial applications. Stabiliser/thickener.
Chemical Family	No Data Available
Chemical Formula	Unspecified
Chemical Name	Guar Gum
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) No Data Available

Globally Harmonised System

Hazard Classification	NOT hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)
Signal Word	None

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications	Health Hazards	**6.3B**	Substances that are mildly irritating to the skin
		6.5A	Substances that are respiratory sensitisers
		6.5B	Substances that are contact sensitisers
	Environmental Hazards	**9.1D**	Substances that are slightly harmful to the aquatic environment or are otherwise designed for biocidal action

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Guar Gum	No Data Available	9000-30-0	100 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	Rinse mouth with water. If swallowed, give a glass of water to drink. If vomiting occurs give further water. Seek medical advice.
Eye	If in eyes, wash out immediately with water. In all cases of eye contamination it is a sensible precaution to seek medical advice.
Skin	If skin contact occurs, remove contaminated clothing and wash skin with running water. If irritation occurs seek medical advice.
Inhaled	Remove victim from area of exposure - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm. Keep at rest until fully recovered. Seek medical advice if effects persist.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient. Material swells on contact with water.
Medical Conditions Aggravated by Exposure	No information available on medical conditions which are aggravated from exposure to this product.

5. FIRE FIGHTING MEASURES

General Measures	Clear area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow firefighting water to reach waterways, drains or sewers. Store firefighting water for treatment.

Flammability Conditions	Avoid dust generation.
Extinguishing Media	In case of fire, appropriate extinguishing media include Dry agent (carbon dioxide, dry chemical powder) - water MUST NOT be allowed to come into contact with substance, forms a very slippery surface and may cause accidents.
Hazardous Products of Combustion	On burning will emit toxic fumes, including those of oxides of carbon.
Special Fire Fighting Instructions	Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. All combustion residues and contaminated water from fire-fighting should be disposed of according to regulations.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves).
Flash Point	300 °C
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	No Data Available

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Avoid accidents, clean up immediately. Increase ventilation. Avoid walking through spilled product as it is slippery when spilt. Use clean, non-sparking tools and equipment. Shut off all possible sources of ignition.
Clean Up Procedures	Contain and sweep/shovel up spills with dust binding material or use an industrial vacuum cleaner. Transfer to a suitable, labelled chemical-waste container and hold for safe disposal.
Containment	Stop leak if safe to do so. Isolate the danger area.
Environmental Precautionary Measures	Do NOT let product reach drains or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management.
Evacuation Criteria	Evacuate all unnecessary personnel.
Personal Precautionary Measures	Personnel involved in the clean-up should wear full protective clothing as listed in section 8.

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid handling which leads to dust formation. In common with many organic chemicals, may form flammable dust clouds in air. Avoid contact with eyes, skin and clothing. Do not inhale product dust/fumes. Use only in a chemical fume hood.
Storage	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Protect from direct sunlight, moisture and static discharges. Store under atmospheric temperature. This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container	Store in original packaging as approved by manufacturer. The material is packaged in multiwall paper bags with polyethylene lining - 25Kg net.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	No exposure standard has been established for this product by the Safe Work Australia (SWA). NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
Exposure Limits	No Data Available No information available on biological limit values for this product.

Biological Limits	
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	RESPIRATOR: No respiratory protection normally required (AS1715/1716). EYES: Safety glasses with side shields (AS1336/1337). HANDS: Wear impervious gloves (AS2161). CLOTHING: Long-sleeved protective clothing and safety footwear (AS3765/2210).
Work Hygienic Practices	No Data Available

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	Free-flowing Powder
Odour	Slight, Bean-like
Colour	Creamy/White
pH	5 - 6
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	No Data Available
Melting Point	No Data Available
Freezing Point	No Data Available
Solubility	Excellent in water 25°C
Specific Gravity	0.68
Flash Point	300 °C
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	170 °C
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	3000-7000 cps (@ No Data Available)
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	No Data Available
Potential for Dust Explosion	No Data Available
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available

Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	Product should not be open to atmosphere for long since material is susceptible to moisture.
Materials to Avoid	Incompatible with strong oxidising agents, and sources of ignition.
Hazardous Decomposition Products	On burning will emit toxic fumes, including those of oxides of carbon.
Hazardous Polymerisation	Hazardous polymerization will not occur.

11. TOXICOLOGICAL INFORMATION

General Information	Oral LD50 Rat: 6770mg/Kg
Carcinogen Category	No Data Available

12. ECOLOGICAL INFORMATION

Ecotoxicity	Algae: Nil - the material when mixed with water it will form a paste and remain for 24 hrs, by which time the paste is to be consumed.
Persistence/Degradability	The material is biodegradable.
Mobility	No information available on mobility for this product. Soluble in water.
Environmental Fate	Avoid contaminating waterways, drains and sewers.
Bioaccumulation Potential	No information available on bioaccumulation for this product.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility. The material is an agricultural product and subject to natures re-cycle effect without causing any harm. As such the material if needed to be disposed, it can be buried deep in soil or dissolved in sea where fish and other living organism will consume the product with no danger to them.
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice.

14. TRANSPORT INFORMATION

16. OTHER INFORMATION

Related Product Codes

GUGUAR0100, GUGUAR0200, GUGUAR0300, GUGUAR0400, GUGUAR0401, GUGUAR0402, GUGUAR0500, GUGUAR0600, GUGUAR0601, GUGUAR0700, GUGUAR0800, GUGUAR0900, GUGUAR1000, GUGUAR1001, GUGUAR1002, GUGUAR1003, GUGUAR1004, GUGUAR1005, GUGUAR1006, GUGUAR1007, GUGUAR1008, GUGUAR1009, GUGUAR1010, GUGUAR1011, GUGUAR1100, GUGUAR1101, GUGUAR1102, GUGUAR1200, GUGUAR1300, GUGUAR1400, GUGUAR1401, GUGUAR1500, GUGUAR1600, GUGUAR1700, GUGUAR1800, GUGUAR1900, GUGUAR2000, GUGUAR2100, GUGUAR2200, GUGUAR2201, GUGUAR2300, GUGUAR2301, GUGUAR2302, GUGUAR2400, GUGUAR2500, GUGUAR2501, GUGUAR2600, GUGUAR2601, GUGUAR2700, GUGUAR2800, GUGUAR2900, GUGUAR3000, GUGUAR3100, GUGUAR3200, GUGUAR3300, GUGUAR3400, GUGUAR3500, GUGUAR3600, GUGUAR3601, GUGUAR3700, GUGUAR3800, GUGUAR3801, GUGUAR3900, GUGUAR3901, GUGUAR4000, GUGUAR4001, GUGUAR4002, GUGUAR4100, GUGUAR4101, GUGUAR4200, GUGUAR4201, GUGUAR4300, GUGUAR4301, GUGUAR4400, GUGUAR4500, GUGUAR4501, GUGUAR4600, GUGUAR5000, GUGUAR5001, GUGUAR5100, GUGUAR5200, GUGUAR5201, GUGUAR5300, GUGUAR5301, GUGUAR5400, GUGUAR5500, GUGUAR5600, GUGUAR5700, GUGUAR5800, GUGUAR5900, GUGUAR5901, GUGUAR6000, GUGUAR6001, GUGUAR6100, GUGUAR6101, GUGUAR6102, GUGUAR6200, GUGUAR6600, GUGUAR6700, GUGUAR6800, GUGUAR6900, GUGUAR7000, GUGUAR7001, GUGUAR7100, GUGUAR7200, GUGUAR7300, GUGUAR7600, GUGUAR7700, GUGUAR8000, GUGUAR8100, GUGUAR8101, GUGUAR8102, GUGUAR8200, GUGUAR8300, GUGUAR8400, GUGUAR8500, GUGUAR8600, GUGUAR8700, GUGUAR8800, GUGUAR8801, GUGUAR8802, GUGUAR8900, GUGUAR9000, GUGUAR9100, GUGUAR9200, GUGUAR9300, GUGUAR9400, GUGUAR9500, GUGUAR9600, GUGUAR9700, GUGUAR9800, GUGUAR9801, GUGUAR9900, GUGUAR0310, GUGUAR5710, GUGUAR5701, GUGUAR1710, GUGUAR1610, GUGUAR3910, GUGUAR5510, GUGUAR0910, GUGUAR0920, GUGUAR0930, GUGUAR0940, GUGUAR5310, GUGUAR1810, GUGUAR0950, GUGUAR0960, GUGUAR5302, GUGUAR1701, GUGUAR1601, GUGUAR2001, GUGUAR1957, GUGUAR1958, GUGUAR1702, GUGUAR2010, GUGUAR2002, GUGUAR2003, GUGUAR2011, GUGUAR2004, GUGUAR1750, GUGUAR1703, GUGUAR2005, GUGUAR1705

Revision

2

Revision Date

03 Jun 2015

Key/Legend

< Less Than
> Greater Than
AICS Australian Inventory of Chemical Substances
atm Atmosphere
CAS Chemical Abstracts Service (Registry Number)
cm² Square Centimetres
CO2 Carbon Dioxide
COD Chemical Oxygen Demand
deg C (°C) Degrees Celcius
EPA (New Zealand) Environmental Protection Authority of New Zealand
deg F (°F) Degrees Farenheit
g Grams
g/cm³ Grams per Cubic Centimetre
g/l Grams per Litre
HSNO Hazardous Substance and New Organism
IDLH Immediately Dangerous to Life and Health
immiscible Liquids are insoluable in each other.
inHg Inch of Mercury
inH2O Inch of Water
K Kelvin
kg Kilogram
kg/m³ Kilograms per Cubic Metre
lb Pound
LC50 LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50 LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.
ltr or **L** Litre
m³ Cubic Metre
mbar Millibar
mg Milligram
mg/24H Milligrams per 24 Hours
mg/kg Milligrams per Kilogram
mg/m³ Milligrams per Cubic Metre
Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH2O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Heath and Safety Commission
OECD Organisation for Economic Co-operation and Development

Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

1. IDENTIFICATION

Product Name	**Potassium Carbonate Liquid**
Other Names	Carbonic Acid, Dipotassium Salt; Pearl ash; Salt of tartar
Uses	Glass industry, chemical processing, cleaning agent, detergents, gas purification, polymer catalyst, rubber additives, raw wool washing.
Chemical Family	No Data Available
Chemical Formula	K2CO3
Chemical Name	Potassium Carbonate Liquid
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) 5

Globally Harmonised System

Hazard Classification		Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)	
Hazard Categories		Skin Corrosion/Irritation - Category 1B Serious Eye Damage/Irritation - Category 1	
Pictograms			
Signal Word		Danger	
Hazard Statements		**H314**	Causes severe skin burns and eye damage.
Precautionary Statements	Prevention	**P260**	Do not breathe dust/fume/gas/mist/vapours/spray.
		P264	Wash hands thoroughly after handling.
		P280	Wear protective gloves/protective clothing/eye protection/face protection.
	Response	**P301 + P330 + P331**	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
		P303 + P361 + P353	IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.
		P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
		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.
		P321	Specific treatment (see First Aid Measures on Safety Data Sheet).
		P363	Wash contaminated clothing before reuse.
	Storage	**P405**	Store locked up.
	Disposal	**P501**	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications	Health Hazards	**6.3A**	Substances that are irritating to the skin
		6.4A	Substances that are irritating to the eye

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Potassium Carbonate	K2CO3	584-08-7	50.00 %
Water	H2O	7732-18-5	50.00 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	Immediately rinse mouth with water. If swallowed, do NOT induce vomiting. Give a glass of water. Never give anything by the mouth to an unconscious patient. Seek immediate medical assistance.
Eye	Immediately wash in and around the eye area with large amounts of water for at least 15 minutes. Eyelids to be held apart. Remove clothing if contaminated and wash skin. Urgently seek medical assistance. Transport promptly to hospital or medical centre.
Skin	If spilt on large areas of skin or hair, immediately drench with running water and remove clothing. Continue to wash skin and hair with plenty of water (and soap if material is insoluble) until advised to stop by the Poisons Information Centre or a doctor.
Inhaled	Remove victim from area of exposure - avoid becoming a casualty. Remove contaminated clothing and loosen remaining clothing. Allow patient to assume most comfortable position and keep warm. Keep at rest until fully recovered. If patient finds breathing difficult and develops a bluish discolouration of the skin (which suggests a lack of oxygen in the blood - cyanosis), ensure airways are clear of any obstruction and have a qualified person give oxygen through a face mask. Apply artificial respiration if patient is not breathing. Seek immediate medical advice.
Advice to Doctor	Treat symptomatically. Can cause corneal burns.
Medical Conditions Aggravated by Exposure	No information available on medical conditions aggravated by exposure to this product.

5. FIRE FIGHTING MEASURES

General Measures	If safe to do so, remove containers from the path of fire.
Flammability Conditions	Not flammable. Decomposes above 950 Deg C.
Extinguishing Media	In case of fire, use appropriate extinguishing media most suitable for surrounding fire conditions.
Fire and Explosion Hazard	Product itself not considered to be an explosion hazard. Mixing product with sodium hydrosulphite, aluminum powder and benzaldehyde may cause mixture to explode.
Hazardous Products of Combustion	Potassium carbonate and lime will react in the presence of water to form caustic potash (K2O). Thermal decomposition may yield oxides of carbon and potassium.
Special Fire Fighting Instructions	Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves) or chemical splash suit.
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	No Data Available

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Eliminate all sources of ignition. Increase ventilation. Avoid walking through spilled product as it may be slippery. Use clean, non-sparking tools and equipment.
Clean Up Procedures	Soak up spilled product using absorbent non-combustible material such as sand or soil. Avoid using sawdust or cellulose. When saturated, collect the material and transfer to a suitable, labelled chemical waste container and dispose of promptly.
Containment	Stop leak if safe to do so.
Decontamination	Flush with water to remove any residue.
Environmental Precautionary Measures	Do not allow product to reach drains, sewers or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Authority.
Evacuation Criteria	Evacuate all unnecessary personnel. Personnel involved in the clean up should wear full protective clothing as listed in section 8.

Personal Precautionary Measures	

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid contact with eyes, skin and clothing. Do not inhale product fumes.
Storage	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container	Store in original packaging as approved by manufacturer.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	No exposure standard has been established for this product by the Safe Work Australia (SWA).NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
Exposure Limits	No Data Available
Biological Limits	No information available on biological limits for this product.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	RESPIRATOR: Where airborne potassium carbonate mists may be present, a NIOSH/MSHA approved high-efficiency particulate filter with full face piece or self-contained breathing apparatus should be used. Follow any applicable respirator use standards and regulations (AS1715/1716). EYES: Chemical goggles, full-face shield (AS1715/1716). HANDS: Impervious gloves of chemically resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse (AS2161). CLOTHING: Body suits, aprons, and/or coveralls of chemical resistant material should be worn at all times. Wash contaminated clothing and dry thoroughly before reuse (AS3765/2210).
Work Hygienic Practices	No Data Available

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Liquid.
Odour	Odourless
Colour	Clear, colourless
pH	11.6 in 3% solution
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	No Data Available
Melting Point	No Data Available
Freezing Point	-12 °C
Solubility	Soluble 100%
Specific Gravity	1.498

Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	138.21
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	No Data Available
Potential for Dust Explosion	Product is a liquid
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	Avoid exposure to heat.
Materials to Avoid	Lime, chlorine trifluoride, magnesium, acids, prolonged contact with aluminum, brass, bronze, copper, lead, tin, zinc or other alkali sensitive metals or alloys. Incompatible with acids. Incompatible with metals.
Hazardous Decomposition Products	Potassium carbonate and lime will react in the presence of water to form caustic potash (K2O). Thermal decomposition may yield oxides of carbon and potassium.
Hazardous Polymerisation	Will not occur

11. TOXICOLOGICAL INFORMATION

General Information	TOXICITY DATA FOR POTASSIUM CARBONATE: Oral LD50 (rat) 1870 mg/kg Oral LD50 (mouse) 2570 mg/kg Inhalation LC50: >4.96 mg/l Dermal LD50: >2000 mg/kg

EyeIrritant	A severe eye irritant. Corrosive to eyes; contact can cause corneal burns. Contamination of eyes can result in permanent injury.
Ingestion	Swallowing can result in nausea, vomiting, diarrhoea, abdominal pain and chemical burns to the gastrointestinal tract.
Inhalation	Breathing high concentrations may be harmful. Breathing this material causes irritation of the throat and lungs with cough and difficult breathing.
SkinIrritant	Contact with skin will result in severe irritation. Corrosive to skin - may cause skin burns.
Carcinogen Category	No Data Available

12. ECOLOGICAL INFORMATION

Ecotoxicity	ECOTOXICITY DATA FOR POTASSIUM CARBONATE: LC50 Rainbow trout 68 mg/L/ 96h LC50 Bluegill sunfish 230 mg/L/ 96h Daphnia magna EC50 (hard water) = 430 mg/l/48h Daphnia pulex EC50 (soft water) = 200 mg/l/48h
Persistence/Degradability	This material is inorganic and not subject to biodegradation.
Mobility	No information available on mobility for this product.
Environmental Fate	Do NOT let product reach waterways, drains and sewers.
Bioaccumulation Potential	This material is believed not to bioaccumulate and persist in environment. Leak or spill may increase pH of waterways and affect aquatic life.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	If utilisation or recycling of the product is not possible, it should be disposed of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	POTASSIUM CARBONATE LIQUID
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (Malaysia)
ADR

Proper Shipping Name	POTASSIUM CARBONATE LIQUID

Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	POTASSIUM CARBONATE LIQUID
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	POTASSIUM CARBONATE LIQUID
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	POTASSIUM CARBONATE LIQUID
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
EMS	No Data Available
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	POTASSIUM CARBONATE LIQUID
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available

Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	5

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	HSR005777

National/Regional Inventories

Australia (AICS)	Listed
Canada (DSL)	Listed
Canada (NDSL)	Not Determined
China (IECSC)	Listed
Europe (EINECS)	Not Determined
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Listed
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Listed
Philippines (PICCS)	Listed
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Listed
USA (TSCA)	Listed

16. OTHER INFORMATION

POCARL1000, POCARL1001, POCARL5000, POCARL5500, POCARL6500, POCARB1800, POCARB1801,

Related Product Codes	POCARB1802, POCARB1819, POCARB1820, POCARB1821, POCARB1822, POCARB1823
Revision	4
Revision Date	08 Aug 2014
Key/Legend	**<** Less Than **>** Greater Than **AICS** Australian Inventory of Chemical Substances **atm** Atmosphere **CAS** Chemical Abstracts Service (Registry Number) **cm²** Square Centimetres **CO2** Carbon Dioxide **COD** Chemical Oxygen Demand **deg C (°C)** Degrees Celcius **EPA (New Zealand)** Environmental Protection Authority of New Zealand **deg F (°F)** Degrees Farenheit **g** Grams **g/cm³** Grams per Cubic Centimetre **g/l** Grams per Litre **HSNO** Hazardous Substance and New Organism **IDLH** Immediately Dangerous to Life and Health **immiscible** Liquids are insoluable in each other. **inHg** Inch of Mercury **inH2O** Inch of Water **K** Kelvin **kg** Kilogram **kg/m³** Kilograms per Cubic Metre **lb** Pound **LC50** LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. **LD50** LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. **ltr** or **L** Litre **m³** Cubic Metre **mbar** Millibar **mg** Milligram **mg/24H** Milligrams per 24 Hours **mg/kg** Milligrams per Kilogram **mg/m³** Milligrams per Cubic Metre **Misc** or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present. **mm** Millimetre **mmH2O** Millimetres of Water **mPa.s** Millipascals per Second **N/A** Not Applicable **NIOSH** National Institute for Occupational Safety and Health **NOHSC** National Occupational Heath and Safety Commission **OECD** Organisation for Economic Co-operation and Development **Oz** Ounce **PEL** Permissible Exposure Limit **Pa** Pascal **ppb** Parts per Billion **ppm** Parts per Million **ppm/2h** Parts per Million per 2 Hours **ppm/6h** Parts per Million per 6 Hours **psi** Pounds per Square Inch **R** Rankine **RCP** Reciprocal Calculation Procedure **STEL** Short Term Exposure Limit **TLV** Threshold Limit Value **tne** Tonne **TWA** Time Weighted Average **ug/24H** Micrograms per 24 Hours **UN** United Nations **wt** Weight

1. IDENTIFICATION

Product Name	**Ethyl Vinyl Acetate Copolymer**
Other Names	Acetic acid, ethenyl ester, copolymer with ethene; ETHYLENE/VA COPOLYMER; Vinyl acetate, ethene polymer
Uses	Industrial resin.
Chemical Family	No Data Available
Chemical Formula	(C4H6O2.C2H4)x
Chemical Name	Ethyl Vinyl Acetate Copolymer
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) No Data Available

Globally Harmonised System

Hazard Classification	NOT hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)
Signal Word	None

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Ethylene-Vinyl Acetate Copolymer	No Data Available	24937-78-8	>99 %
Vinyl acetate	No Data Available	108-05-4	<0.5 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	Seek immediate medical attention. If vomiting occurs, keep head lower than hips to prevent aspiration. If person is unconscious, turn head to side.
Eye	Immediately flush eyes with plenty of water for 15 minutes, holding eyelids open. Seek medical attention.
Skin	Remove contaminated clothing. Wash affected area with plenty of Soap and water for at least 15 minutes. Seek medical attention if symptoms develop or persist. Wash clothing before reuse.
Inhaled	Remove victim from exposure to fresh air. If not breathing, apply artificial respiration. If breathing is difficult, give oxygen. Seek medical attention.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient.
Medical Conditions Aggravated by Exposure	No information available on medical conditions aggravated by exposure to this product.

5. FIRE FIGHTING MEASURES

General Measures	Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk. Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk.
Flammability Conditions	No Data Available
Extinguishing Media	Dry chemical, carbon dioxide, water spray, regular foam, AFFF foam. In case of major fire and large quantities: regular extinguishing agent, fine water spray. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Unsuitable extinguishing media: Water applied directly in jet stream may disperse the product.
Fire and Explosion Hazard	Containers may explode when heated. Molten product may spread fire. Fire may produce irritating gases.
Hazardous Products of Combustion	Complete combustion: CO2, NOx and H2O. Incomplete combustion: CO, soot, aldehydes, ketones, hydrocarbons and volatile fatty acids.
Special Fire Fighting Instructions	Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves).

Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	No Data Available

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Avoid accidents, clean up immediately. Slippery when spilt. Eliminate all sources of ignition. Increase ventilation. Avoid generating dust. Stop leak if safe to do so. Isolate the danger area. Use clean, non-sparking tools and equipment.
Clean Up Procedures	Contain and sweep/shovel up spills with dust binding material or use an industrial vacuum cleaner. Transfer to a suitable, labelled container and dispose of promptly.
Containment	Stop leak if safe to do so. Isolate the danger area.
Environmental Precautionary Measures	Do NOT let product reach drains or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management.
Evacuation Criteria	Evacuate all unnecessary personnel.
Personal Precautionary Measures	Personnel involved in the clean up should wear full protective clothing as listed in section 8.

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid handling which leads to dust formation. Copolymer has a marked tendency to build up static charge when transferred by pneumatic transport, so proper grounding should be ensured. Never weld in storage areas without proper precautions. If product is subjected to ultraviolet radiation in the presence of oxygen without protection, it suffers a slow degradation.
Storage	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container	Store in original packaging as approved by manufacturer.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General

The following exposure standard has been established by Safe Work Australia (SWA):
Vinyl Acetate: CAS No: 108-05-4
TWA 10 ppm (35 mg/m3)
STEL: 20 ppm (70 mg/m3)
NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week.
These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
DNEL CAS: 108-05-4
DN(M)ELs for workers
Acute exposure - systemic effects, Inhalation (mg/m³): 35.2
Acute exposure - local effects, Inhalation (mg/m³): 35.2
Long-term exposure - systemic effects, Dermal (mg/kg bw /day): 0.42
Long-term exposure - systemic effects, Inhalation (mg/m³): 17.6
Long-term exposure - local effects, Inhalation (mg/m³): 17.6
PNEC CAS: 108-05-4
PNEC water
PNEC aqua - freshwater (mg/L): 0.016
PNEC aqua - marine water (mg/L): 0.0016

	PNEC aqua - intermittent releases (mg/L): 0.126 PNEC sediment PNEC sediment – freshwater (mg/kg d.w.): 0.067 PNEC soil PNEC soil (mg/kg soil dw.): 0.0035 PNEC Sewage treatment plant PNEC STP (mg/l): 6
Exposure Limits	No Data Available
Biological Limits	No information available on biological limit values for this product.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Adequate ventilation should be provided so that exposure limits are not exceeded.
Personal Protection Equipment	RESPIRATOR: Respiratory protective mask when melted product vapors are present(AS1715/1716). EYES: Safety goggles to avoid splashes when handling melted product (AS1336/1337). HANDS: Wear appropriate chemical-resistant gloves (AS2161). CLOTHING: Wear appropriate protective chemical-resistant clothing and safety shoes (AS3765/2210).
Work Hygienic Practices	Good work practices and the adoption of good personal hygiene measures reduce unnecessary exposures. Showers should be used. Use soap and no other solvents. Use skin reconditioning cream after work.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	Pellets
Odour	Acetic Acid
Colour	White or transparent
pH	No Data Available
Vapour Pressure	No Data Available
Relative Vapour Density	No Data Available
Boiling Point	No Data Available
Melting Point	80 - 85 °C
Freezing Point	80 - 85
Solubility	Negligible
Specific Gravity	No Data Available
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	937 kg/m3
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	Solubility(ies: Aromatic and halogenated organic solvents.

Potential for Dust Explosion	No Data Available
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	Avoid direct contact with the flames and high temperatures.
Materials to Avoid	Oxidant materials, aromatic and aliphatic hydrocarbons, chloride solvents.
Hazardous Decomposition Products	At temperatures higher than 220-230°C the product decomposes releasing acetic acid. Complete combustion: Carbon, dioxide, water, Nitrc oxide, nitorgen dioxide. Incomplete combustion: Carbon monoxide, soot, aldehydes, ketones, hydrocarbons and volatile fatty acids.
Hazardous Polymerisation	Has not been reported.

11. TOXICOLOGICAL INFORMATION

General Information	Acute toxicity: CAS 108-05-4. Rat oral LD50: 3500 mg/kg; Rabbit dermal LD50: 7440 mg/kg; Rat inhalation LC50: 15810 mg/m³ (4h). Carcinogenicity: CAS: 108-05-4. NOAEC Inhalation = 176 mg/m³; LOAEL Oral = 31 mg/kg. Product rating corresponds to the comparison of the results from the toxicological studies with the criteria set out in Regulation (EC) No 1272/2008 for CMR, categories 1A and 1B.
Inhalation	Exposure to melted product may produce respiratory burns.
EyeIrritant	Exposure to melted product may produce burns. Vapors from melted product may be irritating to the eyes.
SkinIrritant	Exposure to melted product may produce burns.
Carcinogen Category	No Data Available

12. ECOLOGICAL INFORMATION

Ecotoxicity	CAS 108-05-4. NOEC: 0.16 mg/l; 34 days; Pimephales promelas; OECD 210.
Persistence/Degradability	The product has long hydrocarbon insoluble chains, which makes biodegradation easy. Not easily removed from water or soil and has a high persistence in the environment.
Mobility	Not available.
Environmental Fate	Avoid contaminating waterways, drains and sewers.
Bioaccumulation Potential	Polymers are not biodegradable, a potential for bioaccumulation has to be expected
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice. Incinerate at an approved site following all local regulations.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	Ethyl Vinyl Acetate Copolymer
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (Malaysia)
ADR

Proper Shipping Name	Ethyl Vinyl Acetate Copolymer
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	Ethyl Vinyl Acetate Copolymer
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	Ethyl Vinyl Acetate Copolymer
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available

UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	Ethyl Vinyl Acetate Copolymer
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
EMS	No Data Available
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	Ethyl Vinyl Acetate Copolymer
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	No Data Available

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	Not Assessed

National/Regional Inventories

Australia (AICS)	Listed
Canada (DSL)	Not Determined

Canada (NDSL)	Not Determined
China (IECSC)	Not Determined
Europe (EINECS)	Not Determined
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Not Determined
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Not Determined

16. OTHER INFORMATION

Related Product Codes	ETVIAA1000, ETVIAA1001, ETVIAA1002, ETVIAA1003, ETVIAA1004, ETVIAA1100, ETVIAA1200, ETVIAA1300, ETVIAB1000, ETVIAB1001, ETVIAB1002, ETVIAB1003, ETVIAB1004, ETVIAB1005, ETVIAB1006, ETVIAB1007, ETVIAB1100, ETVIAC1000, ETVIAC1001, ETVIAC1002, ETVIAC1003, ETVIAC1004, ETVIAC1005, ETVIAC1006, ETVIAC1007, ETVIAC1008, ETVIAC1009, ETVIAC1010, ETVIAC1011, ETVIAC1012, ETVIAC1100, ETVIAC1101, ETVIAC1102, ETVIAC1103, ETVIAC1200, ETVIAC2000, ETVIAC3000, ETVIAC4000, ETVIAC4500, ETVIAD1000, ETVIAD1001, ETVIAD1002, ETVIAD1003, ETVIAD1004, ETVIAD1005, ETVIAD1006, ETVIAD1007, ETVIAD1008, ETVIAD1009, ETVIAD2000, ETVIAE1000, ETVIAE1001, ETVIAE1002, ETVIAE1003, ETVIAE1004, ETVIAE1005, ETVIAE1006, ETVIAE1100, ETVIAE1200, ETVIAE1201, ETVIAE1500, ETVIAE4000, ETVIAF1000, ETVIAF1001, ETVIAF1002, ETVIAF1003, ETVIAF1004, ETVIAF1005, ETVIAF1006, ETVIAF1100, ETVIAF1200, ETVIAF2000, ETVIAG1000, ETVIAG1001, ETVIAG1002, ETVIAG1003, ETVIAG1004, ETVIAG1005, ETVIAG1100, ETVIAG1200, ETVIAG1500, ETVIAG2000, ETVIAH1000, ETVIAH1001, ETVIAH1002, ETVIAH1003, ETVIAH1004, ETVIAH1005, ETVIAH1200, ETVIAH1300, ETVIAH1400, ETVIAH1401, ETVIAH1402, ETVIAH1500, ETVIAH1600, ETVIAH1700, ETVIAH1800, ETVIAH1900, ETVIAH2000, ETVIAI1000, ETVIAI1001, ETVIAI1002, ETVIAI1003, ETVIAI1004, ETVIAI1200, ETVIAI1300, ETVIAI1400, ETVIAI1700, ETVIAI1800, ETVIAI1900, ETVIAI2000, ETVIAI2500, ETVIAU1000, ETVIAC1700, ETVIAC1701, ETVIAC1702, ETVIAE1600, ETVIAC2319, ETVIAC9100, ETVIAC9101, ETVIAC9102, ETVIAC9103, ETVIAC9104, ETVIAC9105, ETVIAH1801, ETVIAH1601, ETVIAC3010, ETVIAC3011, ETVIAC1703, ETVIAC1704, ETVIAC1705, ETVIAC1706, ETVIAC6394
Revision	3
Revision Date	21 Mar 2015
Key/Legend	**<** Less Than **>** Greater Than **AICS** Australian Inventory of Chemical Substances **atm** Atmosphere **CAS** Chemical Abstracts Service (Registry Number) **cm²** Square Centimetres **CO2** Carbon Dioxide **COD** Chemical Oxygen Demand **deg C (°C)** Degrees Celcius **EPA (New Zealand)** Environmental Protection Authority of New Zealand **deg F (°F)** Degrees Farenheit **g** Grams **g/cm³** Grams per Cubic Centimetre **g/l** Grams per Litre **HSNO** Hazardous Substance and New Organism **IDLH** Immediately Dangerous to Life and Health **immiscible** Liquids are insoluable in each other. **inHg** Inch of Mercury

inH2O Inch of Water
K Kelvin
kg Kilogram
kg/m³ Kilograms per Cubic Metre
lb Pound
LC50 LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50 LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.
ltr or **L** Litre
m³ Cubic Metre
mbar Millibar
mg Milligram
mg/24H Milligrams per 24 Hours
mg/kg Milligrams per Kilogram
mg/m³ Milligrams per Cubic Metre
Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH2O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Heath and Safety Commission
OECD Organisation for Economic Co-operation and Development
Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

1. IDENTIFICATION

Product Name	**Soda Ash Light**
Other Names	Carbonic Acid, Disodium Salt; Disodium carbonatei; Dry alkali; Sodium Carbonate; Sodium Carbonate, Anhydrous
Uses	Intermediate used in a wide variety of chemical and industrial applications.
Chemical Family	Inorganic salt
Chemical Formula	Na2CO3
Chemical Name	Soda Ash Light
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) 5

Globally Harmonised System

Hazard Classification		Hazardous according to the criteria of the Globally Harmonised System of Classification and Labelling of Chemicals (GHS)	
Hazard Categories		Serious Eye Damage/Irritation - Category 1 Specific Target Organ Toxicity (Single Exposure) - Category 3	
Pictograms			
Signal Word		Danger	
Hazard Statements		**H318**	Causes serious eye damage.
		H335	May cause respiratory irritation.
Precautionary Statements	Prevention	**P261**	Avoid breathing dust.
		P271	Use only outdoors or in a well-ventilated area.
		P280	Wear protective gloves/protective clothing/eye protection/face protection.
	Response	**P304 + P340**	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
		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.
		P312	Call a POISON CENTER or doctor/physician if you feel unwell.
	Storage	**P403 + P233**	Store in a well-ventilated place. Keep container tightly closed.
		P405	Store locked up.
	Disposal	**P501**	Dispose of contents/container in accordance with local / regional / national / international regulations.

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

HSNO Classifications	Health Hazards	**6.1D**	Substances that are acutely toxic - Harmful
		6.1E	Substances that are acutely toxic –May be harmful, Aspiration hazard
		6.3A	Substances that are irritating to the skin
		6.4A	Substances that are irritating to the eye

3. COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients

Chemical Entity	Formula	CAS Number	Proportion
Sodium Carbonate	No Data Available	497-19-8	99.2 %
Other Non-Hazardous Ingredients	No Data Available		to 100.0 %

4. FIRST AID MEASURES

Description of necessary measures according to routes of exposure

Swallowed	If swallowed, do NOT induce vomiting. Rinse mouth with water. Seek medical attention.
Eye	Immediately flush eyes with plenty of water for 15 minutes, holding eyelids open. In all cases of eye contamination, it is a sensible precaution to seek medical advice.
Skin	Immediately wash with soap and water. Rinse thoroughly. Seek medical attention if effects occur. Launder contaminated shoes and clothing before reuse.
Inhaled	Remove to fresh air. See a doctor if effects occur.
Advice to Doctor	Treat symptomatically based on judgement of doctor and individual reactions of patient.
Medical Conditions Aggravated by Exposure	Persons with pre-existing skin disorders, eye problems or impaired pulmonary function may be at increased risk from exposure.

5. FIRE FIGHTING MEASURES

General Measures	Clear fire area of all non-emergency personnel. Stay upwind. Keep out of low areas. Eliminate ignition sources. Move fire exposed containers from fire area if it can be done without risk.
Flammability Conditions	Product is a non-flammable solid. Product does not burn.
Extinguishing Media	In case of fire, appropriate extinguishing media include alcohol foam, carbon dioxide, dry chemical or water spray when fighting fires involving this material.
Fire and Explosion Hazard	There is no risk of an explosion from this product under normal circumstances if it is involved in a fire. Violent steam generation or eruption may occur upon application of direct water stream on hot liquids.
Hazardous Products of Combustion	Sodium oxide, oxides of carbon.
Special Fire Fighting Instructions	Do NOT allow fire fighting water to reach waterways, drains or sewers. Store fire fighting water for treatment.
Personal Protective Equipment	Fire fighters should wear a positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots and gloves).
Flash Point	No Data Available
Lower Explosion Limit	No Data Available
Upper Explosion Limit	No Data Available
Auto Ignition Temperature	No Data Available
Hazchem Code	No Data Available

6. ACCIDENTAL RELEASE MEASURES

General Response Procedure	Avoid accidents, clean up immediately. Slippery when spilt. Eliminate all sources of ignition. Increase ventilation. Avoid generating dust. Stop leak if safe to do so. Isolate the danger area. Use clean, non-sparking tools and equipment.
Clean Up Procedures	Contain and sweep/shovel up spills with dust binding material or use an industrial vacuum cleaner. Transfer to a suitable, labelled container and dispose of promptly.
Containment	Stop leak if safe to do so. Isolate the danger area.
Decontamination	After spills, wash area preventing runoff from entering drains. Contaminated area may be neutralised by washing with weak or dilute acid. Vinegar, citrus juice and most soft drinks may be suitable. This material may be suitable for approved landfill.
Environmental Precautionary Measures	Do NOT let product reach drains or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Management.
Evacuation Criteria	Evacuate all unnecessary personnel.
Personal Precautionary Measures	Personnel involved in the clean up should wear full protective clothing as listed in section 8.

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid contact with eyes, skin and clothing. Do not inhale product dust/fumes. Keep exposure to this product to a minimum, and minimise the quantities kept in work areas. Check section 8 of this MSDS for details of personal protective measures, and make sure that those measures are followed. The measures below in 'Storage' should be followed during handling in order to minimise risks to persons using the product in the workplace. Also, avoid contact or contamination of product with incompatible materials listed in section 10.
Storage	Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Avoid wetting. This product is not classified dangerous for transport according to The Australian Code for the Transport of Dangerous Goods By Road and Rail.
Container	Store in original packaging as approved by manufacturer.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	No exposure standard has been established for this product by the Australian Safety and Compensation Council (ASCC). However, the exposure standard for dust not otherwise specified is 10mg/m3 (for inspirable dust) and 3mg/m3 (for respirable dust).
Exposure Limits	No Data Available
Biological Limits	No information available on biological limit values for this product.
Engineering Measures	A system of local and/or general exhaust is recommended to keep employee exposures as low as possible. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area.
Personal Protection Equipment	RESPIRATOR: Use approved respirator with dust protection. (AS1715/1716). EYES: Protective glasses or goggles should be worn when this product is being used. Failure to protect your eyes may cause them harm (AS1336/1337). HANDS: Wear suitable impervious elbow-length gloves (Rubber, PVC) (AS2161). CLOTHING: Protective coveralls and safety footwear. We suggest that protective clothing should be made of rubber or PVC (AS3765/2210).
Special Hazards Precaustions	Thoroughly launder protective clothing before storage or re-use. Advise laundry of nature of contamination when sending contaminated clothing to laundry.
Work Hygienic Practices	No Data Available

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Solid
Appearance	Powder
Odour	No Odour
Colour	White
pH	10.3
Vapour Pressure	Negligible at normal ambient temperatures (@ No Data Available)
Relative Vapour Density	No Data Available
Boiling Point	Decomposes before boiling (100 kPa)
Melting Point	851 °C
Freezing Point	851 °C
Solubility	220g/L 20°C
Specific Gravity	2.509 Water = 1
Flash Point	No Data Available
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available

Bulk Density	0.5 approx.
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	No Data Available
Volatile Percent	No Data Available
VOC Volume	No Data Available
Additional Characteristics	Volatility: Negligible at normal ambient temperatures.
Potential for Dust Explosion	No Data Available
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	No Data Available
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	This product should be kept in a cool place, preferably below 30 deg C. Keep containers tightly closed. Containers should be kept dry.
Materials to Avoid	Water, acids, zinc, tin, aluminium and their alloys.
Hazardous Decomposition Products	Carbon dioxide, usually without carbon monoxide and smoke. Sodium compounds. Fire decomposition products from this product are not expected to be hazardous or harmful.
Hazardous Polymerisation	This product is unlikely to react or decompose under normal storage conditions. However, if you have any doubts, contact the supplier for advice on shelf life properties. The product will not undergo polymerisation reactions.

11. TOXICOLOGICAL INFORMATION

General Information	LD50 (rats) = 4090 mg/kg (sodium carbonate)
EyeIrritant	Irritant. May cause pain, redness, discomfort.
Ingestion	Swallowing large amounts may cause illness.
Inhalation	Prolonged or repeated exposure may cause mild irritation. Dust is irritating.
SkinIrritant	Prolonged or repeated contact may cause mild irritation.
Carcinogen Category	No Data Available

12. ECOLOGICAL INFORMATION

Ecotoxicity	LC50 (P. promelas) = 400 mg/L
Persistence/Degradability	Not biodegradable.
Mobility	No information available on mobility for this product.
Environmental Fate	Avoid contaminating waterways, drains and sewers.
Bioaccumulation Potential	No information available on bioaccumulation for this product.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice. Incinerate at an approved site following all local regulations. This material may be suitable for approved landfill. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	SODA ASH LIGHT
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (Malaysia)
ADR

Proper Shipping Name	SODA ASH LIGHT
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	SODA ASH LIGHT
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	SODA ASH LIGHT
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	SODA ASH LIGHT
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
EMS	No Data Available
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	SODA ASH LIGHT
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	5

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	HSR003265

National/Regional Inventories

Australia (AICS)	Listed
Canada (DSL)	Not Determined
Canada (NDSL)	Not Determined
China (IECSC)	Not Determined
Europe (EINECS)	Not Determined
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Not Determined
Korea (KECI)	Not Determined
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Listed
Philippines (PICCS)	Not Determined
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Not Determined

16. OTHER INFORMATION

Related Product Codes	SOLCAB1000, SOLCAB1001, SOLCAB1002, SOLCAB1003, SOLCAB2000, SOLCAB2001, SOLCAB2002, SOLCAB2003, SOLCAB2004, SOLCAB2005, SOLCAB2006, SOLCAB2007, SOLCAB2008, SOLCAB2009, SOLCAB3000, SOLCAB3001, SOLCAB5500, SOLCAB6000, SOLCAB6100, SOLCAB6500, SOLCAR1000, SOLCAR1001, SOLCAR1002, SOLCAR1003, SOLCAR1004, SOLCAR1005, SOLCAR1006, SOLCAR1007, SOLCAR1008, SOLCAR1009, SOLCAR1010, SOLCAR1011, SOLCAR1012, SOLCAR1013, SOLCAR1014, SOLCAR1015, SOLCAR1016, SOLCAR1017, SOLCAR1018, SOLCAR1019, SOLCAR1020, SOLCAR1021, SOLCAR1022, SOLCAR1023, SOLCAR1024, SOLCAR1025, SOLCAR1026, SOLCAR1027, SOLCAR1028, SOLCAR1029, SOLCAR1030, SOLCAR1031, SOLCAR1032, SOLCAR1033, SOLCAR1100, SOLCAR2000, SOLCAR2001, SOLCAR2002, SOLCAR2003, SOLCAR2004, SOLCAR2005, SOLCAR2006, SOLCAR2500, SOLCAR3000, SOLCAR3001, SOLCAR3002, SOLCAR3003, SOLCAR3500, SOLCAR4000, SOLCAR4001, SOLCAR5000, SOLCAR5001, SOLCAR5100, SOLCAR5500, SOLCAR6000, SOLCAR6100, SOLCAR6900, SOLCAR7000, SOLCAR8000, SOLCAR8001, SOLCAR9000, SOLCAR9500, SOCARB1800, SOCARB1801, SOCARB1802, SOCARB1803, SOCARB1804, SOCARB1805, SOCARB1806, SOLCAR5525, SOLCAR5002, SOLCAR5003, SOLCAR5005, SOLCAR3010, SOLCAR3020, SOLCAR1040

Revision	3
Revision Date	22 May 2014
Key/Legend	**<** Less Than **>** Greater Than **AICS** Australian Inventory of Chemical Substances **atm** Atmosphere **CAS** Chemical Abstracts Service (Registry Number) **cm²** Square Centimetres **CO2** Carbon Dioxide **COD** Chemical Oxygen Demand **deg C (°C)** Degrees Celcius **EPA (New Zealand)** Environmental Protection Authority of New Zealand **deg F (°F)** Degrees Farenheit **g** Grams **g/cm³** Grams per Cubic Centimetre **g/l** Grams per Litre **HSNO** Hazardous Substance and New Organism **IDLH** Immediately Dangerous to Life and Health **immiscible** Liquids are insoluable in each other. **inHg** Inch of Mercury **inH2O** Inch of Water **K** Kelvin **kg** Kilogram **kg/m³** Kilograms per Cubic Metre **lb** Pound **LC50** LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours. **LD50** LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals. **ltr** or **L** Litre **m³** Cubic Metre **mbar** Millibar **mg** Milligram **mg/24H** Milligrams per 24 Hours **mg/kg** Milligrams per Kilogram **mg/m³** Milligrams per Cubic Metre **Misc** or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present. **mm** Millimetre **mmH2O** Millimetres of Water **mPa.s** Millipascals per Second **N/A** Not Applicable **NIOSH** National Institute for Occupational Safety and Health **NOHSC** National Occupational Heath and Safety Commission **OECD** Organisation for Economic Co-operation and Development **Oz** Ounce **PEL** Permissible Exposure Limit **Pa** Pascal **ppb** Parts per Billion **ppm** Parts per Million **ppm/2h** Parts per Million per 2 Hours **ppm/6h** Parts per Million per 6 Hours **psi** Pounds per Square Inch **R** Rankine **RCP** Reciprocal Calculation Procedure **STEL** Short Term Exposure Limit **TLV** Threshold Limit Value **tne** Tonne **TWA** Time Weighted Average **ug/24H** Micrograms per 24 Hours **UN** United Nations **wt** Weight

1. IDENTIFICATION

Product Name	**Mono Ethylene Glycol**
Other Names	1,2-Dihydroxyethane; 1,2-Ethanediol; Ethylene glycol; Glycol; Monoethylene glycol
Uses	Raw material for textile and synthetic fiber industry, industrial coolant and in automotive industry.
Chemical Family	No Data Available
Chemical Formula	C2H602
Chemical Name	Mono Ethylene Glycol
Product Description	No Data Available

Contact Details of the Supplier of this Safety Data Sheet

Organisation	Location	Telephone
Redox Pty Ltd	2 Swettenham Road Minto NSW 2566 Australia	+61-2-97333000
Redox Pty Ltd	11 Mayo Road Wiri Auckland 2104 New Zealand	+64-9-2506222
Redox Inc.	3960 Paramount Boulevard Suite 107 Lakewood CA 90712 USA	+1-424-675-3200
Redox Chemicals Sdn Bhd	Level 2, No. 8, Jalan Sapir 33/7 Seksyen 33, Shah Alam Premier Industrial Park 40400 Shah Alam Sengalor, Malaysia	+60-3-5614-2111

Emergency Contact Details

For emergencies only; DO NOT contact these companies for general product advice.

Organisation	Location	Telephone
Poisons Information Centre	Westmead NSW	1800-251525 131126
Chemcall	Australia	1800-127406 +64-4-9179888
Chemcall	Malaysia	+64-4-9179888
Chemcall	New Zealand	0800-243622 +64-4-9179888
National Poisons Centre	New Zealand	0800-764766
CHEMTREC	USA & Canada	1-800-424-9300 CN723420 +1-703-527-3887

2. HAZARD IDENTIFICATION

Poisons Schedule (Aust) 6

Globally Harmonised System

Decontamination	Wash area down with excess water to remove residual material.
Environmental Precautionary Measures	Do not allow product to reach drains, sewers or waterways. If product does enter a waterway, advise the Environmental Protection Authority or your local Waste Authority.
Evacuation Criteria	Evacuate all unnecessary personnel.
Personal Precautionary Measures	Personnel involved in the clean up should wear full protective clothing as listed in section 8.

7. HANDLING AND STORAGE

Handling	Ensure an eye bath and safety shower are available and ready for use. Observe good personal hygiene practices and recommended procedures. Wash thoroughly after handling. Take precautionary measures against static discharges by bonding and grounding equipment. Avoid contact with eyes, skin and clothing. Do not inhale product vapours. Use with local exhaust ventilation. Always wash hands before smoking, eating, drinking or using the toilet. Wash contaminated clothing and other protective equipment before storage or re-use. Do not dispose of material to sewers or waterways.
Storage	Store out of direct sunlight. Store in a cool, dry, well-ventilated area. Keep containers tightly closed when not in use. Inspect regularly for deficiencies such as damage or leaks. Protect against physical damage. Store away from incompatible materials as listed in section 10. Store away from oxidising agents and foodstuffs. This product is classified as a 'C1' Combustible Liquid for the purpose of storage and handling in accordance with the requirements of AS1940.
Container	Store in original packaging as approved by manufacturer.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

General	The following exposure standard has been established by The Australian Safety and Compensation Council (ASCC); Ethylene glycol (vapour) CAS number 107-21-1 TWA = 20ppm (52mg/m3) STEL = 40ppm (104mg/m3) Ethylene glycol (particulate) CAS number 107-21-1 TWA = 10mg/m3 Skin Absorption Notice - absorption through the skin may be a significant source of exposure. The exposure standard is invalidated if such contact should occur. NOTE: The exposure value at the TWA is the average airborne concentration of a particular substance when calculated over a normal 8 hour working day for a 5 day working week. These exposure standards are guides to be used in the control of occupational health hazards. All atmospheric contamination should be kept to as low a level as is workable. These exposure standards should not be used as fine dividing lines between safe and dangerous concentrations of chemicals. They are not a measure of relative toxicity.
Exposure Limits	No Data Available
Biological Limits	No information available on biological limit values for this product.
Engineering Measures	Ensure ventilation is adequate to maintain air concentrations below Exposure Standard. If material is used at elevated temperatures or as an aerosol, use with local exhaust ventilation or while wearing respirator. Vapour heavier than air - prevent concentration in hollows or sumps. DO NOT enter confined spaces where vapour may have collected. Keep containers closed when not in use.
Personal Protection Equipment	RESPIRATOR: Wear an approved respirator with suitable filter for organic gases and vapours if engineering controls are inadequate (AS1715/1716). EYES: Chemical splash goggles and face shield (AS1336/1337). HANDS: Available information (2) suggests that gloves made from laminated LCP(TM) film, Nitrile, unsupported Neoprene, supported PVC, natural rubber latex or Neoprene latex blend should be suitable for intermittent contact. (AS2161). CLOTHING: Chemical-resistant coveralls and safety footwear (AS3765/2210).
Work Hygienic Practices	When using do not eat or drink. When using do not smoke. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Liquid
Appearance	Liquid.
Odour	Mild Sweet
Colour	Colourless
pH	No Data Available
Vapour Pressure	0.08 hPa (@ 20 °C)
Relative Vapour Density	2.2 Air = 1
Boiling Point	197 °C
Melting Point	No Data Available
Freezing Point	No Data Available
Solubility	Completely soluble
Specific Gravity	1.12
Flash Point	124 °C Method: ASTM D 56, Tag closed cup
Auto Ignition Temp	No Data Available
Evaporation Rate	No Data Available
Bulk Density	No Data Available
Corrosion Rate	No Data Available
Decomposition Temperature	No Data Available
Density	No Data Available
Specific Heat	No Data Available
Molecular Weight	No Data Available
Net Propellant Weight	No Data Available
Octanol Water Coefficient	No Data Available
Particle Size	No Data Available
Partition Coefficient	No Data Available
Saturated Vapour Concentration	No Data Available
Vapour Temperature	No Data Available
Viscosity	21 cP (@ 20 °C)
Volatile Percent	nil
VOC Volume	No Data Available
Additional Characteristics	No Data Available
Potential for Dust Explosion	Product is a liquid.
Fast or Intensely Burning Characteristics	No Data Available
Flame Propagation or Burning Rate of Solid Materials	No Data Available
Non-Flammables That Could Contribute Unusual Hazards to a Fire	No Data Available
Properties That May Initiate or Contribute to Fire Intensity	Heating can cause expansion or decomposition leading to violent rupture of containers.
Reactions That Release Gases or Vapours	No Data Available
Release of Invisible Flammable Vapours and Gases	No Data Available

10. STABILITY AND REACTIVITY

Combustible liquid.

General Information	
Chemical Stability	Product is stable under normal conditions of use, storage and temperature.
Conditions to Avoid	Heat, sparks, flame and build-up of static electricity.
Materials to Avoid	Reacts with strong oxidising agents.
Hazardous Decomposition Products	Fumes, smoke, carbon monoxide.
Hazardous Polymerisation	Hazardous polymerisation does not occur.

11. TOXICOLOGICAL INFORMATION

General Information	Acute toxicity / Chronic toxicity, LD50 (Rat): 4,700 mg/kg Remarks: Estimated fatal dose in human is 100ml Acute dermal toxicity : LD50 (Rabbit): 10,600 mg/kg, Skin Irritation (rabbit, Draize): Mild irritant Skin Irritation (rabbit, Draize): Mild irritant Eye Irritation: (rabbit, Draize): Mild irritant High doses of ethylene glycol in rats and mice have resulted in reproductive and developmental toxicity following exposure by the oral and inhalation (respirable aerosol) routes. These particular data sets are not considered relevant to normal industrial use but do emphasise the need for care in handling. Data from animal and human studies to date do not provide evidence that exposure to ethylene glycol has mutagenic or carcinogenic effects. STOT - single exposure - Target Organs: Central nervous system, Kidney, Heart, Respiratory system Assessment: May cause nausea, vomiting, drowsiness., May cause damage to organs. STOT - repeated exposure - Target Organs: Central nervous system, Heart, Respiratory system Assessment: May cause damage to organs through prolonged or repeated exposure.
EyeIrritant	Mild eye irritation.
Ingestion	Harmful if swallowed. Initial symptoms following a large dose (>100 mL) are those of alcohol intoxication (without the odour of ethanol) progressing to vomiting, headache, stupor, convulsions and unconsciousness. Respiratory system involvement may occur 12 - 24 hours after ingestion. Symptoms may include hyperventilation and rapid shallow breathing. From 24 - 72 hours the patient may experience a decrease in urine output, flank pain progressing to renal failure which may be permanent. Death may occur from respiratory failure or pulmonary oedema.
Inhalation	Inhalation of vapours (from heating), mists or aerosols can produce respiratory irritation and may result in headaches, dizziness and possible nausea.
SkinIrritant	Contact with skin may result in irritation. Will have a degreasing action on the skin. Repeated or prolonged skin contact may lead to irritant contact dermatitis. Can be absorbed through the skin but not readily absorbed in toxic amounts (symptoms may be similar to those described for "INGESTION").
Carcinogen Category	No Data Available

12. ECOLOGICAL INFORMATION

Ecotoxicity	LC50 (Pimephales promelas (fathead minnow)): > 10,000 mg/l, Exposure time: 96 h LC50 (Daphnia magna (Water flea)): 34,440 mg/l, Exposure time: 48 h EC50 (Pseudokirchneriella subcapitata (algae)): > 1,000 mg/, Exposure time: 72 h Toxicity to fish (Chronic toxicity) NOEC: 6,090 mg/l Toxicity to daphnia and other aquatic invertebrates (Chronic toxicity) NOEC: 24,000 mg/l
Persistence/Degradability	Readily biodegradable.
Mobility	Log Pow: -1.36. High mobility in soils.
Environmental Fate	Avoid contaminating waterways, drains and sewers.
Bioaccumulation Potential	Low bioaccumulation potential.
Environmental Impact	No Data Available

13. DISPOSAL CONSIDERATIONS

General Information	Dispose of in accordance with all local, state and federal regulations. All empty packaging should be disposed of in accordance with Local, State, and Federal Regulations or recycled/reconditioned at an approved facility.
Special Precautions for Land Fill	Contact a specialist disposal company or the local waste regulator for advice. Incinerate at an approved site following all local regulations. This material may be suitable for approved landfill.

14. TRANSPORT INFORMATION

Land Transport (Australia)
ADG Code

Proper Shipping Name	Mono Ethylene Glycol
Class	C1 Combustible Liquids - Flash point 61 - 150 °C
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (Malaysia)
ADR

Proper Shipping Name	Mono Ethylene Glycol
Class	C1 Combustible Liquids - Flash point 61 - 150 °C
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (New Zealand)
NZS5433

Proper Shipping Name	Mono Ethylene Glycol
Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Land Transport (United States of America)
US DOT

Proper Shipping Name	Mono Ethylene Glycol

Class	No Data Available
Subsidiary Risk(s)	No Data Available
	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

Sea Transport
IMDG Code

Proper Shipping Name	Mono Ethylene Glycol
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available
EMS	No Data Available
Marine Pollutant	No

Air Transport
IATA DGR

Proper Shipping Name	Mono Ethylene Glycol
Class	No Data Available
Subsidiary Risk(s)	No Data Available
UN Number	No Data Available
Hazchem	No Data Available
Pack Group	No Data Available
Special Provision	No Data Available

National Transport Commission (Australia)
Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

Dangerous Goods Classification	NOT Dangerous Goods according to the criteria of the Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code)

15. REGULATORY INFORMATION

General Information	No Data Available
Poisons Schedule (Aust)	6

Environmental Protection Authority (New Zealand)
Hazardous Substances and New Organisms Amendment Act 2015

Approval Code	HSR001534

National/Regional Inventories

Australia (AICS)	Listed
Canada (DSL)	Listed
Canada (NDSL)	Not Determined
China (IECSC)	Listed
Europe (EINECS)	Not Determined
Europe (REACh)	Not Determined
Japan (ENCS/METI)	Listed
Korea (KECI)	Listed
Malaysia (EHS Register)	Not Determined
New Zealand (NZIoC)	Listed
Philippines (PICCS)	Listed
Switzerland (Giftliste 1)	Not Determined
Switzerland (Inventory of Notified Substances)	Not Determined
Taiwan (NCSR)	Not Determined
USA (TSCA)	Listed

16. OTHER INFORMATION

Related Product Codes	MOETGB1000, MOETGB2000, MOETGB3000, MOETGB3500, MOETGB4000, MOETGB5000, MOETGB6000, MOETGB7500, MOETGB8000, MOETGB9000, MOETGL0600, MOETGL0700, MOETGL0800, MOETGL0900, MOETGL1000, MOETGL1001, MOETGL1002, MOETGL1003, MOETGL1004, MOETGL1005, MOETGL1006, MOETGL1007, MOETGL1008, MOETGL1009, MOETGL1010, MOETGL1011, MOETGL1012, MOETGL1013, MOETGL1014, MOETGL1015, MOETGL1016, MOETGL1017, MOETGL1018, MOETGL1019, MOETGL1020, MOETGL1021, MOETGL1022, MOETGL1023, MOETGL1024, MOETGL1025, MOETGL1026, MOETGL1027, MOETGL1028, MOETGL1029, MOETGL1100, MOETGL1101, MOETGL1200, MOETGL1300, MOETGL1400, MOETGL1500, MOETGL1501, MOETGL1502, MOETGL1600, MOETGL1601, MOETGL1700, MOETGL1800, MOETGL1900, MOETGL1901, MOETGL2000, MOETGL2001, MOETGL2100, MOETGL2200, MOETGL2300, MOETGL2301, MOETGL2400, MOETGL2401, MOETGL2402, MOETGL2500, MOETGL2501, MOETGL2502, MOETGL2503, MOETGL2504, MOETGL2505, MOETGL2600, MOETGL2601, MOETGL2700, MOETGL2701, MOETGL2702, MOETGL2800, MOETGL2900, MOETGL3000, MOETGL3001, MOETGL3200, MOETGL3201, MOETGL3300, MOETGL3400, MOETGL3401, MOETGL3500, MOETGL3600, MOETGL4000, MOETGL4200, MOETGL4400, MOETGL4500, MOETGL5000, MOETGL5001, MOETGL5002, MOETGL5003, MOETGL5004, MOETGL5500, MOETGL6000, MOETGL6500, MOETGL6700, MOETGL6800, MOETGL7000, MOETGL7500, MOETGL7600, MOETGL8000, MOETGL8001, MOETGL9000, MOETGL9800, MOETGL9900, MOETGL8500, MOETGL1801, MOETGL1802, MOETGL1803, MOETGL1650, MOETGL6100, MOETGL6150, MOETGL6200, MOETGL7200, MOETGL7400, MOETGL3100, MOETGL7210, MOETGL1625, MOETGL2350, MOETGL2510, MOETGL3150, MOETGL1610, MOETGL2550, MOETGL3010, MOETGL3011, MOETGL3012, MOETGL3020, MOETGL3030, MOETGL3041, MOETGL3040, MOETGL4700, MOETGL4800, MOETGL5800, MOETGL5810, MOETGL5820, MOETGL5830, MOETGL5805, MOETGL4900, MOETGL7215, MOETGL2010, MOETGL2020, MOETGL2030, MOETGL5050, MOETGL3700, MOETGL3710, MOETGL3720, MOETGL3730
Revision	3
Revision Date	13 Feb 2015
Key/Legend	**<** Less Than **>** Greater Than **AICS** Australian Inventory of Chemical Substances **atm** Atmosphere **CAS** Chemical Abstracts Service (Registry Number) **cm²** Square Centimetres **CO2** Carbon Dioxide **COD** Chemical Oxygen Demand

deg C (°C) Degrees Celcius
EPA (New Zealand) Environmental Protection Authority of New Zealand
deg F (°F) Degrees Farenheit
g Grams
g/cm³ Grams per Cubic Centimetre
g/l Grams per Litre
HSNO Hazardous Substance and New Organism
IDLH Immediately Dangerous to Life and Health
immiscible Liquids are insoluable in each other.
inHg Inch of Mercury
inH2O Inch of Water
K Kelvin
kg Kilogram
kg/m³ Kilograms per Cubic Metre
lb Pound
LC50 LC stands for lethal concentration. LC50 is the concentration of a material in air which causes the death of 50% (one half) of a group of test animals. The material is inhaled over a set period of time, usually 1 or 4 hours.
LD50 LD stands for Lethal Dose. LD50 is the amount of a material, given all at once, which causes the death of 50% (one half) of a group of test animals.
ltr or **L** Litre
m³ Cubic Metre
mbar Millibar
mg Milligram
mg/24H Milligrams per 24 Hours
mg/kg Milligrams per Kilogram
mg/m³ Milligrams per Cubic Metre
Misc or **Miscible** Liquids form one homogeneous liquid phase regardless of the amount of either component present.
mm Millimetre
mmH2O Millimetres of Water
mPa.s Millipascals per Second
N/A Not Applicable
NIOSH National Institute for Occupational Safety and Health
NOHSC National Occupational Heath and Safety Commission
OECD Organisation for Economic Co-operation and Development
Oz Ounce
PEL Permissible Exposure Limit
Pa Pascal
ppb Parts per Billion
ppm Parts per Million
ppm/2h Parts per Million per 2 Hours
ppm/6h Parts per Million per 6 Hours
psi Pounds per Square Inch
R Rankine
RCP Reciprocal Calculation Procedure
STEL Short Term Exposure Limit
TLV Threshold Limit Value
tne Tonne
TWA Time Weighted Average
ug/24H Micrograms per 24 Hours
UN United Nations
wt Weight

Definitions of the word – 'Acceptable"

Dictionary.com
1. capable or worthy of being accepted.
2. pleasing to the receiver; satisfactory; agreeable; welcome.
3. meeting only minimum requirements; barely adequate: an acceptable performance.
4. capable of being endured; tolerable; bearable: acceptable levels of radiation.

Cambridge Dictionary
1. satisfactory and able to be agreed to or approved of:
Clearly we need to come to an arrangement that is acceptable to both parties.
So what is an acceptable level of radiation?
This kind of attitude is simply not acceptable.
2. just good enough, but not very good:
Her performance was acceptable, but not stunning.
The samples varied in quality but were generally acceptable.
This essay is not of an acceptable standard - do it again.
They have returned with a watered down and more acceptable version of the proposal.

Merriam-Webster
1 : capable or worthy of being accepted
an *acceptable* noise level
socially *acceptable* behavior
a compromise that is *acceptable* to both sides
2 a : WELCOME, PLEASING
Compliments are always *acceptable*.
b : barely satisfactory or adequate
The performances varied from excellent to *acceptable*.

English Oxford
Able to be agreed on; suitable.
'the electoral arrangements must be acceptable to the people'
1.1 Moderately good; satisfactory.
'an acceptable substitute for champagne'
1.2 Pleasing; welcome.
'some coffee would be most acceptable'
2Able to be tolerated or allowed.
'pollution in the city had reached four times the acceptable level'

Collins
1. Acceptable activities and situations are those that most people approve of or consider to be normal.
It is becoming more acceptable for women to drink alcohol.
The air pollution exceeds most acceptable levels by 10 times or more.
2. If something is acceptable to someone, they agree to consider it, use it, or allow it to happen.
They have thrashed out a compromise formula acceptable to Moscow.
They recently failed to negotiate a mutually acceptable new contract.
3. If you describe something as acceptable, you mean that it is good enough or fairly good.
On the far side of the street was a restaurant that looked acceptable.
We've made an acceptable start, but it could've been better.
These exercises will result in your being able to hit the ball quite acceptably.

MacMillan
considered by most people to be reasonable or to be something that can be allowed
socially/politically/morally acceptable:
Pollution on this level is no longer socially acceptable.

acceptable to:
The proposals must be acceptable to the shareholders.
acceptable for someone to do something:
By the 1960s, it was becoming more acceptable for women to work in management.
Satisfactory and good enough:*satisfactory, adequate, fine...*
good enough for a particular purpose or situation
A success rate of 65% is acceptable.
good enough but not very good
The service was attentive, the food acceptable but somewhat uninspiring.

The Free Dictionary
1. Adequate to satisfy a need, requirement, or standard; satisfactory: *an acceptable excuse; acceptable behavior..*
2. Satisfactory but not superior; passable: *The restaurant was acceptable but did not live up to its reputation.*
1. satisfactory; adequate
2. pleasing; welcome
3. tolerable
. 1. capable or worthy of being accepted.
2. pleasing to the receiver; agreeable.
3. meeting minimum requirements; barely adequate.
4. capable of being endured; tolerable: *acceptable levels of radiation.*

2015-16 Report of Entity Tax Information

Go to resource

URL: https://data.gov.au/dataset/c2524c87-cea4-4636-acac-599a82048a26/resource/b84c2b8d-c595-4219-987d-fc1add7f00f0/download/20

This report contains the total income, taxable income and tax payable of over 2000 corporate tax entities for the 2015-16 year. This report also includes separate lists of entities whose information was not available by the cut-off date to produce the Report of Entity Tax Information for 2013-14 and 2014-15.

MS Office Preview Data Explorer

Embed

Excel Online Fullscreen

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	A	B	C	D	E	F	G
1	Name	ABN	Total income $	Taxable income $	Tax payable $		
1386	ORBIT REMIT GLOBAL MONEY TRANSFER LIMI	69601986038	125,981,681	51,549	15,465		
1387	ORD MINNETT HOLDINGS PTY LIMITED	32062323728	111,260,704	18,021,825	5,406,548		
1388	ORICA LIMITED	24004145868	2,628,861,683	95,246,218	5,892,260		
1389	ORIENTAL MERCHANT PTY LTD	34007368925	205,520,831	8,185,558	2,454,667		
1390	ORIGIN ENERGY LIMITED	30000051696	11,917,688,617	94,061,718			
1391	ORIGIN ENERGY URANQUINTY POWER PTY LT	26120384938	110,632,744				

2015-16 Report of Entity Tax Information

Go to resource

URL: https://data.gov.au/dataset/c2524c87-cea4-4636-acac-599a82048a26/resource/b84c2b8d-c595-4219-987d-fc1add7f00f0/download/20

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	A	B	C	D	E	F	G
	Name	ABN	Total income $	Taxable income $	Tax payable $		
1619	SANGER AUSTRALIA PTY LTD	25001085687	615,546,882				
1620	SANOFI-AVENTIS AUSTRALIA PTY LTD	31008558807	764,901,754	10,287,117			
1621	SANTA FE HOLDINGS AUSTRALIA PTY LTD	70146265894	108,531,748				
1622	SANTOS LIMITED	80007550923	3,476,002,729				
1623	SANWA PTY LIMITED	96000904987	317,768,651	8,883,329	2,664,502		
1624	SAP AUSTRALIA PTY LTD	26003682504	950,186,711	7,931,259	965,836		
1625	SAPPI TRADING AUSTRALIA PTY LIMITED	17086317071	106,843,729	280,236	84,071		

Go to resource

2014-15 Report of Entity Tax Information

URL https://data.gov.au/dataset/c2524c87-cea4-4635-acac-589a82048a26/resource/1e6c8ae0-61d1-4780-a669-9e4a2abba1a4/download/2

This report contains the total income, taxable income and tax payable of over 1900 corporate tax entities for the 2014-15 year. This report also includes a list of entities whose information was not available by the cut-off date to produce the 2013-14 Report of Entity Tax Information.

MS Office Preview Data Explorer

Embed

Excel Online Fullscreen

Download Save to OneDrive Print Share ...

	A	B	C	D	E
1	Name	ABN	Total income $	Taxable income $	Tax payable $
1298	ORBIS GOLD LIMITED	59120212017	151,482,217		
1299	ORD MINNETT HOLDINGS PTY LIMITED	32052323728	108,274,928	16,317,684	4,895,305
1300	ORICA LIMITED	24004145868	2,801,998,018	270,376,588	57,115,859
1301	ORIENTAL MERCHANT PTY LTD	34007368925	207,387,285	12,421,503	3,722,919
1302	ORIGIN ENERGY LIMITED	30000051696	12,200,600,757		
1303	ORIGIN ENERGY URANQUINTY POWER PTY LTD	26120384938	191,342,029	20,771,682	6,231,505
1304	ORIX AUSTRALIA CORPORATION LIMITED	79002992681	330,059,077	52,555,569	15,766,671
1305	ORORA LIMITED	55004275165	1,863,668,491	62,111,269	202,230
1306	OROTONGROUP LIMITED	14000038675	125,114,304	10,521,494	3,156,448
1307	OSIRIS HOLDINGS PTY LIMITED	29168919391	1,952,729,955	163,693,888	49,108,166

Go to resource

2014-15 Report of Entity Tax Information

URL https://data.gov.au/dataset/c2524c87-cea4-4635-acac-589a82048a26/resource/1e6c8ae0-61d1-4780-a669-9e4a2abba1a4/download/2

This report contains the total income, taxable income and tax payable of over 1900 corporate tax entities for the 2014-15 year. This report also includes a list of entities whose information was not available by the cut-off date to produce the 2013-14 Report of Entity Tax Information.

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	A	B	C	D	E
1	Name	ABN	Total income $	Taxable income $	Tax payable $
1517	SANOFI-AVENTIS AUSTRALIA PTY LTD	31008558807	738,091,581		
1518	SANTA FE HOLDINGS AUSTRALIA PTY LTD	70146265894	119,322,679		
1519	SANTOS LTD	80007550923	3,389,399,798		
1520	SANWA PTY LIMITED	96000904987	322,906,799	7,777,357	2,333,130
1521	SAP AUSTRALIA PTY LTD	26003682504	799,558,030	7,755,370	1,190,771
1522	SAPPI TRADING AUSTRALIA PTY LIMITED	17086317071	101,575,349	486,226	145,868

2013-14 Report of Entity Tax Information

Go to resource | Data API

URL: https://data.gov.au/dataset/c2624c87-cea4-4636-acac-599a820498a2/resource/257d7ede-3a83-4b9b-9434-2f79b9d70ce8/download/2

This report contains the total income, taxable income and tax payable of over 1800 Australian public, private and foreign private entities for the 2013-14 income year.

MS Office Preview | Data Explorer

Embed

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Income tax information for 2013-14

Name	ABN	Total Income $	Taxable Income $	Tax Payable $
OPTIVER AUSTRALIA HOLDINGS PTY LIMITED	35077364286	352,899,853	74,291,854	19,978,634
ORD MINNETT HOLDINGS PTY LIMITED	32062323728	104,279,189	13,152,359	3,939,726
ORICA LIMITED	24004145868	2,883,720,921	226,787,108	42,953,040
ORIENTAL MERCHANT PTY LTD	34007368925	241,497,249	22,776,511	6,649,571
ORIGIN ENERGY LIMITED	30000051696	12,574,554,876	501,252,871	108,004,529
ORIGIN ENERGY URANQUINTY POWER PTY LTD	26120384938	180,075,404	8,560,902	1,872,727
ORIX AUSTRALIA CORPORATION LIMITED	79002992681	365,546,945	45,044,307	13,513,292
ORORA LIMITED	55004275165	819,134,955	27,861,950	
OROTONGROUP LIMITED	14000038675	120,706,605	17,262,358	5,172,677

2013-14 Report of Entity Tax Information

Go to resource | Data API

URL: https://data.gov.au/dataset/c2624c87-cea4-4636-acac-599a820498a2/resource/257d7ede-3a83-4b9b-9434-2f79b9d70ce8/download/2

This report contains the total income, taxable income and tax payable of over 1800 Australian public, private and foreign private entities for the 2013-14 income year.

MS Office Preview | Data Explorer

Embed

Excel Online | Fullscreen

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Income tax information for 2013-14

Name	ABN	Total Income $	Taxable Income $	Tax Payable $
SANGER AUSTRALIA PTY LTD	25001083687	302,853,411	3,742,989	1,722,827
SANOFI-AVENTIS AUSTRALIA PTY LTD	31008558807	880,768,273	44,909,034	3,419,423
SANTA FE HOLDINGS AUSTRALIA PTY LTD	70146265894	110,229,071	283,053	84,919
SANTOS LIMITED	80007550923	4,357,480,582	27,340,938	3,147,975
SANWA PTY LIMITED	96000904987	280,049,751	7,271,116	2,173,788
SAP AUSTRALIA PTY LTD	26003682504	679,706,494	23,089,622	5,783,044

Tax Contribution Disclosure

31 December 2016

Santos

The Board and Management of Santos Ltd are pleased to present the first Tax Contribution Disclosure for the year ended 31 December 2016.

In line with the Santos Tax Policy, the Board has approved adoption of the Board of Taxation's Voluntary Tax Transparency Code (the "Code") and the disclosures in this report are provided in accordance with the recommendations contained in Part A and Part B of the Code.

We also voluntarily provide this disclosure as part of our commitment to following good corporate governance practices and in being transparent in relation to our tax policy, tax strategy, our international related party dealings and tax contributions.

Executive Summary

- As a leading Australian oil and gas producer over 70% of Santos' business assets and revenues are both generated and subject to tax in Australia
- Our tax contribution for 2016 is consistent with a sustained period of lower corporate profits experienced in the oil and gas sector after a significant fall in global oil prices from mid-2014
- In 2016, while Santos did not pay any cash income tax in Australia, it paid over AUD$67 million in Australian taxes, including excise and state petroleum royalties.
- Since 2011, Santos has invested in excess of USD$16 billion in Australian capital development projects, particularly the Gladstone LNG project, which commenced production in September 2015
- Our consolidated financial results remain characterised by the Australian businesses and for 2016 we made an accounting and tax loss
- As an Australian headquartered oil and gas company, our material accounting and tax differences arise from:
    - Profits of overseas businesses which are exempt from tax in Australia. These profits have already been subject to tax in foreign jurisdictions at rates comparable to Australia, or in some cases at higher rates of tax
    - Tax depreciation of significant past and present capital investments made in Australia, in particular investments in the Gladstone LNG project and the Cooper Basin. In addition, our significant past and present investment in Australian exploration activities, aimed at generating new natural gas production and revenues
- Santos has a Board approved Tax Policy and the company has formally recognised the importance of tax risk management through its inclusion in the scope of the Audit and Risk Committee, which reports to the Board
- Santos pays its taxes as required by law and the average effective tax rate between 2011 to 2015 was over 30%. The effective tax rate for 2016 was 29.49%
- Santos is rated as a key (lower risk) taxpayer by the Australian Taxation Office (ATO)

Santos

An Australian energy pioneer since 1954

Santos is an Australian natural gas company. Established in 1954, the company is proud to deliver the economic and environmental benefits of natural gas to homes and businesses throughout Australia and Asia.

Five core long-life natural gas assets sit at the heart of a disciplined, focused strategy to drive sustainable shareholder value: the Cooper Basin, GLNG, Papua New Guinea, Northern Australia and West Australian Gas. Each of these core assets provide stable production, long-term revenue streams and significant upside opportunities.

With one of the largest exploration and production acreages in Australia, a significant and growing footprint in Papua New Guinea and a strategic infrastructure position, Santos is well positioned to benefit from the growing global demand for energy.

Santos is focused on delivering sustainable shareholder value by becoming a low-cost, reliable and high-performance business with the financial flexibility to build and grow the business through the oil price cycle.

Santos is built on a strong foundation of sustainability and social responsibility

Sustainability is an integral part of Santos. This means we responsibly manage our environmental impact, working in partnership with the communities in which we operate, focussing on the health, safety and wellbeing of our people and reliably managing our business across all of our operations.

Embedded in our approach to working with local communities is a commitment to establish and maintain enduring and mutually beneficial relationships. A key part of this is employing locally. Santos employees live and work in many of the communities where we operate, and are actively involved in our community programs and activities.

Open and transparent communication is critical to being a responsible and trusted community member. We actively listen to community concerns and expectations and integrate them into our business planning. Project-specific community engagement plans for our major operations ensure open channels of communication.

For all major projects, we undertake assessments to guide our work and mitigate our social impacts, identify the social benefits we can deliver and guide our community investment strategies. These social benefits and investments include local employment and training, use of local suppliers, provision of health and essential services, infrastructure investment and sponsorship of community events and programs.

As an Australian company, we recognise and respect Aboriginal peoples' attachment to their country and the importance of Aboriginal cultural heritage. We involve Aboriginal people when managing any potential cultural heritage risk resulting from our operations.

We see participating in a voluntary tax transparency initiative as an essential part of our social responsibility and we trust that the disclosures below provide potential users with a better understanding on the link between our business activities and our tax contributions.

Part A

The following disclosures are made in accordance with Part A of the Code to complement our annual disclosures in the 2016 audited statutory accounts:

- A summary of accounting profit (or accounting loss) before income tax expense
- A reconciliation of accounting profit (or accounting loss) before income tax expense to income tax expense (or income tax benefit), identifying material differences
- A reconciliation from income tax expense (or income tax benefit) to Australian income tax payable (or income tax loss), identifying material differences
- The effective tax rates for Australian and global operations

The Santos 2016 statutory accounts are presented on a consolidated basis using US dollars (USD) as the presentation currency. Where applicable, we have noted below certain differences between the consolidated results and our Australian tax disclosures.

KEY TERMS

Accounting Profit (or Accounting Loss) Before Income Tax Expense accounting revenues less expenses before income tax expense as determined under accounting standards

Income Tax Expense (or Income Tax Benefit) the total of current tax expense and deferred tax expense, which is included in the accounting profit (or accounting loss) during the current period

Current Tax Expense this is an estimate only of the tax payable for the current year (it is not how much tax is actually paid for the year)

Deferred Tax Expense (or Deferred Tax Benefit) costs can be deducted for accounting and tax over different periods. Deferred tax expense is the movement in the current year of the future differences between accounting and tax amounts (for example, balance sheet differences between exploration claimed for tax but capitalised for accounting)

Permanent or Non-Temporary Differences these differences reflect amounts recognised for accounting purposes that will not be recognised for tax purposes (or vice versa). They are permanent in nature as they are not expected to have any future impact (for example, the Research and Development tax concession)

Timing or Temporary Differences these differences reflect amounts recognised both for accounting and tax purposes, but at different times. They are timing in that they will have a future impact on tax (for example different rates for accounting and tax depreciation of assets)

Effective Tax Rate this is income tax expense (or income tax benefit) divided by accounting profit (or accounting loss) before tax. It is a measure of the extent to which the taxable profits (or losses) of the company will be subject to tax. Variations typically arise from permanent or non-temporary differences between accounting and tax (for example, accounting adjustments for foreign exchange variations)

Impairment an adjustment to the book value of an asset in the accounts as a result of a change in assumptions about the future value of the asset (for example, the fall in oil price assumptions). The impairment is charged to accounting profit, but is not deducted for tax

Part B

The following disclosures are made in accordance with Part B of the Code.

GOVERNANCE AND TAX RISK

The Santos Board and Management are committed to the highest standards of corporate governance, which includes our approach to tax risk management.

A Santos Tax Policy has been approved by the Board and is designed to meet current and future expectations of the community and the tax authorities, including the ATO. Tax risk is a specific matter within the scope of the Audit and Risk Committee, which report to the Santos Board.

Santos complies fully with its tax obligations and pays its taxes, as required in accordance with the laws, rules and regulations of each jurisdiction in which the company operates. The following commitments are the essence of our Tax Policy and tax strategy:

- maintaining a constructive, co-operative and transparent working relationship with tax authorities
- conducting regular, co-operative and transparent discussions with tax authorities
- complying with our disclosure requirements with tax authorities
- honouring our responsibility to our stakeholders to be a reputable corporate citizen in relation to our tax affairs
- paying our taxes, as required
- following good practice on the voluntary public disclosure of our tax affairs to ensure appropriate transparency
- maintaining strategies to ensure compliance with this tax policy. These include:
    - the maintenance of robust internal controls and processes to ensure we have consistency across our business and meet our tax obligations
    - the identification and management of tax risks in accordance with the Santos Risk Management Policy
    - the alignment of tax outcomes with commercial strategies
    - designating board and management responsibility for taxes and reporting protocols

- providing adequate professional internal and external tax resources
- pursuing certain, documented tax outcomes, including obtaining tax rulings where necessary, and
- monitoring, engaging with stakeholders and communicating the impact of material tax changes.

Approach to tax risk Santos complies fully with its tax obligations in accordance with the laws, rules and regulations of each jurisdiction in which the company operates. This not only includes jurisdictions where our business assets and operations are located, but also includes any locations where we hold a corporate presence, such as the United Kingdom.

Accepted levels of tax risk Both globally and in Australia, Santos seeks to maintain a risk rating from tax authorities consistent with our Tax Policy. In Australia, Santos has successfully maintained a key risk rating from the Commissioner of Taxation which is the lowest risk rating for a company the size of Santos. A key risk rating means the tax positions adopted by Santos are more than likely to be aligned with the ATO views on the law.

Attitude to tax planning Santos values its reputation and relationship with all tax authorities and stakeholders and seeks tax outcomes that are consistent with commercial outcomes and which are clearly understood. Santos seeks advice from independent external experts in specific circumstances, places reliance on public guidance from tax authorities and, where appropriate, seeks rulings from tax authorities.

Approach to engagement Santos has an open and transparent relationship with all tax authorities across a range of activities. In Australia, this includes:

- liaising with the ATO regarding potential transactions
- assisting the ATO with pre-lodgement compliance and post lodgement reviews
- participating in an ongoing dialogue regarding current issues relevant to Santos and the oil and gas industry
- adopting the Board of Taxation's Voluntary Tax Transparency Code

International related party dealings summary Santos predominantly carries on business in Australia with funding sourced from unrelated, reputable, independent financial institutions. Our international related party dealings are limited to a small number of non-material dealings with our subsidiaries in Papua New Guinea, Indonesia, Malaysia, Vietnam, Bangladesh and Singapore.

The main international related party dealings are:

1. The provision of technical services (Papua New Guinea, Vietnam, Malaysia and Bangladesh)
2. Captive insurance from Singapore
3. Inter-company loans to fund business activities (Papua New Guinea, Indonesia, Malaysia, Vietnam, Singapore and Bangladesh).

Santos' international related party dealings have been subject to annual ATO risk reviews and have not impacted our key risk rating.

GLOBAL TAX CONTRIBUTION

Our material Tax Contributions during 2016 are summarised below in USD$ millions:

Country	Corporate Income Tax	Royalty-Related Taxation	Govt. Royalties	Excise	Fringe Benefits Tax	Payroll Tax	Global Total USD$ millions
Australia	-	-	24	2	4	19	49
Vietnam	17	-	6	4	-	-	27
Indonesia	23	-	-	-	-	-	23
East Timor	-	14	-	-	-	-	14
Papua New Guinea	-	-	-	-	-	-	-
Total	**40**	**14**	**30**	**6**	**4**	**19**	**113**

Note tax refunds are not shown.

As stated in Part A, the Australian TCG incurred a tax loss in 2016, resulting in no Australian income tax being paid. The main factors contributing to this are:

- lower corporate profits as a result of the significant fall in global oil prices
- higher costs and tax depreciation deductions due to significant capital investments made in Australia, in particular the Gladstone LNG project.

No royalty-related taxation payments are shown for Australia as the Petroleum Resource Rent Tax (PRRT) is a profits based tax, and the economic cycle of low oil prices and significant capital investment to be recouped on those projects has adversely impacted PRRT revenues and payments not only for Santos, but across the entire industry.

In Australia, Santos also collects and remits Goods & Services Tax (GST) (net GST refunded from the ATO in 2016 was USD$11 million) and pays Pay As You Go (PAYG) withholding tax (total PAYG employment taxes paid in 2016 was USD$120 million).

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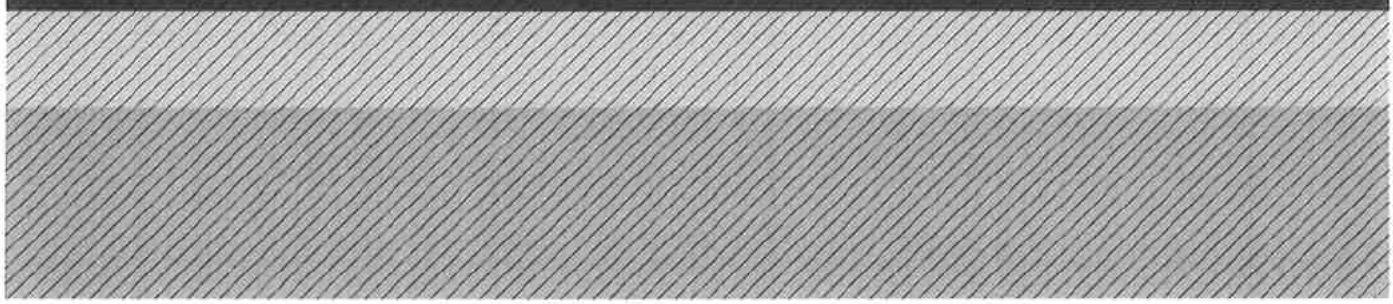
Annual Report 2014



Santos

We have the energy.

10-year summary

As at 31 December	2005	2006	2007	2008	2009	2010	2011	2012	2013	**2014**
Santos average realised oil price (A$/bbl)[3]	73.83	89.35	92.00	117.45	78.83	87.35	115.29	113.78	120.96	**114.21**
Financial performance ($million)[4,5]										
Product sales revenue[3]	2,463	2,750	2,489	2,762	2,181	2,228	2,721	3,223	3,602	**4,037**
Total revenue[3]	2,492	2,779	2,518	2,805	2,251	2,306	2,803	3,289	3,651	**4,099**
Foreign currency gains/(losses)	(4)	1	-	24	(28)	(10)	18	(2)	24	**(5)**
Profit from ordinary activities before tax	1,133	964	719	2,533	717	793	1,282	911	869	**(1,544)**
Income tax relating to ordinary activities	371	321	196	768	205	244	440	318	296	**(482)**
Royalty-related taxes[1]			164	115	78	51	91	75	57	**(127)**
Net profit after tax attributable to the shareholders of Santos Ltd	762	643	359	1,650	434	500	753	519	516	**(935)**
Financial position ($million)[4,5]										
Total assets	6,191	6,903	7,320	9,802	11,361	13,769	15,814	16,988	20,609	**22,345**
Net debt/(cash)	1,599	1,450	1,839	506	(605)	(1,201)	(205)	1,334	4,918	**7,490**
Total equity	2,964	3,356	3,093	4,478	6,967	7,603	8,963	9,354	10,212	**9,413**
Reserves and production (mmboe)										
Proven plus probable reserves (2P)	774	819	879	1,013	1,440	1,445	1,364	1,406	1,368	**1,245**
Production	56.0	61.0	59.1	54.4	54.4	49.9	47.2	52.1	51.0	**54.1**
Exploration[2]										
Wells drilled (number)	22	25	10	13	6	3	4	4	12	**9**
Expenditure ($million)[4]	187	259	150	233	181	90	151	162	391	**323**
Other capital expenditure ($million)[4,5]										
Delineation and development[2]	666	866	955	1,290	1,204	1,684	2,769	2,960	3,704	**3,247**
Buildings, plant and equipment	106	182	202	105	172	107	149	231	274	**261**
General										
Number of employees (excluding contractors)	1,521	1,679	1,786	1,940	2,096	2,367	2,847	3,289	3,502	**3,636**
Number of shareholders	78,157	83,566	77,498	78,933	107,138	112,145	113,173	111,135	112,397	**140,509**
Market capitalisation ($million)	7,280	5,907	8,274	8,696	11,721	11,506	11,560	10,669	14,222	**8,116**
Netback ($/boe)[5]	29.5	32.9	32.9	35.9	22.9	23.0	27.6	31.1	33.9	**33.4**

As at 31 December	2005	2006	2007	2008	2009	2010	2011	2012	2013	**2014**
Share Information										
Share issues	Employee Share Plan/ Executive Share Plan/ Exercise of Options/ Dividend Reinvestment Plan	Employee Share plan/ Executive Share Plan/ Exercise of Options/ Dividend Reinvestment Plan	Employee Share Plan/ Executive Share Plan/ Non-executive Director Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/ Buy Back	Employee Share Plan/ Executive Share Plan/ Non executive Director Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/ Buy Back	Employee Share Plan/ Executive Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/2 for 5 Rights Issue/ Redemption of FUELS/ Convertible Preference Shares	Employee Share Plan/ Executive Share Plan/ Non-executive Director Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/ Placement (institutional)	Employee Share Plan/ Executive Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/ ESG Plan/ ESG Scheme of Arrangement	Employee Share Plan/ Executive Share Plan/ Dividend Reinvestment Plan	Employee Share Plan/ Executive Share Plan/ Dividend Reinvestment Plan / Exercise of Options	Employee Share Plan/ Executive Share Plan/ Dividend Reinvestment Plan / Exercise of Options
Number of issued ordinary shares at year-end (million)	594.4	598.5	586.1	584.9	831.9	875.1	944.6	961.2	972.1	**983.8**
Weighted average number of issued ordinary shares (million)	638.4	647.3	641.2	641.4	781.1	836.3	888.7	954.9	967.5	**978.2**
Dividends – ordinary shares										
Paid during the period (cents per share)	36	40	40	42	42	42	30	30	30	**35**
Declared in respect of the period (cents per share)	38	40	40	42	42	37	30	30	30	**35**
Paid during the period ($million)[4]	212	238	235	248	299	350	263	285	289	**341**
Number of issued preference shares at year-end (million)	6.0	6.0	6.0	6.0	-	-	-	-	-	-
Dividends – preference shares										
Paid during the period ($ per share)										
– ordinary	5.1	5.1	5.6	6.3	4.6	-	-	-	-	-
– special	-	-	-	-	-	-	-	-	-	-
Declared in respect of the period ($ per share)										
– ordinary	5.2	5.3	5.9	6.3	-	-	-	-	-	-
– special	-	-	-	-	-	-	-	-	-	-
Paid during the period ($million)[5]										
– ordinary	31	30	34	38	28	-	-	-	-	-
– special	-	-	-	-	-	-	-	-	-	-
Earnings per share (cents)	114.6	94.7	50.8	251.4	52.0	59.8	84.8	54.4	53.3	**(95.6)**
Return on total revenue (%)[3]	30.6	23.1	14.3	58.8	19.3	21.7	26.9	15.7	14.1	**(22.8)**
Return on average ordinary equity (%)	35.5	23.9	12.4	50.6	7.5	6.9	9.1	5.7	5.3	**(9.5)**
Return on average capital employed (%)	19.8	15.1	9.0	34.1	7.3	7.3	8.7	4.4	3.8	**(5.7)**
Net debt/(net debt + equity) (%)	35.0	30.2	37.3	10.2	(9.5)	(18.7)	(2.3)	12.4	32.5	**44.3**
Net interest cover (times)	14.9	10.1	7.4	38.5	(45.3)	(19.1)	700.9	14.6	4.8	**(5.3)**

1. From 2007, 'Royalty-related taxes' have been accounted for as a tax.
2. Exploration expenditure includes wildcat wells. Delineation and development expenditure includes appraisal, near field exploration wells and CSG expenditure.
3. From 2012, Cooper Basin oil purchases have been recorded as product sales/third-party purchases on a gross basis. Previously they had been recorded as trading income on a net basis. Only 2011 amounts have been restated.
4. Prior year figures have been restated as whole numbers in order to achieve consistency with current year disclosures.
5. The 2012 figures have been restated to reflect adjustments required from the adoption of AASB 11 Joint Arrangements. Prior year amounts have not been restated.

Directors' Report
continued

Net profit

The 2014 net loss attributable to equity holders of Santos Limited of $935 million is $1,451 million lower than the net profit of $516 million in 2013. This decrease is primarily due to higher impairment losses of $1,563 million after tax as a result of the decline in global oil prices.

Net profit includes items before tax of $2,292 million ($1,468 million after tax), as referred to in the reconciliation of net profit to underlying profit below.

Reconciliation of net (loss)/profit to underlying profit[1]

	2014 $million			2013 $million		
	Gross	**Tax**	**Net**	**Gross**	**Tax**	**Net**
Net (loss)/profit after tax attributable to equity holders of Santos Limited			**(935)**			**516**
Add/(deduct) the following:						
Net gains on sales of non-current assets	(4)	1	**(3)**	(14)	4	**(10)**
Impairment losses	2,356	(793)	**1,563**	26	2	**28**
Foreign exchange (gains)/ losses	5	(2)	**3**	(24)	7	**(17)**
Fair-value adjustments on embedded derivatives and hedges	(59)	17	**(42)**	(7)	2	**(5)**
Remediation (income)/costs for incidents net of related insurance recoveries	(6)	2	**(4)**	(9)	2	**(7)**
Other (income)/expense items	–	–	**–**	(3)	2	**(1)**
Other one-off tax adjustments	–	(49)	**(49)**	–	–	**–**
	2,292	(824)	**1,468**	(31)	19	**(12)**
Underlying profit[1]			**533**			**504**

1. Underlying profit is a non-IFRS measure that is presented to provide an understanding of the underlying performance of Santos' operations. The measure excludes the impacts of asset acquisitions, disposals and impairments, as well as items that are subject to significant variability from one period to the next, including the effects of fair-value adjustments and fluctuations in exchange rates. The non-IFRS financial information is unaudited, however the numbers have been extracted from the financial statements which have been subject to audit by the Company's auditor. 'Other (income)/expense items' in 2014 relates to a prior year re-determination adjustment.

Financial position

Summary of financial position

	2014 $million	2013 $million	Variance $million
Exploration and evaluation assets	**1,106**	1,964	(858)
Oil and gas assets and other land, buildings, plant and equipment	**18,689**	16,082	2,607
Restoration provision	**(2,157)**	(1,768)	(389)
Other net assets/(liabilities)[1]	**(207)**	72	(279)
Total funds employed	**17,431**	16,350	1,081
Net debt[2]	**(7,490)**	(4,918)	(2,572)
Net tax liabilities[3]	**(528)**	(1,220)	692
Net assets/equity	**9,413**	10,212	(799)

1. Other net assets comprise trade and other receivables, prepayments, inventories, other financial assets, share of investments in joint ventures, offset by trade and other payables, deferred income, provisions and other financial liabilities.
2. Net debt reflects the net borrowings position and includes interest-bearing loans, net of cash and interest rate and cross-currency swap contracts.
3. Net tax liabilities comprise deferred tax liabilities and current tax payable offset by tax receivable and deferred tax assets.

As at 31 December	2005	2006	2007	2008	2009	2010	2011	2012	2013	**2014**
Share Information										
Share issues	Employee Share Plan/ Executive Share Plan/ Exercise of Options/ Dividend Reinvestment Plan	Employee Share plan/ Executive Share Plan/ Exercise of Options/ Dividend Reinvestment Plan	Employee Share Plan/ Executive Share Plan/ Non-executive Director Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/ Buy Back	Employee Share Plan/ Executive Share Plan/ Non executive Director Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/ Buy Back	Employee Share Plan/ Executive Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/2 for 5 Rights Issue/ Redemption of FUELS/ Convertible Preference Shares	Employee Share Plan/ Executive Share Plan/ Non-executive Director Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/ Placement (institutional)	Employee Share Plan/ Executive Share Plan/ Exercise of Options/ Dividend Reinvestment Plan/ ESG Plan/ ESG Scheme of Arrangement	Employee Share Plan/ Executive Share Plan/ Dividend Reinvestment Plan	Employee Share Plan/ Executive Share Plan/ Dividend Reinvestment Plan / Exercise of Options	Employee Share Plan/ Executive Share Plan/ Dividend Reinvestment Plan / Exercise of Options
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Weighted average number of issued ordinary shares (million)	638.4	647.3	641.2	641.4	781.1	836.3	888.7	954.9	967.5	**978.2**
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Paid during the period (cents per share)	36	40	40	42	42	42	30	30	30	**35**
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Number of issued preference shares at year-end (million)	6.0	6.0	6.0	6.0	-	-	-	-	-	-
Dividends – preference shares										
Paid during the period ($ per share)										
– ordinary	5.1	5.1	5.6	6.3	4.6	-	-	-	-	-
– special	-	-	-	-	-	-	-	-	-	-
Declared in respect of the period ($ per share)										
– ordinary	5.2	5.3	5.9	6.3	-	-	-	-	-	-
– special	-	-	-	-	-	-	-	-	-	-
Paid during the period ($million)[5]										
– ordinary	31	30	34	38	28	-	-	-	-	-
– special	-	-	-	-	-	-	-	-	-	-
Earnings per share (cents)	114.6	94.7	50.8	251.4	52.0	59.8	84.8	54.4	53.3	**(95.6)**
Return on total revenue (%)[3]	30.6	23.1	14.3	58.8	19.3	21.7	26.9	15.7	14.1	**(22.8)**
Return on average ordinary equity (%)	35.5	23.9	12.4	50.6	7.5	6.9	9.1	5.7	5.3	**(9.5)**
Return on average capital employed (%)	19.8	15.1	9.0	34.1	7.3	7.3	8.7	4.4	3.8	**(5.7)**
Net debt/(net debt + equity) (%)	35.0	30.2	37.3	10.2	(9.5)	(18.7)	(2.3)	12.4	32.5	**44.3**
Net interest cover (times)	14.9	10.1	7.4	38.5	(45.3)	(19.1)	700.9	14.6	4.8	**(5.3)**

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Directors' Report
continued

Net profit

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Net profit includes items before tax of $2,292 million ($1,468 million after tax), as referred to in the reconciliation of net profit to underlying profit below.

Reconciliation of net (loss)/profit to underlying profit[1]

	2014 $million			2013 $million		
	Gross	**Tax**	**Net**	**Gross**	**Tax**	**Net**
Net (loss)/profit after tax attributable to equity holders of Santos Limited			**(935)**			**516**
Add/(deduct) the following:						
Net gains on sales of non-current assets	(4)	1	**(3)**	(14)	4	**(10)**
Impairment losses	2,356	(793)	**1,563**	26	2	**28**
Foreign exchange (gains)/ losses	5	(2)	**3**	(24)	7	**(17)**
Fair-value adjustments on embedded derivatives and hedges	(59)	17	**(42)**	(7)	2	**(5)**
Remediation (income)/costs for incidents net of related insurance recoveries	(6)	2	**(4)**	(9)	2	**(7)**
Other (income)/expense items	–	–	**–**	(3)	2	**(1)**
Other one-off tax adjustments	–	(49)	**(49)**	–	–	**–**
	2,292	(824)	**1,468**	(31)	19	**(12)**
Underlying profit[1]			**533**			**504**

1. Underlying profit is a non-IFRS measure that is presented to provide an understanding of the underlying performance of Santos' operations. The measure excludes the impacts of asset acquisitions, disposals and impairments, as well as items that are subject to significant variability from one period to the next, including the effects of fair-value adjustments and fluctuations in exchange rates. The non-IFRS financial information is unaudited, however the numbers have been extracted from the financial statements which have been subject to audit by the Company's auditor. 'Other (income)/expense items' in 2014 relates to a prior year re-determination adjustment.

Financial position

Summary of financial position

	2014 $million	2013 $million	Variance $million
Exploration and evaluation assets	**1,106**	1,964	(858)
Oil and gas assets and other land, buildings, plant and equipment	**18,689**	16,082	2,607
Restoration provision	**(2,157)**	(1,768)	(389)
Other net assets/(liabilities)[1]	**(207)**	72	(279)
Total funds employed	**17,431**	16,350	1,081
Net debt[2]	**(7,490)**	(4,918)	(2,572)
Net tax liabilities[3]	**(528)**	(1,220)	692
Net assets/equity	**9,413**	10,212	(799)

1. Other net assets comprise trade and other receivables, prepayments, inventories, other financial assets, share of investments in joint ventures, offset by trade and other payables, deferred income, provisions and other financial liabilities.
2. Net debt reflects the net borrowings position and includes interest-bearing loans, net of cash and interest rate and cross-currency swap contracts.
3. Net tax liabilities comprise deferred tax liabilities and current tax payable offset by tax receivable and deferred tax assets.

Financial Report

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Consolidated Income Statement
for the year ended 31 December 2014

	Note	2014 $million	2013 $million
Product sales	3	**4,037**	3,602
Cost of sales	4	**(2,899)**	(2,505)
Gross profit		**1,138**	1,097
Other revenue	3	**62**	49
Other income	3	**12**	24
Impairment of non-current assets	4	**(2,356)**	(26)
Other expenses	4	**(320)**	(272)
Finance income	5	**19**	45
Finance costs	5	**(116)**	(62)
Share of net profit of joint ventures	26(b)	**17**	14
(Loss)/profit before tax		**(1,544)**	869
Income tax benefit/(expense)	6	**482**	(296)
Royalty-related taxation benefit/(expense)	6	**127**	(57)
Total taxation benefit/(expense)		**609**	(353)
Net (loss)/profit for the period		**(935)**	516
Net (loss)/profit attributable to:			
Owners of Santos Limited		**(935)**	516
Non-controlling interests		**–**	–
		(935)	516
Earnings per share attributable to the equity holders of Santos Limited (¢)			
Basic (loss)/earnings per share	23	**(95.6)**	53.3
Diluted (loss)/earnings per share	23	**(95.6)**	53.0
Dividends per share (¢)			
Paid during the period	22	**35**	30
Declared in respect of the period	22	**35**	30

The consolidated income statement is to be read in conjunction with the notes to the consolidated financial statements.

Consolidated Statement of Comprehensive Income
for the year ended 31 December 2014

	Note	2014 $million	2013 $million
Net (loss)/profit for the period		**(935)**	516
Other comprehensive income, net of tax:			
Other comprehensive income to be reclassified to profit or loss in subsequent periods:			
Exchange gain on translation of foreign operations		**623**	768
Tax effect	6	**–**	(1)
	21	**623**	767
Loss on foreign currency loans designated as hedges of net investments in foreign operations		**(450)**	(433)
Tax effect	6	**135**	130
	21	**(315)**	(303)
Loss on derivatives designated as cash flow hedges		**(13)**	(5)
Tax effect	6	**4**	1
	21	**(9)**	(4)
Net other comprehensive income to be reclassified to profit or loss in subsequent periods		**299**	460
Items not to be reclassified to profit or loss in subsequent periods:			
Remeasurement of defined benefit obligation	28	**–**	20
Tax effect	6	**–**	(6)
	21	**–**	14
Net other comprehensive income not being reclassified to profit or loss in subsequent periods		**–**	14
Other comprehensive income, net of tax		**299**	474
Total comprehensive (loss)/income		**(636)**	990
Total comprehensive (loss)/income attributable to:			
Owners of Santos Limited		**(636)**	990
Non-controlling interests		**–**	–
		(636)	990

The consolidated statement of comprehensive income is to be read in conjunction with the notes to the consolidated financial statements.

Consolidated Statement of Financial Position
as at 31 December 2014

	Note	2014 $million	2013 $million
Current assets			
Cash and cash equivalents	7	**775**	644
Trade and other receivables	8	**633**	793
Prepayments		**91**	202
Inventories	9	**443**	419
Other financial assets	10	**66**	3
Tax receivable		**57**	17
Total current assets		**2,065**	2,078
Non-current assets			
Receivables	8	**10**	31
Prepayments		**189**	96
Investments in joint ventures	26	**97**	110
Other financial assets	10	**166**	236
Exploration and evaluation assets	11	**1,106**	1,964
Oil and gas assets	12	**18,422**	15,823
Other land, buildings, plant and equipment	13	**267**	259
Deferred tax assets	15	**23**	12
Total non-current assets		**20,280**	18,531
Total assets		**22,345**	20,609
Current liabilities			
Trade and other payables	16	**1,382**	1,235
Deferred income		**51**	91
Interest-bearing loans and borrowings	17	**327**	189
Current tax liabilities		**14**	22
Provisions	18	**169**	185
Other financial liabilities	19	**3**	4
Total current liabilities		**1,946**	1,726
Non-current liabilities			
Deferred income		**150**	82
Interest-bearing loans and borrowings	17	**7,925**	5,582
Deferred tax liabilities	15	**594**	1,227
Provisions	18	**2,136**	1,748
Other financial liabilities	19	**181**	32
Total non-current liabilities		**10,986**	8,671
Total liabilities		**12,932**	10,397
Net assets		**9,413**	10,212
Equity			
Issued capital	20	**6,905**	6,749
Reserves	21	**346**	47
Retained earnings	21	**2,166**	3,420
Equity attributable to owners of Santos Limited		**9,417**	10,216
Non-controlling interests		**(4)**	(4)
Total equity		**9,413**	10,212

The consolidated statement of financial position is to be read in conjunction with the notes to the consolidated financial statements.

Consolidated Statement of Cash Flows
for the year ended 31 December 2014

	Note	2014 $million	2013 $million
Cash flows from operating activities			
Receipts from customers		**4,399**	3,726
Interest received		**18**	54
Overriding royalties received		**11**	12
Insurance proceeds received		**5**	1
Dividends received		**18**	14
Pipeline tariffs and other receipts		**130**	67
Income taxes refunded		**30**	26
Royalty-related taxation refunded		**–**	22
Payments to suppliers and employees		**(2,222)**	(1,785)
Exploration and evaluation – seismic and studies		**(150)**	(109)
Royalty and excise paid		**(97)**	(83)
Borrowing costs paid		**(49)**	–
Carbon costs paid		**(52)**	(41)
Income taxes paid		**(145)**	(214)
Overriding royalty costs		**(4)**	(4)
Royalty-related taxation paid		**(49)**	(58)
Net cash provided by operating activities	27	**1,843**	1,628
Cash flows from investing activities			
Payments for:			
Exploration and evaluation assets		**(455)**	(472)
Oil and gas assets		**(2,834)**	(3,514)
Other land, buildings, plant and equipment		**(52)**	(51)
Acquisitions of exploration and evaluation assets		**–**	(143)
Acquisitions of oil and gas assets		**(33)**	(62)
Acquisitions of controlled entities	25	**(8)**	–
Proceeds from disposal of oil and gas assets	3	**1**	46
Income taxes paid on disposal of non-current assets		**–**	(8)
Borrowing costs paid		**(223)**	(218)
Other investing activities		**(7)**	3
Net cash used in investing activities		**(3,611)**	(4,419)
Cash flows from financing activities			
Dividends paid		**(196)**	(157)
Drawdown of borrowings		**2,167**	1,432
Repayment of borrowings		**(86)**	(22)
Proceeds from issues of ordinary shares		**10**	9
Net cash provided by financing activities		**1,895**	1,262
Net increase/(decrease) in cash and cash equivalents		**127**	(1,529)
Cash and cash equivalents at the beginning of the period		**644**	2,147
Effects of exchange rate changes on the balances of cash held in foreign currencies		**4**	26
Cash and cash equivalents at the end of the period	7	**775**	644

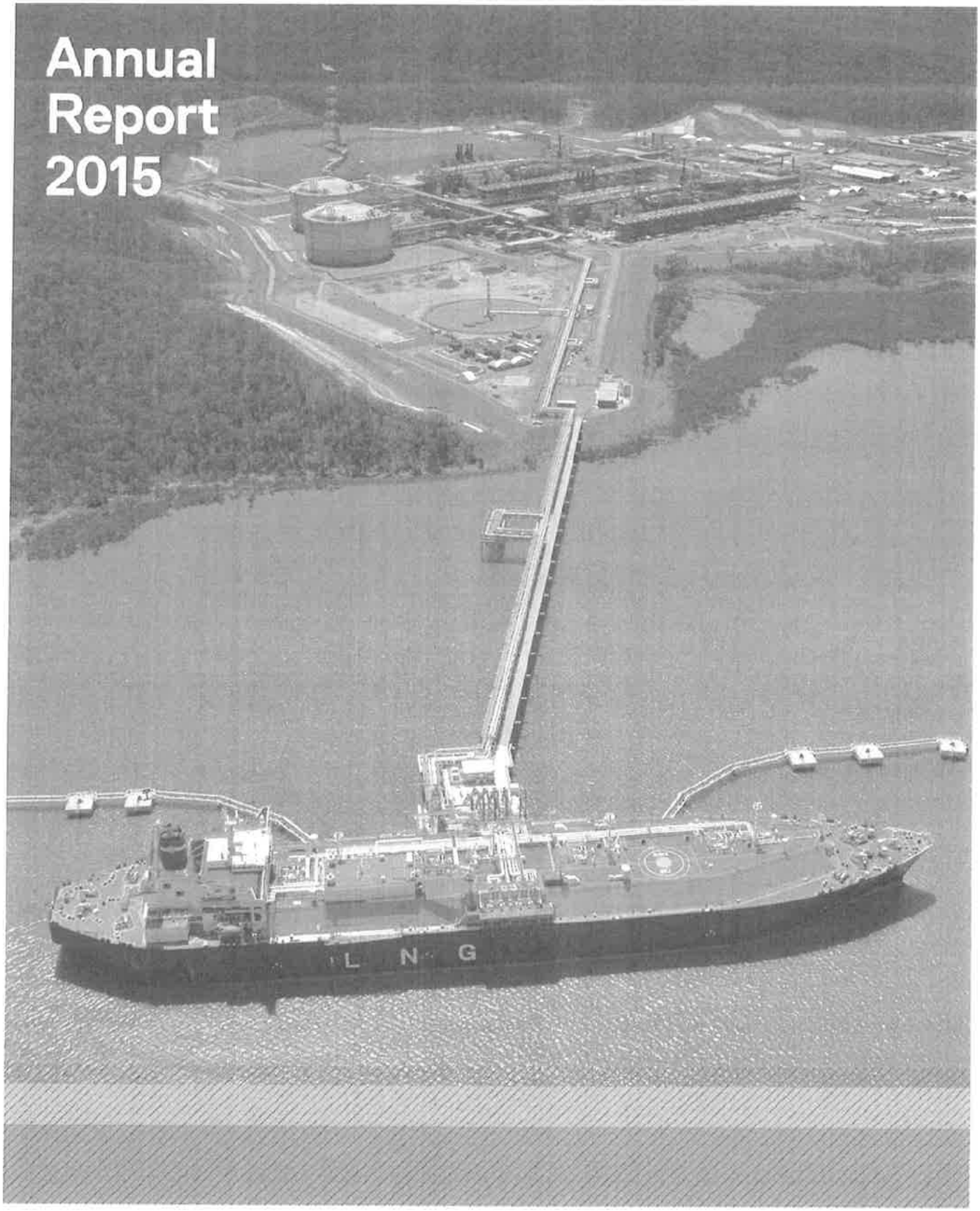
The consolidated statement of cash flows is to be read in conjunction with the notes to the consolidated financial statements.

Consolidated Statement of Changes in Equity
for the year ended 31 December 2014

	Note	Equity attributable to owners of Santos Limited						
		Issued capital $million	Translation reserve $million	Hedging reserve $million	Retained earnings $million	Total equity $million	Non-controlling interests $million	Total equity $million
Balance at 1 January 2013		6,608	(407)	(6)	3,163	9,358	(4)	9,354
Profit for the period		–	–	–	516	516	–	516
Other comprehensive income/(loss) for the period		–	464	(4)	14	474	–	474
Total comprehensive income/(loss) for the period		–	464	(4)	530	990	–	990
Transactions with owners in their capacity as owners:								
Shares issued	20	141	–	–	–	141	–	141
Dividends to shareholders	22	–	–	–	(289)	(289)	–	(289)
Share-based payment transactions	29	–	–	–	16	16	–	16
Balance at 31 December 2013		6,749	57	(10)	3,420	10,216	(4)	10,212
Balance at 1 January 2014		**6,749**	**57**	**(10)**	**3,420**	**10,216**	**(4)**	**10,212**
Loss for the period		**–**	**–**	**–**	**(935)**	**(935)**	**–**	**(935)**
Other comprehensive income/(loss) for the period		**–**	**308**	**(9)**	**–**	**299**	**–**	**299**
Total comprehensive income/(loss) for the period		–	**308**	**(9)**	**(935)**	**(636)**	**–**	**(636)**
Transactions with owners in their capacity as owners:								
Shares issued	20	**156**	**–**	**–**	**–**	**156**	**–**	**156**
Dividends to shareholders	22	**–**	**–**	**–**	**(341)**	**(341)**	**–**	**(341)**
Share-based payment transactions	29	**–**	**–**	**–**	**22**	**22**	**–**	**22**
Balance at 31 December 2014		**6,905**	**365**	**(19)**	**2,166**	**9,417**	**(4)**	**9,413**

The consolidated statement of changes in equity is to be read in conjunction with the notes to the consolidated financial statements.

Annual Report 2015



Santos

We have the energy.

Consolidated Income Statement
for the year ended 31 December 2015

	Note	2015 $million	2014 $million
Product sales	2.2	**3,246**	4,037
Cost of sales	2.3	**(2,513)**	(2,899)
Gross profit		**733**	1,138
Other revenue		**48**	62
Other income		**13**	12
Impairment of non-current assets	3.3	**(3,924)**	(2,356)
Other expenses	2.3	**(192)**	(154)
Finance income	5.2	**7**	19
Finance costs	5.2	**(297)**	(116)
Share of net profit of joint ventures	6.3(c)	**14**	17
Loss before tax		**(3,598)**	(1,378)
Income tax benefit	2.4(a)	**868**	316
Royalty-related tax benefit	2.4(b)	**32**	127
Total tax benefit		**900**	443
Net loss for the period attributable to owners of Santos Limited		**(2,698)**	(935)
Earnings per share attributable to the equity holders of Santos Limited (¢)			
Basic loss per share	2.5	**(234.2)**	(95.6)
Diluted loss per share	2.5	**(234.2)**	(95.6)
Dividends per share (¢)			
Paid during the period	2.6	**30**	35
Declared in respect of the period	2.6	**20**	35

The consolidated income statement is to be read in conjunction with the notes to the consolidated financial statements.

Consolidated Statement of Comprehensive Income
for the year ended 31 December 2015

	2015 $million	2014 $million
Net loss for the period	**(2,698)**	(935)
Other comprehensive income, net of tax:		
Other comprehensive income to be reclassified to profit or loss in subsequent periods:		
Exchange gain on translation of foreign operations	**958**	623
Tax effect	**–**	–
	958	623
Loss on foreign currency loans designated as hedges of net investments in foreign operations	**(704)**	(450)
Tax effect	**211**	135
	(493)	(315)
Loss on derivatives designated as cash flow hedges	**7**	(13)
Tax effect	**(2)**	4
	5	(9)
Net other comprehensive income to be reclassified to profit or loss in subsequent periods	**470**	299
Items not to be reclassified to profit or loss in subsequent periods:		
Remeasurement of defined benefit obligation	**10**	–
Tax effect	**(3)**	–
	7	–
Net other comprehensive income not being reclassified to profit or loss in subsequent periods	**7**	–
Other comprehensive income, net of tax	**477**	299
Total comprehensive loss attributable to owners of Santos Limited	**(2,221)**	(636)

The consolidated statement of comprehensive income is to be read in conjunction with the notes to the consolidated financial statements.

Consolidated Statement of Financial Position
for the year ended 31 December 2015

	Note	2015 $million	2014 $million
Current assets			
Cash and cash equivalents	4.1	**1,154**	775
Trade and other receivables	4.2	**539**	633
Prepayments		**64**	91
Inventories	4.3	**495**	443
Other financial assets	5.5(f)	**1**	66
Tax receivable		**117**	57
Assets held for sale	3.6	**551**	–
Total current assets		**2,921**	2,065
Non-current assets			
Receivables	4.2	**6**	10
Prepayments		**28**	189
Investments in joint ventures	6.3(b)	**98**	97
Other financial assets	5.5(f)	**217**	166
Exploration and evaluation assets	3.1	**715**	1,106
Oil and gas assets	3.2	**17,052**	18,422
Other land, buildings, plant and equipment		**249**	267
Deferred tax assets	2.4(d)	**640**	23
Total non-current assets		**19,005**	20,280
Total assets		**21,926**	22,345
Current liabilities			
Trade and other payables	4.4	**849**	1,382
Deferred income		**9**	51
Interest-bearing loans and borrowings	5.1	**210**	327
Current tax liabilities		**11**	14
Provisions	3.4, 7.1	**172**	169
Other financial liabilities	5.5(f)	**3**	3
Liabilities directly associated with assets held for sale	3.6	**19**	–
Total current liabilities		**1,273**	1,946
Non-current liabilities			
Deferred income		**218**	150
Interest-bearing loans and borrowings	5.1	**7,211**	7,925
Deferred tax liabilities	2.4(d)	**211**	594
Provisions	3.4, 7.1	**2,387**	2,136
Other financial liabilities	5.5(f)	**424**	181
Total non-current liabilities		**10,451**	10,986
Total liabilities		**11,724**	12,932
Net assets		**10,202**	9,413
Equity			
Issued capital	5.3	**10,192**	6,905
Reserves	5.4	**985**	346
Accumulated losses	5.4	**(975)**	2,166
Equity attributable to owners of Santos Limited		**10,202**	9,417
Non-controlling interests		**–**	(4)
Total equity		**10,202**	9,413

The consolidated statement of financial position is to be read in conjunction with the notes to the consolidated financial statements.

Consolidated Statement of Cash Flows
for the year ended 31 December 2015

	Note	2015 $million	2014 $million
Cash flows from operating activities			
Receipts from customers		**3,562**	4,399
Dividends received		**17**	18
Pipeline tariffs and other receipts		**88**	130
Payments to suppliers and employees		**(2,035)**	(2,222)
Exploration and evaluation seismic and studies		**(151)**	(150)
Royalty and excise paid		**(57)**	(97)
Borrowing costs paid		**(219)**	(49)
Carbon costs paid		**(20)**	(52)
Income taxes paid		**(68)**	(115)
Royalty-related tax paid		**(58)**	(49)
Other operating activities		**35**	30
Net cash provided by operating activities	4.1(b)	**1,094**	1,843
Cash flows from investing activities			
Payments for:			
Exploration and evaluation assets		**(370)**	(455)
Oil and gas assets		**(1,487)**	(2,834)
Other land, buildings, plant and equipment		**(22)**	(52)
Acquisitions of oil and gas assets		**(128)**	(33)
Acquisitions of controlled entities		**–**	(8)
Proceeds from disposal of non-current assets	2.2	**77**	1
Borrowing costs paid		**(146)**	(223)
Other investing activities		**(26)**	(7)
Net cash used in investing activities		**(2,102)**	(3,611)
Cash flows from financing activities			
Dividends paid		**(215)**	(196)
Drawdown of borrowings		**904**	2,167
Repayment of borrowings		**(2,516)**	(86)
Proceeds from issues of ordinary shares		**3,193**	10
Net cash provided by financing activities		**1,366**	1,895
Net increase in cash and cash equivalents		**358**	127
Cash and cash equivalents at the beginning of the period		**775**	644
Effects of exchange rate changes on the balances of cash held in foreign currencies		**21**	4
Cash and cash equivalents at the end of the period	4.1	**1,154**	775

The consolidated statement of cash flows is to be read in conjunction with the notes to the consolidated financial statements.

Consolidated Statement of Changes in Equity
for the year ended 31 December 2015

	Note	Equity attributable to owners of Santos Limited							
		Issued capital $million	Translation reserve $million	Hedging reserve $million	Accumulated profits reserve $million	Accumulated profits/ (losses) $million	Total equity $million	Non-controlling interests $million	Total equity $million
Balance at 1 January 2014		6,749	57	(10)	–	3,420	10,216	(4)	10,212
Loss for the period		–	–	–	–	(935)	(935)	–	(935)
Other comprehensive income/(loss) for the period		–	308	(9)	–	–	299	–	299
Total comprehensive income/(loss) for the period		–	308	(9)	–	(935)	(636)	–	(636)
Transactions with owners in their capacity as owners:									
Shares issued	5.3	156	–	–	–	–	156	–	156
Dividends to shareholders	2.6	–	–	–	–	(341)	(341)	–	(341)
Share-based payment transactions		–	–	–	–	22	22	–	22
Balance at 31 December 2014		6,905	365	(19)	–	2,166	9,417	(4)	9,413
Balance at 1 January 2015		**6,905**	**365**	**(19)**	**–**	**2,166**	**9,417**	**(4)**	**9,413**
Transfer retained profits to accumulated profits reserve	5.4	**–**	**–**	**–**	**167**	**(167)**	**–**	**–**	**–**
Items of comprehensive income:									
Loss for the period		**–**	**–**	**–**	**–**	**(2,698)**	**(2,698)**	**–**	**(2,698)**
Other comprehensive income for the period		**–**	**465**	**5**	**–**	**7**	**477**	**–**	**477**
Total comprehensive income/(loss) for the period		**–**	**465**	**5**	**–**	**(2,691)**	**(2,221)**	**–**	**(2,221)**
Transactions with owners in their capacity as owners:									
Shares issued	5.3	**3,287**	**–**	**–**	**–**	**–**	**3,287**	**–**	**3,287**
Dividends to shareholders	2.6	**–**	**–**	**–**	**–**	**(298)**	**(298)**	**–**	**(298)**
Share-based payment transactions		**–**	**–**	**–**	**–**	**21**	**21**	**–**	**21**
Non-controlling interest exit from foreign operations		**–**	**2**	**–**	**–**	**(6)**	**(4)**	**4**	**–**
Balance at 31 December 2015		**10,192**	**832**	**(14)**	**167**	**(975)**	**10,202**	**–**	**10,202**

The consolidated statement of changes in equity is to be read in conjunction with the notes to the consolidated financial statements.

2016 TAX CONTRIBUTION REPORT

YEAR ENDED
30 JUNE 2016

origin

HOW WE REPORT

Origin Energy Limited's (Origin) corporate reporting suite is comprised of its Annual Report, Shareholder Review, Sustainability Report and Income Tax Transparency Report.

Origin is a signatory to the Board of Taxation's voluntary tax transparency code and has released its first Tax Contribution Report for 2016 in response. This report will become part of Origin's corporate reporting suite in future years.

Origin's non-financial performance is described in the company's Sustainability Report and Shareholder Review. The Sustainability Report also outlines Origin's advocacy priorities including the company's position on Australia's fiscal arrangements.

Origin's 2016 reporting suite can be accessed via the company's website.

- Annual Report
- Shareholder Review
- Sustainability Report
- Income Tax Transparency Report (2015)

While disclosures relating to Australia Pacific LNG Pty Ltd (Australia Pacific LNG) are included in Origin's reporting suite; Australia Pacific LNG is excluded from the Origin group for the purpose of this report.

Origin's controlled entities can be found in Origin's Consolidated Financial Statements on pages 103 to 105 in the Annual Report.

MESSAGE FROM THE CHIEF FINANCIAL OFFICER

At Origin, we are proud of the contribution we make to the Australian community and we are pleased to present the company's first Tax Contribution Report. The purpose of this report is to provide a high level of transparency on our approach to tax and further build on our recent efforts to simplify Origin's financial statements.

Since listing on the Australian Securities Exchange in 2000, our strategy has been to connect resources to markets. We explore, produce, transport and sell energy to power millions of Australian homes and businesses every day and play an integral role in shaping Australia's energy future.

The development and operation of our large scale energy projects create significant economic value. We distribute part of the value we create through the payment of taxes and royalties to federal and state governments.

This report includes the reconciliation between Origin's accounting profit to tax expense and tax paid, and is aligned with the Board of Tax's voluntary tax transparency code.

At Origin, we undertake all required tax compliance and reporting obligations. We are open and transparent about our tax arrangements and remain committed to enhancing our reporting.

Thank you for your ongoing interest in Origin.

Gary Mallett

Acting Chief Financial Officer

WHO WE ARE

Origin is the leading Australian integrated energy company.

Origin has the leading energy retailing position in Australia with more than 4.2 million electricity, gas and LPG customer accounts, and has significant positions in power generation and natural gas production. The company's activities also include energy trading, centralised energy services, metering, new energy solutions such as solar and storage, and the development of other new and emerging technologies.

Through its 37.5 per cent shareholding in Australia Pacific LNG, Origin is the upstream operator of Australia's biggest coal seam gas (CSG) to liquefied natural gas (LNG) operation based on the country's largest 2P CSG reserves base.

Origin's strategy of investing in gas and renewables sees the company well placed to lead the transition to less carbon intensive energy not only domestically through its Energy Markets business but also in regional markets through investment in Australia Pacific LNG and the company's growing LNG production.

DISTRIBUTION OF ECONOMIC VALUE

The operation of Origin's integrated business benefits local, regional and national communities through:

- procurement of goods and services from local suppliers when possible;
- creation of employment opportunities;
- investment in community initiatives and local infrastructure;
- wages to our employees and payments to contractors; and
- payment of income taxes, payroll tax, rates and royalties to federal and state governments.

Origin's 2016 Sustainability Report provides more information on the significant contribution the company makes to the communities in which it operates and describes the company's long term approach to distributing economic value.

ORIGIN'S TAX POLICY AND RISK MANAGEMENT FRAMEWORK

Origin takes its obligations in relation to tax seriously and seeks to align its approach to tax to one of sustainably creating and sharing value with stakeholders. While the company seeks to sustainably share value through the payment of taxes and royalties, it also seeks to maximise value for shareholders by mitigating tax risks associated with its activities.

The management of tax risk is an important component of Origin's compliance framework and is managed via Origin's risk management framework. The Board reviews Origin's risk management framework annually and material risks are reported to the Board Risk Committee on a quarterly basis. Further details of the company's risk management framework and its material risks are contained in the Annual Report.

The Origin Board does not support activities which seek to aggressively structure the company's tax position. Tax effect accounting results, significant legislative change and/or court decisions affecting Origin's tax affairs and uncertain tax positions must be reported to the Board at a minimum during each half year reporting period. These matters are also then included in monthly finance reports provided to the Board.

Origin's tax risk directive focuses on the identification and assessment processes, and tax related responsibilities and accountabilities across the business. Origin's tax function reviews any new or non-recurring transaction above a determined threshold, any transaction that has a material non-financial impact and any change in processes involving financial transactions.

Commercial managers across the company must advise the tax function prior to committing to transactions that involve any change in the Origin group's equity or any major transaction. For major transactions whose tax implications will have a material financial impact on the company, Origin seeks to obtain binding rulings from revenue authorities. If Origin relies on public rulings, transactions must comply with the conditions of these rulings, so that Origin is assured of the appropriate tax treatment.

Where Origin holds a joint venture interest, the company's representation on joint venture boards and operating committees helps to align the joint venture entity with the company's position.

ORIGIN'S ENGAGEMENT WITH THE AUSTRALIAN TAX OFFICE

Origin has been classified as a key taxpayer by the Australia Tax Office (ATO) pursuant to its risk-differentiation framework, meaning the ATO considers that it would be unlikely that Origin would lodge tax returns that would apply an interpretation of the tax law which is inconsistent with that of the ATO.

As a key taxpayer Origin's operations are assessed as having a significant effect on the tax system, and accordingly Origin is continually engaging with the ATO on a rolling review basis to confirm compliance with the tax law.

THE AUSTRALIAN TAX CONSOLIDATED GROUP

Origin has operations in Australia as well as a number of overseas countries. Origin lodges a single Australian tax return which consolidates the results of all of its wholly owned Australia resident companies (Origin tax consolidated group). The Origin tax consolidated group includes acquired entities that were originally incorporated in the United Kingdom, Panama, and the Netherlands but are Australian residents for tax purposes. The central management and control of these entities as well as the location of assets and operations in these entities are in Australia.

Origin holds a 37.5 per cent interest in Australia Pacific LNG. Australia Pacific LNG and its wholly owned subsidiary companies are not part of the Origin's tax consolidated group as they are not wholly owned by Origin. This report is for the Origin group and excludes Australia Pacific LNG. Therefore, the taxes paid data in this report does not include taxes paid by Australia Pacific LNG, although for reporting purposes its financial performance is equity accounted in Origin's result. Refer to the section titled Origin's effective tax rate for further explanation.

Origin's tax return discloses the income derived solely from its Australian operations as total income. The Origin group subsidiaries which have operations outside of Australia are not required to lodge an Australian tax return. However, their activities are included within Origin's tax return as an addition to the total income disclosed to the extent they are either concessionally taxed, or derive passive income or income from transactions with the Origin tax consolidated group. These companies also comply with the tax laws applicable to the countries in which they operate and are legitimate operating businesses and are not vehicles to minimise tax.

In FY2016, 96 per cent of Origin's income was earned from operations in Australia. Other income earned from Origin's operations in New Zealand and its activities in other countries represented 3 per cent[1] and 1 per cent[1] of total income respectively.

INTERNATIONAL OPERATIONS

All of the Origin group's cross border related party dealings are conducted on an arm's length basis and they are supported by contemporaneous documentation. There are three key categories of these transactions in Origin:

1. provision of technical petroleum services by the Origin group to its group entities in New Zealand;
2. sale of LPG and associated appliances by the Origin group to its group entities in American Samoa, Cook Islands, Fiji, Papua New Guinea, Samoa, Solomon Islands, Vanuatu and Vietnam which operate LPG sale businesses in those countries; and
3. insurance obtained by the Origin group from its captive insurer subsidiary company in Singapore.

In addition to meeting the Australian transfer pricing requirements, income generated from Origin's international subsidiaries in Fiji, Cook Islands, American Samoa, Samoa, PNG, Singapore, Bermuda, Botswana, Chile, Indonesia, New Zealand and the United States of America is generally taxable in Australia by the operation of Australia's Controlled Foreign Corporation tax rules.

The Origin group also has entities based in Panama, Bermuda and Singapore. The entity based in Panama was acquired by the Origin group in order to acquire an interest in an Australian gas permit and the activities of this entity are subject to tax in Australia.

The entity in Bermuda and entities in Singapore act as holding companies that the Origin group acquired or established to undertake development activities in South East Asia and South America, none of which have generated any income to date. Following a significant reduction in oil prices, the Origin group has discontinued its international exploration and geothermal activities.

1. Total income includes discontinued operations.

ORIGIN'S EFFECTIVE TAX RATE

The Origin group's effective income tax rate for the 30 June 2016 tax year on the statutory accounting loss was 18 per cent and on underlying net profit was 43 per cent. For the 30 June 2015 tax year, it was 9 per cent and 31 per cent respectively. The variance from the corporate tax rate of 30 per cent is primarily due to the tax treatment of the Australia Pacific LNG equity income.

Origin's share of Australia Pacific LNG's net profit or loss after tax is included in Origin's pre-tax accounting profit or loss but is not subject to income tax. Only dividends received from Australia Pacific LNG are subject to income tax not the equity income share. The higher Australia Pacific LNG equity income is as a proportion of profit, the greater the impact on the effective tax rate.

TAXES PAID BY ORIGIN

Origin pays payroll tax, fringe benefits tax and royalties to the ATO and State Revenue Offices, and in FY2016 made total payments of $55 million. The amounts in the accompanying table exclude Australia Pacific LNG.

	2016 ($million)	2015 ($million)
Payroll tax	45	46
Royalties	6	9
Fringe benefits tax	4	4

Origin also collects and remits taxes such as GST, excise and PAYG to the ATO.

In FY2016, Origin recorded a statutory loss of $589 million. This result included impairments of $515 million reflecting costs related to the decision to cease certain development activities ($171 million) and upstream impairments ($344 million) due primarily to downward revisions to reserves in the Otway, Bass and Cooper basins.

Additionally, the FY2016 result included a disproportionate share of costs associated with the infrastructure assets related to the Australia Pacific LNG project.

In FY2015, Origin recorded a statutory loss of $658 million. This primarily reflected the impairment of the company's investment in Contact Energy and upstream assets, the non-cash impact of the depreciation of the Australian dollar on the value of financial instruments and debt, and interest expense which would have been capitalised if the Australia Pacific LNG project was held by Origin rather than via an equity accounted investment.

Accordingly, the company recorded an income tax benefit in the 2015 and 2016 financial years as no corporate income tax was incurred.

RECONCILIATION OF ACCOUNTING PROFIT TO TAX EXPENSE TO TAX PAID

This section provides details of the Origin group's accounting profit before tax, income tax expense and tax paid. Further information can be found in Origin's 2016 Annual Report.

	2016 ($million)	2015 ($million)
Reconciliation between tax expense and pre-tax net profit		
(Loss)/profit from continuing operations before income tax	(737)	(534)
(Loss)/profit from discontinued operations before income tax	35	(114)
	(702)	**(648)**
Income tax using the domestic corporation tax rate of 30 per cent (2015: 30 per cent)		
Prima facie income tax expense on pre-tax accounting profit:		
- at Australian tax rate of 30 per cent	(211)	(194)
- adjustment for difference between Australian and overseas tax rates	15	(1)
Income tax expense on pre-tax accounting profit at standard rates	**(196)**	**(195)**
Increase/(decrease) in income tax expense due to:		
Impairment expense not recoverable	23	80
Write-off exploration expense	13	–
Sale of Contact Energy	(3)	–
Capital loss re-recognition	(30)	–
Reset of tax bases on consolidation of OE Uranquinty into tax group	(9)	–
Share of results of equity accounted investees	65	10
Tax expense/(benefit) on translation of foreign denominated tax balances	(3)	46
Reinstatement of tax depreciation on Contact Energy's powerhouses	–	(15)
Recognition of change in net tax loss position	–	7
Other	11	9
Total non-temporary income tax expense adjustments	**67**	**137**
Under provided in prior years - current and deferred	3	–
Total income tax benefit	**(126)**	**(58)**
Accounting effective company tax rate	18%	9%

	2016 ($million)	2015 ($million)
Reconciliation between tax expense to tax paid		
Total income tax benefit	**(126)**	(58)
Elimination of income tax expense (as outlined in the table above) which does not impact tax payable:		
Capital loss re-recognition	30	–
Recognition of change in net tax loss position	–	(7)
Research & Development credits	9	11
New Zealand tax loss recognition	3	
Contact Energy income tax expense	(14)	15
Under provided in prior years - current and deferred	(3)	–
	25	**19**
Total income tax benefit after removing adjustments not impacting tax payable	**(101)**	**(39)**
Temporary differences:		
Accrued expenses not incurred for tax	2	(110)
Employee benefits	(9)	12
Acquired environmental scheme certificate purchase obligations	(2)	(2)
Acquired energy purchase obligations	(8)	(67)
Provisions	30	28
Inventories	4	(5)
Property, plant and equipment	89	63
Exploration and evaluation assets	(102)	(51)
Financial instruments at fair value	4	105
Adjustment to investment in Australia Pacific LNG relating to capitalised interest	28	21
Other items	55	(35)
Prior period differences	3	44
	94	**3**
Current year tax losses†	**(7)**	**(36)**
Australian income tax paid*	–	–

† Please note that movement of $25 million in the tax value of carry forward losses on page 99 of the 2016 Annual Report includes tax credits, whereas the above figure of $7 million is representative of tax losses only.

* International tax paid of $4 million in FY2016 and $3 million in FY2015.

origin

Origin Income Tax Transparency Report

Year ended 30 June 2016

Origin makes a significant contribution to the communities in which it operates, including the payment of income tax, payroll tax, rates and royalties.

Origin is open and transparent about its tax arrangements and complies with all of its required tax compliance and reporting obligations. All of Origin's operations in Australia and overseas are subject to tax and all of the overseas entities are legitimate operating businesses and are not vehicles to minimise tax.

The Origin Group's effective income tax rate[1] for the 30 June 2016 tax year on the statutory accounting loss was 18 per cent and on underlying net profit[2] was 43 per cent. The variance from the corporate tax rate of 30 per cent is primarily due to the tax treatment of the Australia Pacific LNG equity income[3].

Origin has been classified as a key taxpayer by the Australian Taxation Office (ATO) pursuant to their risk-differentiation framework, meaning the ATO considers that it would be unlikely that Origin would lodge tax returns that would apply an interpretation of the tax law which is inconsistent with that of the ATO. As a key taxpayer Origin's operations are assessed as having a significant effect on the tax system and accordingly Origin is continually engaging with the ATO on a rolling review basis to confirm compliance with the tax law.

The Australian tax consolidated group

Origin has operations in Australia as well as a number of overseas countries. Origin Energy Limited lodges a single Australian tax return which consolidates the results of all of its wholly owned Australian resident companies other than Origin Energy Uranquinty Power Pty Ltd, which lodges a separate Australian income tax return[4]. The Origin Energy Limited tax return discloses the income derived solely from Australian operations as total income. The Origin group subsidiaries which have operations outside of Australia are not required to lodge an Australian tax return and their activities are included within the Origin Energy Limited tax return, as an addition to the total income disclosed, to the extent they are either concessionally taxed or derive passive income or income from transactions with the Origin Australian group. These companies also comply with the tax laws applicable to the countries in which they operate.

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1 Effective income tax rate is calculated as income tax expense/profit or loss before income tax.
2 Underlying net profit is derived from statutory net profit by excluding items that do not align with the manner in which management reviews the financial and operating performance of the business. These items include fair value and foreign exchange movements, and disposals, impairments and business restructuring.
3 While Origin's share of Australia Pacific LNG's net profit/loss is included in Origin's accounting results it is not taxed in Origin, as Australia Pacific LNG is taxed as a stand-alone entity. For more detailed explanation, please refer to the Tax Contribution Report 2016 which can be found on www.originenergy.com.au/content/dam/origin/about/investors-media/senate-submission-carbon-risk-disclosure-160331/origin-income-tax-transparency-report-2016.pdf.
4 Origin Energy Uranquinty joined the Origin tax consolidated group on 8 June 2016 and therefore it will not be lodging a separate income tax return going forward.

origin

Australian Taxation Office tax transparency reporting

The ATO's report on tax entity information for the 2016 income year includes details of tax paid as compared to total income. This report doesn't disclose what is invested to earn that income nor the expenses incurred to derive the income. The ATO report includes the following information in respect of Origin Energy Limited for the year ended 30 June 2016:

Total income	$11,918 million
Taxable income	$94 million
Income tax payable	Nil

Income tax payable of $28.2M (30 per cent of $94 million) was reduced to nil due to available tax offsets including foreign income tax offset of $2.4 million (foreign taxes paid by Origin), franking credit tax offset of $4.8 million (imputation for taxed dividends) and research and development tax incentive offset of $21 million (tax concession for R&D activities that were accrued in the 2016 and 2015 income years).

The accounting statutory loss for the Australian operations of Origin Energy Limited tax consolidated group for the year ended 30 June 2016 was $699 million, as compared to taxable income of $94 million. The variance between these amounts arise from a number adjustments. The nature of the most significant of these adjustments are described below in the ATO Guidance Information section.

The ATO report also includes the following information in respect of the Origin Energy Limited wholly owned subsidiary, Origin Energy Uranquinty Power Pty Ltd, for the year ended 30 June 2016:

Total income	$111 million
Taxable income	Nil
Income tax payable	Nil

Origin Energy Uranquinty Power Pty Ltd owns and operates the Uranquinty Power Station in New South Wales, all of its activities are based in Australia and its financing is undertaken with Australian resident entities.

The accounting profit for the operations of Origin Energy Uranquinty Power Pty Ltd for the year ended 30 June 2016 was $30 million. The variance between accounting profit and tax loss primarily arose from the timing difference between accounting and tax as to when losses from financial arrangements are recognised.

origin

ATO Guidance Information

The ATO has also published guidance to assist in interpreting the tax entity information that it will publish (see: https://www.ato.gov.au/Business/Large-business/In-detail/Tax-transparency/). This should be referred to in detail. However, the following extracts are particularly relevant to Origin and its subsidiaries.

Tax transparency: reporting of entity tax information

Producing the report

Report data sources

Total income

Total income does not include accounting expenses - the total income figure is similar to gross accounting revenue, not profit and it makes no allowances for the costs of earning income.

Taxable income

The inclusion of assessable amounts and allowable deductions to arrive at the taxable income reported, and the omission of expenses from the total income reported, means there is not a simple correlation between total income and taxable income.

Tax and report data

Taxable income

Variations between an entity's tax expense as recorded in its statutory accounts and tax payable as recorded in a tax return can arise for a number of reasons, including:

- *Timing in the depreciation of capital assets will cause differences in the accounting and tax position of an entity; generally tax is more concessional to provide business with incentives to invest.*
- *Deductions for exploration expenditure are allowed as they are incurred under tax law, and may result in deductions in years before a mine or well becomes operational and produces income.*

origin

Origin Income Tax Transparency Report

Year ended 30 June 2015

Origin makes a significant contribution to the communities in which it operates, including the payment of income tax, payroll tax, rates and royalties.

Origin is open and transparent about its tax arrangements and undertakes all of its required tax compliance and reporting obligations. All of Origin's operations in Australia and overseas are subject to tax and all of the overseas entities are legitimate operating businesses and are not vehicles to minimise tax.

The Origin Group's effective income tax rate[1] for the 30 June 2015 tax year on the statutory accounting loss was 8 per cent and on underlying net profit[2] was 31 per cent. The variance from the corporate tax rate of 30 per cent, primarily arose from some non deductible foreign asset accounting impairments.

Origin has been classified as a key taxpayer by the ATO pursuant to the their risk-differentiation framework, meaning the ATO considers that it would be unlikely that Origin would lodge tax returns that would apply an interpretation of the tax law which is inconsistent with that of the ATO. As a key taxpayer Origin's operations are assessed as having a significant effect on the tax system and accordingly Origin is continually engaging with the Australian Taxation office on a rolling review basis to confirm compliance with the tax law.

The Australian tax consolidated group

Origin has operations in Australia as well as a number of overseas countries. Origin Energy Limited lodges a single Australian tax return which consolidates the results of all of its wholly owned Australian resident companies other than Origin Energy Uranquinty Power Pty Ltd, which lodges a separate Australian income tax return. The Origin Energy Limited tax return discloses the income derived solely from Australian operations as total income. The Origin group subsidiaries which have operations outside of Australia are not required to lodge an Australian tax return and their activities are included within the Origin Energy Limited tax return, as an addition to the total income disclosed, to the extent they are either concessionally taxed or derive passive income or income from transactions with the Origin Australian group. These companies also comply with the tax laws applicable to the countries in which they operate.

Australian Taxation Office tax transparency reporting

The ATO's report on tax entity information for the 2015 income year includes details of tax paid as compared to total income. This report doesn't disclose what is invested to earn that income nor the expenses incurred to derive the income. The ATO report includes the following information in respect of Origin Energy Limited for the year ended 30 June 2015:

Total income	$12,201 million
Taxable income	Nil
Income tax payable	Nil

1 Effective income tax rate is calculated as income tax expense/profit before income tax

2 Underlying net profit is derived from statutory net profit by excluding items that do not align with the manner in which the Managing Director reviews the financial and operating performance of the business. These items are categorised as fair value and foreign exchange movements, LNG related items pre revenue recognition and Disposals, impairments and business restructuring

The accounting statutory loss for the Australian operations of Origin Energy Limited tax consolidated group for the year ended 30 June 2015 was $140 million, as compared to a tax loss of $207 million. The variance between these amounts arise from a number adjustments. The nature of the most significant of these adjustments are described below in the ATO Guidance Information section.

The ATO report also includes the following information in respect of the Origin Energy Limited wholly owned subsidiary, Origin Energy Uranquinty Power Pty Ltd, for the year ended 30 June 2015:

Total income	$191 million
Taxable income	$21 million
Income tax payable	$6 million

The accounting profit for the operations of Origin Energy Uranquinty Power Pty Ltd for the year ended 30 June 2015 was $29 million. The variance between accounting profit and taxable income primarily arose from a higher depreciation expense for income tax purposes.

Origin Energy Uranquinty Power Pty Ltd owns and operates the Uranquinty Power Station in New South Wales, all of its activities are based in Australia and its financing is undertaken with Australian resident entities.

ATO Guidance Information

The ATO has also published guidance to assist in interpreting the tax entity information that it will publish (see: https://www.ato.gov.au/Business/Large-business/In-detail/Tax-transparency/). This should be referred to in detail. However, the following extracts are particularly relevant to Origin and its subsidiaries.

Tax transparency: reporting of entity tax information

...

Tax return labels

...

Total income

...

The company tax return instructions explain the amount to be written at the income label in the tax return is an accounting system amount and corresponds to the relevant amount in the entity's financial statements for the income year. This amount may vary from taxpayer to taxpayer, depending on how their accounting system is set up. It is a gross revenue figure and may include exempt income, other non-assessable income and foreign source income. The inclusion of such amounts increases total income relative to taxable income and accounting profit.

Importantly, total income does not take into account expenses. The total income figure is similar to gross accounting revenue, not profit. It makes no allowances for the costs of earning income. (emphasis added)

Taxable income

...

An entity's taxable income may include franking credits and non-deductible items that increase accounting profit, but will also reflect available concessions or adjustments allowable for income tax purposes such as tax losses utilised from prior years. The inclusion of such assessable amounts and/or allowable deductions to arrive at the taxable income reported, and the omission of expenses from the total income reported, means it is not a simple equation between 'Total income' and 'Taxable income'.

Background information

...

Factors affecting taxable income

Variations between an entity's tax expense as recorded in its statutory accounts and tax payable as recorded in a tax return can arise for a number of reasons:

- *Timing in the depreciation of capital assets will cause differences in the accounting and tax position of an entity. Generally tax is more concessional to provide business with incentives to invest.*
- *Deductions for exploration expenditure are allowed under tax law and may result in large deductions for depreciating assets in development years before a mine or well becomes income producing (ie years of losses).*

Origin Income Tax Transparency Report

Year ended 30 June 2014

Origin makes a significant contribution to the communities in which it operates, including by paying income tax, payroll tax, rates and royalties.

Origin is open and transparent about its tax arrangements and undertakes all required tax compliance and reporting obligations. All of Origin's operations in Australia and overseas are subject to tax and all of the overseas entities are legitimate operating businesses and are not vehicles to minimise tax.

The Origin Group's effective income tax rate on statutory profit was 15 per cent and 29 per cent on underlying net profit[1], for the 30 June 2014 tax year. The variance from the corporate tax rate of 30 per cent, primarily arose from a reduction in the tax liability for accounting purposes, upon the resolution of an electricity and gas industry issue with the Australian Taxation Office, with respect to the tax treatment of unbilled income.

Origin has been classified as a key taxpayer by the ATO under its risk-differentiation framework, meaning the ATO considers that it would be unlikely that Origin would lodge tax returns that would apply an interpretation of the tax law which is inconsistent with that of the ATO.

Australian Taxation Office tax transparency reporting

The ATO's report on tax entity information for the 2014 income year includes details of tax paid as compared to revenue. This report doesn't disclose what is invested to earn that income nor the expenses incurred to derive the revenue.

The ATO report includes the following information in respect of Origin Energy Limited for the year ended 30 June 2014:

Total income	$12,574,554,876
Taxable income	$501,252,871
Income tax payable	$108,004,529

The primary income tax liability of $150,375,861 (ie $501,252,871 at 30 per cent) has been reduced to $108,004,529 due to the application of franking credits, foreign tax credits, research and development offsets and franking deficit tax offsets.

The accounting profit for the Australian operations of Origin Energy Limited for the year ended 30 June 2014 was $557,662,303, as compared to taxable income of $501,252,871. The variance between these amounts arise from many adjustments. The nature of these adjustments are described below in the ATO Guidance Information section.

The ATO report includes the following information in respect of the Origin Energy Limited wholly owned subsidiary, Origin Energy Uranquinty Power Pty Ltd, for the year ended 30 June 2014:

Total income	$180,075,404
Taxable income	$8,560,902
Income tax payable	$1,872,727

[1] Underlying net profit is derived from statutory net profit, by excluding items that are not regarded as arising from the ordinary operations such as one off transactions and mark to market movements in assets.

Payroll Tax Rates and Thresholds

The table below lists the current and historical thresholds and rates for payroll tax.

Period	Annual wage threshold	Monthly wage threshold	Rate
July 2017 to June 2018	$1 500 000	$125 000	5.5%
July 2016 to June 2017	$1 500 000	$125 000	5.5%
July 2015 to June 2016	$1 500 000	$125 000	5.5%
July 2014 to June 2015	$1 500 000	$125 000	5.5%
July 2013 to June 2014	$1 500 000	$125 000	5.5%
July 2012 to June 2013	$1 500 000	$125 000	5.5%
July 2011 to June 2012	$1 500 000	$125 000	5.5%
July 2010 to June 2011	$1 250 000	$104 167	5.9%
July 2009 to June 2010	$1 250 000	$104 167	5.9%
July 2008 to June 2009	$1 250 000	$104 167	5.9%
July 2007 to June 2008	$1 250 000	$104 167	6.2%
July 2006 to June 2007	$1 250 000	$104 167	6.2%
July 2005 to June 2006	$1 000 000	$83 333	6.2%
July 2004 to June 2005	$800 000	$66 667	6.2%
July 2003 to June 2004	$600 000	$50 000	6.2%
July 2002 to June 2003	$600 000	$50 000	6.3%

Calculating Your Payroll Tax

Introduction

Payroll tax is calculated by applying a percentage (see Appendix 5 for current and historic rates) to your net NT taxable wages.

All the calculations are done automatically when you enter the required wages information in your online monthly return, which is required by the 21st day of the next month (for example, April's return is to be lodged and paid by 21 May).

(See Lodging and Paying Your Payroll Tax Returns.)

Information you will Need Before Lodging your Monthly Return

Before accessing your online return, you will need available the following information:

- NT wages for the business for which the return is being done, split into the following categories:

NT Gross Wages

a. Wages and salaries
b. Contractor payments
c. Commissions/bonuses/allowances
d. Fringe benefits
e. Employee share contributions
f. Termination payments
g. Directors' fees
h. Other

NT Exempt Wages

a. Workers compensation
b. Defence force leave
c. Overseas employees
d. Maternity leave
e. Other

Important: Because your monthly deductible amount (MDA) is fixed for each month between July and May you do not need to provide when doing each monthly return details of interstate or group wages (this is not required until doing the Annual Return).

Example 2: DEF Pty Ltd is not grouped and only pays wages in the NT. Total net NT wages for 2014-15 were $1 900 000. Because this is greater than the $1 500 000 tax-free threshold, payroll tax will be payable. DEF's tax-free entitlement and liability are calculated in the following steps:

Step 1: Gross wages are $1 900 000

Step 2: Maximum possible tax-free component is $1 500 000

Step 3: Gross wages exceed $1 500 000 by $400 000.

Step 4: The $1 500 000 maximum possible tax-free component is reduced by $1 in $4 of the $400 000 excess (i.e. reduced by $100 000 from $1 500 000 to $1 400 000).

Step 5: Therefore, DEF's taxable wages are $1 900 000 less $1 400 000 tax-free component (ADA) or $500 000.

Step 6: DEF's payroll tax liability is $500 000 x 5.5%; which equals $27 500.

Example 3: GHI Pty Ltd, JKL Pty Ltd and MNO Pty Ltd are all grouped (they have common directors and shareholders). They each pay wages in the NT, but not in any other state or territory. Their net taxable wages in 2014-15 were as follows:

GHI:	$2 900 000
JKL:	$400 000
MNO:	$600 000
Total	$3 900 000

GHI has been selected as the designated group employer (DGE). The businesses' payroll tax liability is calculated in the following steps:

Step 1: Gross group wages are $3 900 000

Step 2: Maximum possible tax-free component is $1 500 000

Step 3: Gross wages exceed $1 500 000 by $2 400 000.

Step 4: The $1 500 000 maximum possible tax-free component is reduced by $1 in $4 of the $2 400 000 excess (i.e. reduced by $600 000 from $1 500 000 to $900 000).

Step 5: The $900 000 tax-free component (ADA) is allocated in full to GHI as the DGE.

Step 6: GHI's taxable wages are therefore: $2 900 000 - $900 000 = $2 000 000

Step 7: GHI's payroll tax liability is $2 000 000 x 5.5% = $110 000.

Step 8: JKL and MNO are liable for payroll tax at 5.5% on their total gross wages:

JKL: $400 000 x 5.5% = $22 000

MNO: $600 000 x 5.5% = $33 000

Example 4: GHI Pty Ltd, JKL Pty Ltd and MNO Pty Ltd are all grouped (they have common directors and shareholders). They each pay wages in the NT, but not in any other state or territory. Their net taxable wages in 2014-15 were as follows:

GHI:	$2 900 000
JKL:	$400 000
MNO:	$600 000
Total	$3 900 000

GHI has been selected as the DGE. On 1 July 2015, GHI acquires control of PQR Pty Ltd, a Perth-based company that pays $1 800 000 in wages in Western Australia. It has no employees in the NT. As a consequence of the PQR acquisition, the group's Australian wages increase from $3 900 000 to $5 700 000. The businesses' payroll tax liability is calculated in the following steps:

Step 1: Gross group wages are $5 700 000

Step 2: Maximum possible tax-free component is $1 500 000

Step 3: Gross wages exceed $1 500 000 by $4 200 000.

Step 4: The $1 500 000 maximum possible tax-free component is reduced by $1 in $4 of the $4 200 000 excess (reduced by $1 050 000 from $1 500 000 to $450 000).

Step 5: The $450 000 is adjusted to reflect the ratio of NT wages ($3 900 000) to Australian wages ($5 700 000):
ADA for 2015-16 = $450 000 x ($3 900 000/$5 700 000) = $307 894

Step 6: The $307 894 tax-free component (ADA) is allocated in full to GHI as the DGE.

Step 7: GHI's taxable wages are therefore: $2 900 000 - $307 894 = $2 592 106

Step 8: GHI's payroll tax liability is $2 592 106 x 5.5% = $142 565.

Step 9: JKL and MNO are liable for payroll tax at 5.5% on their total gross wages:
JKL: $400 000 x 5.5% = $22 000
MNO: $600 000 x 5.5% = $33 000

Note: PQR has no direct NT liability but would need to register and pay payroll tax in Western Australia (if it has not already done so). However, PQR remains jointly and severally liable for the payroll tax debts of each other group member incurred from 1 July 2015 onwards, the date of its acquisition.

Example 5: BDE Pty Ltd is ungrouped and its head office is based in SA. The NT branch has wage and superannuation costs of $2 700 000 per annum. Total taxable wages paid by BDE Pty Ltd in the NT, SA and other interstate branches is $10 400 000 per annum.

Because total Australian wages exceeds the $7 500 000 cut-off point, BDE Pty Ltd has no entitlement to any tax-free component in the NT. Therefore, its NT payroll tax liability will be $2 700 000 x 5.5% = $148 500.