File No: NA/487

March 1998

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Ethyl octyl sulphide

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act* 1989 (the Act), and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Family Services.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, Worksafe Australia, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

Monday - Wednesday	8.30 am - 5.00 pm
Thursday	8.30 am - 8.00 pm
Friday	8.30 am - 5.00 pm

Copies of this full public report may also be requested, free of charge, by contacting the Administration Coordinator on the fax number below.

For enquiries please contact the Administration Coordinator at:

Street Address: 92 Parramatta Rd Camperdown, NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, Sydney 2001, AUSTRALIA
Telephone: (61) (02) 9577-9466 FAX (61) (02) 9577-9465

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Ethyl octyl sulphide

1. APPLICANT

Donhad Pty Ltd of 18-22 Jackson Street BASSENDEAN WA 6054 has submitted a standard notification statement in support of their application for an assessment certificate for ethyl octyl sulphide.

2. IDENTITY OF THE CHEMICAL

Chemical Name:	ethyl octyl sulphide
Chemical Abstracts Service (CAS) Registry No.:	3698-94-0
Other Names:	1-(ethylthio)octane 8-thiaundecane FPPR-60
Trade Name:	Mineral Flotation Collector S-701
Molecular Formula:	$C_{10}H_{22}S$
Structural Formula:	

$$CH_3(CH_2)_7SCH_2CH_3$$

Molecular Weight:	174
Method of Detection and Determination:	gas chromatography
Spectral Data:	nuclear magnetic resonance and mass spectra used to confirm structure were supplied

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	clear to pale yellow liquid with a sweet odour

Boiling Point:	102-103°C at 1.47 kPa; 232°C at 101.3 kPa
Specific Gravity:	0.89 at 20°C
Vapour Pressure:	< 0.013 kPa at 25°C
Water Solubility:	< 1.5 $mg.L^{-1}$ at 25°C
Partition Co-efficient (n-octanol/water):	log P_{OW} = 5.6 (calculated from water solubility) log P_{AW} = -1.1 (calculated from water solubility)
Hydrolysis as a Function of pH:	not determined (see comments below)
Adsorption/Desorption:	log K_{OC} = 3.56 (calculated from K_{OW})
Dissociation Constant:	not determined (see comments below)
Flash Point:	> 96°C
Explosive Properties:	will not explode; does not form explosive mixtures with air
Reactivity/Stability:	stable at ambient conditions; incompatible with oxidising materials

Comments on Physico-Chemical Properties

The water solubility of the chemical was determined using a nephelometric method. The value obtained agrees well with the highest measured concentration, 1.4 $mg.L^{-1}$ (measured using gas chromatography), in the fish ecotoxicity study.

The notified chemical contains no functional groups which are likely to undergo hydrolysis or which will gain or lose a proton in the environmental pH range (4-9). Partition coefficients for octanol and water, and air and water, as well as the adsorption/desorption coefficient were calculated using standard QSAR calculations.

4. PURITY OF THE CHEMICAL

Degree of Purity:	96.3% (96.0 - 96.7%)
Toxic or Hazardous Impurities:	none
Non-hazardous Impurities:	

Name	*CAS Number*	*% Weight*
4-methyl-3-thiadecane	53970-40-4	<3
5-ethyl-3-thianonane	71607-39-1	<3
1-octene	111-66-0	<1
ethanethiol	75-08-1	<0.05
ethyl disulphide	110-81-6	<0.05

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified chemical is to be used as a specialised mineral flotation agent in the mining industry. The chemical is to be imported at a rate of 1 to 10 tonnes in the first year rising to 200 tonnes per year by the fifth year.

6. OCCUPATIONAL EXPOSURE

The notified chemical is to be imported in bulk containers (isotainers). These isotainers are shipped directly to up to 7 mine sites where the contents are transferred to bulk storage tanks. Exposure to transport workers is unlikely and would only occur in the event of an accident.

At the mine site, there will be a maximum of five deliveries per year. Hoses will be coupled to the isotainer and bulk holding tank using Kamlok fittings. Transfer then takes 2 to 3 hours to complete. Exposure is most likely to occur when hoses are uncoupled. Following transfer, the notified chemical is in a completely contained system comprising the holding tank, dosing tank and dosing pump. Dosing is computer controlled. Workers are in the vicinity of the chemical storage tanks for up to 2 hours per day, 230 days per year. Workers may have to take preventative action in the rare event of a spill or leak in which case dermal or ocular exposure are possible.

Due to the low vapour pressure of the chemical local exhaust ventilation is not used except in confined spaces.

Maintenance or repair of pumps is expected to be carried out 3 to 4 times per year and take 3 to 4 hours to complete. Standard practice is to flush the pump with water and isolate it, in which case exposure to the notified chemical should be low. Similarly, if tank maintenance is required, the tanks would be drained and flushed with water.

7. PUBLIC EXPOSURE

The notified chemical will not be sold to the public. Given that the notified chemical is used only at mining sites, it is not volatile and no disposal occurs after use, no public exposure is expected from industrial use. In the event of a transport accident,

spills will be contained with soil or sand and collected for recycling or neutralised with lime and disposed of to approved landfill.

8. ENVIRONMENTAL EXPOSURE

Release

The notified chemical will be transported to mine sites in isocontainers and the chemical will be transferred into bulk storage tanks. From the storage tanks, it will be automatically transferred into dosing tanks, from where it is fed into the mineral flotation process. Release during normal operating conditions is expected to be minimal. Isotanks are expected to be returned for refilling or recycling.

In the flotation cells, the average dose of the notified chemical will be 40 g/metric tonne of solids and for every tonne of solids three tonnes of water will be used. Hence, the concentration of the notified chemical in the flotation cell will be 10 ppm. During the flotation process, the chemical will become associated with the mineral particles which after aeration will be sent for smelting. Hence, the bulk of the chemical will enter the smelting process. Residues of the chemical remaining in the water (either dissolved in the water or associated with unrecovered ore) will be sent to lined holding ponds. The notifier estimates that these residues will account for less than 0.5% (less than 1 tonne) of the imported chemical per annum. The notifier has indicated that tests by Dow Chemical Company on water from flotation cells (containing the notified chemical and chalcopyrite) found that levels of the chemical in the water were below the detection limit (4 ppb) in a research trial.

Dry tailings in the holding ponds eventually will be buried *in situ* with topsoil and the surface revegetated.

Release of the notified chemical from the holding ponds is not anticipated as a result of flooding. The capacity of the holding pond at the New South Wales site is in excess of ten times the estimated capacity to contain a 1 in 100 year 72-hour duration event. In the unlikely event that the tailings dam is breached the concentration of the chemical in the dam would be significantly reduced by dilution. The notified chemical has a high volatility from water (further discussed in the Fate section below). Hence, the release of significant quantities of the notified chemical to the atmosphere could occur from holding ponds and moist concentrates during drying and transport.

Fate

The biodegradation of the chemical was investigated over a 10-day period in two activated sludge media using a modification of the standard BOD procedure. The reduction in concentration with time of the notified chemical in the aqueous phase of activated sludge media was determined using gas chromatography. The degradation was monitored for media seeded with activated sludge from both an industrial and municipal sewage treatment works. After 5 days incubation 76% and 98% removal of the notified chemical were observed in the industrial and municipal systems, respectively. The level of notified chemical was below the detection limit

(0.01 mg.L^{-1}) in both systems after 10 days. Control samples treated with $HgCl_2$ (to kill the activated sludge) showed no apparent loss of the notified chemical suggesting that the disappearance of the notified chemical in the activated sludge media was through biodegradation.

The Henry's law constant (K = 1.53×10^{-2} atm.m^3.$mole^{-1}$) was calculated using the molecular weight, vapour pressure and the water solubility, according to the method described by Mackay and Wolkoff (1). This value indicates that the notified chemical is likely to volatilise from water (2). This is confirmed by Level 1 Mackay calculations for the notified chemical which indicate that at equilibrium approximately 5.3%, 4.9%, 0.2% and 89.6% will be partitioned to soil, sediment, water and air, respectively. As some of the values (vapour pressure = 0.013 kPa, water solubility = 1.5 mg.L^{-1} and log K_{OW} = 5.64) used in the Mackay modelling were limit values the partitioning to air should be treated with caution. However, the partitioning of the chemical to air is confirmed by the calculated air/water partition coefficient (log P_{AW} = -1.1) and Level 1 Mackay calculations performed using ASTER (3) which indicate that at equilibrium approximately 4.69%, 4.38%, 0.50% and 90.43% will be partitioned to soil, sediment, water and air, respectively, based on values (vapour pressure = 1.9×10^{-3} kPa, water solubility = 0.617 mg.L^{-1} and log K_{OW} = 5.07) calculated using QSAR calculations. The Mackay model assumes an equilibrium is established between all phases. In the environment an equilibrium state will not be reached as chemical which reaches the atmosphere will be effectively removed from the system (by diffusion into the atmosphere or blown away by wind). Hence, over time the sediment/water and water/air partitioning will be driven toward the loss of the chemical to the atmosphere. This partitioning to the atmosphere would occur from holding ponds and moist concentrates during drying and transport. Additionally, during the ecotoxicity studies on aquatic organisms the notifier has estimated a half life in the test media of 192 h, due to volatilisation from the solution.

In the atmosphere it is likely that the chemical will be degraded through reaction with hydroxyl radicals, either via hydroxyl radical addition to the sulfur atom or by hydrogen abstraction from the alkyl moieties of the chemical (4).
In the smelting process the chemical will be destroyed by oxidation yielding water and oxides of carbon and sulfur.

A bioconcentration factor of 1.2×10^4 was estimated from the water solubility of the chemical by the notifier using a standard QSAR calculation, indicating that the chemical has potential to bioconcentrate. However, this will be mitigated by the substances biodegradability, volatility and expected low exposure of the notified chemical to natural waterways.

9. EVALUATION OF TOXICOLOGICAL DATA

There was a certain limited amount of toxicological data available for the notified chemical, namely, acute oral and dermal toxicities, skin and eye irritation. The notifier submitted the data in the form of a copy of an application for a Premanufacture Notice for New Chemical Substances to the US Environmental Protection Agency by The Dow Chemical Company, Michigan, USA. This application covered acute oral toxicity, skin and eye irritation. In addition, a separate study on dermal toxicity was submitted.

Toxicological data for an analogue, hydroxyethyl octyl sulphide (trade name: MGK Repellent 874), was accepted as providing an indication for that of the notified chemical. These data were for skin sensitisation, subchronic toxicity, teratology and gentoxicity.

9.1 Acute Toxicity

Summary of the acute toxicity of ethyl octyl sulphide

Test	*Species*	*Outcome*
acute oral toxicity	rat	LD_{50} > 2 000 $mg.kg^{-1}$
acute dermal toxicity	rabbit	LD_{50} = 2 000 $mg.kg^{-1}$
skin irritation	rabbit	slight irritant
eye irritation	rabbit	slight irritant

9.1.1 Oral Toxicity

Species/strain:	rat/Fischer 344
Number/sex of animals:	3 males
Observation period:	14 days
Method of administration:	gavage
Clinical observations:	none
Mortality:	none
Test method:	similar to OECD guidelines (5)
LD_{50}:	> 2 000 $mg.kg^{-1}$
Result:	the notified chemical was of low acute oral toxicity in rats

9.1.2 Dermal Toxicity (6)

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	2 males per dose
Observation period:	14 days
Dose/method of administration:	800 or 2 000 $mg.kg^{-1}$/under impervious cuff for 24 hours
Clinical observations:	lethargy and apparent anorexia at the high dose; topical effects on the application sites included moderate redness and slight to marked swelling
Mortality:	none at 800 $mg.kg^{-1}$; 1 death on day 2 at 2 000 $mg.kg^{-1}$
Test method:	according to OECD guidelines (5)
LD_{50}*:*	2 000 $mg.kg^{-1}$
Result:	the notified chemical was of low dermal toxicity in rabbits

9.1.3 Inhalation Toxicity

not done

9.1.4 Skin Irritation

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	1 male
Observation period:	14 days
Method of administration:	10 applications over a period of 14 days to the ear (0.1 mL left uncovered), or to the intact or abraded abdomen (0.5 mL under semi-occlusive dressing) for 24 hours; applications on days 1 to 5, 8 to 10, 12 and 15
Test method:	similar to OECD guidelines (5)
Result:	the notified chemical was a slight irritant to the rabbit skin; after exposure for 24 hours slight redness and swelling and very slight necrosis were observed; repeated contact resulted in

	moderate redness and swelling and slight necrosis

9.1.5 Eye Irritation

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	1 male
Observation period:	72 hours
Method of administration:	0.1 mL of the notified chemical into the conjunctival sac of one eye
Test method:	similar to OECD guidelines (5)
Result:	the notified chemical was a slight irritant to the rabbit eye; iridal effects were very slight to slight with a peak response at 24 hours post-treatment; no corneal effects were observed; slight conjunctival redness was observed at 1 hour post-treatment

9.1.6 Skin Sensitisation: 2-hydroxyethyl-n-octyl sulphide

9.1.6.1 MGK Repellent 874 (7)

Species/strain:	guinea pig/Dunkin-Hartley
Number of animals:	12 test, 5 control
Induction procedure:	0.5 mL of a 1% v/v dilution of the chemical in white mineral oil was applied under an occlusive patch; the initial induction application was for 24 hours followed by a rest for at least one day; applications 2 to 9 were for 6 hours duration followed by a rest of at least one day; applications were conducted 3 times per week followed by a 2-week rest period
Challenge procedure:	0.5 mL of a 1% v/v dilution of the chemical in white mineral oil was applied under an occlusive patch for 24 hours to a site differing from the induction sites

Challenge outcome:

	Test animals		Control animals	
Challenge concentration	***24 hours****	***48 hours****	***24 hours***	***48 hours***
1%	0/12**	0/12	0/5	0/5

* time after patch removal
** number of animals exhibiting positive response

Test method: similar to OECD guidelines (5)

Result: the test chemical was not a skin sensitiser in guinea pigs at a concentration of 1%

9.1.6.2 X-3240-78 (8) and X-3154-76 (9)

Two samples of 2-hydroxyethyl-n-octyl sulphide with different lot numbers from the same company were tested using the same protocol, 2 years apart.

Species/strain: guinea pig/unknown

Number of animals: 6 test

Induction procedure: 0.3 mL of the chemical under occlusive dressing for 24 hours following which the animals were rested for one day; the procedure was repeated for 10 applications followed by a 2-week rest period

Challenge procedure: as for induction, at a site differing from the induction site

Test method: unspecified

Result: the test chemicals were not skin sensitisers in guinea pigs although substance X-3154-76 produced slight irritation in the controls which made scoring problematic

9.1.6.3 Repeat Insult Patch Test: MGK Repellent 874 (10)

Species/strain: human

Number of subjects: two groups: group A, 21 ambulatory volunteers ranging in age from 20 months to 55 years; group B, 40 nursing home inmates ranging in age from 30 to ‘well above’ 70

Induction procedure: group A subjects: the chemical, at a concentration of 6% in isopropanol, was

	initially applied 15 times under occluded patch with the edges sealed using Blenderm; it was found the Blenderm induced reactions at the edges of the patches; the same group of subjects was treated again with both occluded and unoccluded samples; in each case there were 15 applications with a 24-hour rest period during the week and 48 hours on weekends; the occluded application in this case was made by saturation of the gauze pad of a Band-Aid Plastic Strip (Johnson & Johnson) which was applied tightly to the skin but not sealed group B subjects: occluded patches using Band-Aid Plastic Strips as above were applied 4 times to different sites for 5 days followed by a 2-day rest period
Challenge procedure:	group A subjects: a 2-week rest period following the last application was followed by a 24 hour challenge in the same manner but at a different site group B subjects: 7 days of rest intervened after the removal of the fourth patch, the first challenge was performed uncovered; 7 days after the first challenge, 3 applications constituting the second challenge were performed: either uncovered, under a patch using a Band-Aid Plastic Strip or under a standard occluded patch with Blenderm
Test method:	unknown
Result:	MGK Repellent 874 was not a skin irritant or a skin sensitiser in humans at a concentration of 6%

9.2 Repeated Dose Toxicity (11)

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	5/sex/dose group
Method of administration:	the test chemical was diluted in corn oil and applied under semi-occlusive dressing for 6

	hours once a day
Dose/Study duration::	doses of 0, 50 (low dose: LD), 100 (mid dose: MD) or 200 (high dose: HD) mg.kg.d^{-1} were applied once a day for 21 days
Clinical observations:	none related to treatment
Skin reactions:	varying degrees of pustule formation, erythema (up to 'well-defined') and oedema (up to slight) and eschar formation were seen in all groups and ascribed to the dressing and corn oil vehicle treatment-related desquamation was observed in 2 LD males, 3 MD females and 2 MD males, and all but one female of the HD group moderate to severe erythema, usually in combination with moderate oedema was observed in 3/10 controls, 4/10 LD animals, all MD and HD males and 2 HD females
Clinical chemistry/Haematology	*haematology:* the only observation possibly related to treatment was in HD females: lower white blood cell levels, decreased neutrophils and increased lymphocytes; these changes were within the normal reference range *clinical chemistry:* no dose-related changes
Organ weights:	no treatment-related changes
Histopathology:	no treatment-related changes
Test method:	similar to OECD guidelines (5)
Result:	MGK Repellent 874 exhibited no organ toxicity in rabbits on repeated dermal application for 21 days at doses of 50, 100 or 200 mg.kg.d^{-1}

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* Reverse Mutation Assay (12)

Strains:	TA 98, TA 100, TA 1535, TA 1537 and TA 1538

Concentration range:	effective range was 3.3 - 333 μg.plate^{-1} with some protection against test chemical-mediated toxicity via rat liver S9 fraction
Test method:	similar to OECD guidelines (5)
Result:	no induced mutations were observed in the indicator strains in either the presence or absence of metabolic activation provided by rat liver S9 fraction; at doses above 100 μg.plate^{-1}, in the absence of S9 fraction, toxicity was moderate to extreme

9.3.2 Mutagenicity Assay in Mouse L5178 TK+/- Cells (13)

Species/cell line:	mouse/L5178 TK+/-
Doses:	0.01 - 0.05 μL.mL^{-1} without metabolic activation provided by rat liver S9 fraction for 4 hours; 0.042 - 0.094 μL.mL^{-1} with S9 fraction for 4 hours
Test method:	similar to OECD guidelines (5)
Result:	MGK Repellent 874 was not mutagenic in mouse L5178 cells either in the presence or absence of metabolic activation provided by rat liver S9 fraction

9.3.3 Chromosomal Aberrations in Chinese Hamster Ovary (CHO) Cells (14)

Species/cell line:	Chinese Hamster/CHO cells
Doses:	0.007 - 0.075 μL.mL^{-1} for 10 hours in the absence of metabolic activation provided by rat liver S9 fraction and 0.013 - 0.15 μL.mL^{-1} for 2 hours in its presence
Test method:	similar to OECD guidelines (5)
Result:	MGK Repellent 874 did not induce structural chromosomal aberrations in either the presence or absence of metabolic activation provided by rat liver S9 fraction

9.3.4 Unscheduled DNA Synthesis in Rat Primary Hepatocytes (15)

Species/cell line:	rat/primary hepatocytes

Doses:	0.001 - 0.05 μL.mL^{-1} for 18 - 20 hours
Test method:	similar to OECD guidelines (ref)
Result:	MGK Repellent 874 did not induce an increase in unscheduled DNA synthesis in rat primary hepatocytes

9.4 Rat Developmental Toxicity (Teratology) Study (16)

Species/strain:	rat/Sprague-Dawley
Number of animals:	24 females per dose group
Method of administration:	oral gavage
Dose/Study duration::	0, 100 (low dose: LD), 300 (mid dose: MD) or 1 000 (high dose: HD) mg.kg.d^{-1} between days 6 and 15 of pregnancy
Pregnancy data:	similar mean numbers of corpora lutea, implantations and live foetuses found in all groups; pre- and post-implantation losses were similar to or lower than in the control group in all treated groups
Major abnormalities:	3 major abnormalities (umbilical hernia in a LD rat; cleft palate in a HD rat; microphthalmia in a HD rat) were considered to be of spontaneous origin
Minor abnormalities:	no treatment related incidences of minor external/visceral or minor skeletal abnormalities except for a variant of 14th vestigial rib in the HD group; the values in the control group and at lower dose levels were unusually low, however
Test method:	similar to OECD guidelines (ref)
Result:	oral administration of MGK Repellent 874 at 1 000 mg.kg.d^{-1} to the pregnant rat during organogenesis elicited minimal maternal toxicity, no embryolethality, teratogenicity or any conclusive evidence of embryonic growth retardation; there were no adverse effects of treatment at 100 or 300 mg.kg.d^{-1} in the pregnant rat or the embryo *in utero*

9.5 Overall Assessment of Toxicological Data

The notified chemical exhibited low acute oral (LD_{50} > 2 000 mg.kg^{-1}) and dermal (LD_{50} = 2 000 mg.kg^{-1}) toxicities in rats and rabbits, respectively. It was a slight skin and eye irritant in rabbits.

An analogue of the notified chemical, hyroxyethyl-n-octyl sulphide was not a skin sensitiser in guinea pigs when applied at 1% or 100%. A 6% solution gave no evidence of allergic reaction in a repeat insult patch test in humans. No evidence of organ toxicity was found in rabbits treated dermally for 21 days with up to 200 mg.kg.d^{-1}. No evidence of genotoxicity was observed when tests for mutagenicity were conducted in bacteria and mouse cells, a test for clastogenicity was conducted in CHO cells or a test for unscheduled DNA synthesis was conducted in rat primary hepatocytes. No evidence of developmental effects was found in pregnant rats treated at up to 1 000 mg.kg.d^{-1}.

On the basis of the above data the notified chemical would not be classified as hazardous according to the National Occupational Health and Safety Commission's *Approved Criteria for Classifying Hazardous Substances* (17).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The following ecotoxicity studies have been supplied by the notifier. The tests were carried out according to OECD Test Methods (5).

Species	Test	Concentrations[a] (mg.L^{-1})	Result (mg.L^{-1})	Reference
fathead minnow (*Pimephales promelas*)	96 h acute	0, 0.78, 2.2, 3.6, 6.0, 10.0	LC_{50} > 1.4[b] NOEC = 1.4	(18)
water flea (*Daphnia magna*)	48 h acute	0, 0.19, 0.32, 0.54, 0.9, 1.5	EC_{50} = 0.73 (95% CL 0.66-0.82)	(18)

[a] Nominal concentrations [b] Highest measured concentration determined for the nominal concentration of 10.0 mg.L^{-1} using gas chromatography, approximates water solubility.

The fish study was conducted under static renewal conditions, while in the Daphnia study the test vessels were capped to prevent loss of test material.

No data was provided for toxicity of the notified chemical to algal species as required under the Act. The notifier has indicated that testing on algal species was not practical due to the volatility of the chemical from the aqueous test medium. It is acknowledged that testing volatile insoluble compounds presents difficulties (19). However, such tests are routinely carried out, and ecotoxicity results for algae would be required should significant exposure of the aquatic compartment be expected.

Acute toxicity data for S-701 calculated using QSAR calculations by ASTER (3) are as follows:

Species	*LC_{50}/mg.L^{-1}*
bluegill sunfish *(Lepomis macrochirus)*	1.1
fathead minnow *(Pimephales promelas)*	1.3
channel catfish *(Ictalurus punctatus)*	0.57
rainbow trout *(Oncorhynchus mykiss)*	0.49
water flea *(Daphnia magna)*	0.84

The provided ecotoxicity data for the notified chemical indicate that the notified chemical is not toxic to fish up to the limit of its solubility in water but is highly toxic to aquatic invertebrates. The data calculated using QSARs indicates that the notified chemical is also potentially to be highly toxic to fish as well as Daphnia.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The majority of the chemical will be destroyed in the smelting process, yielding water and oxides of carbon and sulfur. Due to the high volatility of the chemical from water it will be released from holding ponds and moist concentrates during drying and transport. These releases are expected to be diffuse and it is anticipated that the chemical will degrade through reaction with hydroxyl radicals in the atmosphere. The low concentration of the chemical in the holding ponds is not expected to present a hazard to aquatic organisms and discharge from the ponds to natural waterways from the proposed use site is not anticipated. Chemical which remains associated with the sludge of the holding ponds is not expected to be mobile when the sludge is buried, due to the low water solubility and consequential high partition coefficient of the chemical.

Hence, the overall environmental hazard of the notified chemical is rated as low

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified chemical would not be classified as hazardous according to the Approved Criteria in relation to acute toxicity and skin or eye irritancy on the basis of animal studies. On the basis of toxicological studies on a close analogue of the notified chemical, hydroxyethyl-n-octyl sulphide, the notified chemical would not be classified as hazardous according to the Approved Criteria in relation to subchronic toxicity, skin sensitisation or genotoxicity. On this basis the notified chemical can be considered of low hazard to human health.

The notified chemical is to be imported in sturdy isotainers so that exposure of transport workers is unlikely except in the event of an accident.

Transfer of the notified chemical from isotainers to bulk holding tanks should result in low exposure to the chemical when disconnecting lines and from residues or spills. The notified chemical is automatically metered into the ore slurry from a bulk holding tank and the system is stated to be closed so that worker exposure is unlikely.

Some worker exposure may be expected during pump maintenance but may be prevented by the wearing of gloves and protective clothing.

Given the likely low hazard of the notified chemical and low level of exposure the health risk to workers or the general public arising from transport, storage, use or disposal of the notified chemical is expected to be minimal.

13. RECOMMENDATIONS

To minimise occupational exposure to the notified chemical the following guidelines and precautions should be observed:

- Spillage of the notified chemical should be avoided, spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal;
- When work is to proceed in confined spaces, Australian Standard 2865 (20) should be consulted;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the Material Safety Data Sheet (MSDS) should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (21).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, secondary notification of the notified chemical shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. In addition, Secondary notification will be required if the method of use changes in such a way as to greatly increase the environmental exposure of the notified chemical, particularly to natural waters, or if additional information becomes available on

adverse environmental effects of the chemical. Ecotoxicity results for algae would be required should more significant exposure of the aquatic compartment be expected (e.g. from mine sites without a similar ability to retain water as the proposed site).

16. REFERENCES

1. Mackay, D. & Wolkoff, A.W. 1973, 'Rate of evaporation of low-solubility contaminants from water bodies to atmosphere', *Environ. Sci. Technol.*, vol. 7, no. 7, pp. 611-614.

2. Cohen, S.Z., Creeger, S.M., Carsel, R.F. & Engield, C.G. 1984, *Potential pesticide contamination of groundwater from agricultural uses*, American Chemical Society Symposium Series, vol. 259, Treatment and Disposal of Pesticide Wastes, American Chemical Society, Washington DC, USA, pp. 297-325.

3. United States Environmental Protection Agency 1998, *ASTER Ecotoxicity profile: ethyl octyl sulfide*, United States Environmental Protection Agency, National Health and Environmental Effects Research Laboratory, Mid-Continent Ecology Division, Duluth, Minnesota, USA, Telnet address: ecotox.epa.gov 2323.

4. Atkinson, R. 1985, 'Kinetics and mechanisms of the gas-phase reactions of the hydroxyl radical with organic compounds under atmospheric conditions', *Chemical Reviews*, vol. 85, pp. 69-201.

5. Organisation for Economic Co-operation and Development 1995-1996, *OECD Guidelines for the Testing of Chemicals on CD-Rom*, OECD, Paris.

6. Jeffrey, M.M., Yano, B.L. & Battjes, J.E. 1988, *Ethyl Octyl Sulphide: Acute Dermal Toxicity Study in Fischer 344 Rats*, The Dow Chemical Company, MI, USA.

7. Romanelli, P. 1990, *MGK Repellent 874 Code No. 673-90 Guinea Pig Dermal Sensitisation - Modified Buehler Method*, Project no., 90-7122A, Biosearch Incorporated, PA, USA.

8. Gabriel, K.L. 1978, *Guinea Pig Contact Dermal Irritation/Sensitization: X-3240-78*, Project no., 78-1172A, Biosearch Inc, PA, USA.

9. Gabriel, K.L. 1976, *Guinea Pig Contact Dermal Irritation/Sensitization: X-3154-76*, Biosearch Inc, PA, USA.

10. Shelanski, M.V. 1966, *Repellent 874 - Lot No. 24 - Formula No. LB-490-66 - Tested as a 6% v/v Solution in Isopropanol, Repeated Insult Patch Test*, Industrial Biology Laboratories Ltd

11. Husband, R.F.A. 1994, *MGK Repellent 874 21 Day Dermal Toxicity Study in the Rabbit*, Project no., MCA/21/93, Toxicol Laboratories Limited, Herefordshire, England.

12. San, R.H.C. & Wagner, V.O. 1990, *Salmonella/Mammalian Microsome Plate Incorporation Mutagenicity Assay (Ames Test)*, Project no., T9488.501, Microbiological Associates Inc, MD, USA.

13. San, R.H.C. & Clarke, J.J. 1991, *L5178 TK+/- Mouse Lymphoma Mutagenesis Assay*, Project no., T9488.701, Microbiological Associates Inc, MD, USA.

14. Putman, D.L. & Morris, M.J. 1991, *Chromosome Aberrations in Chinese Hamster Ovary (CHO) Cells*, Project no., T9488.337, Microbiological Associates Inc, MD, USA.

15. Curren, R.D. 1991, *Unscheduled DNA Synthesis in Rat Primary Hepatocytes*, Project no., T9488.380, Microbiological Associates Inc, MD, USA.

16. Irvine, L.F.H. 1992, *MGK Repellent 874 (R874)*, Project no., MCA/4/91, Toxicol Laboratories Limited, Herefordshire, England.

17. National Occupational Health and Safety Commission 1994, *Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]*, Australian Government Publishing Service, Canberra.

18. Dill, D.C., Milazzo, D.P. & Bartlett, E.A. 1985, *Evaluation of the toxicity of ethyloctylsulfide to representative aquatic organisms*, Project no., ES-798, Mammalian and Environmental Toxicology, Health and Environmental Sciences, Dow Chemical USA, Michigan, USA, Unpublished.

19. ECETOC 1996, *Aquatic testing of sparingly soluble volatile and unstable substances*, Monograph No. 26, European Centre for Ecotoxicology and Toxicology of Chemicals, Belgium.

20. Standards Australia 1995, *Australian Standard 2865-1995, Safe Working in Confined Spaces*, Standards Association of Australia, Sydney.

21. National Occupational Health and Safety Commission 1994, *National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]*, Australian Government Publishing Service, Canberra.