File No: NA/709

April 2000

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

C_{6-8} alkylether carboxylic acid

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 the National Occupational Health and Safety Commission 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 Aged Care.

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, National Occupational Health and Safety Commission, 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 -94 Parramatta Rd CAMPERDOWN NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, SYDNEY NSW 2001, AUSTRALIA
Telephone: (61) (02) 9577 9514 FAX (61) (02) 9577 9465

Director
Chemicals Notification and Assessment

TABLE OF CONTENTS

FULL PUBLIC REPORT

C_{6-8} alkylether carboxylic acid

1. APPLICANT

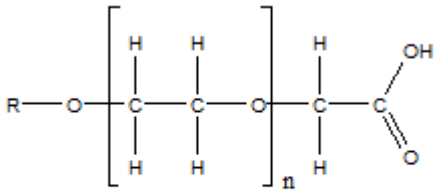
Asia Pacific Specialty Chemicals Ltd of 15 Park Rd, Seven Hills NSW 2147 has submitted a standard notification statement in support of their application for an assessment certificate for C_{6-8} alkylether carboxylic acid.

The notifier has not requested that any information relating to the notified chemical be exempt from publication in the Full Public Report and Summary Report.

2. IDENTITY OF THE CHEMICAL

Chemical Name:	poly(oxy-1,2-ethanediyl)-α-(carboxymethyl)-ω-(C_{6-8} alkoxy)
Chemical Abstracts Service (CAS) Registry No.:	no CAS number has been assigned for the notified chemical; the major components have individual CAS numbers as follows C_6 – 105391-15-9 C_8 – 107600-33-9
Other Names:	C_{6-8} alkylether carboxylic acid Akypo MB 2621
Marketing Name:	AKYPO LF4
Molecular Formula:	$RO(CH_2CH_2O)_nCH_2COOH$ where R = C_6H_{13} or C_8H_{17} and n = 4 - 9

Structural Formula:



R=C_{6-8} n=4-9

Molecular Weight:	460

range 320 – 568

No molecular weight characterisation was provided by the notifier; the quoted molecular weight of 460 seems appropriate in view of the stoichiometry above.

Method of Detection and Determination:	infrared spectroscopy
Spectral Data:	2923, 2890, 1727, 1460, 1350, 1300, 1250, 1205, 1125, 1035, 945, 855, 670 cm^{-1}

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified chemical is imported in 86.5 % pure form, with the major impurity being water. The physical and chemical properties below are for the imported product.

Appearance at 20°C and 101.3 kPa:	clear colourless to light yellow liquid
Boiling Point:	approximately 100°C
Specific Gravity:	1.0 at 20°C
Vapour Pressure:	not determined (see comments below)
Water Solubility:	miscible in all proportions
Particle Size:	the notified chemical will only be used in liquid form
Partition Co-efficient (n-octanol/water):	not determined (see comments below)
Hydrolysis as a Function of pH:	not determined (see comments below)
Adsorption/Desorption:	not determined (see comments below)
Dissociation Constant:	pH of a 100 g/L aqueous solution at 20°C is 1.5 - 3
Flash Point:	not flammable
Flammability Limits:	not flammable
Autoignition Temperature:	> 200°C
Explosive Properties:	not explosive
Reactivity/Stability:	stable at room temperature; reacts with bases to form salts

3.1 Comments on Physico-Chemical Properties

The methods used and the values quoted could not be confirmed as no test reports were provided.

A number of the chemical structures conforming to the above formula were examined using the USEPA ASTER Estimation Model. The estimates of some of physical parameters are discussed below.

The notifier has stated that they expect the chemical to have a very low vapour pressure. They also claim that it is 'soluble in all proportions of water' and therefore likely to be mobile in soil. The US EPA ASTER estimation model results indicate that when R = C_6 the solubility is likely to be greater than 1000 mg/L and thus readily soluble, and for R = C_7 and C_8 the solubility is likely to be moderate (between 10 and 1000 mg/L). This supports the notifiers claim, as does the fact that in the fish toxicity study a solubility of up to 1000 mg/L appears to have been observed.

The hydrolytic behaviour of the chemical has not been investigated. The chemical contains no functional groups that are likely to be susceptible to hydrolysis within the environmental pH range of 4 to 9. The results for each of the possible structures given by the ASTER model indicate that hydrolysis is unlikely.

The notifier indicates that as the chemical is a surfactant, a reliable partition coefficient cannot be determined. Based on its expected high solubility they claim the chemical is likely to have a low octanol/water partition coefficient (Log P_{ow}) but this may be offset by its surface activity, which would also affect the measurement of the partition coefficient.

No data were provided for the adsorption/desorption behaviour of the notified chemical. Again the notifier has indicated that based on the expected high water solubility and expected low partition coefficient the chemical should not bind strongly to the organic matter in the soil and may potentially be mobile in soil. However, any surface activity would increase the binding of the chemical to soils and sediments.

The ASTER estimated results for Log P_{ow} range from 2.51 to 3.89 and for Log K_{oc} range from 2.7 to 3.45. This indicates that the chemical is likely to have low mobility in soil, i.e. it will adhere to soil or sediment particles. However, these results should be treated with some caution. The Mackay Level 1 Environmental Partitioning values generated by the ASTER model indicate that as the alkyl chain increases the partitioning into soil/sediments will also increase. For example the estimation indicated that when R = C_6 and n = 4, 4.7 % of the chemical may adhere to soil/sediments but when R = C_8 and n = 9 this increased to approximately 54.8 %.

4. PURITY OF THE CHEMICAL

Degree of Purity: 86.5 %

Hazardous Impurities: none

Non-hazardous Impurities (> 1% by weight):

Chemical name:	water
Weight percentage:	12 %
CAS No.:	7732-18-5
Chemical name:	sodium chloride
Weight percentage:	< 1.5 %
CAS No.:	7647-14-5

Additives/Adjuvants: none

5. USE, VOLUME AND FORMULATION

The notified chemical will be imported in 86.5 % pure form and reformulated in Australia to produce an electroplating brightener formulation used to produce a zinc cobalt alloyed deposit for automotive and building parts. The electroplating brightener will contain approximately 15 % notified chemical (w/w). This will be packed into 25 L containers and used in electroplating baths of approximately 3000 L capacity at a rate of 1 – 2 L per day.

The notified chemical will be imported by air in 150 kg open top polyethylene drums. The notifier estimates that the import volume will be 10 tonnes per annum for the first five years of importation.

6. OCCUPATIONAL EXPOSURE

Transport and Storage
Airport workers will unload the 150 kg polyethylene drums containing the notified chemical from the cargo area and load them into trucks for transport to the notifier's warehouse and then to the reformulation site. This will involve 1 – 3 airport workers for one hour per time, and 1 – 2 transport drivers for 1 – 3 hours per time, once or twice per year. On delivery, the notified chemical will be handled by 1 – 2 storage workers, for half an hour per shipment. The notified chemical will be in 86.5 % pure form at this stage. No exposure is expected for these workers except in the case of an accident causing damage to the containers.

After reformulation, the notified chemical will be stored, then transported to around 10 sites where it will be used. The notifier estimates that 2 – 3 transport drivers and 10 – 15 storage personnel at both the reformulation and customer sites will be involved in handling the product containing around 15 % notified chemical. For each shipment, the product will be handled by these workers for around 2 hours. Shipments will occur one or two times per month. No exposure is expected for these workers except in the case of an accident causing damage to the containers.

Reformulation

Reformulation to produce the electroplating brightener is estimated to occur 5 – 10 times per year. The product is produced by blending the notified chemical with water and other ingredients in a stainless steel or plastic tank in 2000 L batches. The finished product is filled into 25 L containers for shipment to customers. No details of the method of transfer of the notified chemical to the tank or transfer of the finished product to the final packages were given, but addition to the tank and blending appear to be carried out in the open. The notifier states that fume extraction is used during the blending process.

Exposure of the workers involved in the reformulation is likely to be by dermal and possibly ocular routes. Little inhalation exposure is expected due to the low volatility of the notified chemical and the presence of local exhaust ventilation to reduce the exposure to mists possibly formed during blending.

The reformulation process will involve two workers, with exposure to the 86.5 % pure notified chemical for 1 – 2 hours, and to the product containing 15 % notified chemical for 2 – 4 hours, both 5 – 10 times per year. The notifier states that full protective clothing, comprising chemical resistant gloves, glasses, boots and coveralls, will be used during the blending process.

Electroplating
The electroplating brightener is dispensed into the baths using automatic dosing pumps. Worker exposure will be limited to dermal exposure to the 15 % solution of notified chemical while connecting and disconnecting containers from the dosing pumps, and to the dilute solution in the electroplating bath. The notifier estimates that 20 – 30 workers will be exposed to the notified chemical, for a maximum of 5 minutes per day.

7. PUBLIC EXPOSURE

There is limited potential for exposure of the public to the notified chemical. The notified chemical is not sold to the public. No residual notified chemical is expected to be present on electroplated products. Public exposure to the notified chemical from environmental sources is also unlikely because release is expected to be low, and the notified chemical is likely to be biodegraded (see Fate, below) and present at low concentrations.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

In the reformulation process the import containers are triple rinsed, with the rinse water being used to make up the final product. The notifier has indicated there will be only minimal losses due to spills during reformulation. Any material that is spilt will be washed into the on site treatment plant. The vessels/tanks used in the reformulation all have conical bottoms, so that at the time of emptying only very small amounts of product are left. All washwater is sent to the effluent waste treatment plant. All effluent from the plant is treated before being

disposed of by a Victorian EPA accredited waste management service.

The customer electroplating sites will have effluent treatment plants on-site. All spillage will be collected and sent to these. The notifier indicated that at the user sites it is likely that the containers/drums will be rinsed and the rinsate used in the electroplating bath solution. The brightener is consumed in the bath and subsequently replenished daily. It has been indicated in the submission that the bath solution has an infinite life, so it is unlikely that it will be disposed of, only replenished as needed. Should the solution have to be disposed of, this would be done by specialist licensed hazardous waste contractors; the solution will not be discharged untreated to the sewer.

8.2 Fate

There is the potential for this chemical to enter the aquatic environment via spills at the reformulation plant or at the end user sites, or in the spent bath solution, but this is unlikely.

A biodegradation test was done by the notifier, and a very brief test report was supplied (Institut Fresenius, 1988). It appears that an OECD modified screening test (Guideline 301E) was used. This test involves the dissolving of a measured amount of test material in an inorganic solution, which is then inoculated with a micro-organisms and aerated at 20-25°C in the dark. The results of the test showed that 99 % of the chemical degraded in 23 days. The degradation was determined by a reduction in the BiAS (bismuth-active substance) level in the test medium. While this does not meet the OECD criteria for "readily biodegradable", as only the loss of the parent compound is measured and mineralisation is not taken into account, degradation may be expected in the aquatic environment.

9. EVALUATION OF TOXICOLOGICAL DATA

Acute oral toxicity data was provided for the notified chemical. Bacterial point mutation testing was carried out on a close analogue, Akypo LF2. Analogue data for skin and eye irritation and skin sensitisation was provided for Akypo Soft 45NV, a sodium salt of an analogue chemical. Information of repeat dose toxicity for the analogue sodium lauryl trioxyethylene sulphate was provided by the notifier.

9.1 Acute Toxicity

Summary of the acute toxicity of C_{6-8} alkylether carboxylic acid

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50} > 5000 mg/kg	(Whittaker, 1986)

9.1.1 Oral Toxicity (Whittaker, 1986)

Species/strain: rat/Sprague-Dawley

Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	single limit dose of 5000 mg/kg, administered by gavage; vehicle 0.25 % aqueous solution of gum tragacanth; dose volume 10 mL/kg
Test method:	OECD TG 401
Mortality:	no deaths were recorded during the study
Clinical observations:	no clinical signs of toxicity were observed
Morphological findings:	no gross abnormalities were observed at necropsy
LD_{50}:	> 5000 mg/kg
Result:	the notified chemical was of very low acute oral toxicity in rats

9.2 Analogue Irritation and Sensitisation Data

The notifier indicated that acute skin and eye irritation data and skin sensitisation data submitted for Akypo-Soft 45NV (NA/604) should be used as analogue data for the notified chemical. This data can give some information relevant to the notified chemical, but the relevance is limited by the fact that the notified chemical is a carboxylic acid, whereas Akypo-Soft 45NV is the sodium salt of a related acid. As the notified chemical is a moderately strong organic acid (the pK_a of the related chemical, glycolic acid, is 3.83) a high level of irritancy would be expected on the basis of pH alone, and this effect will not be seen for the analogue (which is a severe eye irritant regardless). The analogue is likely to serve as an appropriate model for the skin sensitising properties of the notified chemical.

Summaries of the analogue data are given below (taken from NA/604).

9.2.1 Skin Irritation (Leuschner, 1995c)

Species/strain:	rabbit/Himalayan
Number/sex of animals:	3 males
Observation period:	up to 4 days
Test Substance:	Akypo-Soft 45NV (as supplied, 21 % analogue chemical)
Method of administration:	0.5 mL of the test substance was applied to intact skin for 4 hours

Draize scores (Draize, 1959):

Time after treatment (days)	***Animal #***			
	1	***2***	***3***	***4***
Erythema [I]				
1	0	1	1	0
2	0	0	0	0
3	0	1	1	0
Oedema				
1	0	0	0	0
2	0	0	0	0
3	0	0	0	0

[i] see Attachment 1 for Draize scales

Test method: OECD TG 404

Result: the test substance was a slight skin irritant in rabbits

9.2.2 Eye Irritation (Leuschner, 1995b)

Species/strain: rabbit/New Zealand White

Number/sex of animals: 3 females

Observation period: up to 11 days

Test Substance: Akypo-Soft 45NV (as supplied, 21 % analogue chemical

Method of administration: 0.1 mL of the test substance was placed in the conjunctival sac of the right eye of each rabbit

Draize scores (Draize, 1959) of unirrigated eyes:

	Time after instillation				
Animal	***1 hour***	***24 hours***	***48 hours***	***72 hours***	***11 days***
Cornea					
1	0[1]	0	0	0	0
2	1	1	1	1	0[#]
3	1	1	1	1	0

Iris															
1	0			0			0			0			0		
2	0			1			1			1			0#		
3	0			1			1			1			0≅		
Conjunctiva	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***	***r***	***c***	***d***
1	1	0	3	1	0	3	1	0	3	1	0	3	0	0	-
2	1	0	3	1	1	3	1	1	3	1	1	3	0#	0≅	-
3	1	0	3	1	1	3	1	1	3	1	1	3	0#	0≅	-

[1] see Attachment 1 for Draize scales r= redness c= chemosis d= discharge

1 at 10 days
≅ 0 at 10 days

Test method: OECD TG 405

Commentt: the irritation produced by the test substance was persistent, with corneal opacity and iris effects evident in two animals after 9 days; conjunctival redness was seen in two animals at 10 days and chemosis in one animal at 9 days

Result: the test substance containing 21 % notified chemical was a severe eye irritant in rabbits

9.2.3 Skin Sensitisation (Leuschner, 1995a)

Species/strain: guinea pig/Dunkin Hartley

Number of animals: 10 males (test group), 5 males (control group)

Test Substance: Akypo-Soft 45NV

Induction procedure:

Day 0
each animal received 3 intracutaneous injections (0.1 mL) in the scapular region:

- Freund's Complete Adjuvant (FCA), 1:1 with 0.9 % saline
- The test substance (undiluted)
- The test substance in a 1:1 mixture of FCA

Day 7
the same region was treated with 2 mL of the test substance (undiluted) using the patch-test technique for 48 hours

Challenge procedure: Day 21
the left flank of each animal was treated with 2 mL of solution (0.8 % aqueous hydroxypropylmethyl cellulose gel) containing the test substance (0.01 %) under occlusive dressing for 24 hours

Challenge outcome:

Challenge concentration	***Test animals 24 hours****	***48 hours****	***Control animals 24 hours***	***48 hours***
0.01%	0/10**	0/10	0/5	0/5

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

Test method: OECD TG 406

Result: the test substance was not a sensitiser to the skin of guinea pigs

9.3 Analogue Repeated Dose Toxicity

The notifier indicated that analogue repeated dose toxicity data for Akypo-Soft 45NV (NA/604) should be used as analogue data for the notified chemical. The data was for the analogues, sodium lauryl sulphate, sodium lauryl ethoxysulphate, sodium lauryl glyceryl ether sulphanate and sodium lauryl trioxyethylene sulphate. Of these, only the latter chemical has sufficient similarity to the notified chemical to serve as an appropriate analogue. The basis for the analogy is the presence of a long chain fatty alcohol and a series of ethoxy groups; significant differences include the sulphate rather than carboxymethyl termination and the sodium salt rather than acid nature of the chemical.

A summary of the analogue data are given below (taken from NA/604).

9.3.1 Two-Year Repeat Dose Oral toxicity Study (based on analog data of sodium lauryl glyceryl ether sulphanate and sodium lauryl trioxyethylene sulphate) (Tusing et al., 1962)

Species/strain: rat/Carworth Farm 'E'

Number/sex of animals: 30/sex/group; in the control and all dose groups

Method of administration: test substance incorporated in the diet

Dose/Study duration: each group received 0.1 % or 0.5 % of the test substance daily in the diet for a period of 105 weeks; 10 animals of each group were sacrificed at 52 weeks and the remainder at 105 weeks

Gross Observations:	no differences in appearance or behaviour among treated and control animals; no differences in gross pathology
Clinical observations:	no adverse effects on clinical conditions of the animals were noted in the study
Clinical chemistry/Haematology	no effects on haematological profile or clinical chemistry parameters
Histopathology:	no treatment-related microscopic effects; the isolated instances of significant changes in organ:body weight in the experimental groups could not be related to microscopic changes and were not considered biologically important
Test method:	(Fitzhuch and Nelson, 1948; Heyroth, 1954; Hine, 1959)
Result:	no adverse effects were observed in the animals with respect to survival, growth, food consumption, hematologic values, blood chemistry and urine analysis

9.4 Genotoxicity

A report on the ability of a close analogue of the notified chemical (AKYPO LF2, also known as AKYPO MB1585) to produce point mutations in bacterial systems was provided by the notifier.

9.4.1 *Salmonella typhimurium* Reverse Mutation Assay (Varley, 1984)

Strains:	*Salmonella typhimurium* TA98, TA100, TA1535, TA1537
Concentration range:	0, 4, 20, 100, 500, 2500 μg/plate
Metabolic activation:	10 % rat liver S9 fraction (Aroclor 1254-induced) in standard cofactors
Positive controls:	with S9: 2-aminoanthracene 2 μg/plate without S9 TA98: 2-nitrofluorene 0.5 μg/plate TA100,TA1535: sodium azide 1.0 μg/plate

	TA1537: 9-aminoacridine 50 μg/plate
Test method:	OECD TG 471 (plate incorporation method)
Comment:	each experiment, in the presence and absence of S9, was repeated once and all concentrations were tested in triplicate toxicity, indicated by a reduced background lawn, was observed at 2500 μg/plate in all cases under the conditions of the study, the test substance caused no substantial increases in revertant colony numbers over control counts at any concentration in either the presence or absence of rat liver microsomal enzymes all positive and negative controls responded appropriately and all criteria for a valid study were met
Result:	the notified chemical was considered to be non-mutagenic under the conditions of the assay, either in the presence or absence of exogenous metabolic activation

9.5 Overall Assessment of Toxicological Data

The notified chemical was of very low oral toxicity in rats (LD_{50} > 5000 mg/kg). No reports on the dermal or inhalation toxicity of the notified chemical or analogues were provided by the notifier.

The analogue chemical for which the notifier provided information was a slight skin irritant and a severe eye irritant. This chemical is, however, a sodium salt of a similar acid, and the acid form would be expected to have different irritation potential due to the low pH of the material. The MSDS for the notified chemical indicates that the pH of a 100 g/L solution of the notified chemical is in the range 1.5 – 3. A lower pH again would be expected for the 86 % pure product which is being imported. The NOHSC *Approved Criteria for Classifying Hazardous Substances* (Approved Criteria) (NOHSC, 1999) states that a chemical should be classified as corrosive if it has a demonstrated pH of less than 2, and that acidic reserves should also be taken into account. The 86.5 % pure form of the notified chemical should therefore be classified as corrosive, with the risk phrase R34 'Causes burns' in line with the classification for other liquid moderately strong organic acids such as acetic acid and propionic acid. The notified chemical is expected to be a stronger acid than acetic acid, as the related chemical, glycolic acid, has a pK_a of 3.83, compared with 4.75 for acetic acid. Assuming this value for pK_a, a pH of 1.9 for a 1 M solution (420 g/L) can be calculated. In the substantially pure form, there are also large acidic reserves.

Based on the analogue results, the long term systemic toxicity of the notified chemical is expected to be low. An analogue of the notified chemical was found to not be genotoxic in a bacterial point mutation test.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier has supplied the following ecotoxicity studies. Though only brief reports are available, it appears that the tests were carried out according to OECD Test Methods.

Species	Test	Concentrations	Result
Poecilia reticulata	96 h acute	320, 560, and 1000 mg/L	LC_{50} > 320-560 mg/L NOEC < 560 mg/L
Rainbow trout *(Oncorhynchus mykiss)*	96 h acute	0, 1, 10, and 100 mg/L	LC_{50} > 100 mg/L NOEC > 100 mg/L
Water Flea (*Daphnia magna*)	48 h acute	0, 8, 16, 32, 64, 128, 256, 512 and 1000 mg/L	EC_{50} = 67 mg/L NOEC = 32 mg/L

* NOEC - no observable effect concentration

The rainbow trout test and the immobilization test used as the test compound Akypo LF2 (similar to the notified chemical, but with R = C_8 and n = 8).

The *Poecilia reticulata* test (de Boer, 1990) was conducted using the Dutch test Guideline NEN 6504 which is a semi static method (solution changed every 48 hours) used determine fish acute toxicity of a chemical over 96 hours. In the test 10 fish were used per concentration (320, 560, and 1000 mg/L) with mortality being checked every 24 hours and the test solution being renewed after 48 hours. The pH and dissolved oxygen were monitored throughout the study. The test report does not indicate if observations of the fish, other than mortality, were taken (eg mobility, behaviour or physical) and consequently no NOEC was quoted. However, from the results given it appears that the NOEC would be less than 560 mg/L.

OECD Guideline No 203 was used to test the 96 hour acute toxicity of Akypo LF2 to trout (Sewell, 1993). Ten fish were used for each concentration (0, 1, 10, and 100 mg/L) with the solution being renewed daily and mortality recorded at 3, 6, 24,48, 72 and 96 hours. The test was conducted in duplicate. The test report provided is very brief, while the test itself appears to be a screening rather than a quantifying test. It is noted that the compound was said to be a "direct dispersion in water".

OECD Guideline No 202 was used to test the 48 hour acute immobilisation of daphnia by Akypo LF2 (Kamp, 1993). Five daphnia were used for each concentration (0, 8, 16, 32, 64, 128, 256, 512 and 1000 mg/L) with the 16 hour day/8 hour night cycle being maintained and mobility of the daphnia recorded at every 24 hours. Immobility was determined to be when the daphnia could no longer swim. The animals were fed daily and the temperature maintained at 20°C. The test was conducted in quadruplicate.

A number of the chemical structures conforming to the above formula were examined using the USEPA ASTER Estimation Model. The estimates of fish and daphnia toxicity are tabulated below.

Structure	Daphnia 48 hr LC_{50} (mg/L)	Fish 96 hr LC_{50} (mg/L)
R = C_6, n = 4	45	35 – 66

$R = C_6$, n = 9	44	34 – 81
$R = C_6$, n = 6	39	29 – 71
$R = C_7$, n = 4	16	12 – 29
$R = C_7$, n = 6	16	11 – 28
$R = C_7$, n = 9	15	10 – 25
$R = C_8$, n = 4	6	4 – 11
$R = C_8$, n = 6	6	4 – 11
$R = C_8$, n = 8	6.6	4.2 – 11
$R = C_8$, n = 9	6	4 – 11

The calculated results given by ASTER indicate higher toxicity than the test results provided by the notifier (by up to 1.5 orders of magnitude). They also cover two levels of toxicity (1 - 10 mg/L is considered "moderately toxic" while 10 - 100 mg/L is considered "slightly toxic"). The test results provided by the notifier indicate that the notified chemical may be practically non-toxic to fish and slightly toxic to daphnia. This variability indicates that size/structure of the chemical may significantly affect the toxicity. The ASTER results indicate that as the size of alkyl chain increases the toxicity increases.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The chemical is a liquid used in solution, therefore there is a possibility that it will reach the aquatic environment.

A worst case scenario would be if three of the 150 kg drums at the reformulation plant lost their contents to sewer.

Amount notified chemical to sewer	450 kg
Volume of water handled by WerribeeTP	500 ML/day
Dilution in receiving water	1:10
PEC (for day of release)	0.09 mg/L

A worst case national PEC for the use of the chemical, presuming that the untreated spent bath solution is disposed to sewer would be:

Volume of chemical to sewer	10 000 kg
Number of days used (approx)	260 days
Population	18 Million
Volume of water used per person	150 L
Dilution in receiving waters	1:10
PEC	0.0012 mg/L

Both estimated PECs are orders of magnitude below the ecotoxicity values provided and those calculated by ASTER. It is therefore likely that this chemical will pose a low hazard to the aquatic environment.

The notified chemical is not likely to present a hazard to the environment when it is stored, transported and used in the proposed manner.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

For the notified chemical, the only toxicity data that was provided was an acute oral toxicity study, which showed that the acute oral toxicity was low. Based on analogue studies for a salt form of a related acid, the notified chemical would be expected to be a slight skin irritant and a severe eye irritant. However, the notified chemical is strongly acidic, particularly in the 86.5 % pure product which is being imported. The Approved Criteria state that a chemical should be classified as corrosive if it has a demonstrated pH of less than 2, and that acidic reserves should also be taken into account. Accordingly, the notified chemical is classified as corrosive (R34) in line with the classification for other liquid moderately strong organic acids such as acetic acid and propionic acid. Based on these analogues, the reformulated 15 % solution for end use is classified as a hazardous substance with the risk phrase R36/38, "Irritating to eyes and skin".

Based on the analogue results, the long term systemic toxicity of the notified chemical is expected to be low. An analogue of the notified chemical was found to not be genotoxic in a bacterial point mutation test.

Occupational Health and Safety
The main occupational risk is expected to arise from dermal and ocular exposure to the imported 86.5 % solution of the notified chemical and to the reformulated electroplating brightener, containing 15 % notified chemical. Inhalation is not expected to be a major route of exposure due to the high molecular weight of the notified chemical.

Use of the electroplating brightener will be automated, and exposure of workers is expected during connection and disconnection of containers with the automatic dosing pumps. Reformulation may involve a greater degree of exposure to both the 86.5 % imported solution and the product containing the notified chemical at 15 %.

A high level of protection of the eyes and skin is required for workers handling the notified chemical, both during reformulation and end use. During reformulation, chemical resistant clothing, chemical resistant gloves, and safety goggles should be used. During connection and disconnection of containers of the electroplating brightener, gloves and goggles should be worn.

Public Health
The notified chemical will not be available to the public. It will be used in electroplating baths, and is not expected to be present as residues on the electroplated products. Environmental concentrations of the notified chemical are expected to be low. Therefore there is negligible potential for public exposure to the notified chemical arising from its use as a component of electroplating brightener formulations. Based on the toxicity profile and use pattern, it is considered that the notified chemical will not pose a significant hazard to public health.

13. RECOMMENDATIONS

To minimise occupational exposure to C_{6-8} alkylether carboxylic acid the following guidelines and precautions should be observed:

- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990); impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia/Standards New Zealand, 1998); all occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);

- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should be put into containers for disposal;

- Good personal hygiene should be practised to minimise the potential for ingestion;

- A copy of the MSDS should be easily accessible to employees.

If the conditions of use are varied from the notified use, greater exposure of the public may occur. In such circumstances, secondary notification may be required to assess the hazards to public health.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in a format consistent with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994).

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. No other specific conditions are prescribed.

16. REFERENCES

de Boer J (1990) Determination of Acute Toxicity of Substances to Fish with *Poecilia reticulata* (*Lebistes reticulatus*), Project No. 89-1450-I, Krachtwerktuigen Laboratorium.

Draize JH (1959) Appraisal of the Safety of Chemicals in Foods, Drugs and Cosmetics. Association of Food and Drug Officials of the US, 49 : 2-56.

Fitzhuch and Nelson (1948) Chronic Oral Toxicities of Surface Active Agents. J. Am. Pharm. Assoc.,Sci. Ed., 37 : 29 - 32.

Heyroth (1954). The Systemic Toxicity of Synthetic Detergents. Proc. Chem. Specialities Mfrs. Asoc. 40th Midyear Meeting.

Hine A, Finley, and Moore (1959) Studies on the Toxicity of Two Alkyl Aryl Sulfonates. J. Am. Pharm. Assoc., Sci. Ed., 42 : 489 - 495.

Institut Fresenius (1988) Investigation of the Product AKYPO MB 26215 (Akypo LF4) for Biological Degradability, Project No. 8712AL84101, Institut Fresenius Gruppe, Taunusstein-Neuhof, Germany.

Kamp N (1993) Acute Immobilisation Test According to OECD 202 - AKYPO LF2, Project No. 93TA038647, Institut Fresenius Gruppe, Taunusstein-Neuhof, Germany.

Leuschner PJ (1995a) Contact Hypersensitivity to Akypo RLM 45N in Albino Guinea Pigs - Maximisation Test, Project No. 8833a/94, Laboratory of Pharmacology and Toxicology, Hamburg, Germany.

Leuschner PJ (1995b) Primary Eye Irritation Study with Akypo RLM 45N in Rabbits, Project No. 8999a/94, Laboratory of Pharmacology and Toxicology, Hamburg, Germany.

Leuschner PJ (1995c) Primary Skin Irritation Study with Akypo RLM 45N in Rabbits, Project No. 9000a/94, Laboratory of Pharmacology and Toxicology, Hamburg, Germany.

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.

National Occupational Health and Safety Commission (1999) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1999)]. Australian Government Publishing Service, Canberra.

Sewell IG (1993) Acute Toxicity to Rainbow Trout, Project No. 590/5, SafePharm Laboratories Ltd, Derby, UK.

Standards Australia (1987) Australian Standard 2919-1987, Industrial Clothing. Standards Association of Australia.

Standards Australia (1990) Australian Standard 3765.2-1990, Clothing for Protection against Hazardous Chemicals Part 2 Limited protection against specific chemicals. Standards Association of Australia.

Standards Australia (1994) Australian Standard 1336-1994, Eye protection in the Industrial Environment. Standards Association of Australia.

Standards Australia/Standards New Zealand (1992) Australian/New Zealand Standard 1337-1992, Eye Protectors for Industrial Applications. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994) Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1998) Australian/New Zealand Standard 2161.2-1998, Occupational protective gloves, Part 2: General requirements. Standards Association of Australia.

Tusing TW, Paynier OE, Opdyke DL, et al. (1962) Toxicologic Studies on Sodium Lauryl Glyceryl Ether Sulphonate and Sodium Lauryl Trioxethylene Sulphate. Toxicology and Applied Pharmacology, 4 : 402 - 409.

Varley R (1984) Bacterial Mutagenicity Tests on Akypo MB1585, Project No. 189/8409, Toxicol Laboratories Ltd, Ledbury, Herefordshire, UK.

Whittaker CJ (1986) Single Dose Oral Toxicity Study in the Rat AKYPO MB 2621, Project No. 246/8609, Toxicol Laboratories Ltd, Ledbury, Herefordshire, UK.

Attachment 1

The Draize Scale for evaluation of skin reactions is as follows:

Erythema Formation	*Rating*	*Oedema Formation*	*Rating*
No erythema	0	No oedema	0
Very slight erythema (barely perceptible)	1	Very slight oedema (barely perceptible)	1
Well-defined erythema	2	Slight oedema (edges of area well-defined by definite raising	2
Moderate to severe erythema	3	Moderate oedema (raised approx. 1 mm)	3
Severe erythema (beet redness)	4	Severe oedema (raised more than 1 mm and extending beyond area of exposure)	4

The Draize scale for evaluation of eye reactions is as follows:

CORNEA

Opacity	*Rating*	*Area of Cornea involved*	*Rating*
No opacity	0 none	25% or less (not zero)	1
Diffuse area, details of iris clearly visible	1 slight	25% to 50%	2
Easily visible translucent areas, details of iris slightly obscure	2 mild	50% to 75%	3
Opalescent areas, no details of iris visible, size of pupil barely discernible	3 moderate	Greater than 75%	4
Opaque, iris invisible	4 severe		

CONJUNCTIVAE

Redness	*Rating*	*Chemosis*	*Rating*	*Discharge*	*Rating*
Vessels normal	0 none	No swelling	0 none	No discharge	0 none
Vessels definitely injected above normal	1 slight	Any swelling above normal	1 slight	Any amount different from normal	1 slight
More diffuse, deeper crimson red with individual vessels not easily discernible	2 mod.	Obvious swelling with partial eversion of lids	2 mild	Discharge with moistening of lids and adjacent hairs	2 mod.
Diffuse beefy red	3 severe	Swelling with lids half-closed	3 mod.	Discharge with moistening of lids and hairs and considerable area around eye	3 severe
		Swelling with lids half-closed to completely closed	4 severe		

IRIS

Values	*Rating*
Normal	0 none
Folds above normal, congestion, swelling, circumcorneal injection, iris reacts to light	1 slight
No reaction to light, haemorrhage, gross destruction	2 severe