File No: NA/506

Date: June 1997

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Acrylic Polymer in TRASAR 23400

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, Sport, and Territories 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

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

Acrylic Polymer in TRASAR 23400

1. APPLICANT

Nalco Australia Pty Ltd of 2 Anderson Street BOTANY NSW 2109 has applied for the following information relating to 'acrylic polymer in TRASAR 23400' to be exempt from publication in the Full Public and Summary Reports.

2. IDENTITY OF THE CHEMICAL

Acrylic polymer in TRASAR 23400 is not considered to be hazardous based on the nature of the polymer and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data and details of the polymer composition have been exempted from publication in the Full Public Report and the Summary Report.

Trade Name:	TRASAR 23400 (contains < 30% w/w of the notified polymer)
Number-Average Molecular Weight (NAMW):	> 1 000
Maximum Percentage of Low Molecular Weight Species Molecular Weight < 1 000:	< 10%
Method of Detection and Determination:	gel permeation chromatography; infra-red and fluorescence spectroscopy

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is manufactured as an aqueous solution and is never isolated. The notifier claims that data are not available for the notified polymer. Therefore, except where stated, the physico-chemical data are for an aqueous solution of the sodium salt of the 'untagged' polymer, whose structure was supplied by the notifier.

Appearance at 20°C and 101.3 kPa:	clear yellow liquid (notified polymer)
Boiling Point:	100°C
Specific Gravity:	1.27 at 21.7°C
Vapour Pressure:	not determined

Water Solubility :	soluble (notified polymer)
Partition Co-efficient (n-octanol/water):	not determined
Hydrolysis as a Function of pH:	not determined
Adsorption/Desorption:	not determined
Dissociation Constant:	not determined
Flash Point:	not determined
Flammability Limits:	not determined
Autoignition Temperature:	not determined
Explosive Properties:	not determined
Reactivity/Stability:	not expected to be reactive

Comments on Physico-Chemical Properties

The notified polymer is an aqueous solution and the notifier states that it is completely soluble in water. It is agreed that the polymer should be highly soluble in water. It contains functional groups that may undergo hydrolysis under extreme pH conditions, however, this is unlikely under normal environmental conditions.

The notifier claims that the notified polymer is likely to have a relatively low partition coefficient due to its high water solubility but is likely to bind strongly to clay. It is anticipated that the polymer will be highly mobile in common soils, with some possible binding to clay particles.

The polymer is expected to remain highly ionised in the environment, based on the pKa values for the ionisable groups on the notified polymer.

4. PURITY OF THE CHEMICAL

Degree of Purity:	> 60%
Toxic or Hazardous Impurities:	sodium hydroxide is present as an impurity in the post-manufacture form of the notified polymer at a concentration of 2%, which would result in the classification of this product as an irritant according to the *List of Designated Hazardous Substances* (1); other impurities (total of < 10%) are present at concentrations below the cutoff for classification as hazardous (1, 2), even when

potential cumulative effects are taken into account

Non-hazardous Impurities: < 30%

Maximum Content of Residual Monomers: < 7%

5. USE, VOLUME AND FORMULATION

The notified polymer will not be manufactured in Australia. It will be manufactured and reformulated overseas, and will then be imported as a component (at a concentration of < 30%) of TRASAR 23400. The notified polymer will be used as a fluorescent 'tag' in polymer consumption studies for industrial cooling water treatment systems. Polymers are used in water treatment systems for functions such as solids dispersion, stabilisation of corrosion inhibitors and/or iron and inhibition of scale formation. The notified polymer allows the concentration of the active polymer to be directly measured by fluorescence, enabling on-line measurement of polymer consumption and the effect of polymer dose changes.

Approximately 1.8 to 3.6 tonnes of the notified polymer will be imported each year for the first five years.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be imported as a component of TRASAR 23400. This product will be imported in 200 L steel drums, and will be transported by road from dockside to the notifier's site. It is expected that waterside, warehouse and transport workers will only come into contact with the notified polymer in the event of an accident.

Quality control officers and research and development chemists may be dermally exposed to the notified polymer when collecting samples of the newly-arrived stock and testing to ensure that specifications are met. Exposure will be intermittent, however, as these workers expected to handle the notified polymer for approximately half an hour, 10 days per year.

Dermal exposure is possible when workers at the notifier's site transfer TRASAR 23400 from the 200 L steel drums into PORTA-FEED® 1 500 L intermediate bulk containers (IBCs). An immersed siphon tube and flexible hosing connected to a pump will be used for this transfer. Accidental eye contact may also occur while transferring the product containing the notified polymer, however, inhalational exposure is unlikely, due to the high NAMW of the polymer and the expected low vapour pressure. The notifier states that equipment will be flushed with water prior to any required maintenance work, thus minimising exposure to the notified polymer. Transfer operators may be exposed to the notified polymer for up to 5 hours per day, 30 days per year.

Field representatives may be dermally exposed to the notified polymer for up to

2 hours per day, 340 days per year while working on diagnostic polymer consumption studies at customer sites. It is expected that diagnostic work with the notified polymer will take place for up to 6 months at each site. TRASAR 23400, containing the notified polymer, will be delivered to customer sites in the PORTA-FEED® containers. Once dosage rates for the site's water cooling system have been established, exposure to the notified polymer is expected to be minimal, as the dosing system is automated. Worker exposure to cooling water containing the notified polymer may occur, however the concentration of the notified polymer will be very low (approximately 3.6 to 18 ppm) at this stage of the treatment process.

7. PUBLIC EXPOSURE

No public exposure is expected to occur during storage, decanting or transfer of the notified polymer. The notified polymer will not be sold to the public and will only be used for industrial applications. No significant public exposure to the notified polymer during its industrial use is anticipated.

Given the low concentration of notified polymer expected to be discharged to the sea or receiving waters, no significant public exposure to the notified polymer will occur via this route.

8. ENVIRONMENTAL EXPOSURE

Release

The imported product will be repackaged into the PORTA-FEED® shuttle containers[1] at the notifier's site, before distribution to customer sites. The PORTA-FEED® system is designed to reduce wastes and the risk of chemical spills. Empty drums will be rinsed with water and recycled off-site. The pumps and hosing used to transfer the product will also be rinsed. The notifier estimates that up to

0.9 kg of the notified polymer will be flushed to the site's effluent treatment plant twice per year.

Diagnostic polymer consumption studies will be carried out by the notifier's field representatives only, at about five sites per year. The notifier claims that diagnostic work with the product would be for a limited period of 1 to 6 months at each site. The notifier also claims that these systems have extremely high water consumption requirements. The water used in the cooling systems is recirculated as much as possible. The dosage rate will be approximately 3.6 to 18 ppm. Release of cooling water containing the notified polymer may occur through drift (small droplets entrained in cooled air, typically < 0.1%), leaks or blowdown (removal of liquid to avoid excessive build-up of naturally occurring salts in the cooling water, between 4

[1] The PORTA-FEED® system contains a 'shuttle' tank and a 'base' tank, and eliminates the need for drums. The shuttle tank is used for the transportation of the product. The two tanks are connected via the transfill line hose. Transfer of the product from the shuttle tank is done automatically under the influence of gravity. When the shuttle tank empties it is disconnected and returned to the notifier for reuse.

and 25%). The released cooling water, containing the notified polymer, will be directed to the site's effluent treatment plant, which after treatment will be sent to sewer.

A major source of environmental release of the notified polymer is in the unlikely event of an accident during transport, storage or handling of TRASAR 23400. The product can be contained with absorbent material.

Fate

The majority of the notified polymer will be used in diagnostic polymer consumption studies at major industrial sites with large water consumption requirements. A small amount of the polymer will be lost during the repackaging process. The majority of the polymer, including wastes from repacking, will be released to waste water treatment plants. Here, the notified polymer is not expected to bind to the organic fraction of the sludge. However, some binding to soil and sediment may occur. The polymer may also sediment out to sludge through possible complexation with calcium salts and/or flocculation. However, the majority of the polymer is expected to remain in the aquatic compartment, entering the environment in the liquid effluent discharged from the plant. In the environment, the notified polymer is likely to very slowly degrade via abiotic process/pathways.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicological information was provided by the notifier, which is acceptable under the Act, as the notified polymer has a NAMW greater than 1 000.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicology data were provided, which is acceptable for polymers of NAMW greater than 1 000 according to the Act.

Biological membranes are not permeable to polymers of very large molecular size and therefore bioaccumulation of the notified polymer is not expected (3, 4). Also, its high water solubility and expected low P_{ow} will limit its bioavailability and hence bioaccumulation (5).

Poly(acrylic acid) anionic polymers are of concern to green algae exhibiting moderate toxicity through their ability to chelate nutrient elements (6). However, the notified polymer is a random copolymer, only possessing some sections available for chelation. Also, toxicity of poly(acrylic acid) polymers has been shown to be mitigated by the addition of Ca^{2+} (6). Therefore, once the notified polymer is exposed to the natural aquatic environment, the toxicity should be significantly reduced.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Up to 0.9 kg of the notified polymer will be sent to the notifier's on-site waste water treatment facility twice per year due to wastes generated during repackaging. This effluent treatment plant treats 200 000 L per day that is released via sewer to the Malabar sewage treatment works (STW). The effluent from the STW is released via deep ocean outfall discharge. Therefore, in a worst case scenario where none of the polymer is removed in sludge, the notifier estimates that a concentration of 4.5 ppm may be released to sewer. Assuming a 1:100 dilution factor at the STW, the polymer will be released at a concentration of approximately 45 ppb to the ocean, where further dilution of 1:10 is expected to occur. Therefore, the predicted environmental concentration (PEC) is approximately 4.5 ppb.

Most of the notified polymer (up to 3.6 tonnes per year) will be released during blowdown at concentrations no greater than 18 ppm. This will be diluted by large volumes from other wastewater sources. The notifier claims that a typical power station site's effluent treatment plant may release 3 600 tonnes of wastewater per day. Therefore, assuming a dilution of 1:20 for the treatment plant, and a worst case scenario where none of the polymer is removed in sludge, it is estimated by the notifier that a concentration of 0.9 ppm (notified polymer) may be released to the sewer. Further dilution will occur in the STW, though to what extent is unknown and dependent on the total volume of effluent treated. Assuming a dilution factor of 1:3, and a dilution factor of 1:2 in the receiving waters (for a river outfall), then the PEC of the notified polymer is approximately 0.15 ppm.

These levels should not exhibit significant toxicity to aquatic organisms and algae, as the calculations are considered to be worst case scenarios and do not take into account the likely removal of the notified polymer due to sedimentation through complexation with calcium salts and/or flocculation, or adsorption to soil/sediment in the sludge. Therefore, actual concentrations entering the environment are expected to be considerably less.

It is also possible that wastewaters from an industrial site may also be sent to an on-site tailings or ash dam (*ie* in the case of a power station). Here the notified polymer is expected to remain within the dam, slowly degrading over time. Due to the polymer's infrequent use, it should not accumulate to high levels.

Based on the supplied information, the polymer should only enter the environment at very low concentrations and subsequently should not produce any significant

adverse effects. Therefore, the environmental hazard through the proper use of the product TRASAR 23400, containing the notified polymer, is evaluated to be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer has a NAMW of approximately 3 000 and is therefore not expected to traverse biological membranes and constitute a toxicological hazard. Although the notified polymer contains residual monomers and other impurities (see

Section 4 for details), they are unlikely to pose a toxicological hazard at the concentrations present in the end use product, TRASAR 23400. Levels of low molecular weight species are relatively low (< 10% of polymer species have a molecular weight less than 1 000). As TRASAR 23400 contains less than 30% of the notified polymer, concentrations of hazardous impurities and low molecular weight species will be correspondingly reduced.

The notified polymer in its post-manufactured form contains sodium hydroxide (CAS number 1310-73-2) as an impurity at a concentration of 2%. This concentration of sodium hydroxide is above the concentration cutoff for classification as an irritant, as recommended by the *List of Designated Hazardous Substances* (1). Therefore, if a product containing the notified polymer also contains sodium hydroxide as an impurity at a concentration at or above 1%, the product would need to be classified as hazardous, according to Worksafe criteria (1, 2).

The occupational health risk posed to transport worker by the notified polymer is negligible, due to the expected low toxicity of the polymer, and the lack of exposure for these workers under normal circumstances.

Quality control officers, research and development chemists and transfer operators at the notifier's site may be intermittently exposed to the notified polymer at a concentration of less than 30% when handling TRASAR 23400. While dermal contact is expected to be the main route of exposure, the NAMW of the notified polymer should preclude transmission across biological membranes. Ocular and inhalational exposure are not expected to be significant routes of contact, and given the expected low toxicity of the notified polymer, the occupational health risk for these workers is expected to be low. Field representatives may be exposed to the notified polymer on a more regular basis, but the occupational health risk is also expected to be low, for the reasons outlined above.

Levels of polymer impurities and residual monomers in treated wastewater are expected to be extremely low, and are not expected to present a toxicological threat to public health. In addition, if public contact with the notified polymer were to occur, the high NAMW for the polymer suggests that absorption is unlikely, therefore there is negligible risk to public safety.

13. RECOMMENDATIONS

To minimise occupational exposure to acrylic polymer in TRASAR 23400 the following guidelines and precautions should be observed:

- It is good work practice to wear industrial clothing which conforms to the specifications detailed in Australian Standard (AS) 2919 (7) and occupational footwear which conforms to Australian and New Zealand Standard (AS/NZS) 2210 (8) to minimise exposure when handling any industrial chemical;

- Spillage of products containing the notified polymer should be avoided, spillages should be cleaned up promptly and put into containers for disposal;

- 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.

In addition, if a product containing the notified polymer also contains the impurity sodium hydroxide at a concentration at or above 1%, the product should be classified as hazardous in accordance with Worksafe criteria (1, 2), and appropriate precautions should be taken in the workplace to avoid contact with this potentially hazardous substance.

14. MATERIAL SAFETY DATA SHEET

The MSDS for a product containing the notified polymer was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (9).

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 polymer 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

1. National Occupational Health and Safety Commission 1994, *List of Designated Hazardous Substances [NOHSC:10005(1994)]*, Australian Government Publishing Service, Canberra.

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

3. Anliker, R., Moser, P. & Poppinger, D. 1988, 'Bioaccumulation of dyestuffs and organic pigments in fish. Relationships to hydrophobicity and steric factors', *Chemosphere*, vol. 17, no. 8, pp. 1631-1644.

4. Gobas, F.A.P.C., Opperhuizen, A. & Hutzinger, O. 1986, 'Bioconcentration of hydrophobic chemicals in fish: relationship with membrane permeation', *Environmental Toxicology and Chemistry*, vol. 5, pp. 637-646.

5. Connell, D.W. 1989, 'General characteristics of organic compounds which exhibit bioaccumulation', in *Bioaccumulation of Xenobiotic Compounds*, CRC Press, Boca Raton.

6. Nabholz, J.V., Miller, P. & Zeeman, M. 1993, 'Environmental Risk Assessment of New Substances under the Toxic Substances Control Act Section Five', in *Environmental Toxicology and Risk Assessment, American Society for Testing and Materials*, ASTM STP 1179, Philadelphia, pp. 40-55.

7. Standards Australia 1987, *Australian Standard 2919-1987, Industrial Clothing*, Standards Association of Australia, Sydney.

8. Standards Australia/Standards New Zealand 1994, *Australian/New Zealand Standard 2210-1994, Occupational Protective Footwear*, Standards Association of Australia/Standards Association of New Zealand, Sydney/Wellington.

9. 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.