File No: PLC/119

November 1999

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

Derivative J

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 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, 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 the full public report may also be requested, free of charge, by contacting the Administration Coordinator.

Please direct enquiries or requests for full public reports to the Administration Coordinator at:

Street Address:	92 Parramatta Road, CAMPERDOWN NSW 2050, AUSTRALIA
Postal Address:	GPO Box 58, SYDNEY NSW 2001, AUSTRALIA
Telephone:	(61) (02) 9577 9514
Facsimile:	(61) (02) 9577 9465

Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Derivative J

1. APPLICANT

Grace Australia Pty Ltd of 1126 Sydney Road FAWKNER VIC 3060 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for Derivative J.

2. IDENTITY OF THE CHEMICAL

The molecular and structural formulae, spectral data and details of the polymer composition have been exempted from publication in the Full Public Report.

Chemical Name:	2-propenoic acid, homopolymer, reaction products with polyethylene-polypropylene glycol, 2-aminopropyl, methyl ether
Chemical Abstracts Service (CAS) Registry No.:	179733-16-5
Marketing Name:	Derivative J

Characterisation as a Synthetic Polymer of Low Concern

Number-Average Molecular Weight (NAMW):	8 365.8 ± 837
Weight-Average Molecular Weight:	26 430
Polydispersity:	3.15
Maximum Percentage of Low Molecular Weight Species	
Molecular Weight < 500:	0.29% ± 0.13
Molecular Weight < 1 000:	1.34% ± 0.48
Polymer Stability	stable under normal environmental conditions
Reactivity	polymer is not designed to be reactive under normal conditions of use

Charge Density	polymer contains carboxylic acid groups which will be negatively charged between pH range 4 - 9
Water Solubility:	polymer is soluble in water in all proportions from 1 to 90%

The polymer meets the proposed criteria for assessment as a synthetic polymer of low concern under Regulation 4A of the *Industrial Chemicals (Notification and Assessment) Act 1989*.

Method of Detection and Determination:	Infrared spectroscopy

Comments on Chemical Identity

GPC testing has been conducted on the notified polymer, Derivative J. The notified polymer has functional groups limited to amides, imides, ethers and carboxylic acids. These functional groups are considered to be unreactive with the exception of the pH sensitive carboxylate pendant groups which can protonate to form the undissociated free acid. The notifier estimates that a typical Derivative J molecule may be expected to have 60 free carboxylic acid groups present.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	liquid
Boiling Point:	>100°C
Specific Gravity:	1.1
Vapour Pressure:	$<1.34 \times 10^{-3}$ kPa at 25°C
Hydrolysis as a function of pH:	not specified
Flash Point:	243 °C
Flammability Limits:	Not applicable
Autoignition Temperature:	Not applicable
Explosive Properties:	Not applicable

Comments on Physico-Chemical Properties

Tests were performed according to EEC/OECD test guidelines at facilities complying with OECD Principles of Good Laboratory Practice.

Water solubility and GPC test results from the notified polymer have been presented.

Based on its high molecular weight, the notified polymer would have low volatility.

The notified polymer contains amide/imide, ether and carboxylic acid functional groups. The carboxylic functional groups may react with bases and amines to form polymer salts. The notified polymer is predicted to be highly water-soluble (1-90%) due to the presence of pendant carboxylates along the polyacrylate backbone.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 99%

Maximum Content of Residual Monomers: the notified polymer is formed by reacting two polymers, each with residual monomer level of <1.0%

5. USE, VOLUME AND FORMULATION

The notified polymer, Derivative J will be used as a concrete additive. It will be imported as a 35% component of a semi-finished or finished concrete additive known as ADVA Flow. As a semi-finished additive, defoamers will be added by the notifier prior to distribution to customers. ADVA Flow is diluted to approximately 0.5% in batch concrete. Therefore, in a typical batch of concrete, the notified polymer is present at a maximum of 0.2%.

There is also a possibility that neat Derivative J will be imported and is subsequently reformulated to produce ADVA Flow for end use. Reformulation will be done by the notifier.

The notified polymer will be used to reduce the water content in concrete mix production at the same time producing concrete mix with improved workability. Approximately 50 tonnes of the notified polymer will be imported during the first year and is expected to increase in the next four years.

6. OCCUPATIONAL EXPOSURE

The notified polymer will be imported as 35% (w/w) component of a finished or semi-finished concrete additive, ADVA Flow, in 200L drums. In future, ADVA flow may be shipped into Australia in isotanks, totes or bulk via tanker trucks. Should ADVA Flow be formulated in Australia in future, neat notified polymer will be imported and reformulated at the notifier's site.

Following importation, transport workers will deliver the finished and semi-finished ADVA Flow in 200L drums. Finished ADVA Flow will be delivered to customers ready for adding into a concrete mix. As a semi-finished ADVA Flow, plant operators will incorporate other ingredients such as defoamers, before delivery to customers. Quality control technician will take small quantity of ADVA Flow to test its quality. Sales staff may also dispense a small quantity of ADVA Flow during a small-batch run test.

The concrete containing the notified polymer will be reformulated at concrete plants. ADVA flow will be automatically dispensed from storage tanks into concrete mixing trucks to prepare the concrete mix, containing approximately 0.2% notified polymer. The concrete will be transported to concrete contractor's site where contractors will pour and finish the concrete. Once the concrete has hardened, the notified polymer will be contained within the concrete matrix and will not be available for exposure.

At the notifier's site

At the notifier's site, workers who will handle semi-finished or finished ADVA Flow include transport workers, forklift drivers, plant operators, quality control technicians, sales staff and dispenser technicians.

Transport workers
Transport workers will deliver the semi-finished or finished ADVA Flow to the notifier's site or to customers, respectively.

If transported in bulk in the future, workers will hook-up the sealed delivery systems, pump ADVA Flow into the tanker trucks and dispense the product into storage tanks at the customer facilities. The storage tanks are directly connected to an automatic dispensing system which would add ADVA Flow and other ingredients to the ready-mix concrete truck. Worker exposure to drips and spills could occur while connecting and disconnecting pumps. The maximum exposure for these workers is estimated to be 2 hours/day.

In the event that ADVA Flow is formulated in Australia, the maximum exposure for these workers is estimated as 4 hours/day.

Quality control technicians sample and test ADVA Flow. They will handle small quantities of ADVA Flow. The maximum exposure for transport workers is estimated as 1 hour/day.

Forklift drivers
Forklift drivers on and off load palletised semi-finished or finished ADVA Flow from transport trucks. No exposure is expected since workers will be handling sealed drums. In the event that ADVA Flow is formulated in Australia, these workers will also handle sealed drums containing neat notified polymer. The maximum exposure for these workers is estimated as 2 hours/day.

Plant operators
Plant operators are not expected to be exposed to the notified polymer except when adding small amounts of minor components such as defoamers to semi-finished ADVA Flow.

In the event that the ADVA Flow is formulated in Australia, plant operators will supervise the pumping of the notified polymer and the addition of other components from the storage tanks into the mix tanks, and the operation of the mix tank. Workers may experience dermal exposure to drips and spills while transferring semi-finished ADVA Flow or neat Derivative J to mixing tanks, or finished ADVA Flow to storage tanks. The maximum duration exposure for these workers is estimated to be 2 hours/day.

Quality control technicians
Quality control technicians sample and test ADVA Flow. They will handle small quantities of ADVA Flow. The maximum exposure for these workers is estimated as 1 hour/day.

Sales staff
During a small-batch run test, sales staff will dispense the ADVA Flow by hand into laboratory mixers. Finished ADVA Flow contains 35% (w/w) notified polymer. The maximum duration exposure for these workers is estimated to be 4 hours/day.

Dispenser technicians
Dispenser technicians install the storage and dispensing systems at the customer's concrete plant. The dispensing systems will automatically dispense ADVA Flow from the storage tanks directly into a concrete mixing truck, where it is subsequently mixed with other concrete ingredients. The notified polymer will be present at approximately 0.2%. Exposure to the notified polymer is expected to be primarily dermal exposure to drips and spills during trials of newly installed systems. The maximum duration exposure for these workers is estimated to be 4 hours/day.

At the concrete producer's site

Concrete producer and labourers
Concrete producers develop concrete mix designs and labourers provide general labour at the concrete plant. These workers may be exposed to fresh concrete containing the notified polymer (0.2%) when carrying out their tasks. The maximum exposure for these workers is estimated as 4 hours/day.

Concrete truck drivers
Concrete truck drivers may be exposed to the fresh concrete and fumes when washing out the inside of the mixing drum. Water is used to clean out the trucks. Whenever possible, the wash water will remain in the mixer drum to be used in the next batch of concrete. The maximum exposure for these workers is estimated as 4 hours/day.

At the concrete contractor's site

Jobsite technicians
These workers sample fresh concrete or place fresh concrete into moulds for subsequent testing of the quality of the hardened concrete. The notified polymer will be present at approximately 0.2%. The maximum exposure for these workers is estimated as 6 hours/day.

Workers may come into contact with hardened concrete; however, the notified polymer will be bound in hardened matrix and not separately available.

Placing and finishing crew
These workers will shovel and rake fresh concrete, consolidate with vibrators and trowel finish the concrete surface. The notified polymer will be present at approximately 0.2%. The maximum exposure for these workers is estimated as 8 hours/day.

7. PUBLIC EXPOSURE

Public exposure may occur in the event of an accidental spill. Spillage will be contained and absorbed using inert material such as sand, earth or vermiculite, and collected into containers. Containers are sealed and disposed of according to local regulations. Once concrete containing ADVA Flow hardens, the notified polymer is bound within the concrete matrix.

8. ENVIRONMENTAL EXPOSURE

Release

The notifier states that release of the polymer will be limited to fugitive emissions (volatilisation and spillage) from the product containing the notified polymer. Based on its high molecular weight, the notified polymer would have low volatility. Some low molecular weight impurities in the notified polymer may be volatile.

Spillage of the notified chemical is expected to occur during transfer of drum contents into bulk delivery tanks. The notifier estimates total release of ADVA Flow across all sites to be approximately 100L/annum, representing an annual release of the notified polymer of 35L/annum. The notifier has stated that this spillage is directed to water recycling tanks and reused in subsequent concrete batches.

Residual polymer in transport drums is estimated to be 1% (410L/annum). This represents approximately 144L of notified polymer per annum.

There is also potential for the release of the notified polymer via wastewater from external and internal washing of ready mix concrete mixing trucks. This wastewater is stored temporarily in concrete setting bays and reused in subsequent admixtures. The notifier has stated that setting bays are designed to minimise risk of overflow during significant rainfall events. Where occasional overflow does occur, diluted contaminated wastewater will be discharged to the sewer. The notifier estimates that the maximum amount of the notified polymer in the setting basin is approximately 50 ppm. Assuming the setting bay has a

volume of 30 000L, and a concentration of 50 ppm at 50% capacity, then at the point of overflow the concentration of the notified polymer is expected to be approximately 25 ppm.

The notifier states that the majority of the notified polymer will be bound within the concrete matrix where minimal migration of the notified polymer is expected.

The potential total release of the notified polymer (in its liquid form) across all sites is estimated to be 179L per annum. However, this value is likely to be reduced further if the spillage and contaminated wash out water is contained and reused to make subsequent concrete batches.

Fate

The majority of the notified polymer will be bound within the matrix of the concrete, and once hardened, minimal migration of the notified polymer is expected.

It is anticipated that the notified polymer will enter the aquatic compartment from drum and truck washout water. The notified polymer will enter landfill as rubble concrete, as residual in drums not processed through recycling facilities, and in absorbents used to recover spills.

No information was provided regarding the degradability of the polymer. It is possible that the polymer will partition between solution and sorbed phase (bound to aquatic sediments and organic particles in suspension) through the presence of reactive carboxyl functional groups. Under these circumstances, it is anticipated that the notified polymer will degrade very slowly via biotic and abiotic processes. Polymers of high molecular weight are considered not to permeate biological membranes (Connell, 1990). Consequently, bioaccumulation of the notified polymer is not expected.

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted.

The Material Safety Data Sheet (MSDS) for the notified polymer cites toxicity information. The notified polymer has low acute oral (LD_{50} >500) and moderate dermal (LD_{50} >1 000) toxicity in rats. Potential health effects from exposure to the notified polymer were also described in the MSDS. These include:

- Vapour is not expected to cause any adverse health effects during typical handling. Exposure to high air concentrations of aerosol and mists generated by spraying or by vapours caused by heating in poorly ventilated areas may cause irritation of nose and throat. May result in headache, nausea and drowsiness.

- The notified polymer is a slight irritant to the skin and eyes of rabbits. Direct contact with eyes and skin may cause irritation; and

- Ingestion of large amounts of the notified polymer may irritate the digestive system resulting in stomach pain, nausea and vomiting.

This information is incorporated into the MSDS for ADVA Flow (30-35% notified polymer).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted. Nabholtz et al (Nabholtz et al, 1993) indicate that anionic polymers can be a concern for algal growth inhibition. Toxicity to green algae as defined by the 96hEC50 for growth inhibition is moderate, with toxicity values ranging from 1 to 100 mg/L. Furthermore, the highest toxicity is related to those with carboxylic acids on every other carbon in the polymer backbone. While this appears to be the case for the notified chemical, exposure to the aquatic compartment will be low.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The majority of the notified polymer will be incorporated into the matrix of the concrete. Once the concrete has solidified, the notified polymer is expected to pose minimum risk to the environment.

Approximately 179L/annum of the notified polymer may be released into the environment as a consequence of spillage and drum residues. This spillage is expected to be distributed across several sites and not restricted to a single site. This would minimise the degree of risk to the environment at any given time.

The main environmental hazard would arise from the release of the notified polymer during storage or transport. The use of bunded containment minimises the risk of release at storage sites. The MSDS appears to adequately address spills and disposal.

A further environmental hazard could arise from the release of untreated polymer-contaminated water into the aquatic compartment. This risk is greatly reduced by recycling truck wash water discharged into concrete setting basins for subsequent batches of concrete.

The low expected environmental exposure of the notified polymer when integrated into concrete suggests that the overall environmental hazard should be minimal.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Assessment of Toxicological Hazard

The acute toxicity information contained in the MSDS indicates that the notified polymer has a low acute oral toxicity (LD_{50} >500) in rats and moderate dermal toxicity (LD_{50} >1 000) in rabbits. Considering the study design and summary data only described in the MSDS, the dermal toxicity of the notified polymer cannot be assessed against the NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1999). The notified polymer is not highly reactive and has a high molecular weight, therefore it will not readily cross biological membranes. In rabbits, the notified polymer was a slight skin and eye irritant. Overall, the toxicity of the notified polymer is low based on the above information.

The notifier states that no injuries or diseases related to the use of the notified polymer have been reported from overseas experience. However, there have been a few recorded accounts of worker complaints of minor transient health effects such as nose and throat irritation, headache and nausea following exposure to ADVA Flow. These effects were also stipulated in the MSDS.

Occupational Health and Safety
At the notifier's site, transport workers and fork lift drivers are not expected to be exposed to the notified polymer since they will be handling sealed drums of ADVA Flow. Quality control technicians, plant operators, salesmen and dispenser technicians may experience dermal exposure to the notified polymer when carrying out their tasks. To minimise exposure to the notified polymer and topical (irritant) effects, workers are to wear overalls, safety glasses or goggles, rubber boots and PVC or rubber gloves. Faceshield as appropriate may also be worn. Respiratory protection is not normally required; however, if specific use generates vapours or mist, purifying respirators designed to filter mist and organic vapours are recommended.

Since concrete mixing and dispensing is carried out using automated and enclosed processes, worker exposure is expected to be low. In addition, concrete mixing trucks have the capability for compressed air flushing of hoses, which would minimise spills and worker exposure to any material left in hoses.

At the concrete producer's site, labourers and truck drivers may be exposed to fresh concrete containing the notified polymer. The maximum concentration of the notified polymer in concrete is 0.2%. Truck drivers may also be exposed to the fresh concrete and fumes when washing out the inside of concrete truck mixing drum. Given the low concentration of notified polymer, this is not of occupational health and safety concern.

At the contractor's site, workers may experience dermal exposure to the notified polymer during shoveling and raking, and sampling of fresh concrete, or when placing fresh concrete into moulds for subsequent testing of the quality of the hardened concrete. Once the concrete is hardened, the notified polymer will be bound within the concrete matrix, therefore exposure or health effects are not expected.

The presence of low concentrations of notified polymer in the concrete mix is expected to be negligible contributor of health risk when handling fresh concrete. However, due to the high pH of the fresh concrete, concrete producers, contractors and labourers are to wear rubber boots and impervious gloves when handling concrete.

Public Health
The notified polymer will be supplied to industrial customers and not the general public. Public contact will only occur from touching hardened concrete or from accidental dermal, ocular and inhalation exposure from a spill. Consequently, the potential for public exposure to the notified polymer during all phases of its life cycle is considered to be very low.

13. RECOMMENDATIONS

To minimise occupational exposure to the notified polymer 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 or mittens should conform to AS 2161.2 (Standards Australia, 1998), and 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 then 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.

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* (National Occupational Health and Safety Commission, 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 subsection 64(1) of the Act, secondary notification will be required if the polymer characteristics cease to satisfy the criteria under which it has been accepted as a Synthetic Polymer of Low Concern. 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

Connell DW (1990) General Characteristics of Organic Compounds which Exhibit Bioaccumulation. In: Bioaccumulation of Xenobiotic Compounds. CRC Press, Boca Raton, USA.

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.

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

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, Sydney.

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

Standards Australia (1998) Australian Standard 2161.2:1998, Occupational Protective Gloves, Part 2: General Requirements. Standards Association of Australia, Sydney.

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, Sydney/Wellington.

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.