File No: NA/657

December 1999

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

BAC 2J

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Director
31 December 1999

FULL PUBLIC REPORT

BAC 2J

1. APPLICANT

Shell Chemicals Australasia Trading P/L of 1 Spring St MELBOURNE VIC 3000 has submitted a standard notification statement in support of their application for an assessment certificate for BAC 2J.

The notifier has applied for the following information relating to the notified chemical to be exempt from publication in the Full Public and Summary Reports: identity and product formulation details.

2. IDENTITY OF THE CHEMICAL

Chemical Name:	Exempt information
Chemical Abstracts Service (CAS) Registry No.:	Exempt information
Other Names:	borate ester
Trade Name:	BAC 2J
Molecular Formula	Exempt information
Structural Formula:	Exempt information
Molecular Weight:	Exempt information

Spectral Data:	The notifier did not provide spectroscopic data or other information specifying procedures for chemical identification of the new compound alone, but did include an infrared spectrum of the mixture of the compound with its methyl analogue and the parent chemical. This mixture would be typical of the brake fluid into which the new chemical will be incorporated and sold in Australia, and the IR spectrum provided serves to characterise the main chemical functionalities in this mixture.

Comments on Chemical Identity

The notified chemical is never isolated, but is formed together with the methyl analogue, with the resulting mixture used in the formulation of brake and clutch fluids. The notifier has provided the composition of two representative brake fluids. One of these (named Shell Brake Fluid Dot 4) contains the notified chemical. The methyl ester analogue of the notified chemical is the subject of a separate new chemical notification (NA/658) and is also in Shell Brake Fluid Dot 4.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C, 101.3 kPa:	clear liquid
Boiling Point:	> 300°C at 102.5 kPa
Density:	1 050 – 1 080 kg/m^3 at 20 °C
Vapour Pressure:	0.2 kPa (estimated – see notes below)
Water Solubility:	completely soluble - see notes below
Partition Co-efficient (n-octanol/water):	log P_{ow} < 1 (estimated) - see notes below
Hydrolysis as Function of pH:	no data available - see notes below
Adsorption/Desorption:	no data provided - see notes below
Dissociation Constant:	no data provided - see notes below
Flash Point:	> 144°C (estimated from similar products)

Flammability Limits: not determined

Autoignition Temperature: > 320°C

Explosive Properties: none

Reactivity/Stability: hydrolysis of the ester groups in the presence of water

Comments on Physico-Chemical Properties

As could be expected from the high proportion of polar functionalities in the compound, the new chemical is completely soluble in water.

Due to lack of data the notifier could not provide information on the hydrolysis of the compound. However the polar moieties are very stable and unlikely to hydrolyse in the usual environmental pH region between 4 and 9. The notifier indicated that hydrolytic cleavage of the borate ester bonds is possible. Since the components of the brake fluid are hygroscopic, it is likely that water would become absorbed during normal usage of the formulations containing the new compound, and consequently it is likely that some hydrolysis to boric acid and the parent compound could occur.

The n-octanol/water partition coefficient for the formulated brake fluid containing the new chemical was determined using the reverse phase HPLC method where the retention time of the compound(s) on a C_{18} column is compared with those of a series of standard compounds with known values of log P_{ow} (i.e. aniline with log P_{ow} = 0.94 and DDT with log P_{ow} = 5.88). The results indicated the brake fluid contained two components detectable by the instrumentation, with determined values of log P_{ow} of 0.5 for the major component and 1.9 for the minor one. These two values probably correspond to the methyl and butyl esters respectively. Calculations based on the method of molecular fragment addition gave an estimate of log P_{ow} < 1. Taken together, all the results indicate the new chemical has very little affinity for hydrocarbon-like environments and would partition exclusively to water.

The notifier supplied an estimated range for log K_{oc} calculated from the range of log P_{ow} values. The method used was not specified but for log P_{ow} = 0.5 gave log K_{oc} = 1.1, and for log P_{ow} = 1.9 the corresponding value for log K_{oc} = 2.0. As mentioned above it is probable that the measured log P_{ow} of 1.9 is applicable to the butyl ester (the subject of this notification), and hence the derived value for log K_{oc} of 2.0 indicates that the new compound may bind weakly to soils. These results indicate that neither of the new chemicals in the brake fluid would bind strongly to soils or sediments, but if released to this compartment it is likely that the butyl ester (i.e. the subject of this notification) would be mobile, while the methyl analogue (NA/658) would be very mobile.

The compound contains no functionalities capable of readily dissociating in aqueous media, and the notifier indicated that dissociation constant data are not applicable.

4. PURITY

Degree of Purity:	99.9%
Hazardous Impurities:	none
Non-hazardous Impurities (> 1% by weight):	none
Additives/Adjuvants:	none

5. USE, VOLUME AND FORMULATION

The notified chemical will be imported as a component of brake fluids at a concentration of < 10% in 200 L drums or 0.5 – 1.0 L packs. The methyl analogue of the notified chemical, assessed in the accompanying notification (NA/658), comprises > 40% of the brake fluids. The 200 L drums will be used in car manufacturing to automatically fill brake fluid reservoirs on new cars. The smaller packs will be retailed mainly to garages for servicing cars. The notifier estimates that 80 – 200 tonnes of the brake fluid will be imported per year for the next 5 years. This equates to a maximum of 12 tonnes per year of the notified chemical.

6. OCCUPATIONAL EXPOSURE

The notified chemical will be imported in 200 L steel drums or sturdy polyethylene bottles up to 1 L capacity. Exposure of workers during transport and storage should only occur in the event of accidental spillage.

No formulation of the notified chemical will occur in Australia.

The tonnage to be imported is likely to be split evenly between the bulk and individual containers. For each service station, brake fluid reservoirs are refilled by pouring manually from the container and small spills may occur and typically be cleaned up with rags. Greater exposure, largely dermal, may be expected to occur during brake or clutch repair or as part of a routine service, where the fluid in the entire system may be replaced. The fluid would be collected in a container and added to a storage vessel which is removed by a licensed contractor for incineration.

Where brake fluid is added to reservoirs during new car manufacture, the notifier states this is a one person operation where hoses are connected to a drum and fluid pumped via an automated system. A diagram of this process was provided. Exposure is expected to be mainly dermal and restricted to drips and spills while connecting and disconnecting the lines. Exposure is possible when the brake fluid filling line is flushed and/or dismantled for

maintenance and mainly will be dermal. The notifier has indicated that gloves and safety spectacles are worn during handling of the brake fluids. In end use the brake fluid remains in the enclosed hydraulic brake system.

7. PUBLIC EXPOSURE

Public exposure largely will be limited to those who service their own and will therefore have a need on occasion to service the hydraulic brake system on their vehicles. During this activity substantial dermal exposure is possible if material is spilt, but under normal circumstances is likely to be minimal.

In the event of a transport accident the main potential source of exposure would be from fumes derived from burning brake fluid. In the absence of a fire any spilt material could be readily recovered through adsorption onto sand, soil or vermiculite with disposal according to local government regulations

The use of the notified chemicals in the manufacture of new cars or the servicing of cars is unlikely to result in exposure of the public. The brake fluids are non-volatile liquids and brake systems on vehicles are essentially sealed, hence under normal circumstances the public will not have an opportunity to come into contact with the notified chemicals.

8. ENVIRONMENTAL EXPOSURE

Release

No reference to the quantities of chemical likely to be lost and released as a result of accidental spillage or left in containers after refilling hydraulic circuits was made in the submission. However, it can be estimated that up to 5% of total import quantity could be lost through these causes, which amounts to a maximum annual release of up to 500 kg. It is likely that this material would be hosed off garage floors and washed into sewage systems. However, since the product will be used throughout Australia, the release in this manner will be very diffuse, and concentrations of the new chemical in sewage will be at very low levels.

Some material will also be released from the hydraulic systems in vehicles as a result of leaks, and while this may initially be assimilated into soil, the high water solubility indicates that the chemical could be mobile in this medium, and would eventually be released to the water compartment. Again release will be very diffuse and at low levels and subject to constant dilution, so the chemical is unlikely to become concentrated in particular regions. Most brake fluid removed from the reservoirs in vehicles at motor garages is likely to be mixed with waste oils, which would be sent for oil recycling, or possibly be incinerated. Consequently, little release from this activity is expected.

Empty containers of the brake fluid are likely to contain some residual unused product, and the notifier indicates that these packages would be discarded with domestic garbage and be

disposed of into landfill. Again the expected mobility in soil indicates this would eventually be leached from the landfill and drained to water courses.

Fate

The brake fluid containing the new chemical is not readily biodegradable, which was established by the results of two tests - the Closed Bottle Test and the Modified Sturm Test. The Closed Bottle test indicated only 6-10% degradation after 28 days, while the Sturm test indicated 22-26% degradation after the 28 day period. It is significant that at the conclusion of the Sturm test steady degradation of the material was still proceeding, indicating that the chemicals in the brake fluid may be ultimately biodegradable. In both the Closed Bottle and Sturm test there was no indication of inhibition of bacterial activity by the test material, and the bacterial cultures employed rapidly degraded sodium benzoate in the presence of the brake fluid.

The results of these tests indicate that brake/clutch fluid containing the new compound which is released to the soil or water compartment would be slowly degraded by biological action producing water, carbonate and salts of boric acid.

At the end of their useful lives, motor vehicles are usually scrapped and recycled for metals recovery. It is anticipated that most of the brake and clutch fluid left in the reservoirs would be incinerated during resmelting of the vehicles in blast furnaces. Incineration of the brake fluid would produce water vapour and carbon dioxide, while the borate component would to be converted to solid borates which would remain in the ash or slag wastes from the furnaces, and most likely be deposited into landfill.

9. EVALUATION OF TOXICOLOGICAL DATA

There were no data available for the notified chemical itself but there were data for Shell Brake Fluid Dot 4. According to the acute toxicity report (Gardner, 1992) in which analysis of the substance tested was provided, Shell Brake Fluid Dot 4 contains < 20% of the notified chemical and > 40% of the methyl analogue. Some data were also available for Brake Fluid Dot 4 Super which the notifier states contains the methyl ester analogue at a concentration of > 50%. It is accepted that the brake fluids tested adequately indicate the toxicity of the notified chemical.

9.1 Acute Toxicity

Summary of the acute toxicity of Shell Brake Fluid Dot 4 and/or Dot 4 Super

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50} > 5 000 mg/kg	(Gardner, 1990; Gardner, 1992)
acute dermal toxicity	rat	LD_{50} > 2 000 mg/kg	(Gardner, 1990; Gardner, 1992)
skin irritation	rabbit	non-irritant	(Gardner, 1990; Gardner, 1992)
eye irritation	rabbit	slight irritant	(Gardner, 1990; Gardner, 1992)
skin sensitisation	guinea pig	non-sensitiser	(Gardner, 1990)

9.1.1 Oral Toxicity (Gardner, 1990; Gardner, 1992)

Shell Brake Fluid Dot 4

Species/strain:	rat/Fischer 344
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	undiluted test material by gavage at 4.72 mL/kg
Clinical observations:	in most or all animals: abasia/ataxia, hunched posture, piloerection, lachrymation and, at a later stage, unkempt appearance and staining/soiling of the anogenital fur; less common signs were lethargy among male rats, bradypnoea among the females and prostration in rats of either sex; the principal signs of reaction were first apparent within one hour of dosing or, in the case of unkempt appearance and soiling of anogenital fur, within four hours of dosing; recovery, as judged by external appearance and behaviour, was advanced by day 2 and complete by day 8
Mortality:	none
Morphological findings:	none

Test method:	EEC method B1
LD_{50}:	> 5 000 mg/kg
Result:	the test substance was of very low acute oral toxicity in rats

Shell Brake Fluid Dot 4 Super

Species/strain:	rat/Fischer 344
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	undiluted test material by gavage
Clinical observations:	hunched posture within 1 hour of dosing; other isolated signs were lachrymation, abasia, lethargy, unkempt appearance and encrustation of the periorbital zone; recovery, as judged by external appearance and behaviour, was complete by day 3
Mortality:	none
Morphological findings:	none
Test method:	OECD TG 401
LD_{50}:	> 5 000 mg/kg
Result:	the test substance was of very low acute oral toxicity in rats

9.1.2 Dermal Toxicity (Gardner, 1990; Gardner, 1992)

Shell Brake Fluid Dot 4

Species/strain:	rat/Fischer 344
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	single dose at 1.89 mL/kg,under occlusive dressing for 24 hours

Clinical observations:	none
Mortality:	none
Morphological findings:	minor vascular congestion of the dermis in 2 male and 3 female rats
Test method:	EEC Method B3
LD_{50}:	> 2 000 mg/kg
Result:	the test substance was of low acute dermal toxicity in rats

Shell Brake Fluid Dot 4 Super

Species/strain:	rat/Fischer 344
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	under occlusive dressing for 24 hours
Clinical observations:	none
Mortality:	none
Morphological findings:	none
Test method:	OECD TG 402
LD_{50}:	> 2 000 mg/kg
Result:	the test substance was of low acute dermal toxicity in rats

9.1.3 Inhalation Toxicity

Not done.

9.1.4 Skin Irritation (Gardner, 1990; Gardner, 1992)

Shell Brake Fluid Dot 4

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	3/sex
Observation period:	72 hours
Method of administration:	0.5 mL of undiluted test substance under semi-occlusive dressing for 4 hours
Test method:	EEC Method B4
Result:	the notified chemical was not a skin irritant in rabbits; no erythema or oedema was observed in any animal at any time point

Shell Brake Fluid Dot 4 Super

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	3/sex
Observation period:	72 hours
Method of administration:	0.5 mL of undiluted test substance under semi-occlusive dressing for 4 hours
Test method:	OECD TG 404
Result:	the notified chemical was not a skin irritant in rabbits; no erythema or oedema was observed in any animal at any time point

9.1.5 Eye Irritation (Gardner, 1990; Gardner, 1992)

Shell Brake Fluid Dot 4

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	3/sex
Observation period:	72 hours
Method of administration:	0.1 mL of undiluted test substance into the lower conjunctival sac of one eye of each animal

Test method:	EEC Method B5
Result:	the notified chemical was a slight eye irritant in rabbits no corneal or iridal effects were observed; slight conjunctival redness was observed in 5 rabbits from 1 – 24 hours and in the 6th animal also at 48 hours; slight chemosis was observed in 4 rabbits at 1 and 4 hours, in 2 rabbits at 4 hours only and slight discharge occurred in 2 rabbits at 1 and 4 hours and in 1 rabbit at 4 hours only

Shell Brake Fluid Dot 4 Super

Species/strain:	rabbit/New Zealand White
Number/sex of animals:	3/sex
Observation period:	72 hours
Method of administration:	0.1 mL of undiluted test substance into the lower conjunctival sac of one eye of each animal
Test method:	OECD TG 405
Result:	the notified chemical was a slight eye irritant in rabbits no corneal or iridal effects were observed; slight conjunctival redness was observed in all rabbits at 1 and 24 hours; at 4 hours conjunctival redness was slight in 4 rabbits and moderate in the remaining 2 rabbits; up to mild chemosis was observed in 5 rabbits at 1 to 24 hours, and in 1 rabbit to 4 hours; in all rabbits up to 4 hours, slight discharge

9.1.6 Skin Sensitisation (Gardner, 1990)

Shell Brake Fluid Dot 4 Super

Species/strain:	guinea pig/Dunkin-Hartley
Number of animals:	5/sex (control); 10/sex (test)

Induction procedure:	two rows of intradermal injections (0.1 mL) on either side of the mid-line in the scapular region as follows: - Freund's Complete Adjuvant (FCA) - 0.6% (m/v) test substance in water - 0.6% (m/v) test substance in FCA/water (1:1) this was followed 1 week later by topical induction with undiluted test substance in water under occlusive dressing for 48 hours
Challenge procedure:	3 weeks after intradermal induction, 60% (m/v) of the test substance in water was applied to flanks under occlusive dressing for 24 hours; sites were scored 24 and 48 hours after patch removal
Test method:	OECD TG 406
Result:	the notified chemical was not a skin sensitiser in guinea pigs as no erythema or oedema was observed at any challenge site at any time point

9.2 Repeated Dose Toxicity (Taupin, 1993)

Shell Brake Fluid Dot 4

Species/strain:	rat/SD
Number/sex of animals:	5/sex/dose group
Method of administration:	oral gavage
Dose/Study duration::	0, 25, 150 or 1 000 mg/kg/day for 28 days
Clinical observations:	no clinical signs and no bodyweight changes or changes in food consumption in any dose group
Clinical chemistry/Haematology	no significant observations
Macroscopic findings:	no macroscopic findings and no organ weight changes

Histopathology:	the livers of all males and some females at the top dose exhibited slight centrilobular hypertrophy
Test method:	not specified
Result:	the NOEL was 150 mg/kg/day on the basis of liver centrilobular hypertrophy at 1 000 mg/kg/day

9.3 Genotoxicity

***Salmonella typhimurium* Reverse Mutation Assay with Shell Brake Fluid Dot 4 (Brooks & Wiggins, 1992)**

Shell Brake Fluid Dot 4

Strains:	*Salmonella typhimurium* strains TA 1535, TA 1537, TA 1538, TA 98, TA 100 and *Escherichia coli* WP2 *uvrA*(pKM101)
Concentration range:	31.1 – 5 000 µg/plate
Test method:	Maron and Ames (Maron & Ames, 1983): metabolic activation was provided by Aroclor 1254-induced rat liver S9 fraction; positive control compounds to check that the strains exhibited the appropriate responses were benzo(a)pyrene, potassium dichromate, neutral red, sodium azide, 2-nitrofluorene, 2-aminoanthracene and 9-aminoacridine
Result:	the test substance was neither cytotoxic nor mutagenic in any of the bacterial strains in the presence or absence of metabolic activation provided by rat liver S9 fraction; the negative controls were within acceptable limits and the positive controls gave the expected responses

9.4 Developmental Toxicity (Taupin, 1992)

Shell Brake Fluid Dot 4

Species/strain:	rat/SD
Number and sex of animals:	10 females/dose group

Doses:	0 (control), 25 (low), 150 (mid) or 1 000 (high) mg/kg/day; positive control group 1 000 mg/kg/day ethylene glycol diethyl ether (EGDE)
Method of administration:	oral gavage on days 7 – 17 of gestation; animals were allowed to litter naturally; dams and surviving pups were killed on day 5 of lactation
Bodyweight and food intake:	not adversely affected
Morphological findings:	none in dams
Clinical signs:	none in either dams or pups
Mortality:	none
Test method:	Chernoff and Kavlock developmental toxicity screen in the rat (Brown et al., 1981; Chernoff & Kavlock, 1981; Chernoff & Kavlock, 1982)
Result:	no dose-related differences in duration of gestation, post implantation loss, pup loss at birth, viability of pups or litter weights EGDE treated animals showed total resorption of litters the test substance is considered unlikely to be a teratogen

9.5 Overall Assessment of Toxicological Data

Shell Brake Fluid Dot 4 and Dot 4 Super, with similar composition to products to be imported, were shown to be of very low acute oral toxicity (LD_{50} > 5 000 mg/kg) and low dermal toxicity (LD_{50} > 2 000 mg/kg) in rats. They were not irritating to rabbit skin, but were slight eye irritants in the same species. The Dot 4 Super was not a skin sensitiser in guinea pigs. Dot 4 was not mutagenic in bacteria, was not developmentally toxic in rabbits. In a 28-day oral (gavage) repeated dose study in rats the NOEL for Dot 4 was 150 mg/kg/day, based on adaptive effects on the liver at 1 000 mg/kg/day. The notified chemical is not determined to be a hazardous substance according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1994a).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The notifier provided summary reports on ecotoxicity in support of their application. The tests were performed with the formulated brake fluid containing < 20% of the notified chemical and > 40% of the methyl analogue (see report for NA/658) and not on the chemical itself. The ecotoxicity tests were performed in accordance with United States EPA Test Guidelines.

Test	*Species*	*Results (Nominal)*
Acute Toxicity	*Salmo gairdneri* (Rainbow trout)	LC_{50}(96 h) = 590 mg/L NOEC (96 h) = 213 mg/L
Acute Immobilisation	*Daphnia magna*	EC_{50}(48 h) > 1,000 mg/L NOEC(48 h) > 1 000 mg/L
Inhibition of Algal Growth	*Selenastrum capricornutum*	E_bC_{50}(72 h) = 430 mg/L
Inhibition of Bacterial Respiration	*Pseudomonas fluorescens*	19% inhibition at 1 000 mg/L

The tests on rainbow trout (identified as the species *Salmo gairdneri* in the test report dated June 1987) were performed using solutions of the brake fluid made up in dechlorinated water. The tests were conducted over a 96-hour period at a monitored temperature of between 13 and 17°C using static methodology with daily renewal of the test medium. Three solutions of the brake fluid at nominal concentrations of 213, 533 and 1 065 mg/L were tested, together with one control (no chemical).

Ten fish were tested at each concentration. During these tests the pH remained between 7.2 and 8.5, dissolved oxygen levels were between 9.0 and 10.6 mg/L and water hardness measured as $CaCO_3$ was around 255 mg/L.

The tests results indicate that the brake fluid containing the new chemical is practically non-toxic to the rainbow trout with a 96-hour LC_{50} of 590 mg/L determined using Probit analysis. At a nominal concentration of 533 mg/L, two fish had died after 72 hours, while at the highest concentration, 1 065 mg/L, all animals were dead after 24 hours exposure. The report did not mention sub lethal effects on the behaviour of the fish.

The acute immobilisation tests on Daphnia were performed using solutions of the test material made up in dechlorinated water. The tests were conducted over a 96-hour period at a monitored temperature of between 18 and 22°C using static methodology with daily renewal of the test medium. Three solutions of brake fluid at nominal concentrations of 100, 200 and 1 000 mg/L were tested, together with one control (no chemical).

Ten Daphnia were tested at each concentration. During these tests the pH of the test solutions remained between 8.1 and 8.4, while dissolved oxygen levels were between 8.6 and

9.0 mg/L. Although 3 Daphnia became immobile during the course of the test, these incidences were random and did not reflect any concentration or time dependence.

The tests results indicate that the brake fluid is non toxic to Daphnia with a 48 hour EC_{50} of greater than 1 000 mg/L.

A test on the inhibition of algal growth was also conducted on *Selenastrum capricornutum* over a 96 hour incubation period at 22-26°C with ten nominal concentrations of the test material between 1 and 1 000 mg/L, together with six controls containing no chemical. The growth of biomass was monitored from the cell count (Coulter counter), and the results show the brake fluid to be practically non-toxic to this species of green algae.

The test on inhibition of bacterial respiration was conducted as part of the study on biodegradation, using *Pseudomonas fluorescens* suspended in the test medium with concentrations of brake fluid up to 1 000 mg/L. The test at 1 000 mg/L produced 19% inhibition, with smaller effects at lower concentrations. It may be concluded from these results that both the brake fluid and the new chemical do not inhibit bacterial respiration. A parallel test using pentachlorophenate demonstrated marked inhibition on bacterial respiration, with EC_{50} of 18 mg/L.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Brake and clutch fluids containing the new chemical are contained within closed hydraulic systems, and little will be released during normal operations of motor vehicles. Most brake fluid removed from vehicles would be mixed with waste oil and either be incinerated or sent for recycling. However, some brake fluid containing the new chemical will be released to the environment as a result of spills and inappropriate disposal practice, but this will be very diffuse and at low levels. The chemical is completely water soluble and most of the released material is expected to eventually enter the water compartment where it will be slowly degraded through microbiological processes to water and carbon dioxide. The new chemical contains a small quantity of boron which would be converted to borates or boric acid. The high water solubility precludes bioaccumulation. Ecotoxicity data derived from tests on the formulated brake fluid (which is the form in which the new chemical would be released) indicates that it is practically non toxic to those aquatic species against which it was tested. Consequently, it is reasonable to infer that the new chemical itself is at worst slightly toxic to these organisms.

The majority of spent brake fluids removed from vehicles will be incinerated producing water vapour and oxides of carbon, together with solid borates which will remain in the ash or furnace slag.

The above considerations indicate minimal hazard to the environment when the new chemical is used as a component of hydraulic brake and clutch fluids in the manner indicated by the notifier.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

No toxicological data were available for the notified chemical, only for brake fluids which contain the butyl and methyl borate esters which are the subject of assessments NA/657 and NA/658. The data are considered to adequately identify the hazards of the notified chemicals since they can be considered analogues of each other.

Based on the toxicological data supplied, the likely health effects of the notified chemical can be predicted to be: low acute and subchronic toxicity, no skin irritation or skin sensitisation and no developmental or genotoxicity. However, it is likely that the notified chemical is a slight eye irritant. The notified chemical would not be determined to be hazardous according to NOHSC *Approved Criteria for Classifying Hazardous Substances* (National Occupational Health and Safety Commission, 1994a).

The notified chemical is to be imported in 200 L steel drums or small (up to 1 L) polyethylene bottles. In either case exposure to transport or storage workers should only occur in the event of accidental spillage.

The brake or clutch fluids containing the notified chemical will be added to the hydraulic systems of motor vehicles during servicing of existing vehicles or during bulk filling of the systems in the manufacture of new motor vehicles. Approximately 50% of the imported brake fluids will be added from 200 L drums by pumping and 50% from smaller containers. Servicing of vehicles by automotive mechanics for the most part is expected to require topping up of hydraulic systems. Where repair of brakes or clutches occurs, the systems may be drained and refilled. In these cases, it may be expected that dermal exposure could be significant since wearing of gloves is likely to be rare. However, there is little risk of adverse health effects from such exposure given the toxicological profile of the notified chemical. Exposure of eyes is most likely to occur secondarily as a result of hand contamination or directly. This is likely to be infrequent but could result in irritant effects. Used fluids are likely to be collected in drums and removed for incineration by licensed contractors. The risk of adverse health effects for the contractors may be similar to that for hydraulic system servicing. Addition of fluids in new vehicle manufacture by automatic pumping means that exposure is likely to be limited and infrequent. It will be restricted to exposure to drips and spills when connecting and disconnecting lines and, more rarely, flushing of the system and during maintenance. As for other scenarios, the main risk is eye irritancy, mainly from secondary contact.

The low vapour pressure of the notified chemical is expected to preclude inhalation exposure. However, if the hydraulic fluids are being used in a manner which may generate oil mists, employers should ensure that the NOHSC exposure standard of 5 mg/m^3 is not exceeded.

Public exposure to the notified chemical is likely to be minimal, restricted primarily to the home mechanic. The available toxicological data indicates a low level of toxicological hazard and as dermal absorption is likely to be slight due to the high water solubility and low log P_{ow} of the notified chemical, the risks associated with this exposure are negligible. In the event of a

transport accident resulting in a fire and rupture of the primary containers of brake fluid, some potential exists for the liberation of boron combustion products. The nature of these combustion products is unknown, however the environmental assessment of the notified chemical indicates that combustion in a furnace results in solid borates as a residue and hence the likely hazard from the boron component in this situation is low.

13. 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, 1994b).

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.

14. RECOMMENDATIONS

To minimise occupational exposure to the notified chemical 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);
- 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. Spillage 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.

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

Brooks TM & Wiggins DE (1992) Brake Fluid Dot 4: Bacterial Mutagenicity Studies, Project No. SGBR 92.022, Sittingbourne Research Centre, Kent, U.K.

Brown JM, Jorgenson TA & D.G. A (1981) Validation of an *in vivo* Pre-screen for the Determination of Embryo/Fetal Toxicity in Mammals. Teratology, 21 : 33A.

Chernoff N & Kavlock RJ (1981) A Potential *in vivo* Screen for the Determination of Teratogenic Effects in Mammals. Teratology, 21 : 34A.

Chernoff N & Kavlock RJ (1982) An *in vivo* Teratology Screen Utilising Pregnant Mice. Journal of Toxicology and Environmental Health, 10 : 541 - 550.

Gardner JR (1990) Brake Fluid Dot 4 Super: Acute Oral and Dermal Toxicity, Skin and Eye Irritancy and Skin Sensitisation Potential, Project No. SBGR 90.189, Sittingbourne Research Centre, Kent, U.K.

Gardner JR (1992) Brake Fluid Dot 4: Acute Oral and Dermal Toxicity in Rat, Skin and Eye Irritancy in Rabbit, Project No. SBGR 92.011, Sittingbourne Research Centre, Kent, U.K.

Maron DM & Ames BN (1983) Revised Methods for *Salmonella* Mutagenicity Test. Mutation Research, 113 : 173-215.

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

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

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

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

Taupin PJY (1992) Brake Fluid Dot 4: Chernoff and Kavlock (CKA) Developmental Toxicity Screen in the Rat, Project No. SGBR 92.233, Sittingbourne Research Centre, Kent, U.K.

Taupin PJY (1993) Brake Fluid Dot 4: A 28-Day Oral (Gavage) Toxicity Study in the Rat, Project No. SGBR 92.180, Sittingbourne Research Centre, Kent, U.K.