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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME  
(NICNAS)**

**FULL PUBLIC REPORT**

**Polymer in Disperbyk 103**

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**Director  
NICNAS**

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## **FULL PUBLIC REPORT**

### **Polymer in Disperbyk 103**

#### **1. APPLICANT AND NOTIFICATION DETAILS**

APPLICANT(S)

Nuplex Industries (Aust) Pty Ltd (ABN 25 000 045 572)  
49 - 61 Stephen Rd  
BOTANY NSW 2019

and

Akzo Nobel Pty Ltd (ABN 000 017 354)  
51 McIntyre Rd  
SUNSHINE VIC 3020

NOTIFICATION CATEGORY

Limited: Polymer with NAMW  $\geq 1000$  (greater than 1 tonne per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)

Data items and details claimed exempt from publication: Chemical name, other name, molecular and structural formulae, molecular weight, polymer constituents, import volume, identity of recipient, formulation details, spectral data and specific use.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)

Variation to the schedule of data requirements is claimed as follows: Physicochemical properties only available for Disperbyk-103 manufactured in 1-methoxy-2-propyl acetate.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)

None.

NOTIFICATION IN OTHER COUNTRIES

None.

#### **2. IDENTITY OF CHEMICAL**

MARKETING NAME(S)

Disperbyk-103 (contains < 50% notified polymer).

MOLECULAR WEIGHT

Number Average Molecular Weight (Mn) > 1000

Weight Average Molecular Weight (Mw) > 1000

SPECTRAL DATA

METHOD	Infrared (IR) spectroscopy
Remarks	A reference spectrum was provided.

METHODS OF DETECTION AND DETERMINATION

METHOD	Infrared spectroscopy
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### 3. COMPOSITION

#### DEGREE OF PURITY

> 90%

#### HAZARDOUS IMPURITIES/RESIDUAL MONOMERS

One hazardous impurity was identified at a concentration that would not render the notified polymer a hazardous substance.

#### NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS (>1% by weight)

A by-product formed during manufacturing at < 10%.

#### ADDITIVES/ADJUVANTS

The notified polymer is contained in a solvent solution (Disperbyk-103) at less than 50%.

### 4. INTRODUCTION AND USE INFORMATION

#### MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

As a component of Disperbyk-103.

#### MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

<i>Year</i>	<i>1</i>	<i>2</i>	<i>3</i>	<i>4</i>	<i>5</i>
<i>Tonnes</i>	1 - 3	1 - 3	1 - 3	1 - 3	1 - 3

#### USE

As a wetting and dispersing additive in paint formulation and potentially epoxy fillers.

### 5. PROCESS AND RELEASE INFORMATION

#### 5.1. Distribution, transport and storage

##### PORT OF ENTRY

All major ports.

##### TRANSPORTATION AND PACKAGING

Transport of the imported polymer solution is by road or rail in 200 L steel drums. The formulated coating is transported by road or rail in 5 L, 20 L or 200 L steel drums.

#### 5.2. Operation description

##### Paint Manufacture:

A mixing vat is loaded with the notified polymer solution and other ingredients and the contents undergo high speed dispersing and blending. Once the batch has been adjusted and passed quality testing, it is filtered and filled into containers which will be stored on-site in a warehouse until required by customers. The notified polymer is at  $\leq 5\%$  in the paint.

##### Paint Application:

Industrial paint application involves the use of spray, roller coatings or dipping equipment in an environment with a filtered exhaust system. Architectural coatings will be applied by professional painters and during periods of Do-It-Yourself (DIY), by brush, roller and occasionally spray.

##### Prepreg Solution Manufacture

Manufacture of a formulation for prepreg manufacture from the imported resin solution is expected to be the same as described above for paint manufacture.

##### Prepreg Formation

Prepregs are essentially fibres preimpregnated with partially cured resin. The resin solution is fed into a hopper or to a central resin tank, either manually or by an automated process. The fibres are then “calendered” into the resin with Doctor blades controlling the extent and thickness and the prepreg is partially cured prior to cutting and storage in temperature resistant containers. The prepreg is transferred to a circuit board and pressure is applied.

### 5.3. Occupational exposure

#### *Number and Category of Workers*

Information in this section is available for paint manufacture and application. For prepreg manufacture and use, customers have not been identified and details are not yet available.

<i>Category of Worker</i>	<i>Number</i>	<i>Exposure Duration (hrs/day)</i>	<i>Exposure Frequency (days/yr)</i>
Transport and warehousing	10	1	200
<i>Paint Manufacture</i>			
High speed dispersing	40	4	30
Make up	40	2	30
QC	10	8	30
Container filling	40	8	30
Retail colourant addition	2000	0.5	250
<i>Paint Application</i>			
Addition to coater trays	10	8	200
Spray painting	200	8	200
Cleaning of spray equipment	30	2	200

#### *Exposure Details*

Transport and storage workers should only be exposed to the notified polymer in the event of an accident involving rupture of import containers.

For paint manufacture the imported additive solution is pumped into a mixing vessel for high speed mixing with the paint automatically drummed off. The notified polymer is at less than 5% of the final formulation. Dermal and ocular exposure is possible if drips and spills occur during the transfer process and is controlled by the wearing of coveralls, impervious gloves and goggles. Once in the paint formulation exposure to the notified polymer is minimised by the use of automated drum filling and the low level of polymer in the final formulation. Exposure during cleaning and maintenance operations will generally be controlled by personal protective equipment and the low level of notified polymer in the final formulation.

Exposure to the notified polymer during paint application is minimised by the low concentration of notified polymer in the final paint. It is expected that inhalation of spray will be controlled by the use of a mask but exposure of the hands (primarily) is likely to occur during roller or brush application and possibly during clean up.

Although customers for prepreg resin solution manufacture and application are yet to be identified, certain general conclusions can be drawn. Manufacture of the resin solution involves similar exposure scenarios to paint manufacture. Formation of the prepreg is largely automated with potential exposure occurring if there is spillage as fibres pass through the resin tank, spills from Doctor blades and when the impregnated fibres pass through an oven for partial curing. However, the notified polymer is at a maximum of 2% in the prepreg resin. Exposure during circuit board formation is unlikely as it is largely automated in addition to the low concentration of the notified polymer in the resin.

### 5.4. Release

#### RELEASE OF CHEMICAL AT SITE

The polymer is used as a wetting and dispersing agent in paint and potentially in resin formulations.

During reformulation release from the sites is expected to be restricted to spills, cleaning of equipment and rinsing of drums. The formulation occurs in automated and closed reactors to minimise the chance of accidental release with any spills being contained within the bunded areas of the site. The total amount of waste from these sources is expected to be minimal with around 30 kg per annum released based on the maximum import volume of 3 tonnes. All of the waste is expected to be collected by licensed contractor for disposal. The polymer is non – volatile and it is expected to have negligible release to the atmosphere.

#### RELEASE OF CHEMICAL FROM USE

The majority of the polymer will be used in paints, although there is a potential for up to 5% of the polymer to be used for the resin to be used in prepreg formulation for circuit boards. If the polymer is used in resin formulations for eventual use in printed circuit boards it is likely to be site specific with no likely release of the chemical to the aquatic environment.

The most likely and also worst case scenario involves 100% of the polymer being used in paint formulations. In this case 80% of the chemical is expected to be used industrially with 20% in DIY applications. It is expected that 80% of the paint product will be applied by spraying and 20% by roller. No further information was provided, therefore it has been assumed that the split of spraying versus roller is approximately uniform across industrial and DIY applications.

Consequently approximately 2.4 tonnes of the chemical will be used industrially with approximately 1900 kg per annum being applied in spray booths. Overspray and rinsing of equipment will normally account for approximately 35% of the notified chemical. This waste will contain up to 670 kg of the notified chemical and will be collected using filter pads and settling.

Although the polymer is used industrially in paints that are used in marine environments no release is expected to occur. The paint will be applied to ocean going vessels, but will be incorporated in the cured paint, with very limited release to the marine environment. During painting of vessels in dry dock any overspray or spillage is likely to be allowed to cure and collected.

Industrial roller applications may account for 480 kg of the polymer per annum. It is expected that cleaning of equipment will account for 1% of this amount, resulting in up to 5 kg being wasted. Assuming that any industrial roller applications are likely to be performed in the same place as the spray applications then the waste 5 kg will be settled or cured in dry docks with limited environmental release.

For DIY applications up to 600 kg will be used per annum with approximately 480 kg being used in spray applications. Similarly it is expected that the overspray will be 35%, resulting in up to 170 kg of the notified chemical being wasted. This waste will be collected on newspaper and allowed to harden.

For DIY applications it is expected that 1% of the paint containing the notified polymer is wasted during the washing of equipment. Consequently of the 600 kg of chemical used in DIY applications around 6 kg will be released to sewer.

The residue remaining in the paint drums is expected to account for approximately 0.5% (15 kg) and will be disposed during drum recycling.

If 150 kg of notified chemical is to be used in the manufacture of resins, for prepreg formulations for printed circuit boards, the notifier has indicated that the following surprisingly high release pattern is likely. During resin formulation 15 kg of waste will be generated by cleaning minor spills, cleaning equipment and rinsing of drums. Similarly 15 kg of waste is expected to be generated during prepreg formulation. For the formation of the printed circuit board it is expected that 6 kg per will be wasted from the cleaning of moulds.

### 5.5. Disposal

Disposal of waste from industrial applications will be carried out by licensed contractors and landfilled. During drum recycling the rinseate is likely to be landfilled or possibly incinerated. For DIY applications the cured paint contained on newspapers will be disposed as domestic waste to landfill. If the chemical is used in resins for printed circuit board manufacture then any waste will be disposed to landfill.

### 5.6. Public exposure

The public may be exposed to the notified polymer if there is a transport accident involving rupture of import containers.

Following importation and incorporation of the notified polymer into paint, DIY painters could potentially be exposed to the notified polymer at 5% or less during paint application. Although the majority of the paint is expected to be applied to a surface, some (largely) dermal exposure will occur as gloves are not typically worn.

The public may be exposed (rarely) to circuit boards containing the resin but it will be in a cured form and not bioavailable.

## 6. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer is manufactured in the solvent 1-methoxy-2-propyl acetate and is never isolated. Therefore, the physico-chemical properties relate to this solution, Disperbyk-103.

**Appearance at 20°C and 101.3 kPa** Pale yellow liquid.

**Melting Point/Freezing Point** Not determined.

**Boiling Point** 146°C at 101.3 kPa

Remarks Data from MSDS.

**Density** 1060 kg/m<sup>3</sup> at 20°C

Remarks No test results available. Data from MSDS.

**Vapour Pressure** 0.3 kPa at 20°C (calculated)

Remarks No test results available . Data from MSDS.

**Water Solubility** 2.513 x 10<sup>-10</sup> - 6.594 g/L at 25°C

METHOD EPIWIN v3.12

Remarks Estimate from Log Kow (WSKOW v1.41) used the smallest and a representative species of series and relates to the non-ionised species. The notified chemical is likely to exhibit properties intermediate to the two extremes, and further the anionic species will be more soluble.

### Hydrolysis as a Function of pH

METHOD EPIWIN v3.12

<i>pH</i>	<i>Species</i>	<i>T (°C)</i>	<i>t</i> <sub>1/2</sub> <days>
7	smallest	25	588
8	ditto	25	58.8
7	representative	25	19
8	ditto	25	199

Remarks The smallest and a representative species of a series was used for determination and relates to the non-ionised species. The notified chemical is likely to exhibit properties intermediate to the two extremes will likely be more soluble.

The notified polymer contains functional groups which are expected to undergo hydrolysis in the extremes of the pH range.



**Partition Coefficient (n-octanol/water)** log Pow 0.52 – 6.67

METHOD	EPIWIN v3.12
Remarks	KOWWIN v1.67 used the smallest and a representative species of series and relates to the non-ionised species. The notified chemical is likely to exhibit properties intermediate to the two extremes, and further the anionic species will be more soluble.

**Adsorption/Desorption** log K<sub>oc</sub> 3.16 – 17.5

METHOD	EPIWIN v3.12
Remarks	PCKOCWIN used the smallest and a representative species of series and relates to the non-ionised species. The notified chemical is likely to exhibit properties intermediate to the two extremes, and further the anionic species will be more soluble.

**Dissociation Constant** Not determined.

Remarks	The notified chemical contains anionic functionality with multiple pKa values. The chemical is likely to display acidity typical of this functional group.
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**Particle Size** Not applicable.

**Flash Point** 47°C

Remarks	Data from MSDS.
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**Flammability Limits** Upper: 7.0%  
Lower: 1.5%

Remarks	Data from MSDS.
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**Autoignition Temperature** > 300°C (calculated)

Remarks	Data from MSDS.
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**Explosive Properties** Not expected to be explosive based on structure.

**Reactivity** Stable under normal environmental conditions.

## 7. TOXICOLOGICAL INVESTIGATIONS

<i>Endpoint and Result</i>	<i>Assessment Conclusion</i>
Rat, acute oral LD50 > 6000 mg/kg bw	low toxicity
Rabbit, skin irritation	non-irritating
Rabbit, eye irritation	slightly irritating

### 7.1. Acute toxicity – oral

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 401 Acute Oral Toxicity.
Species/Strain	Rat/Wistar
Vehicle	0.25% Tylose
Remarks - Method	None

#### RESULTS

<i>Group</i>	<i>Number and Sex of Animals</i>	<i>Dose mg/kg bw</i>	<i>Mortality</i>
1	3/sex	2000	0
2	“	4000	0
3	“	6000	0

LD50	> 6000 mg/kg bw
Signs of Toxicity	None
Effects in Organs	None
Remarks - Results	None

CONCLUSION The notified chemical is of low toxicity via the oral route.

TEST FACILITY Pharmatox (1995a)

### 7.2. Irritation – skin

TEST SUBSTANCE	Notified chemical
METHOD	OECD TG 404 Acute Dermal Irritation/Corrosion.
Species/Strain	Rabbit/New Zealand White
Number of Animals	3
Vehicle	None
Observation Period	7 days
Type of Dressing	Semi-occlusive.
Remarks - Method	None

#### RESULTS

<i>Lesion</i>	<i>Mean Score* Animal No.</i>			<i>Maximum Value</i>	<i>Maximum Duration of Any Effect</i>	<i>Maximum Value at End of Observation Period</i>
	1	2	3			
<i>Erythema/Eschar</i>	0	0	0	0		
<i>Oedema</i>	0	0	0	0		

\*Calculated on the basis of the scores at 24, 48, and 72 hours for EACH animal.

Remarks - Results None

CONCLUSION The notified chemical is non-irritating to the skin.

TEST FACILITY                      Pharmatox (1995b)

### 7.3. Irritation – eye

TEST SUBSTANCE                      Notified chemical

METHOD                      OECD TG 405 Acute Eye Irritation/Corrosion.  
Species/Strain                      Rabbit/New Zealand White  
Number of Animals                      3  
Observation Period                      7 days  
Remarks - Method                      None

#### RESULTS

<i>Lesion</i>	<i>Mean Score*</i>			<i>Maximum Value</i>	<i>Maximum Duration of Any Effect</i>	<i>Maximum Value at End of Observation Period</i>
	1	2	3			
<i>Conjunctiva: redness</i>	0	0	0	1	8 hours	0
<i>Conjunctiva: chemosis</i>	0	0	0	0		0
<i>Conjunctiva: discharge</i>	0	0	0	2	8 hours	0
<i>Corneal opacity</i>	0	0	0	0		0
<i>Iridial inflammation</i>	0	0	0	0		0

\*Calculated on the basis of the scores at 24, 48, and 72 hours for EACH animal.

Remarks - Results                      None

CONCLUSION                      The notified chemical is slightly irritating to the eye.

TEST FACILITY                      Pharmatox (1995c)

## 8. ENVIRONMENT

### 8.1. Environmental fate

#### 8.1.1. Ready biodegradability

TEST SUBSTANCE	The smallest and largest and representative species of a series differing in carbon chain length.
METHOD	ECOSAR v0.99h
CONCLUSION	All were estimated as not readily biodegradable.

#### 8.1.2. Bioaccumulation

TEST SUBSTANCE	The smallest and largest and representative species of a series differing in carbon chain length.
METHOD	EPIWIN 3.12 (BCFWIN v2.15)
RESULTS	
Bioconcentration Factor	3.162 – 862.5
Remarks - Results	log Pow 0.52 – 6.67 used (estimated)
CONCLUSION	The smallest and largest and representative species of a series differing in carbon chain length have a low potential to bioaccumulate. The representative species in its neutral form has a moderate potential to bioaccumulate. The anionic species will be less likely to bioaccumulate.

### 8.2. Ecotoxicological investigations

No ecotoxicity data were submitted but EPIWIN estimates were used. The highest toxicity was estimated for the water available fraction (WAF) for an intermediate carbon chain length molecule for *Daphnia* at 0.047 mg/L. The lowest estimate was for the most hydrophilic species for *Daphnia* with a value of 4770 mg/L.

Anionic polymers are known to be moderately toxic to algae. The mode of toxic action is overchelation of nutrient elements needed by algae for growth. The highest toxicity is when the acid is on alternating carbons of a polymer backbone. This is unlikely to apply to the notified polymer. The toxicity to algae is likely to be further reduced due to the presence of calcium ions, which will bind to the functional groups (Nabholz *et al.* 1993).

## **9. RISK ASSESSMENT**

### **9.1. Environment**

#### **9.1.1. Environment – exposure assessment**

The notified polymer is used as a paint and resin additive. Minimal release is expected during reformulation of the chemical into the paint or resin formulations. Waste from overspray during use of the notified chemical is expected to be collected by filtration and settling or on newspaper. All of the waste from spills, residues and overspray is eventually expected to be disposed to landfill. If the chemical is used in resins for printed circuit board manufacture then any waste will be disposed to landfill.

The coated articles at the end of their useful life will be disposed to landfill or recycled. For metal articles the polymer will be destroyed in furnaces to form water vapour, oxides of carbon, with the oxides of phosphorus and magnesium reporting to the slag. In landfill the polymer is likely to eventually undergo in-situ degradation by biotic and abiotic process.

A small quantity (~ 6 kg) will be released to the aquatic environment throughout Australia via the sewer from DIY applications. A predicted environmental concentration, assuming 200 L per day per person with 20.5 million persons may be calculated as 0.004 µg/L for fresh water release.

#### **9.1.2. Environment – effects assessment**

The notified polymer is not likely to readily biodegrade but the representative species may have potential to bioaccumulate. The EPIWIN estimates of toxicity indicate that a Predicted No Effect Concentration (PNEC) may be calculated as 0.047 µg/L using 0.047 mg/L and a safety factor of 1000. This is of course a rough estimate as no data for actual tests are available.

#### **9.1.3. Environment – risk characterisation**

Although the PNEC is not based on actual data and is therefore only an approximation, a worst case Risk Quotient (RQ) may be estimated. Using the PEC of 0.004 µg/L and the PNEC of 0.047 µg/L an estimated RQ of 0.1 is calculated. Based on this release pattern the chemical does not pose an unacceptable risk to the environment.

### **9.2. Human health**

#### **9.2.1. Occupational health and safety – exposure assessment**

Whether reformulated into paint or into a resin solution the exposure scenarios are similar and typical of these processes. The main likelihood of exposure is from drips and spills of the imported polymer solution as it is transferred to mixing vessels. This is typically a low exposure situation as work practices during these operations are generally well controlled with the use of drum spears and well designed pumps and couplings. In addition, workers typically wear impervious gloves, coveralls and goggles if necessary to control any accidental spillage. Once the notified polymer is reformulated it is at a low concentration which means that subsequent operations are low exposure by virtue of this fact alone.

Application of paint by spraying can lead to inhalation exposure and spray booths are used for the majority of operations. Where this is not possible exposure would need to be controlled by the use of a mask or respirator depending on components in the paint other than the notified polymer, particularly if spraying occurs in a confined space. With application by brush and roller generally the intention is to apply the majority of the paint to a surface to be coated. Minor drips and spills may find their way onto the skin and may be there for some time.

For prepreg manufacture, after formulation of the resin solution, exposure to the notified polymer is low and the process is largely automated. Some drips and spills and possible exposure is controlled by the use of appropriate PPE. The same considerations apply for circuit board manufacture.

#### **9.2.2. Public health – exposure assessment**

The public is unlikely to be exposed to the notified polymer in the imported solution except in the event of a transport accident involving rupture of import containers.

The public may be exposed to the polymer in paint at a low concentration with dermal exposure likely as gloves most probably will not be employed. Exposure could be expected to be prolonged.

#### **9.2.3. Human health – effects assessment**

The notified chemical was shown to be of low acute oral toxicity in rats, was not a skin irritant in rabbits and was a slight eye irritant in rabbits. Given that the polymer is > 1000 molecular weight with a moderate amount of species < 1000 NAMW, and considering the structure, it can be predicted that it would be of low acute dermal toxicity, not sensitising or genotoxic and should not exhibit toxicity after repeated dosage.

Based on the available data, the notified chemical is **not classified** as a hazardous substance in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC 2004).

#### **9.2.4. Occupational health and safety – risk characterisation**

Given the benign toxicological profile of the notified polymer and the likely low concentrations to which workers are exposed, there should be a low risk of adverse health effects from any of the scenarios described.

#### **9.2.5. Public health – risk characterisation**

Given the benign toxicological profile of the notified polymer and the likely low concentrations to which the public are exposed, there should be a low risk of adverse health effects from any of the scenarios described.

### **10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS**

#### **10.1. Hazard classification**

Based on the available data the notified chemical is not classified as hazardous under the NOHSC *Approved Criteria for Classifying Hazardous Substances*.

#### **10.2. Environmental risk assessment**

On the basis of the release pattern:

The chemical is not considered to pose a risk to the environment based on its reported use pattern.

#### **10.3. Human health risk assessment**

##### **10.3.1. Occupational health and safety**

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

##### **10.3.2. Public health**

There is Low Concern to public health when used as described.

### **11. MATERIAL SAFETY DATA SHEET**

#### **11.1. Material Safety Data Sheet**

The MSDS of Disperbyk-103 provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC 2003). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

### 11.2. Label

The label for Disperbyk-103 provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994). The accuracy of the information on the label remains the responsibility of the applicant.

## 12. RECOMMENDATIONS

### CONTROL MEASURES

#### Occupational Health and Safety

- A copy of the MSDS should be easily accessible to employees.
- If products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

#### Environment

#### Disposal

- The notified chemical should be disposed of by authorised landfill.

#### Emergency procedures

- Spills or accidental release of the notified chemical should be handled by physical containment, followed by absorbing onto inert material such as vermiculite sand etc. Collect using no sparking equipment and place into suitable labelled containers for disposal.

### 12.1. Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(2) of the Act:

- if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

No additional secondary notification conditions are stipulated.

## 13. BIBLIOGRAPHY

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