File No: NA/880

December 2000

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

CIN 10076964

This Assessment has been compiled in accordance with the provisions of the *Industrial Chemicals (Notification and Assessment) Act* 1989 (the Act) and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by the National Occupational Health and Safety Commission which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment and the assessment of public health is conducted by the Department of Health and Aged Care.

For the purposes of subsection 78(1) of the Act, copies of this full public report may be inspected by the public at the Library, National Occupational Health and Safety Commission, 92-94 Parramatta Road, Camperdown NSW 2050, between the following hours:

Monday - Wednesday	8.30 am - 5.00 pm
Thursday	8.30 am - 8.00 pm
Friday	8.30 am - 5.00 pm

Copies of this full public report may also be requested, free of charge, by contacting the Administration Coordinator on the fax number below.

For enquiries please contact the Administration Coordinator at:

Street Address: 92 -94 Parramatta Rd CAMPERDOWN NSW 2050, AUSTRALIA
Postal Address: GPO Box 58, SYDNEY NSW 2001, AUSTRALIA
Telephone: (61) (02) 9577 9514 FAX (61) (02) 9577 9465

Director
Chemicals Notification and Assessment

TABLE OF CONTENTS

FULL PUBLIC REPORT

CIN 10076964

1. APPLICANT

Kodak (Australiasia) Pty Ltd of 173 Elizabeth Street COBURG VIC 3058 (ABN 49 004 057 621) has submitted a standard notification statement in support of their application for an assessment certificate for CIN 10076964**.** The notified chemical has presently been used in Australia, under CEC permit No 433 (CEC/471) dated 16 June 2000.

2. IDENTITY OF THE CHEMICAL

The chemical name, other name, CAS number, molecular and structural formulae, molecular weight, spectral data, exact use and release have been exempted from publication in the Full Public Report and the Summary Report.

Marketing Name: CIN 10076964

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C & 101.3 kPa: Off-white solid

Melting Point: 64-69°C

Boiling Point: 328°C

Relative Density: 1 126.2 kg/m^3.

Vapour Pressure: <1.3x10^{-7} kPa at 25°C

Water Solubility: 0.002 mg/L at 25°C

Partition Co-efficient (n-octanol/water): log K_{ow} = 6.7 (see comments below).

Hydrolysis as a Function of pH: Not determined.

Adsorption/Desorption: Not determined.

Dissociation Constant: Not determined.

Particle Size: 1.492 mm

Flash Point:	Not determined.
Flammability Limits:	Not highly flammable.
Autoignition Temperature:	471°C
Explosive Properties:	Not explosive under the influence of a flame, shock or a friction.
Reactivity/Stability:	Not oxidizing.

3.1 Comments on Physico-Chemical Properties

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

Porter (2000a) used OECD Guideline 105, column elution method, to determine the water solubility of the notified chemical via column elution and a high performance liquid chromatography analysis. The test was run in duplicate. The water solubility of the chemical was 0.002 mg/L, thus classifying the chemical as very slightly soluble.

Isaacs (2000) attempted to use OECD Guideline 111 to determine the hydrolysis as a function of pH. In a preliminary test, aliqouts of three buffer solutions (pH 4, 0.01 M sodium acetate, pH 7, 0.02 M phosphate and pH 9, 0.025 M sodium borate) containing the test chemical were analysed by HPLC/UV at 0, 2.4, 24 and 120 hours. By 120 hours the concentration of the chemical had decreased by more than 10% and white particles were observed in the solutions. The solutions were centrifuged and the resultant precipitate analysed via HPLC/UV. The precipitate contained the chemical. It was therefore concluded that the chemical could not be maintained in solution and that the hydrolysis test could not be done. In theory the sulphonamide may hydrolyse, but this is unlikely due to the chemical's very slight solubility.

The partition coefficient was determined by Porter (2000b) via the OECD Guideline 117, based on a reverse-phase HPLC separation method. Stock solutions of the chemical and the standards biphenyl, 2,6-diphenylpyridine and 1,1-bis(4-chlorophenyl)-2,2,2-trichlorethane were prepared using methanol (MeOH) with 0.5% acetone. A fourth standard was prepared using p-quaterphenyl in tetrahydrofuran (THF) with 0.5% acetone. Working solutions of each were prepared at 50-400 mg/L. The standards, with their known log K_{ow} values, produced a predictable plot pattern. From this it was determined that the log K_{ow} of the chemical was 6.7.

North and Wieszczyk (2000) attempted to use OECD Guideline 106 to determine the adsorption/desorption of the chemical, however it was found that due to the chemical's very slight solubility it was not possible. Due to the high partition coefficient it is likely that the chemical will adhere to soil/sediments.

Wieszczyk (2000) attempted to determine the pKa dissociation of the chemical using OECD Guideline 112. The chemical was soluble in 5 organic solvents, MeOH, acetone, acetonitrile (ACN), THF and dimethylsulfoxide (DMSO), and insoluble in 2-propanol (IPA). When a neutral matrix was formed by the addition of water, the chemical precipitated. Two series of test samples in organic co-solvent matrix of 5% MeOH, 5% ACN, 5% acetone, 5% IPA, 5% THF or 5% DMSO and water were set-up. To one series sodium hydroxide was added to

form a basic matrix, and to the other hydrochloric acid was added to form an acidic matrix. The chemical precipitated in all solutions, indicating that the test could not be conducted. It is noted the substance contains neither acidic protons nor basic nitrogens.

4. PURITY OF THE CHEMICAL

Degree of Purity: 99.9%

Hazardous Impurities:

Chemical name:	p-Toluidine
Synonyms:	Benzenamine, 4-methyl-
CAS No.:	106-49-0
Weight percentage:	<0.1
Toxic properties:	Toxic by inhalation, in contact with skin and if swallowed; danger of cumulative effects; very toxic to aquatic organisms (NOHSC, 1999a). Exposure standard: TWA, 2 ppm or 8.8 mg/m^3; carcinogen category 2 with "Sk" notation (NOHSC, 1995).

Non-hazardous Impurities (> 1% by weight): None.

Additives/Adjuvants: None.

5. USE, VOLUME AND FORMULATION

The notified chemical will be used in the manufacture of photographic film and paper.

The notified chemical is not manufactured in Australia. It will be imported as a pure chemical at 2.5 tonnes in the first year and rising to 23 tonnes per annum thereafter.

The notified chemical is an off-white solid and packed in 8.36 kg lots in plastic bags inside cardboard cartons.

6. OCCUPATIONAL EXPOSURE

Transport and Storage
Transport and storage workers are not likely to be exposed to the notified chemical except in the case of an accident involving damage to the packaging.

Mixing
The appropriate amount of the notified chemical, in solid form, will be weighed and added to mix tanks with other substances to form gelatin dispersions (<10 % notified chemical) in multi-batch runs. Weighing and addition to the mix tanks will be performed manually.

Dermal contact would be the main route of exposure for workers at the mix tank site. However, inhalation and eye exposure to the solid form of the notified chemical may also occur because weighing and adding to the mix tank is an open process.

The notifier indicates that 12 operators will be involved in producing the gelatin dispersions. The addition of the notified chemical will take approximately 3 minutes per batch, 7 times per day, and 1 090 times per year.

Weighing of the notified chemical and addition to the mix tank will be conducted under air extractors with filters and mechanical ventilation. Workers handling the dry powder are to wear company provided overalls, safety glasses, disposable vinyl gloves, and a positive air hood with particle filter.

Melting
The gelatin dispersion will be stored in a cold room up to several weeks prior to use. At the melt tank site, the gelatin dispersion will be transferred mechanically into a melt tank, and mixed with other ingredients. The final concentration the notified chemical in the dilution will be <5%. A sample of the melt will be taken for laboratory testing. The melt dispersion will be pumped to automated processing equipment, where the notified chemical will be incorporated into photographic films and paper.

The occupational exposure would predominantly be by dermal contact during the addition of gelatin dispersion into the melt tanks. Intermittent dermal exposure to the notified chemical is also possible during cleaning of automated processing equipment. The notifier indicates that 16 operators and 4 laboratory technicians will be involved in handling the gelatin dispersions. Workers are to wear overalls, safety glasses and disposable vinyl gloves during this process.

End users
The notifier indicates that the notified chemical will be under overcoat layers in the finished articles, and no exposure of end users such as photographers and minilab operators is likely.

7. PUBLIC EXPOSURE

Photographic film and paper containing the notified chemical will be sold to the public; consequently, there will be widespread availability in the public domain. Once incorporated onto photographic film or paper, the gelatine dispersion containing the notified chemical will reside beneath several overcoat layers, which limits the possibility of dermal contact. Consequently, the potential for public exposure to the notified chemical during all phases of its life cycle is considered to be low.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

Some chemical is likely to be left in the import bags after they have been emptied, however this is likely to be less than 10 kg per year. Production equipment will operate under air

extraction and it is estimated that filters will collect less than 15 kg per year. It is likely that less than 25 kg of notified chemical will be disposed of as reject product. The residues, filter material and any reject product will be disposed to landfill. Less than 250 kg/year of notified chemical may result from the cleaning of production equipment. This material would be released to the Melbourne sewerage system, and discharged to the sea after treatment at the Werribee sewage treatment plant. However, the notifier has indicated that the process liquors will go for silver recovery, where it is likely that the notified chemical will become incorporated in the resultant filter cake. Both filter cake and rejected finished articles coated with the melt containing the notified chemical will be sent to the USA, for smelting to recover the silver. In this process the notified chemical will be destroyed.

Most of the chemical is expected to be retained in the photographic emulsion, and would consequently be dispersed widely through use throughout Australia. Disposal of old photographs and negatives is likely to be through deposition into landfill where very slow release could be expected as the old photographs and the emulsion become degraded. Some old photographs and negatives may be incinerated, which would destroy the chemical, producing water vapour and oxides of nitrogen and sulphur and hydrogen chloride.

8.2 Fate

Foley (2000a) attempted the determination of the Biochemical Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) of the chemical. The BOD could not be determined due to the insolubility of the chemical in the aqueous matrix. The COD was measured in compliance with OECD Principles of Good Laboratory Practice, [C(97) 186(Final)], Annex 2, Method C.6, and found to be 2.48 g COD/g test substance.

Beglinger (2000a) determined the biodegradation potential of the chemical using EEC Directive 92/69, Part C.4-C (Modified Sturm Test), and OECD Test Guideline 301B. The substance was added directly to test carboys due to very slight solubility. The test sample used had a 20 mg DOC/L. Over the 28 days, biodegradation reached 5% and -3% in the two replicates, indicating the substance is not readily biodegradable under the conditions of the test. The control solution containing sodium benzoate reached 69% biodegradation over the 28 day test.

The very slight water solubility and high n-octanol/water partition coefficient indicate that once released to the water compartment, the notified chemical would very likely become strongly associated with aquatic sediments. While the notified chemical is not biodegradable under aerobic conditions, once adsorbed into aquatic sediments it may be slowly degraded through biological and abiotic processes operative in anaerobic environments. The degradation products are likely to be water, methane and oxides of carbon. Any material disposed of into landfill (eg residues in empty bags) is also expected to become associated with the organic component of soils, and may also be slowly degraded over time. However, in the absence of additional test data on biodegradation rates under both aerobic and anaerobic conditions, the assessment concludes that the notified chemical is likely to persist in the environment. This may have implications for bioaccumulation potential (see further below).

Discarded photographs and film negatives placed in landfill are likely to degrade and slowly release the notified chemical. It would associate with the organic component of the soil, and slowly degraded. Some discarded photographs and negatives may be incinerated, resulting in

complete destruction of the notified chemical with formation of oxides of nitrogen and sulphur and hydrogen chloride.

Considering the molecular weight, very slight water solubility, high n-octanol/water partition coefficient and the fact it is not readily biodegradable, the notified chemical may have a high potential for bioaccumulation (Connell, 1990). However, the majority of the chemical released to sewer will largely be confined to the Melbourne sewer system, including Werribee Treatment Farm, and very little will be released to natural waters, mitigating this potential.

9. EVALUATION OF TOXICOLOGICAL DATA

Toxicological tests were performed according to OECD test guidelines at facilities complying with OECD Principles of Good Laboratory Practice.

9.1 Acute Toxicity

Summary of the acute toxicity of CIN 10076964

Test	*Species*	*Outcome*	*Reference*
acute oral toxicity	rat	LD_{50}> 2 000 mg/kg	Jessup, 2000a
acute dermal toxicity	rat	LD_{50}> 2 000 mg/kg	Shepard, 2000a
skin irritation	rabbit	Non irritating	Mosher, 1999
eye irritation	rabbit	Non irritating	Shepard, 2000b
skin sensitisation	guinea pig	Non sensitising	Jessup, 2000b

9.1.1 Oral Toxicity (Jessup, 2000a)

Species/strain:	Rats/Sprague-Dawley
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	A single oral dose of 2 000 mg/kg (20%, in 0.5% carboxymethyl cellulose) was given by gavage.
Test method:	OECD TG 401
Mortality:	None.
Clinical observations:	None.
Morphological findings:	No treatment related changes were observed at necropsy. Microscopic investigation was not conducted in the study.

Comment:	None.
LD_{50}:	> 2 000 mg/kg.
Result:	The notified chemical was of very low acute oral toxicity in rats.

9.1.2 Dermal Toxicity (Shepard, 2000a)

Species/strain:	Rats/Sprague-Dawley
Number/sex of animals:	5/sex
Observation period:	14 days
Method of administration:	A single dermal dose of 2 000 mg/kg (moistened with water) was applied under an occlusive dressing for 24 hours.
Test method:	OECD TG 402
Mortality:	None.
Clinical observations:	None.
Morphological findings:	No treatment related changes were observed at necropsy. Microscopic investigation was not conducted in the study.
Comment:	None.
LD_{50}:	> 2 000 mg/kg
Result:	The notified chemical was of low dermal toxicity in rats.

9.1.3 Inhalation Toxicity

No report on inhalation toxicity study was provided.

9.1.4 Skin Irritation (Mosher, 1999)

Species/strain:	Rabbits/New Zealand White
Number/sex of animals:	3 (sex not provided).
Observation period:	72 hours
Method of administration:	A single dermal dose of 0.5 g notified chemical (moistened with water) was applied under an occlusive dressing for 4

hours.

Test method: OECD TG 404

Draize scores: Draize scores for erythema and oedema were zero during the 72 hours in the 3 animals.

Comment: None.

Result: The notified chemical was not irritating to the skin of rabbits.

9.1.5 Eye Irritation (Shepard, 2000b)

Species/strain: Rabbits/New Zealand White

Number/sex of animals: Non irrigated group: 3;
Irrigated group: 3.

Observation period: 72 hours.

Method of administration: A single dose (0.1 g notified chemical) was placed into the conjunctival sac of the right eye of each animal. The treated eyes of 3 animals were immediately washed with running distilled water, and the eyes of the other 3 animals were not irrigated. The untreated eye served as a control.

Test method: OECD TG 405

Draize scores of unirrigated eyes:

		Time after instillation			
Animal	***Irrigated***	***1 hour***	***24 hours***	***48 hours***	***72 hours***
Corneal opacity					
1	No	0	0	0	0
2	No	0	0	0	0
3	No	0	0	0	0
4	Yes	0	0	0	0
5	Yes	0	0	0	0
6	Yes	0	0	0	0
Iris					
1	No	0	0	0	0
2	No	0	0	0	0
3	No	0	0	0	0

4	Yes	0		0		0		0	
5	Yes	0		0		0		0	
6	Yes	0		0		0		0	
Conjunctiva		***r***	***c***	***r***	***c***	***r***	***c***	***r***	***c***
1	No	0	0	0	0	0	0	0	0
2	No	1*	0	0	0	0	0	0	0
3	No	1*	0	1	0	0	0	0	0
4	Yes	1	0	1	0	0	0	0	0
5	Yes	0	0	0	0	0	0	0	0
6	Yes	1	0	0	0	0	0	0	0

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

Comment: Corneal and adnexal staining were not evident for unwashed or washed eyes when fluorescein dye was applied to the eyes at the 24-hour examination.

Result: The notified chemical was not irritating to the eyes of rabbits.

9.1.6 Skin Sensitisation (Jessup, 2000b)

Species/strain: Guinea pigs/Crl:(HA)BR

Number of animals: Control group: 10;
Test group: 20.

Induction procedure:

test group: Intradermal Induction:

day 0 Three pairs of intradermal injections (0.1 mL) across the shoulder region of the animals:
- Freund's complete adjuvant (FCA) 1:1 in water;
- 5% notified chemical in corn oil;
- 5% notified chemical in a 1:1 mixture of FCA and water.

day 6 Local irritation
Animals received a dermal dose (0.5 mL) of 10% sodium lauryl sulfate in petrolatum at the induction sites.

day 7 Topical Induction:
A 48-hour occluded application of 100% notified chemical (1 g, moistened with water) to the test area.

control group: Treated similarly to the test animals using corn oil in the

intradermal injections and water in the topical application instead of the notified chemical.

Challenge procedure:

day 21 — Test and Control animals:
Occluded applications of a patch of 100% notified chemical (0.5 g) on the upper left flank and water on right flank of each animal for 24 hours.

Test method: OECD TG 406

Challenge outcome:

	Test animals		***Control animals***	
Challenge concentration	***24 hours****	***48 hours****	***24 hours***	***48 hours***
100%	**0/20	0/20	0/20	0/20
water	0/20	0/20	0/20	0/20

* time after patch removal
** number of animals exhibiting positive response (discrete or patchy oedema)

Comment: No positive control was included in the study.

Result: The notified chemical was not sensitising to the skin of guinea pigs.

9.2 Repeated Dose Toxicity (Jessup, 2000c)

Species/strain: Rats/Sprague-Dawley

Number/sex of animals: 5/sex/group.

Method of administration: Oral by gavage.

Dose/Study duration: Control group: 0 mg/kg/day,
Low dose: 100 mg/kg/day,
Mid dose: 300 mg/kg/day,
High dose: 1 000 mg/kg/day,
(vehicle: corn oil).

Animals were treated for 28 consecutive days.

Test method: OECD TG 407

Clinical observations:
One male in the control group died on Day 24. No other mortality occurred during the study.

One high dose female had eschar formation on the head on days 17-20 and 29. Another high dose female had a mass on the neck from day 24 through day 29.

The mean forelimb and hindlimb grip strength values in high dose females was lower on day 28. The females in the low dose group on day 21 had higher mean score for induced tremor severity and lower feed consumption.

There were no significant differences in body weight gain or motor activity determination in both sexes in all the test groups.

Clinical chemistry/Haematology
There were no significant differences in hematology or clinical chemistry assays in both sexes in all the test groups.

Pathology:
There were no significant differences in organ weights or terminal body weights in both sexes in all the test groups.

Some gross and histopathological findings in the test groups were considered to be attributed by gavage error, trauma resulting from animal restraint, or agonal effects occurring shortly prior to death, rather than treatment related.

Comment:
The control male that died prior to study termination had adhesions in the pleural cavity and a thickened diaphragm, as well as physical evidence of deposition of vehicle into the pleural cavity.

Two statistically significant differences were noted in the functional observational battery, but these findings were not considered to be of biological significance. The higher mean score for induced tremor severity in low dose females had no dose response relationship. The lower mean forelimb and hindlimb grip strength values in the high dose females were not accompanied by other neurobehavioral changes.

Result:
A no-observed-effect level (NOEL) of ≥ 1 000 mg/kg/day was established from the study (the highest dose tested).

9.3 Genotoxicity

9.3.1 *Salmonella typhimurium* and *Escherichia coli* Reverse Mutation Assay (Lawlor, 2000)

Strains:	*Salmonella typhimurium*: TA98, TA100, TA1535 and TA1537; *Escherichia coli*: WP2*uvr*A (pKM101).
Metabolic activation:	S9-mix was prepared from the rats pretreated with Aroclor 1254.

Concentration range:	0, 10, 33.3, 100, 333, 1 000 ad 5 000 μg/plate with and without S9-mix (vehicle: DMSO). Positive controls: When without S9-mix 2-nitrofluorene for TA98, sodium azide for TA100, TA1535, ICR-191 for TA1537, and 4-nitroquinoline-N-oxide for WP2*uvr*A. When with S9-mix 2-aminoanthracene for all strains.
Test method:	OECD TG 471
Comment:	In the range finding study, the notified chemical remained dissolved in all preparations. In the main study, slight precipitate was observed from 333 μg/plate for both strains in the presence and absence of S9-mix, thus the lawns at 3 330 and 5 000 μg/plate were not evaluated due to precipitation. Cytotoxicity was observed at 100 and 333 μg/plate without and with S9-mix, respectively in TA100. In WP2*uvr*A, cytotoxicity was not observed up to 5 000 μg/plate in the presence of S9-mix, but was noticed at 333 μg/plate in the absence of S9-mix. All positive and negative controls responded appropriately.
Result:	The notified chemical was non mutagenic under the conditions of the test.

9.3.2 Chromosomal Aberration Assay in Chinese Hamster Ovary Cells (Murli, 2000)

Cells:	Chinese hamster ovary (CHO) cells.
Metabolic activation system:	S9-mix was prepared from the rats pretreated with Aroclor 1254.
Dosing schedule:	Vehicle: DMSO

Metabolic Activation	• Study Number	Test concentration (μg/mL)	Controls
-S9	IA	treatment time = 3 hours (20 hours harvest) 0, 5.73, 8.19*, 11.7*, 16.7* and 23.9* μg/mL	Positive: MMC
	II	treatment time = 17.8 hours (20.3 hours harvest) 0, 1.25, 2.5*, 5*, 10*, 15*, 20 and 25 μg/mL	Negative: vehicle
+S9	IA	treatment time = 3 hours (20 hours harvest) 0, 8.19, 11.7*, 16.7*, 23.9* and 34.2* μg/mL	Positive: CP
	II	treatment time = 3 hours (20 hours harvest) 0, 5, 10*, 15, 20*, 25*, 30* and 35 μg/mL	Negative: vehicle

MMC - mitomycin C
CP - cyclophosphamide
DMSO – dimethylsulphoxide
* - cultures selected for metaphase analysis

Test method: OECD TG 473

Comment: No significant increase in cells with chromosomal aberrations, polyploidy, or endore-duplication was observed in the cultures analyzed in both the initial and confirmatory assays.

The results of positive controls were not reported.

Result: The notified chemical was non clastogenic under the conditions of the test.

9.3.3 Micronucleus Assay in the Bone Marrow Cells of the Mouse

No report of *in vivo* micronucleus assay was provided.

9.4 Overall Assessment of Toxicological Data

The notified chemical was of very low acute oral toxicity (LD_{50}>2 000 mg/kg) and low acute dermal toxicity (LD_{50}>2 000 mg/kg) in rats. It was not an eye or skin irritant in rabbits, nor a

skin sensitiser in guinea pigs. The notifier provided a report of using an Irritection Assay System to assess the potential ocular irritancy *in vitro* for the notified chemical. The results suggested that the notified chemical may have the potential to produce, at most, minimal eye irritation (Emmons, 2000), which was in consistent with the *in vivo* test results.

In a repeat dose oral toxicity study in rats, a NOEL was established as ≥ 1 000 mg/kg/day, the highest dose tested. In genotoxicity studies, the notified chemical was not mutagenic in bacteria, nor did it induce an increased incidence of chromosomal aberrations in Chinese hamster ovary cells *in vitro*. No report of an *in vivo* micronulcleus assay was provided.

Based on the available toxicological data, the notified chemical CIN 10076964 is not classified as a hazardous substance according to the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b).

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The following ecotoxicity studies have been supplied by the notifier. The tests were carried out according to OECD Test Methods.

Species	Test	Nominal Concentrations (mg/L)	Result (mg/L)	Reference
Fathead Minnow *(Pimephales promelas)*	96 h acute semi-static (OECD TG 203)	0.1	LC_{50} > 0.022 (est.) NOEC = 0.022	Moulton, 2000a
Water Flea (*Daphnia magna*)	48 h acute (OECD TG 202)	0.00625, 0.0125, 0.025, 0.05 and 0.1	EC_{50} = 0.008 (est.) NOEC = 0.002	Moulton, 2000b
Water Flea (*Daphnia magna*)	Full life cycle toxicity test, 21 day	1.9, 3.8, 7.5, 15 and 30 µg a.i./L	EC_{50} > 16 µg a.i./L LOEC = 8.3 µg a.i./L NOEC = 4.3 µg a.i./L	Cafarella, 2000
Algae (*Selenastrum capricornutum*)	72 h growth (OECD TG 201)	0.1	E_RC_{50} > 0.0055 E_BC_{50} > 0.0055 NOEC = 0.0055	Moulton, 2000c
Activated sludge microorganisms	Respiration inhibition test (OECD TG 209)	25, 50, 100, 500 and 1000	EC_{50} > 1000 NOEC = 1000	Beglinger, 2000b

Moulton (2000) used OECD Guideline 203 to determine the toxic effects of the notified chemical on fish using fathead minnow. The study was a semi-static limit test, with the solutions replaced at 48 hours and a photoperiod of 16 hours light and 8 hours dark being maintained. Each test vessel contained 20 L of solution with a nominal concentration of 0.1 mg/L notified chemical. The water solubility of the chemical had been determined to be

0.002 mg/L, so at the nominal concentration the chemical may have been present as a suspension. To determine the actual chemical concentration, samples of the test solution were analysed using HPLC/UV and it was concluded that the chemical concentration was 0.022 mg/L. At the beginning of the study the test solutions appeared clear and colourless with a few particulates at the surface, however at the end of the test, one of the vessels had a thin film on the surface of the solution. The test solution was allowed to settle for 1 hour before 10 fish were added to the vessel. The general health of these animals monitored for 96 hours. The study was conducted in duplicate, with duplicate controls for the carrier solvent N,N-dimethylformamide and dilution water. In the vessels with the notified chemical the temperature was maintained at 20-23ºC, pH was between 8.0 to 8.3, while dissolved oxygen started at 8.3 and dropped to 7.5 mg/L. Similar variations were observed in the controls.

No mortality or abnormal behaviour was observed in any of the test vessels or in the controls. It was concluded that the NOEC was 0.022 mg/L. Moulton (2000) estimated that the LC_{50} is greater than this.

An acute toxicity test of the new chemical to *Daphnia magna* was conducted by Moulton (2000b) following the OECD Guideline 202, using a static methodology. The nominal test concentrations used were 0.00625, 0.0125, 0.025, 0.05 and 0.1 mg/L. To determine the actual chemical concentration, samples of the test solution were analysed using HPLC/UV and it was concluded that the actual chemical concentrations were 0.0005, 0.002, 0.007, 0.011 and 0.016 mg/L. Ten daphnia were added to each test glass beaker and it was covered with a clear watch glass. Throughout the study a photoperiod of 16 hours light/8 hours dark was maintained, with general behaviour observations made at 0, 24 and 48 hours. The test solutions were clear and colourless with no particles/film present throughout the study. The study was conducted in duplicate, with duplicate controls for the carrier solvent N,N-dimethylformamide and dilution water. Temperature was maintained at 21-23ºC, pH was 8.3 to 8.4 and dissolved oxygen levels were between 8.4 and 8.7 mg/L in the test vessels with the notified chemical. Similar variations were observed in the controls.

Mobility changes were observed in the nominal concentrations of 0.025 (0.007) and 0.05 (0.011) mg/L, with 100% immobility in the concentration 0.1 (0.016) mg/L. The SAS statistical software, EC-LC50.SAS (ver. 1) was used to calculate the EC_{50} value. It was estimated to be 0.008 mg/L.

Cafarella (2000) used OECD Guideline 211 to determine the full life cycle toxicity of the chemical on daphnia. The test conditions were temperature maintained at 19-20ºC, photoperiod of 16 light/8 hours dark and flow-through set-up. The test ran for 21 days during which observations were made on behaviour/mobility, survival, number of offspring and reproduction. It was found that the four lowest concentrations did not have any impact of the growth, condition, offspring or reproduction levels of the daphnia. The dry weight of the daphnia at the end of the study at a concentration of 8.3 µg a.i./L indicated that the chemical had had an impact. Therefore the LOEC was determined to be 8.3 µg a.i./L, while the EC_{50} was greater than 16 µg a.i./L.

Moulton (2000c) determined the toxicity of the chemical to algae via OECD Guideline 201. The nominal concentration of the notified chemical was 0.1 mg/L. Each test vessel was inoculated with algae to give a cell count of 10^4 cells/mL. Throughout the study, the flasks were shaken at 100 rpm, the temperature was maintained at 24ºC with a 742.5 foot-candle illumination. At the beginning of the study the pH in the test vessels was about 7.4 (7.445-

7.487), while at the end it had slightly increased to 7.75 (7.586-7.753). No inhibition of growth rate or biomass was observed. The NOEC is 0.0055 mg/L, with the E_RC_{50} and E_BC_{50} being greater than this.

Beglinger (2000b) conducted a 3 hour test using activated sludge from a domestic waste water treatment plant to determine the impact of the chemical on activated sludge microorganisms. The sludge was exposed to five concentrations (25, 50, 100, 500 and 1000 mg/L) of the notified chemical. The respiration rate was measured following the 3 hour exposure period, and compared with that in a control vessel. None of the samples indicated any significant inhibition of bacterial respiration compared with the controls, and it was concluded that the notified chemical was not toxic to sewage bacteria up to a nominal concentration of 1000 mg/L. It should be noted that the chemical was present as particulates in the test vessels. The results showed a degree of variability, but OECD Guideline 209 does indicate that results may vary.

The ecotoxicity data from the acute toxicity studies indicates that the notified chemical may not be toxic up to the limits of its water solubility for fish and algae, and is highly toxic to daphnia. The chronic toxicity data indicates that the chemical is moderately toxic to daphnia over time.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notified chemical is not considered to pose a hazard to the environment when used as a component of photographic emulsions in the manner indicated in the submission.

If, as a worst case scenario, the industrial effluent is disposed of to sewer before treatment in the Silver Recovery Plant, approximately 230 kg (max) would be released into the Melbourne sewerage system each year.

Total influent to the Werribee sewage treatment plant	= 500,000,000 L/day
Number of days per year	= 365 days
Amount of notified chemical in sewer	= 230 kg
Predicted Environmental Concentration (PEC)	= 230 kg/(500 ML X 365 days)
	= 0.0013 µg/L

The calculated PEC value is more than 3 orders of magnitude below the expected acute and chronic toxic levels for daphnia. However, since the process effluent will undergo treatment in the Silver Recovery Plant prior to release to sewer, the amount of the notified chemical actually being released will be very much lower.

The chemical is not readily biodegradable or susceptible to chemical hydrolysis, and once released it may persist in the environment. Due to the very slight water solubility and high n-octanol/water partition coefficient, most of the chemical released to the sewer is expected to associate with the aquatic sediments. The notified chemical may persist in the environment so the concentration in sewer sediments may increase with time. However, most of the chemical released to the sewer system would be expected to stay in the sewer lines or adsorb to pasture/soil at the Werribee Treatment Farm.

Up to 50 kg/year of the notified chemical may be disposed to landfill as reject gelatin dispersion, empty bag residues and in air filters. Chemical released from these sources will become associated with the organic component of soils and sediments, and is not expected to be mobile.

Most of the chemical is expected to be retained in the photographic emulsions of film negatives and photographs, which are likely to be eventually discarded into landfill. Here the chemical is expected to be slowly released as the photographs degrade, and associate with the organic component of soils. Some discarded photographs may be incinerated which will completely destroy the compound with production of water vapour and oxides of nitrogen and sulphur and hydrogen chloride.

While the notified chemical does exhibit the potential to bioaccumulate, little will be released to natural water, therefore the potential environmental hazard is expected to be low when used as a component of photographic emulsions in the manner indicated in the submission.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

CIN 10076964 was of very low acute oral toxicity and low acute dermal toxicity. It was not an eye or skin irritant, nor a skin sensitiser in animal experiments. An *in vitro* study suggested that the notified chemical may have the potential to produce, at most, minimal eye irritation. In a repeat dose oral toxicity study in rats, a NOEL was established as ≥ 1 000 mg/kg/day, the highest dose tested. In genotoxicity studies, the notified chemical was not mutagenic in bacteria, nor did it induce an increased incidence of chromosomal aberrations in Chinese hamster ovary cells *in vitro*.

The notified chemical does not meet the criteria for classification as a hazardous substance according to the *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b) with the toxic end points provided.

- ***Occupational Health and Safety***

Occupational exposure to the notified chemical can be divided into exposure to the powdered solid, the gelatin dispersions, and the finished photographic film and paper. The particle size of CIN 10076964 is not in the inspirable or respirable range, and therefore the potential

hazard by inhalation is expected to be low. Workers will handle the solid for short periods during weighing and addition to the mix tanks where the gelatin dispersion is produced. Exposure may occur many times throughout the year. There is a risk of eye irritation on acute exposure to dust from the chemical.

The risk of adverse health effects will be further reduced by local exhaust ventilation during the processes which involve handling the solid. The wearing of overalls, protective gloves, glasses and respiratory protection while weighing and mixing the powdered solid will also be required.

The handling of the gelatin dispersions, containing less than 10 % notified chemical, has potential of dermal exposure, particularly during cleaning of equipment, although the hazard is expected to be low due to the low toxicity of the notified chemical. Standard procedures require the use of gloves, overalls and protective glasses. After incorporation in articles, the potential hazard should be negligible as the notified chemical will be beneath several layers.

Public Health

Photographic film and/or paper containing the notified chemical will be sold to the public; consequently, there will be widespread availability in the public domain. Once incorporated onto photographic film and paper, the gelatine dispersion containing the notified chemical will reside beneath several layers, which limits the possibility of dermal contact. The toxicity of the notified chemical is low. Consequently, the risk to the public from the use of the notified chemical in photographic film and paper is considered to be low.

13. RECOMMENDATIONS

To minimise occupational exposure to CIN 10076964 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 and AS 3765.2 (Standards Australia, 1990); impermeable gloves should conform to AS/NZS 2161.2 (Standards Australia/ Standards New Zealand, 1998); all occupational footwear should conform to AS/NZS 2210 (Standards Australia/ Standards New Zealand, 1994a); respirators should conform to AS/NZS 1715 (Standards Australia/ Standards New Zealand, 1994b) and AS/NZS 1716 (Standards Australia/ Standards New Zealand, 1994c);

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

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

If products containing the notified chemical are hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances* (NOHSC, 1999b), workplace practices and control procedures consistent with State and Territory hazardous substances regulations must be in operation.

14. MATERIAL SAFETY DATA SHEET

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

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the Act, the director must be informed if any of the circumstances stipulated under subsection 64(2) of the Act arise, and secondary notification of the notified chemical may be required. No other specific conditions are prescribed.

16. REFERENCES

Beglinger JM (2000a) Determination of Ready Biodegradability (Abiotic Degradation) using the CO_2 Evolution Test (Modified Sturm): Study number EN-105-732475-A: Environmental Sciences Section, Eastman Kodak Company, New York, USA.

Beglinger JM (2000b) Activated Sludge Respiration Inhibition Test: Study number EN-620-732475-A: Environmental Sciences Section, Eastman Kodak Company, New York, USA.

Cafarella MA (2000) ST206AL – Full Life Cycle Toxicity Test with Water Fleas, *Daphnia magna*, Under Flow-through Conditions: Springborn Study Number 1852.6164: Springborn Laboratories Inc, Massachusetts.

Connell DW (1990) Bioaccumulation of Xenobiotic Compounds: CRC Press.

Emmons RE (2000) Irritection assay, Laboratory Project ID 1999-0158, Eastman Kodak Company, USA.

Foley, MP (2000a) Biochemical Oxygen Demand (BOD): Report Number L11993-BOD: Environmental Analytical Services, Eastman Kodak Company, New York, USA.

Foley M. (2000b) Chemical Oxygen Demand (COD): Report Number L11993-COD: Environmental Analytical Services, Eastman Kodak Company, New York, USA.

Isaacs B (2000) Abiotic Degradation – Hydrolysis as a Function of pH: Report Number L11993-HYD: Environmental Analytical Services, Eastman Kodak Company, New York, USA.

Jessup SD (2000a) Acute oral toxicity study in the rat, Laboratory Project ID 99-0158A0, Eastman Kodak Company, USA.

Jessup SD (2000b) Skin sensitization study (GPMT) in the guinea pig, Laboratory Project ID 99-0158A3, Eastman Kodak Company, USA.

Jessup SD (2000c) Four-week oral toxicity study in rats, Laboratory Project ID 990158G2, Eastman Kodak Company, USA.

Lawlor TE (2000) Mutagenicity test in the *Salmonella-Escherichia coli*/mammalian-microsome reverse mutation assay with a confirmatory assay, Covance Study No. 21032-0-409R, Covance Laboratories Inc. USA.

Mosher JW (1999) Acute dermal irritation study in the rabbit, Laboratory Project ID 99-0158A2, Eastman Kodak Company, USA.

Moulton ME (2000a) An Acute Aquatic Effects Limit Test with the Fathead Minnow, *Pimephales promelas*: : Study number EN-401-732475-B: Environmental Sciences Section, Eastman Kodak Company, New York, USA.

Moulton ME (2000b) An Acute Aquatic Effects Test with the Daphnid, *Daphnia magna*: : Study number EN-403-732475-B: Environmental Sciences Section, Eastman Kodak Company, New York, USA.

Moulton ME (2000c) An Growth Inhibition Limit Test with the Alga, *Selenastrum capricornutum*: : Study number EN-512-732475-A: Environmental Sciences Section, Eastman Kodak Company, New York, USA.

Murli H (2000) Chromosomal aberration in Chinese hamster ovary (CHO) cells, Covance Study No. 21032-0-437OECD, Covance Laboratories Inc. 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 (1995) Adopted National Exposure Standards for Atmospheric Contaminants in the Occupational Environment, [NOHSC:1003(1995)]. In: Exposure Standards for Atmospheric Contaminants in the Occupational Environment: Guidance Note and National Exposure Standards. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999a) List of Designated Hazardous Substances [NOHSC:10005(1999)]. Australian Government Publishing Service, Canberra.

National Occupational Health and Safety Commission (1999b) Approved Criteria for Classifying Hazardous Substances [NOHSC:1008(1994)]. Australian Government Publishing Service, Canberra.

North E and Wieszczyk L (2000) Adsorption/desorption: : Report Number L11993-SAD: Environmental Analytical Services, Eastman Kodak Company, New York, USA.

Porter NK (2000a) Water Solubility – Column Elution: Report Number L11993-WS: Environmental Analytical Services, Eastman Kodak Company, New York, USA.

Porter NK (2000b) Partition Coefficient: Report Number L11993-KOW: Environmental Analytical Services, Eastman Kodak Company, New York, USA.

Shepard KP (2000a) Acute dermal toxicity study in the rat, Laboratory Project ID 99-0158A1, Eastman Kodak Company, USA.

Shepard KP (2000b) Acute eye irritation study in the rabbit, Laboratory Project ID 99-0158A6, Eastman Kodak Company, USA.

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

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

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

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

Standards Australia/Standards New Zealand (1994b) Australian/New Zealand Standard 1715-1994, Use and Maintenance of Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand.

Standards Australia/Standards New Zealand (1994c) Australian/New Zealand Standard 1716-1994, Respiratory Protective Devices. Standards Association of Australia/Standards Association of New Zealand.

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

Wieszczyk LJ (2000) pKa Determination: Report Number L11993-PKA: Environmental Analytical Services, Eastman Kodak Company, New York, USA.

Attachment 1

The Draize Scale (Draize, 1959) for evaluation of skin reactions is as follows:

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

The Draize scale (Draize *et al*., 1944) for evaluation of eye reactions is as follows:

CORNEA

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

CONJUNCTIVAE

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

IRIS

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

Draize, J. H., Woodward, G., Calvery, H. O. (1944) Methods for the Study of Irritation and Toxicity of Substances Applied Topically to the Skin and Mucous Membranes, J. Pharmacol. Exp. Ther. 82 : 377-390.

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