

SCREENING-LEVEL HAZARD CHARACTERIZATION

2-Methyl-1,3-propanediol (CASRN 2163-42-0)

The High Production Volume (HPV) Challenge Program¹ was conceived as a voluntary initiative aimed at developing and making publicly available screening-level health and environmental effects information on chemicals manufactured in or imported into the United States in quantities greater than one million pounds per year. In the Challenge Program, producers and importers of HPV chemicals voluntarily sponsored chemicals; sponsorship entailed the identification and initial assessment of the adequacy of existing toxicity data/information, conducting new testing if adequate data did not exist, and making both new and existing data and information available to the public. Each complete data submission contains data on 18 internationally agreed to “SIDS” (Screening Information Data Set^{1,2}) endpoints that are screening-level indicators of potential hazards (toxicity) for humans or the environment.

The Environmental Protection Agency’s Office of Pollution Prevention and Toxics (OPPT) is evaluating the data submitted in the HPV Challenge Program on approximately 1400 sponsored chemicals by developing hazard characterizations (HCs). These HCs consist of an evaluation of the quality and completeness of the data set provided in the Challenge Program submissions. They are not intended to be definitive statements regarding the possibility of unreasonable risk of injury to health or the environment.

The evaluation is performed according to established EPA guidance^{2,3} and is based primarily on hazard data provided by sponsors; however, in preparing the hazard characterization, EPA considered its own comments and public comments on the original submission as well as the sponsor’s responses to comments and revisions made to the submission. In order to determine whether any new hazard information was developed since the time of the HPV submission, a search of the following databases was made from one year prior to the date of the HPV Challenge submission to the present: (ChemID to locate available data sources including Medline/PubMed, Toxline, HSDB, IRIS, NTP, ATSDR, IARC, EXTOXNET, EPA SRS, etc.), STN/CAS online databases (Registry file for locators, ChemAbs for toxicology data, RTECS, Merck, etc.) and Science Direct. OPPT’s focus on these specific sources is based on their being of high quality, highly relevant to hazard characterization, and publicly available.

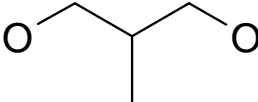
OPPT does not develop HCs for those HPV chemicals which have already been assessed internationally through the HPV program of the Organization for Economic Cooperation and Development (OECD) and for which Screening Initial Data Set (SIDS) Initial Assessment Reports (SIAR) and SIDS Initial Assessment Profiles (SIAP) are available. These documents are presented in an international forum that involves review and endorsement by governmental authorities around the world. OPPT is an active participant in these meetings and accepts these documents as reliable screening-level hazard assessments.

¹ U.S. EPA. High Production Volume (HPV) Challenge Program; <http://www.epa.gov/chemrtk/index.htm>.

² U.S. EPA. HPV Challenge Program – Information Sources; <http://www.epa.gov/chemrtk/pubs/general/guidocs.htm>.

³ U.S. EPA. Risk Assessment Guidelines; <http://cfpub.epa.gov/ncea/raf/rafguid.cfm>.

These hazard characterizations are technical documents intended to inform subsequent decisions and actions by OPPT. Accordingly, the documents are not written with the goal of informing the general public. However, they do provide a vehicle for public access to a concise assessment of the raw technical data on HPV chemicals and provide information previously not readily available to the public.

Chemical Abstract Service Registry Number (CASRN)	<p style="text-align: center;">2163-42-0</p>
Chemical Abstract Index Name	<p style="text-align: center;">1,3-Propanediol, 2-methyl-</p>
Structural Formula	
<p>CASRN 2163-42-0 is a liquid with high water solubility and moderate vapor pressure. It is expected to have high mobility in soil. Volatilization from water and moist soil is considered low based on its Henry's Law constant. The rate of hydrolysis is considered negligible. The rate of atmospheric photooxidation is considered moderate. It is expected to have low persistence (P1) and low bioaccumulation potential (B1).</p> <p>Acute oral and inhalation toxicity of CASRN 2163-42-0 in rats and acute dermal toxicity in rabbits is low. This chemical is not irritating to rabbit and human skin or rabbit eyes and is a mild sensitizer in guinea pigs. Repeated oral exposure of rats to this chemical showed no systemic toxicity with a NOAEL of 1000 mg/kg-bw/day. In an oral two-generation reproductive toxicity study in rats, no systemic, reproductive, or developmental (pre- and post-natal) toxicity was seen up to 1000 mg/kg-bw/day. In oral prenatal developmental toxicity studies with rats and rabbits, no maternal toxicity or developmental effects were noted up to 1000 mg/kg-bw/day. The NOAELs for reproductive and developmental toxicity were 1000 mg/kg-bw/day. This chemical did not induce gene mutation in bacteria and mammalian cells or chromosomal aberrations in human lymphocyte cells <i>in vitro</i>.</p> <p>The acute toxicity values of CASRN 2163-42-0 for fish, aquatic invertebrates and aquatic plants are >100 mg/L.</p> <p>No data gaps were identified under the HPV Challenge Program.</p>	

The sponsor, Lyondell Chemical Company, submitted a Test Plan and Robust Summaries to EPA for 2-methyl-1,3-propanediol (CAS No. 2163-42-0; 9th CI name: 1,3-propanediol, 2-methyl-) on December, 16, 2003. EPA posted the submission on the ChemRTK HPV Challenge website on January, 27, 2004

(<http://www.epa.gov/oppt/chemrtk/pubs/summaries/2mth3pro/c14924tc.htm>). EPA comments on the original submission were posted to the website on June 29, 2004. Public comments were also received and posted to the website. The sponsor submitted updated/revised documents on August 27, 2004, which were posted to the ChemRTK website on September 21, 2004.

1. Chemical Identity

1.1 Identification and Purity

The HPV submission⁴ for this chemical did not include information on purity in the Test Plan. However, the robust summaries identified the purity of the test material to be greater than 99% (August 2004).

1.2 Physical-Chemical Properties

The physical-chemical properties of 2-methyl-1,3-propanediol are summarized in Table 1. 2-Methyl-1,3-propanediol is a liquid with high water solubility and moderate vapor pressure.

Property	Value
CASRN	2163-42-0
Molecular Weight	90.12
Physical State	Viscous liquid
Melting Point	<-54°C (measured)
Boiling Point	212°C (measured)
Vapor Pressure	2.1×10 ⁻² mm Hg at 25°C (measured)
Water Solubility	≥3,000 mg/L at 25 °C (measured)
Dissociation Constant (pK _a)	Not applicable
Henry's Law Constant	2.3×10 ⁻⁷ atm·m ³ /mole (estimated)
Log K _{ow}	0.24 (measured)

¹Lyondell Chemical Company. September 21, 2004. Revised Test Plan and Robust Summary for 2-Methyl-1,3-Propanediol. <http://www.epa.gov/oppt/chemrtk/pubs/summaries/2mth3pro/c14924tc.htm>.

⁴Lyondell Chemical Company (2003). 2-Methyl-1,3-propanediol, CASRN 2163420. Robust Summary. <http://www.epa.gov/oppt/chemrtk/pubs/summaries/2mth3pro/c14924tc.htm>

2. General Information on Exposure

2.1 Production Volume and Use Pattern

2-Methyl-1,3-propanediol had an aggregated production volume and/or import in the United States between 10 and 50 million pounds during calendar year 2005.

Information submitted as part of 2006 IUR for the industrial processing and use and commercial and consumer use of this chemical was claimed as confidential. The HSDB indicates that the chemical is primarily used as a solvent in personal care products (neutralizer, emollient, emulsifier, and humectant) as well as in the manufacture of resins and coatings. The HPV submission states that the chemical is used to manufacture resins and coatings which are used in applications such as bathroom countertops and tubs as well as boat manufacture.

2.2 Environmental Exposure and Fate

No quantitative information is available on releases of this chemical to the environment.

The environmental fate properties are provided in Table 2. 2-Methyl-1,3-propanediol is a liquid with high water solubility and moderate vapor pressure. It is expected to have high mobility in soil. Volatilization of 2-methyl-1,3-propanediol from water and moist soil is considered low based on its Henry's Law constant. The rate of hydrolysis is considered negligible. The rate of atmospheric photooxidation is considered moderate. 2-Methyl-1,3-propanediol is expected to have low persistence (P1) and low bioaccumulation potential (B1).

Property	Value
Photodegradation Half-life	11.2 hours (estimated)
Hydrolysis Half-life	Stable
Biodegradation	54% in 28 days (at 10mg/L) in Sturm test (not readily biodegradable)
Bioconcentration	BCF = 3 (estimated)
Log K _{oc}	0.0 (estimated) ²
Fugacity (Level III Model)	Air = 3.33% Water = 49.2% Soil = 47.4% Sediment = 0.0736%
Persistence ³	P1 (low)
Bioaccumulation ³	B1 (low)

¹Lyondell Chemical Company. September 21, 2004. Revised Test Plan and Robust Summary for 2-Methyl-1,3-Propanediol. <http://www.epa.gov/oppt/chemrtk/pubs/summaries/2mth3pro/c14924tc.htm>.

²US EPA. 2008. Estimation Programs Interface Suite™ for Microsoft® Windows, v 3.20. United States Environmental Protection Agency, Washington, DC, USA. <http://www.epa.gov/opptintr/exposure/pubs/episuite.htm>.

³Federal Register. 1999. Category for Persistent, Bioaccumulative, and Toxic New Chemical Substances. *Federal Register* 64, Number 213 (November 4, 1999) pp. 60194–60204.

3. Human Health Hazard

The human health hazard data are summarized in Table 3.

Acute Oral Toxicity

Wistar rats (10/sex) were administered 2-methyl-1,3-propanediol via gavage at 5000 mg/kg-bw and observed for 14 days. All animals survived to scheduled necropsy. Clinical signs of toxicity included diarrhea, chromorhinorrhea and soiling of the anogenital area. Necropsy findings included pink fluid in the bladder of two animals.

LD₅₀ > 5000 mg/kg-bw

Acute Inhalation Toxicity

Wistar rats (5/sex) were exposed to 2-methyl-1,3-propanediol at a nominal concentration of 5100 mg/m³ (5.1 mg/L) for 4 hours and observed for 14 days. Necropsy findings from three males and all females were limited to the lungs and comprised thickened hyaline spots or small areas on all lobes. Small white areas were also apparent in one male.

LC₅₀ > 5.1 mg/L

Acute Dermal Toxicity

New Zealand White rabbits (10/sex) were administered 2-methyl-1,3-propanediol dermally at 2000 mg/kg-bw for 24 hours and observed for 14 days. Clinical signs of toxicity included diarrhea, yellow nasal discharge, few feces, bloated abdomen and soiling of the anogenital area. Mean male and female body weights were not decreased during the observation period. One female died on study day 12. Necropsy findings in the decedent animal included abnormalities of the lungs (congested, hemorrhagic), pleural cavity (excess fluid), liver (pale margins) and gastrointestinal tract (red areas, gas filled). Necropsy findings among three of the nine of the survivors included abnormalities of the kidney (dark areas) and gastrointestinal tract (distended with yellow liquid contents). One animal had a tissue mass and hemorrhagic areas in the dorsal abdominal wall.

LD₅₀ > 2000 mg/kg-bw

Repeated-Dose Toxicity

Wistar rats (10/sex/group) were administered 2-methyl-1,3-propanediol via gavage at 0, 300, 600 or 1000 mg/kg-bw/day for at least 91 consecutive days. There was no mortality, morbidity or clinical signs of toxicity in any group. No treatment-related effects were observed on body weight, food consumption, ophthalmology examination, hematology, clinical chemistry, organ weights, gross pathology or histopathology.

NOAEL = 1000 mg/kg-bw/day (based on no effects at the highest dose tested)

Reproductive Toxicity

(1) In a two-generation reproductive toxicity study, Sprague-Dawley rats (30/sex/dose) were administered 2-methyl-1,3-propanediol via gavage at 0 (deionized water), 100, 300 or 1000 mg/kg-bw/day for a minimum of 70 days prior to mating. The exposure period of the F0 generation continued throughout mating, gestation and lactation until euthanasia. The F1 generation was exposed *in utero* and throughout lactation and weaning until postnatal day (PND) 21. Males and females from the F1 generation selected for mating were treated from PND 22, as described for the F0 generation. One male from the 300 mg/kg-bw/day F0 generation was euthanized *in extremis*, but all other animals survived to scheduled necropsy. No treatment-related clinical findings were apparent. Exposure to 2-methyl-1,3-propanediol did not result in any changes in body weight, food intake, reproductive performance (mating index, fertility index, mean pre-coital interval, estrous cycle length), gestation length, sperm parameters (motility, morphology or production rate) or litter and offspring parameters (live litter size, number live pups, males/litter, pup survival, pup body weight, anogenital distance) in any generation. Necropsy observations were unremarkable.

NOAEL (systemic and reproductive toxicity) = 1000 mg/kg-bw/day (based on no effects at the highest dose tested)

Developmental Toxicity

(1) Pregnant Wistar rats (24/dose) were administered 2-methyl-1,3-propanediol via gavage at 0, 300, 600 or 1000 mg/kg-bw/day once daily on gestation days 0 – 20. With the exception of a single female from the 1000 mg/kg-bw/day group, all females were pregnant. Treatment with 2-methyl-1,3-propanediol in the dams did not produce morbidity, premature deaths, clinical signs of toxicity, changes in maternal body weight, body weight gain, food consumption or macroscopic abnormalities at necropsy. No differences were noted in pre-implantation loss or number of live fetuses/group compared with historical controls. Fetal sex ratios were comparable among dose groups. A slight decrease in fetal body weight (< 2% decrease) was observed in litters from dams given 1000 mg/kg-bw/day. No treatment-related macroscopic changes or visceral or skeletal alterations were reported.

NOAEL (maternal and developmental toxicity) = 1000 mg/kg-bw/day (based on no effects at the highest dose tested)

(2) Pregnant Wistar rats (25/dose) were administered 2-methyl-1,3-propanediol via gavage at 0, 100, 300 or 1000 mg/kg-bw/day on gestation days 0 – 19. All dams survived until scheduled necropsy. Treatment with 2-methyl-1,3-propanediol in the dams did not produce clinical signs of toxicity, changes in maternal body weight, body weight gain or macroscopic abnormalities at necropsy. Maternal reproduction data showed no effect of treatment on the number of pregnant females that delivered litters, pre-implantation loss (compared with historical controls), late resorptions or number of corpora lutea or implantation sites. Interuterine growth and survival and mean litter size were unaffected by treatment with 2-methyl-1,3-propanediol. Fetal sex ratios were comparable between the doses and fetal weight was unaffected by treatment. No soft tissue malformation or developmental variations were observed. No consistent treatment-related differences in ossification parameters – were found; observed unossified sternbrae, ossified cervical centrum and rudimentary ribs were considered unrelated to treatment.

NOAEL (maternal and developmental toxicity) = 1000 mg/kg-bw/day (based on no effects at the highest dose tested)

(3) New Zealand White rabbits (female; no./dose not indicated) were administered 2-methyl-1,3-propanediol via gavage at 0, 250, 500 or 1000 mg/kg-bw/day on gestation days 0 – 28. Treatment with 2-methyl-1,3-propanediol did not produce morbidity, clinical signs of toxicity, changes in maternal body weight, body-weight gain or food consumption or macroscopic abnormalities at necropsy. Maternal reproduction data showed no effect of treatment on the number of pregnant females that delivered litters or interuterine growth and survival (post-implantation loss, live litter size, fetal body weight, fetal sex ratio). There was no evidence of a treatment-related effect on external, soft tissue or skeletal malformations or variations.

NOAEL (maternal and developmental toxicity) = 1000 mg/kg-bw/day (based on no effects at the highest dose tested)

Genetic Toxicity – Gene Mutation

In vitro

(1) *Salmonella typhimurium* strains TA1537, TA98, TA1535 and TA100 were exposed to 2-methyl-1,3-propanediol at concentrations of 100, 333, 1000, 3330 or 5000 µg/plate in the presence and absence of metabolic activation. Positive and negative controls were tested concurrently and produced appropriate responses. Cytotoxicity was not observed at any dose. A negative response was obtained in all tester strains.

2-Methyl-1,3-propanediol was not mutagenic in this assay.

(2) Chinese hamster cells (V79) were exposed to 2-methyl-1,3-propanediol at concentrations of 333, 1000, 3330 and 5000 µg/mL in the presence and absence of metabolic activation. A satisfactory response was obtained for both the solvent control and the positive control substances. Cytotoxicity was not observed at any dose. There was no increase in mutant frequency at the HPRT-locus in either of the independent repeat studies.

2-Methyl-1,3-propanediol was not mutagenic in this assay.

Genetic Toxicity – Chromosomal Aberrations

In vitro

Human lymphocytes were exposed to 2-methyl-1,3-propanediol at concentrations of 10 – 5000 µg/mL in the absence of metabolic activation and 333 – 5000 µg/mL in the presence of activation. Positive controls were tested concurrently and produced an appropriate response. Cytotoxicity was not observed at any dose. There was no biologically meaningful increase in chromosomal aberrations.

2-Methyl-1,3-propanediol did not induce chromosomal aberrations in this assay.

Additional Information

Skin Irritation

(1) New Zealand Albino rabbits (six/dose, gender not specified) were administered undiluted 2-methyl-1,3-propanediol on to two intact and two abraded sites per animal under an occlusive dressing for 24 hours and observed for 72 hours post-application. No erythema or edema was noted during the observation period. No clinical signs of toxicity were observed.

2-Methyl-1,3-propanediol was not irritating to rabbit skin in this assay.

(2) Volunteers (25 male and female subjects, ages 18 – 70 years) were dermally exposed daily to 2-methyl-1,3-propanediol as an undiluted liquid (100%) or as a 50% aqueous solution under an occluded dressing for 14 days. 2-Methyl-1,3-propanediol did not exhibit a potential for cumulative dermal irritation in 25 subjects with self-assessed sensitive skin.

2-Methyl-1,3-propanediol was not irritating to human skin in this assay.

Eye Irritation

(1) New Zealand Albino rabbits (six/dose, gender not specified) were instilled with 0.1 mL of undiluted 2-methyl-1,3-propanediol in to one eye per rabbit for 24 hours and observed for 72 hours. All six treated eyes appeared normal with no corneal, irridial or conjunctival reactions present.

2-Methyl-1,3-propanediol was not irritating to rabbit eyes in this assay.

(2) New Zealand Albino rabbits (three/dose, gender not specified) were instilled with 0.1 mL of undiluted 2-methyl-1,3-propanediol in to one eye per rabbit for 0.5 minutes, washed with lukewarm water for 20 – 30 seconds and observed for 72 hours. No corneal or irridial reactions were present; however, slight conjunctival redness was present in one rabbit at 24 hours.

2-Methyl-1,3-propanediol was not irritating to rabbit eyes in this assay.

Skin Sensitization

(1) In a guinea pig maximization test, 20 Himalayan albino guinea pigs were administered three pairs of intradermal injections of 2-methyl-1,3-propanediol in an area of clipped scapular skin during the induction phase. These injections included 10% w/w of 2-methyl-1,3-propanediol in physiological saline, 50% w/w Freund's Complete Adjuvant in distilled water and 10% w/w 2-methyl-1,3-propanediol in 50% aqueous Freund's Complete Adjuvant. A topical induction was also completed involving 0.5 mL of 2-methyl-1,3-propanediol, undiluted, applied with an occlusive dressing for 48 hours. In the challenge phase, 0.5 mL of a solution of 2-methyl-1,3-propanediol was applied (0 [distilled water], 25, 50 and 100%) under occlusion for 24 hours and observed for 48 hours post-challenge. No erythema or edema was present 48 hours after dermal exposure (induction phase). No skin reactions were present after the challenge phase. No mortality or signs of systemic toxicity were noted. Average body weight gain in treated animals was slightly greater than that of the controls. Slight redness (grade 1) was noted in 3/20 (15%) of the test group after the challenge with 50% of 2-methyl-1,3-propanediol.

2-Methyl-1,3-propanediol was mildly sensitizing in this assay.

(2) Five studies evaluated the potential for dermal sensitization in humans. Male and female subjects (104 – 110/study) were given a patch-test using 2-methyl-1,3-propanediol. In the induction phase, approximately 0.2 mL of 2-methyl-1,3-propanediol (50% aqueous dilution) was applied to the skin with an occlusive or semi-occlusive dressing and removed after 24 hours. The application was repeated 3 times/week for a total of 9 – 10 applications. Skin reactions were evaluated 24 or 48 hours later, immediately prior to re-application of the patch. In the challenge phase, a patch containing 2-methyl-1,3-propanediol (50% aqueous dilution) was applied 2 weeks after the 10th application (occlusive or other condition was not specified). These were removed after a 24-hour contact period and reactions at the skin site assessed immediately and again after 24 – 72 hours. Subjects that responded to the challenge were re-challenged 7 days later under occlusive and semi-occlusive conditions. Mild skin irritation was observed in some subjects during the induction phase (< 10% of participants). A mild delayed reaction was seen during the challenge phase in only one study (< 5% of subjects), but it is unclear if these were irritant or allergic in nature.

2-Methyl-1,3-propanediol was not sensitizing in four out of five studies; equivocal findings were provided in one study.

Conclusion: Acute oral and inhalation toxicity of CASRN 2163-42-0 in rats and acute dermal toxicity in rabbits is low. This chemical is not irritating to rabbit and human skin or rabbit eyes and is a mild sensitizer in guinea pigs. Repeated oral exposure of rats to this chemical showed no systemic toxicity with a NOAEL of 1000 mg/kg-bw/day. In an oral two-generation reproductive toxicity study in rats, no systemic, reproductive, or developmental (pre- and post-natal) toxicity was seen up to 1000 mg/kg-bw/day. In oral prenatal developmental toxicity studies with rats and rabbits, no maternal toxicity or developmental effects were noted up to 1000 mg/kg-bw/day. The NOAELs for reproductive and developmental toxicity were 1000 mg/kg-bw/day. This chemical did not induce gene mutation in bacteria and mammalian cells or chromosomal aberrations in human lymphocyte cells *in vitro*.

4. Hazard to the Environment

The environmental hazard data are summarized in Table 3.

Acute Toxicity to Fish

Carp (*Cyprinus carpio*, 10/vessel) were exposed to 2-methyl-1,3-propanediol at nominal concentrations of 0.1, 1.0, 10, 100 or 1000 mg/L under static conditions for 96 hours. Mean measured concentrations for the highest nominal concentration were 891 mg/L at the start of the study and 979 mg/L at 96 hours. No mortality was noted at any point in either control or test vessels in the study.

96-h LC₅₀ > 1000 mg/L

Acute Toxicity to Aquatic Invertebrates

Water fleas (*Daphnia magna*, 10/vessel) were exposed to 2-methyl-1,3-propanediol at nominal concentrations of 0.1, 1.0, 10, 100 or 1000 mg/L under static conditions for 48 hours. Mean measured concentrations for the highest nominal concentration were 1023 mg/L at the start of the study and 1032 mg/L at 96 hours. No immobilization was noted at 24 or 48 hours in either the control or test vessels.

48-h EC₅₀ > 1000 mg/L

Toxicity to Aquatic Plants

Green algae (*Scenedesmus subspicatus*) were exposed to 2-methyl-1,3-propanediol at nominal concentrations of 0, 100, 180, 320, 560 or 1000 mg/L under static conditions for 72 hours. Measured concentrations for the 100, 320 and 1000 mg/L were 120, 361 and 873 mg/L at the start of the study and 100, 383 and 1023 mg/L at 72 hours. No significant inhibition of cell growth or reduction of growth rate was noted at any concentration tested.

72-h EC₅₀ (growth) > 1000 mg/L

Conclusion: The acute toxicity values of CASRN 2163-42-0 for fish, aquatic invertebrates and aquatic plants are >100 mg/L.

Table 3. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program	
Endpoints	SPONSORED CHEMICAL 2-Methyl-1,3-propanediol (2163-42-0)
Summary of Human Health Data	
Acute Oral Toxicity LD₅₀ (mg/kg-bw)	> 5000
Acute Inhalation Toxicity LC₅₀ (mg/L)	> 5.1
Acute Dermal Toxicity LD₅₀ (mg/kg-bw)	> 2000
Repeated-Dose Toxicity NOAEL/LOAEL Oral (mg/kg-bw/day)	NOAEL = 1000
Reproductive Toxicity NOAEL/LOAEL Oral (mg/kg-bw/day) Systemic & Reproductive Toxicity	NOAEL = 1000
Developmental Toxicity NOAEL/LOAEL Oral (mg/kg-bw/day) Maternal and Developmental Toxicity	NOAEL = 1000
Genetic Toxicity – Gene Mutation <i>In vitro</i>	Negative
Genetic Toxicity – Chromosomal Aberrations <i>In vitro</i>	Negative
Additional Information Skin Irritation Eye Irritation Sensitization	Not irritating Not irritating Mild sensitizer
Summary of Environmental Effects – Aquatic Toxicity Data	
Fish 96-h LC₅₀ (mg/L)	> 1000
Aquatic Invertebrates 48-h EC₅₀ (mg/L)	> 1000
Aquatic Plants 72-h EC₅₀ (mg/L) (growth)	> 1000