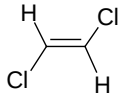
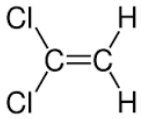
SCREENING-LEVEL HAZARD CHARACTERIZATION

SPONSORED CHEMICAL
trans-1,2-Dichloroethylene CASRN 156-60-5

SUPPORTING CHEMICAL
1,1-Dichloroethylene CASRN 75-35-4

Chemical Abstract Service Registry Number (CASRN)	**Sponsored Chemical** **156-60-5** **Supporting Chemical** **75-35-4**
Chemical Abstract Index Name	**Sponsored Chemical** **Ethene, 1,2-dichloro-, (1E)-** **Supporting Chemical** **Ethene, 1,1-dichloro-**
Structural Formula	**Sponsored Chemical**  SMILES: C(=CCl)Cl **Supporting Chemical**  SMILES: C=CClCl

Summary

trans-1,2-Dichloroethylene is a clear liquid with high vapor pressure and high water solubility. It is expected to have high mobility in soil. Volatilization of *trans*-1,2-dichloroethylene is considered high based on its Henry's Law constant. The rate of hydrolysis is considered negligible. The rate of atmospheric photooxidation is considered slow. *trans*-1,2-Dichloroethylene is not readily biodegradable and is expected to have moderate persistence (P2) and low bioaccumulation potential (B1).

Acute oral (rats and mice) and inhalation (rats) toxicity of *trans*-1,2-dichloroethylene is low. In a 90-day repeated inhalation study in rats, no treatment-related effects were observed; the NOAEC is 15.9 mg/L-day (highest concentration tested). In a 14-week dietary study in rats

and mice, increased liver weights in female rats and hematological effects in males were observed at 380 mg/kg-bw/day; the NOAEL for systemic toxicity is 190 mg/kg-bw/day. Effects in mice were limited to decreased body weight and body weight gains in females at 1830 mg/kg-bw/day; the NOAEL for systemic toxicity is 915 mg/kg-bw/day. In 90-day drinking water studies in rats and mice, no treatment-related effects were observed in rats; the NOAEL for systemic toxicity is 3000 mg/kg-bw/day (highest dose tested). Male mice exhibited suppression in humoral immune status at 17 mg/kg-bw/day and above; the NOAEL for systemic toxicity is not established. No specific reproductive toxicity studies are available; however, no adverse effects on the reproductive organs were observed in the 90-day inhalation study in rats and the 90-day drinking water and 14-week dietary repeated dose toxicity studies in rats and mice. In a prenatal inhalation developmental toxicity study in rats, maternal toxicity included clinical signs and reduced food consumption at 8 mg/L-day; the NOAEC for maternal toxicity is not established. Developmentally, decreased fetal body weight was observed at 48 mg/L-day; the NOAEC for developmental toxicity is 24 mg/L-day. *trans*-1,2-Dichloroethylene was not mutagenic in a bacteria and did not induce chromosomal aberrations or sister chromatid exchange in mammalian cells *in vitro*. *trans*-1,2-Dichloroethylene did not induce micronuclei in mice *in vivo*.

For *trans*-1,2-dichloroethylene, the 96-h LC_{50} for fish is 140 mg/L, and the 48-h EC_{50} for aquatic invertebrates is 220 mg/L. For the supporting chemical, 1,1-dichloroethylene, the 96-h LC_{50} for fish is 74 mg/L, the 48-h EC_{50} for aquatic invertebrates is 79 mg/L, and the 72-h EC_{50} for toxicity to aquatic plants is 290 mg/L for biomass.

No data gaps were identified under the HPV Challenge Program.

The sponsor, PPG Industries, Inc., submitted a Test Plan and Robust Summaries to EPA for *trans*-1,2-dichloroethylene (CASRN 156-60-5; ethene, 1,2-dichloro-, (1E)-) on March 6 2003. EPA posted the submission on the ChemRTK HPV Challenge Web site on March 20, 2003. (http://www.epa.gov/chemrtk/pubs/summaries/trnsdicl/c14348tc.htm). EPA comments on the original submission were posted to the website on July 17, 2003. The sponsor submitted updated/revised documents on September 30, 2003 and June 29, 2004, which were posted to the ChemRTK website on November 5, 2003 and September 3, 2004, respectively. Public comments were also received and posted to the website.

Supporting Chemical Justification

The sponsor submitted data for the supporting chemical 1,1-dichloroethylene (CASRN 75-35-4) for ecotoxicity endpoints without an adequate rationale. The revised test plan included data on the physical-chemical properties and available ecotoxicity data for 1,1-dichloroethylene. The physical-chemical properties of the two chemicals are similar and available data suggest that the supporting chemical is more toxic than the sponsored substance, discounting an underestimation for toxicity of the sponsored substance. Therefore, EPA agrees with the use of the supporting chemical data for the ecotoxicity endpoints, where needed, to address the SIDS endpoints.

1. Chemical Identity

1.1 Identification and Purity

trans-1,2-Dichloroethylene is a clear liquid with high vapor pressure and high water solubility. The test plan states that the typical purity of the marketed substance is >99.7%.

1.2 Physical-Chemical Properties

The physical-chemical properties of *trans*-1,2-dichloroethylene are summarized in Table 1.

Table 1. Physical-Chemical Properties of *trans*-1,2-Dichloroethylene[1]

Property	SPONSORED CHEMICAL *trans*-1,2-Dichloroethylene	SUPPORTING CHEMICAL 1,1-Dichloroethylene[3]
CASRN	156-60-5	75-35-4
Molecular Weight	96.94	96.94
Physical State	Clear liquid	Clear liquid
Melting Point	-49.4 °C (measured)	-122 °C
Boiling Point	48°C (measured)	31.7°C
Vapor Pressure	264.8 mm Hg at 20 °C (measured)	600 mm Hg at 25 °C [665 hPa at 20 °C]
Dissociation Constant (pK_a)	Not applicable	Not applicable

Table 1. Physical-Chemical Properties of *trans*-1,2-Dichloroethylene[1]		
Property	**SPONSORED CHEMICAL *trans*-1,2-Dichloroethylene**	**SUPPORTING CHEMICAL 1,1-Dichloroethylene[3]**
Henry's Law Constant	4.08×10^{-3} atm-m^3/mole (measured)[2]	2.61×10^{-2} atm-m^3/mole at 25 °C
Water Solubility	6300 mg/L at 25 °C (measured)	2500 mg/L at 25 °C
Log K_{ow}	2.06 (measured)	2.02

[1]PPG Industries Inc. 2004. Revised Test Plan and Robust Summary for trans 1,2-Dichloroethylene. Available online at http://www.epa.gov/chemrtk/pubs/summaries/trnsdicl/c14348tc.htm as of December 13, 2011.
[2]SRC. 2011. The Physical Properties Database (PHYSPROP). Syracuse, NY: SRC Inc. Available online at http://www.syrres.com/esc/physprop.htm as of December 13, 2011.
[3]Data taken from Revised Test Plan and Robust Summary for trans 1,2-Dichloroethylene. Available online at http://www.epa.gov/chemrtk/pubs/summaries/trnsdicl/c14348tc.htm as of December 13, 2011. Additional information from TOXNET: http://toxnet.nlm.nih.gov/cgi-bin/sis/search2/f?./temp/~aYsSZk:3

2. General Information on Exposure

2.1 Production Volume and Use Pattern

trans-1,2-Dichloroethylene had an aggregated production and/or import volume in the United States between 1 to 10 million pounds during calendar year 2005 (U.S. EPA, 2010).

Non-confidential information in the IUR indicated that the industrial processing and uses of the chemical include urethane and other foam product (except polystyrene) manufacturing as functional fluids; and other basic organic chemical manufacturing as solvents (for cleaning or degreasing.) No commercial and consumer uses were reported for the chemical.

2.2 Environmental Exposure and Fate

trans-1,2-Dichloroethylene is expected to have high mobility in soil. It achieved 8% of its theoretical biochemical oxygen demand (BOD) in 28 days using the closed bottle (OECD TG 301 D) test at an initial concentration of 6 mg/L and was classified as not readily biodegradable. It was also not readily biodegradable, achieving 0% of its theoretical BOD in 28 days at concentrations of 2.32 and 6.06 mg/L in other closed bottle tests. A biodegradation study using settled sewage amended with yeast extracts to inoculate BOD water, showed 93–95% total loss of *trans*-1,2-dichloroethylene (of which 26–33% volatilized) after 28 days. Under anaerobic conditions, 73% of *trans*-1,2-dichloroethylene was lost in 6 months with the accompanying formation of vinyl chloride using organic sediment obtained from the Florida Everglades. The rate of hydrolysis is considered negligible. Volatilization of *trans*-1,2-dichloroethylene is considered high based on its Henry's Law constant. The rate of atmospheric photooxidation is

considered slow. *trans*-1,2-Dichloroethylene is expected to have moderate persistence (P2) and low bioaccumulation potential (B1).

The environmental fate characteristics of *trans*-1,2-dichloroethylene are summarized in Table 2.

Table 2. Environmental Fate Characteristics of *trans*-1,2-Dichloroethylene [1]

Property	Value
Photodegradation Half-life	3.8 days (estimated)[2]
Hydrolysis Half-life	Stable
Biodegradation	8% after 28 days (not readily biodegradable); 0% after 28 days (not readily biodegradable)[3]; 73% after 6 months under anaerobic conditions[4]
Bioaccumulation Factor	BAF = 12.1 (estimated)[2]
Log K_{oc}	1.6 (estimated)[2]
Fugacity (Level III Model)[2]	
Air (%)	31.7
Water (%)	52.4
Soil (%)	15.7
Sediment (%)	0.2
Persistence[5]	P2 (moderate)
Bioaccumulation[5]	B1 (low)

[1]PPG Industries Inc. 2004. Revised Test Plan and Robust Summary for trans 1,2-Dichloroethylene. Available online at http://www.epa.gov/chemrtk/pubs/summaries/trnsdicl/c14348tc.htm as of December 13, 2011.
[2]U.S. EPA. 2011. Estimation Programs Interface Suite™ for Microsoft® Windows, v4.10. U.S. Environmental Protection Agency, Washington, DC, USA. Available online at http://www.epa.gov/opptintr/exposure/pubs/episuitedl.htm as of December 13, 2011.
[3]National Institute of Technology and Evaluation. 2002. Biodegradation and Bioaccumulation of the Existing Chemical Substances under the Chemical Substances Control Law. Available online at http://www.nite.go.jp/en/chem/qsar/cscl_data.html.
[4]Hazardous Substance Databank. 2011. trans 1,2-Dichloroethylene (CASRN 156-60-5). Available online at http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB as of December 13, 2011.
[5]Federal Register. 1999. Category for Persistent, Bioaccumulative, and Toxic New Chemical Substances. *Federal Register* 64, Number 213 (November 4, 1999) pp. 60194–60204.

Conclusion: *trans*-1,2-Dichloroethylene is a clear liquid with high vapor pressure and high water solubility. It is expected to have high mobility in soil. Volatilization of *trans*-1,2-dichloroethylene is considered high based on its Henry's Law constant. The rate of hydrolysis is considered negligible. The rate of atmospheric photooxidation is considered slow. *trans*-1,2-Dichloroethylene is not readily biodegradable and is expected to have moderate persistence (P2) and low bioaccumulation potential (B1).

3. Human Health Hazard

A summary of health effects data submitted for SIDS endpoints is provided in Table 3.

Acute Oral Toxicity

(1) CD-1 mice (8/sex/dose) were administered *trans*-1,2-dichloroethylene in Emulphor (an ionic emulsifier) and deionized water (1:9 v/v) via gavage at doses ranging from 800 to 3500 mg/kg and observed for up to 14 days. No mortalities occurred at doses up to 1200 mg/kg in males or females. At 3500 mg/kg, 100 and 88% mortality occurred in male and females, respectively.
LD_{50} = 2122 mg/kg (male)
LD_{50} = 2391 mg/kg (female)

(2) Sprague-Dawley rats (10/sex/dose) were administered *trans*-1,2-dichloroethylene in corn oil via gavage at doses ranging from 4500 to 8500 mg/kg. Rats were observed for up to 14 days following dosing. All deaths occurred within 30 hours after dosing.
LD_{50} = 7902 mg/kg (male)
LD_{50} = 9939 mg/kg (female)

Acute Inhalation Toxicity

Sprague-Dawley rats (5/sex/dose) were exposed to *trans*-1,2-dichloroethylene vapors (whole-body) at concentrations of 0, 12,300, 22,500, 28,100 or 34,100 ppm (~ 49, 89, 111 or 135 mg/L, respectively) for 4 hours. Mortalities occurred at concentrations of ≥ 89 mg/L (during exposure periods).
4-h LC_{50} ~ 96 mg/L

Repeated-Dose Toxicity

(1) In a 90-day inhalation study, Sprague-Dawley rats (15/sex/dose) were exposed to *trans*-1,2-dichloroethylene vapors (whole-body) at mean analytically determined concentrations of 0, 200, 1000 or 4000 ppm (approximately 0, 0.79, 3.96 or 15.86 mg/L-day, respectively) 6 hours/day, 4 days/week. There were no adverse compound-related effects at any concentration level on body weight, clinical signs, body weight gain, food consumption, clinical or anatomical pathology parameters or liver cell proliferation. No other exposure-related effects were mentioned in the robust study summary.
NOAEL ~ 15.9 mg/L-day (highest dose tested)

(2) In a 14-week dietary study, Fischer 344 rats (15/sex/dose) were fed *trans*-1,2-dichloroethylene microencapsulated in feed at average doses of 190, 380, 770, 1540 or 3210 mg/kg-bw/day for males and 190, 395, 780, 1580 or 3245 mg/kg-bw/day for females. Concentrations in the feed were 0, 3125, 6250, 12500, 25,000 or 50,000 ppm. There were no treatment-related deaths, no clinical signs of toxicity and no signs of neurotoxicity (as assessed by functional observational battery endpoints) at any dose. Mean body weight of male rats in the

3210 mg/kg-bw/day dose group was significantly less than the controls. Food consumption of the exposed groups was similar to the control. There were significant decreases ($p<0.01$) in hematocrit values, hemoglobin concentration and erythrocyte counts in the male and female rats exposed to the two highest dose groups at 21 days and at week 14. After week 14, these effects were also seen in male rats exposed to as low as 380 mg/kg-bw/day. There were no treatment-related alterations in clinical chemistry parameters. The liver weights of female rats were significantly greater ($p<0.05$) than controls in the 395 mg/kg-bw/day dose group. The absolute kidney weights of male rats exposed to 1540 and 3210 mg/kg-bw/day were significantly decreased ($p<0.01$) compared to controls. No treatment-related effects on organ weights (heart, lung, testes and thymus) were noted. There were no treatment-related increases in gross or microscopic lesions, or changes in sperm motility or vaginal cytology parameters. Additional details from NTP at: http://ntp.niehs.nih.gov/ntp/htdocs/st_rpts/tox055.pdf
LOAEL = 380 mg/kg-bw/day (based on increased liver weights in female rats and decreases in hematocrit, hemoglobin and erythrocyte counts in male rats)
NOAEL = 190 mg/kg-bw/day

(3) In a 14-week dietary study, B6C3F1 mice (10/sex/dose) were fed *trans*-1,2-dichloroethylene microencapsulated at average doses of 0, 480, 920, 1900, 3850 or 8065 mg/kg-bw/day for males and 0, 450, 915, 1830, 3760 or 7925 mg/kg-bw/day for females for 14 weeks. Concentrations in the feed were 0, 3150, 6250, 12500, 25,000 or 50,000 ppm. There were no treatment-related deaths, no clinical signs of toxicity and no signs of neurotoxicity (as assessed by functional observational battery endpoints) at any dose. Mean body weights and body weight gains of females decreased at doses ≥ 1830 mg/kg-bw/day. Food consumption of the exposed groups was similar to the control. There were no treatment-related alterations in clinical chemistry parameters. The relative liver weights of males exposed to 1900 mg/kg-bw/day were increased when compared to controls. No treatment-related effects on organs weights (heart, kidney, lung, testes and thymus) were noted in the robust study summary. There were no treatment-related gross or microscopic lesions or changes in sperm motility and vaginal cytology parameters when compared to controls.
LOAEL = 1830 mg/kg-bw/day (based on decreased body weight and body weight gains in females)
NOAEL = 915 mg/kg-bw/day

(4) In a 90-day drinking water study, Sprague-Dawley rats (20/sex/dose) were administered *trans*-1,2-dichloroethylene orally in drinking water at 0, 500, 1500 or 3000 mg/kg-bw/day (0, 402, 1311 or 3114 mg/kg-bw/day in males and 353, 1257 or 2809 mg/kg-bw/day in females). There were no treatment-related effects on body weight, general behavior, hematology, urinalysis or serum chemistries. There were significant decreases in kidney weights observed in females at1257 and 2809 mg/kg-bw/day. No other treatment-related effects on were noted. Histologic examination of liver, kidneys, testes and ovaries revealed no exposure-related changes. Additional details from NTP at: http://ntp.niehs.nih.gov/ntp/htdocs/st_rpts/tox055.pdf
NOAEL = 3000 mg/kg-bw/day (highest dose tested)

(5) In a 90-day drinking water study, CD-1 mice were administered *trans*-1,2-dichloroethylene orally in drinking water at average doses of 17, 175 or 387 mg/kg-bw/day for males and 23, 224 or 452 mg/kg-bw/day for females mg/kg-bw/day. Administered concentrations in the drinking

water were 0, 0.1, 1.0 or 2.0 mg/mL. A decrease in glutathione levels (21%) was observed in male mice exposed to 387 mg/kg-bw/day. There was a decrease in aniline hydroxylase activity in female mice exposed to all dose levels. Marked suppression in humoral immune status was also observed in male mice at all dose levels as indicated by a decreased ability of spleen cells to produce antibody against sheep erythrocytes. Macrophage function was depressed in female mice (the robust summary does not report the magnitude of this effect, or at what dose(s) this effect occurred). No treatment-related effects on body and organ weights, hematology, serum and liver chemistries, necropsy, hepatic microsomal activities, blood coagulation and fluid consumption were noted in the robust study summary. Additional details from NTP at: http://ntp.niehs.nih.gov/ntp/htdocs/st_rpts/tox055.pdf
LOAEL = 17 mg/kg-bw/day (based on suppression in humoral immune status in male mice)
NOAEL = Not established

Reproductive Toxicity

No specific reproductive toxicity studies are available.

(1) In the 90-day repeated inhalation study in Sprague-Dawley rats described previously, no macroscopic or microscopic effects on reproductive organs were observed at any dose level.

(2) In the 14-week dietary study in Fischer 344 rats described previously, no macroscopic or microscopic effects on reproductive organs were observed at any dose level.

(3) In the 14-week dietary toxicity study in B6C3F1 mice described previously, no macroscopic or microscopic effects on reproductive organs were observed at any dose level.

(4) In the 90-day drinking water study in Sprague-Dawley rats described previously, no macroscopic or microscopic effects on reproductive organs were observed at any dose level.

Developmental Toxicity

Pregnant Crj:CD(SD) rats (24/dose) were exposed *trans*-1,2-dichloroethylene vapors at 0, 2000, 6000 or 12,000 ppm (approximately 0, 8, 24 or 48 mg/L, respectively) for 6 hours/day during gestation days 7 – 16. Overt maternal toxicity was observed as a marked reduction in weight gain at 48 mg/L-day and in feed consumption at 24 mg/L-day. Marked body weight gain suppression was also noted at the 48 mg/L concentration on days 11 – 13 and a reduction in feed consumption for days 13 – 15 was noted at a concentrations ≥ 8 mg/L-day. Lacrimation and stained periocular hair and signs of ocular irritation were observed in dams in all dose groups. Increased incidences of alopecia, lethargy and salivation were observed in dams exposed to 48 mg/L. There were no differences in pregnancy rate, corpora lutea, fetuses per litter or number of stunted fetuses in exposed versus control groups. Mean combined and female fetal body weights were markedly reduced in the litters of dams exposed to 48 mg/L (the magnitude of this change was not specified in the robust summary). A slight increase in the incidence of hydrocephalus

was observed in fetuses in the high-dose group. Additional details from NTP at: http://ntp.niehs.nih.gov/ntp/htdocs/st_rpts/tox055.pdf
LOAEL (maternal toxicity) ~ 8 mg/L-day (based on clinical signs)
NOAEL (maternal toxicity) = Not established
LOAEL (developmental toxicity) ~ 48 mg/L-day (based decreased fetal body weights)
NOAEL (developmental toxicity) ~ 24 mg/L-day

Genetic Toxicity – Gene Mutations

In vitro

In a reverse-mutation assay, *Salmonella typhimurium* strains TA98, TA100, TA1535 and TA1537 were exposed to *trans*-1,2-dichloroethylene at concentrations of 0, 33.3, 100, 333.3, 1000, 3333.3 or 10,000 µg/plate in the presence and absence of metabolic activation. Positive and negative controls were included, but the robust summary did not specify if appropriate results were obtained. *trans*-1,2-Dichloroethylene was not mutagenic in any of four strains of *S. typhimurium* with or without metabolic activation.
***trans*-1,2-Dichloroethylene was not mutagenic in this assay.**

Genetic Toxicity – Chromosomal Aberrations

In vitro

Chinese hamster ovary (CHO) cells were exposed to *trans*-1,2-dichloroethylene at concentrations of 1600, 3000 or 5000 µg/mL in the presence and absence of metabolic activation for 10 hours. No induction of chromosomal aberrations was observed with or without metabolic activation. Positive and negative controls were included, but the robust summary did not specify if appropriate results were obtained.
***trans*-1,2-Dichloroethylene did not induce chromosomal aberrations in this assay.**

In vivo

(1) Male B6C3F1 mice (10/dose) were exposed to *trans*-1,2-dichloroethylene in corn oil at doses of 500, 1000 or 2000 mg/kg via intraperitoneal injection. Doses of 500 – 2000 mg/kg did not induce chromosomal aberrations in bone marrow cells of male mice. Positive controls were tested; however, the results were not provided.
***trans*-1,2-Dichloroethylene did not induce chromosomal aberrations in bone marrow in this assay.**

(2) In a 14-week dietary study, male B6C3F1 mice (10/dose) were fed *trans*-1,2-dichloroethylene microencapsulated in feed at concentrations of 0, 3125, 6250, 12500, 25,000 or 50,000 ppm (approximately 0, 480, 920, 1900, 3850 or 8065 mg/kg-bw/day). The use of a positive control was not mentioned in the robust summary. There was no increase in the frequency of micronucleated normochromatic erythrocytes (NCEs) in the peripheral blood of the mice. There was no effect on the percentage of micronucleated polychromatic erythrocytes

among the total erythrocyte population, indicating no inhibition or stimulation of erythropoiesis in the bone marrow.
***trans*-1,2-Dichloroethylene did not induce micronuclei in this assay**

Genetic Toxicity – Other

In vitro

CHO cells were exposed to *trans*-1,2-dichloroethylene at concentrations of 160, 500, 1600 or 5000 μg/mL for 26 hours in the absence of metabolic activation and for 2 hours in the presence of metabolic activation. Positive and negative controls were included, but the robust summary did not specify if appropriate results were obtained. Treatment did not induce sister chromatid exchanges (SCEs) without metabolic activation. A single trial with metabolic activation was judged to be equivocal based on a significant trend test ($p < 0.005$) and the absence of significantly increased frequency (> 20%) at any individual dose points compared with negative control values.
***trans*-1,2-Dichloroethylene did not induce sister chromatid exchange in this assay.**

In vivo

Male B6C3F1 mice (5/dose) were exposed to *trans*-1,2-dichloroethylene in corn oil at doses of 500, 1000 or 2000 mg/kg via intraperitoneal injection. Doses of 500 – 2000 mg/kg did not induce sister chromatid exchanges in bone marrow cells of male mice. Positive controls were tested; however, the results were not provided.
***trans*-1,2-Dichloroethylene did not induce sister chromatid exchange in this assay**

Conclusion: Acute oral (rats and mice) and inhalation (rats) toxicity of *trans*-1,2-dichloroethylene is low. In a 90-day repeated inhalation study in rats, no treatment-related effects were observed; the NOAEC is 15.9 mg/L-day (highest concentration tested). In a 14-week dietary study in rats and mice, increased liver weights in female rats and hematological effects in males were observed at 380 mg/kg-bw/day; the NOAEL for systemic toxicity is 190 mg/kg-bw/day. Effects in mice were limited to decreased body weight and body weight gains in females at 1830 mg/kg-bw/day; the NOAEL for systemic toxicity is 915 mg/kg-bw/day. In 90-day drinking water studies in rats and mice, no treatment-related effects were observed in rats; the NOAEL for systemic toxicity is 3000 mg/kg-bw/day (highest dose tested). Male mice exhibited suppression in humoral immune status at 17 mg/kg-bw/day and above; the NOAEL for systemic toxicity is not established. No specific reproductive toxicity studies are available; however, no adverse effects on the reproductive organs were observed in the 90-day inhalation study in rats and the 90-day drinking water and 14-week dietary repeated dose toxicity studies in rats and mice. In a prenatal inhalation developmental toxicity study in rats, maternal toxicity included clinical signs and reduced food consumption at 8 mg/L-day; the NOAEC for maternal toxicity is not established. Developmentally, decreased fetal body weight was observed at 48 mg/L-day; the NOAEC for developmental toxicity is 24 mg/L-day. *trans*-1,2-Dichloroethylene

was not mutagenic in a bacteria and did not induce chromosomal aberrations or sister chromatid exchange in mammalian cells *in vitro*. *trans*-1,2-Dichloroethylene did not induce micronuclei in mice *in vivo*.

Table 3. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program – Human Health Data

Endpoint	*trans*-1,2-Dichloroethylene (156-60-5)
Acute Oral Toxicity **LD_{50} (mg/kg)**	**(rat)** **7902 (m)** **9939 (f)** **(mouse)** **2122 (m)** **2391 (f)**
Acute Inhalation Toxicity **LC_{50} (mg/L)**	**~ 96**
Repeated-Dose Toxicity **NOAEL/LOAEL** **Oral (mg/kg-bw/day)**	**(rat; 14-week diet)** **NOAEL= 190** **LOAEL = 380** **(mouse; 90d –drinking water)** **NOAEL= NE** **LOAEL = 17**
Repeated-Dose Toxicity **NOAEC/LOAEC** **Inhalation (mg/L-day)**	**(rat; 90-d)** **NOAEC ~ 15.9 mg/L** **(highest concentration tested)**
Reproductive Toxicity **NOAEL/LOAEL** **Oral (mg/kg-day)**	No effects on reproductive organs were observed in 90-day and 14-week studies in rats and mice.
Developmental Toxicity **NOAEL/LOAEL** **Inhalation (mg/L-day)** **Maternal Toxicity** **Developmental Toxicity**	 **NOAEC=** **Not established** **LOAEC = 8** **NOAEC= 24** **LOAEC = 48**
Genetic Toxicity – Gene Mutations ***In vitro***	**Negative**
Genetic Toxicity – Chromosomal Aberrations ***In vitro***	**Negative**
Genetic Toxicity – Chromosomal Aberrations ***In vivo***	**Negative**

Measured data in BOLD

4. Hazard to the Environment

A summary of aquatic toxicity data submitted for SIDS endpoints is provided in Table 4. The table also indicates where data for the supporting chemical are read-across (RA) to the sponsored chemical.

Acute Toxicity to Fish

trans-1,2-Dichloroethylene (CASRN 156-60-5)
Bluegill sunfish (*Lepomis macrochirus*) were exposed to *trans*-1,2-dichloroethylene at unspecified nominal concentrations under static conditions for 96 hours. The dissolved oxygen concentrations ranged from 9.7 mg/L at the start of exposure to 0.3 mg/L after 96 hours of exposure. The pH of the test solutions ranged from 7.9 to 6.5 and the temperature ranged from 21 to 23 °C. The measurements were made in the control, low, middle and high concentrations. The 96-hour LC_{50} was determined to be 140 mg/L (95% confidence limit, 120 – 160 mg/L). The original report did not specify whether the test material was *cis*- or *trans*-1,2-dichloroethylene.
96-h LC_{50} = 140 mg/L

1,1-Dichloroethylene (CASRN 75-35-4, supporting chemical)
Bluegill sunfish (*L. macrochirus*) were exposed to 1,1-dichloroethylene at unspecified nominal concentrations under static conditions for 96 hours. The dissolved oxygen concentrations ranged from 9.7 mg/L at the start of exposure to 0.3 mg/L after 96 hours of exposure. The pH of the test solutions ranged from 7.9 to 6.5 and the temperature ranged from 21 to 23 °C. The measurements were made in the control, low, middle and high concentrations. The 96-hour LC_{50} was determined to be 74 mg/L (95% confidence limit, 57 – 91 mg/L).
96-h LC_{50} = 74 mg/L

Acute Toxicity to Aquatic Invertebrates

trans-1,2-Dichloroethylene (CASRN 156-60-5)
Water fleas (*Daphnia magna*) (15/concentration) were exposed to *trans*-1,2-dichloroethylene at five to eight nominal concentrations under static conditions for 48 hours. The reported EC_{50} value is based on nominal concentrations.
48-h EC_{50} = 220 mg/L

1,1-Dichloroethylene (CASRN 75-35-4, supporting chemical)
Water fleas (*D. magna*) (15/concentration) were exposed to 1,1-dichloroethylene at five to eight nominal concentrations under static conditions for 48 hours. The reported EC_{50} value is based on nominal concentrations.
48-h EC_{50} = 79 mg/L

Toxicity to Aquatic Plants

1,1-Dichloroethylene (CASRN 75-35-4, supporting chemical)
(1) Green algae (*Pseudokirchneriella subcapitata*) were exposed to 1,1-dichloroethylene for 96 hours. The original report did not provide details about the test methods.
96-h EC_{50} (biomass) = 798 mg/L

(2) Green algae (*Skeletonema costatum*) were exposed to 1,1-dichloroethylene for 96 hours. The original report did not provide details about the test methods.
96-h EC_{50} (biomass) = 712 mg/L
72-h EC_{50} (biomass) = 290 mg/L

Conclusion: For *trans*-1,2-dichloroethylene, the 96-h LC_{50} for fish is 140 mg/L, and the 48-h EC_{50} for aquatic invertebrates is 220 mg/L. For the supporting chemical, 1,1-dichloroethylene, the 96-h LC_{50} for fish is 74 mg/L, the 48-h EC_{50} for aquatic invertebrates is 79 mg/L, and the 72-h EC_{50} for toxicity to aquatic plants is 290 mg/L for biomass.

Table 4. Summary Table of the Screening Information Data Set as Submitted under the U.S. HPV Challenge Program – Aquatic Toxicity Data

Endpoint	SPONSORED CHEMICAL *trans*-1,2-Dichloroethylene (156-60-5)	SUPPORTING CHEMICAL 1,1-Dichloroethylene[3] (75-35-4)
Fish 96-h LC_{50} (mg/L)	**140**	**74**
Aquatic Invertebrates 48-h EC_{50} (mg/L)	**220**	**79**
Aquatic Plants 72-h EC_{50} (mg/L) Biomass	No Data 290 (RA)	**290**

Bold = measured data (i.e. derived from testing); (RA) = read-across

5. References

U.S. Environmental Protection Agency (2010) Non-confidential 2006 IUR Records by Chemical, including Manufacturing, Processing and Use Information for CASRN 156-60-5. Inventory Update Reporting (IUR); Version 6: Updated May 12, 2010. Available online at http://www.epa.gov/cdr/tools/previouslycollected.html