6 TOXICITY ASSESSMENT

The toxicity assessment weighs the available evidence regarding the potential for particular chemicals to cause adverse effects in an exposed individual. The assessment also considers the relationship between the extent of an exposure to a chemical and the increased likelihood and/or severity of effects. The toxic effects of a chemical generally depend on a number of factors. Therefore, a full description of the toxic effects of a chemical includes a listing of what adverse health effects the chemical may cause and how the occurrence of these effects depends upon dose, route, and duration of exposure. Two broad categories of chemically induced disease states were evaluated in this toxicity assessment: cancer and noncancer health effects. The exposure assessment estimates the chronic dosage of chemicals received by an individual in a given exposure scenario, and the toxicity assessment links potential adverse effects associated with exposure to the particular chemical. The dose received determines the magnitude of risk.

EPA has performed the toxicity assessment for numerous chemicals and has made available the resulting toxicity information and toxicity values in EPA IRIS, which have undergone extensive peer review.

6.1 TOXICITY VALUES FOR CHRONIC EXPOSURES

Toxicity values are used in risk characterization to estimate the potential for cancer and noncancer effects in a potentially exposed human receptor. Four types of toxicity values are used herein to express a COPC's dose-response-effect relationship:

An inhalation unit risk (IUR) for estimating the likelihood of carcinogenic effects from inhalation of a COPC;

- An oral cancer slope factor (CSF) for estimating the likelihood of carcinogenic effects from indirect exposures to a COPC;
- An inhalation reference air concentration (RfC) for estimating possible noncarcinogenic effects from inhalation of a COPC; and
- An oral reference dose (RfD) for estimating possible noncarcinogenic effects from indirect exposure to a COPC.

In general, IUR and RfC values, expressed in units of (µg/m3)-1 and (mg/m3), respectively, and oral CSF and RfD values, expressed in the units of (mg/kg-day)-1 and mg/kg-day, respectively, are derived from long-term animal studies and incorporate uncertainty factors to compensate for extrapolation of observed adverse effects in laboratory animals when estimating possible adverse effects of chemicals in humans. If adequate human data from epidemiological studies are available, these data are used to reduce uncertainty in deriving toxicity values.

Toxicity values were obtained for this MPHRA from information sources based on the hierarchy of human health toxicity values described in Office of Solid Waste and Emergency Response (OSWER) Directive 9285.7-53 (USEPA, 2003) and consistent with CDPHE's Policy on Use of Human Health Toxicity Values in Environmental Risk Assessment and Remediation Management (CDPHE, 2004). The recommended toxicity value hierarchy is as follows:

- Tier 1 - USEPA's Integrated Risk Information System (IRIS)
- Tier 2 - USEPA's provisional peer reviewed toxicity values
- Tier 3 - Other toxicity values, including:

- The California EPA (CalEPA) - Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database
- The ATSDR minimal risk levels (MRLs)
- The Health Effects Assessment Summary Tables (HEAST) (values obtained from the USEPA Region IX Regional Screening Level [RSL] tables [USEPA, 2015])

(Note: The US EPA Region 9 preliminary remediation goals (PRGs) were harmonized with similar risk-based screening levels used by US EPA Regions 3 and 6 into a single table: "Regional Screening Levels (RSL) for Chemical Contaminants at Superfund Sites.")

These information sources provide lists of available, verifiable toxicity values for various chemicals. These information sources do not, however, provide toxicity values for mustard agent. Mustard toxicity values were obtained from the US Army Public Health Command (USAPHC, formerly US Army Center for Health Promotion and Preventative Medicine [USCHPPM]). USAPHC provides pertinent chemical warfare agent health related guidance and policy documents, as well as technical sources of chemical, physical, and toxicological properties and values. Mustard toxicity was evaluated using the most recent toxicity values published by USAPHC for the Army.

Thirty seven (37) COPCs are missing toxicity values for one, but not both, of the exposure routes and have been assigned an extrapolated toxicity value. A route-to-route extrapolation was performed when a COPC toxicity value was available for one route (i.e., inhalation or oral) but not the other. In these cases, the available toxicity value was extrapolated to the other route using the adult body weight and standard inhalation rate. This extrapolation was performed for cancer toxicity values (unless available data indicated the COPC was not a carcinogen via that route) and noncancer toxicity values.

In addition to the chronic toxicity values described above, USEPA has published a list of 67 chemicals that were studied by various researchers and found to have a mutagenic mode of action (see Table 1a in USEPA, 2005c). USEPA recommends that the toxicity values be adjusted when early-life exposures to these chemicals are possible (USEPA, 2005c). Review of this published list, as well as information contained within IRIS, confirms that vinyl chloride, methylene chloride, and trichloroethylene are the only COPCs that USEPA has identified as having a mutagenic mode of action. For vinyl chloride, the USEPA recommends that the cancer toxicity values be adjusted by a factor of 2 for continuous exposure from birth. For methylene chloride and trichlorethylene, the USEPA IRIS database recommends that the cancer toxicity values be adjusted using age dependent adjustment factors (ADAF). Based on USEPA's recommendations, vinyl chloride, methylene chloride, and trichloroethylene are the only COPCs where the mutagenic mode of action was addressed in this MPHRA. Section 7.1 presents additional discussion of this topic.

Table 6-1 presents the IURs, CSFs, RfCs, and RfDs obtained from various sources based on the hierarchy presented above. Twenty eight (28) COPCs (including lead) that may potentially be present in PCAPP or EDS emissions have no verifiable toxicity values available from the sources listed in the hierarchy above and therefore cannot be included in the quantifiable risk assessment (nor can a route-to-route extrapolation be performed). For the 2008 MPHRA, the BPT made requests to the Chemical, Biological, Radiological, & Nuclear Defense Information Analysis Center (CBRNIAC) to identify any available human toxicity data for the COPCs with no available toxicity values. The CBRNIAC could only find published human health effects information for a small number of the COPCs with no toxicity values. Furthermore, although some data were available and indicated various levels of adverse health effects associated with

exposure to these COPCs, no toxicity values have been developed from the available study data. No additional inquiries were made. A discussion of the impact of this data gap is included in the uncertainty analysis in Section 8, and the impact has been evaluated qualitatively.

Table 6-1. Toxicity Values for Chronic Exposures

COPC	CAS Number	Cancer				Noncancer			
		Inhalation		Oral		Inhalation		Oral	
		$(ug/m3)^{-1}$	Reference	$(mg/kg/day)^{-1}$	Reference	(mg/m3)	Reference	(mg/kg/day)	Reference
1,1,1,2-tetrachloroethane	630-20-6	7.4E-06	IRIS	2.6E-02	IRIS	1.2E-01	route-to-route	3.0E-02	IRIS
1,1,1-trichloroethane	71-55-6	N/A	N/A	N/A	N/A	5.0E+00	IRIS	2.0E+00	IRIS
1,1,2,2-tetrachloroethane	79-34-5	5.8E-05	Cal EPA	2.0E-01	IRIS	8.0E-02	route-to-route	2.0E-02	IRIS
1,1-dichloroethane	75-34-3	1.6E-06	Cal EPA	5.7E-03	Cal EPA	8.0E-01	route-to-route	2.0E-01	PPRTV
1,1-dichloroethene	75-35-4	None available	None available	None available	None available	7.0E-03	CDPHE	5.0E-02	IRIS
1,2,3-trichlorobenzene	87-61-6	N/A	N/A	N/A	N/A	3.2E-03	route-to-route	8.0E-04	PPRTV
1,2,4-trichlorobenzene	120-82-1	Oral carc. only	N/A	2.9E-02	PPRTV	2.0E-03	PPRTV	1.0E-02	IRIS
1,2,4-trimethyl benzene	95-63-6	N/A	N/A	N/A	N/A	7.0E-03	PPRTV	1.8E-03	route-to-route
1,2-bis(ethylthio)-ethene	13105-10-7	N/A	N/A	N/A	N/A	None available	None available	None available	None available
1,2-bis(vinylthio)-ethane	63938-34-1	N/A	N/A	N/A	N/A	None available	None available	None available	None available
1,2-dichlorobenzene	95-50-1	N/A	N/A	N/A	N/A	2.0E-01	HEAST	9.0E-02	IRIS
1,2-dichlorobutane	616-21-7	N/A	N/A	N/A	N/A	None available	None available	None available	None available
1,2-dichloroethane	107-06-2	2.6E-05	IRIS	9.1E-02	IRIS	7.0E-03	PPRTV	6.0E-03	PPRTV
1,2-dichloropropane	78-87-5	1.0E-05	Cal EPA	3.6E-02	Cal EPA	4.0E-03	IRIS	9.0E-02	ATSDR
1,3-dichlorobenzene	541-73-1	N/A	N/A	N/A	N/A	None available	None available	None available	None available
1,4-dichlorobenzene	106-46-7	1.1E-05	Cal EPA	5.4E-03	Cal EPA	8.0E-01	IRIS	7.0E-02	ATSDR
1,4-dioxane	123-91-1	5.0E-06	IRIS	1.0E-01	IRIS	3.0E-02	IRIS	3.0E-02	IRIS
1,4-dithiane	505-29-3	N/A	N/A	N/A	N/A	4.0E-02	route-to-route	1.0E-02	IRIS
1,4-oxathiane	15980-15-1	N/A	N/A	N/A	N/A	None available	None available	None available	None available
1-chlorobutane	109-69-3	N/A	N/A	N/A	N/A	1.6E-01	route-to-route	4.0E-02	PPRTV
1-hexene	592-41-6	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2,2-dimethyl-trans-thiirane	3772-13-2	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2,3-dimethyl-thiophene	632-16-6	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2,4,6-trinitrotoluene	118-96-7	7.5E-06	route-to-route	3.0E-02	IRIS	2.0E-03	route-to-route	5.0E-04	IRIS
2,4-dichlorophenol	120-83-2	N/A	N/A	N/A	N/A	1.2E-02	route-to-route	3.0E-03	IRIS
2,4-dinitrotoluene	121-14-2	8.9E-05	Cal EPA	6.8E-01	IRIS	8.0E-03	route-to-route	2.0E-03	IRIS
2,6-dinitrotoluene	606-20-2	1.7E-04	route-to-route	6.8E-01	IRIS	1.2E-03	route-to-route	3.0E-04	PPRTV
2-butanone	78-93-3	N/A	N/A	N/A	N/A	5.0E+00	IRIS	6.0E-01	IRIS
2-chlorobutane	78-86-4	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2-chloroethoxyethane	112-26-5	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2-ethyl 1,3-butadiene	3404-63-5	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2-hexanone	591-78-6	N/A	N/A	N/A	N/A	3.0E-02	IRIS	5.0E-03	IRIS
2-methyl phenol	95-48-7	None available	None available	None available	None available	6.0E-01	Cal EPA	5.0E-02	IRIS
2-methyl-1,3-dithiacyclopentane	5616-51-3	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2-methyl-1,3-dithiane	6007-26-7	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2-methyl-1,3-oxathiolane	17642-74-9	N/A	N/A	N/A	N/A	None available	None available	None available	None available
2-methylnaphthalene	91-57-6	N/A	N/A	N/A	N/A	1.6E-02	route-to-route	4.0E-03	IRIS
3-methyl phenol	108-39-4	None available	None available	None available	None available	6.0E-01	Cal EPA	5.0E-02	IRIS
4-methyl phenol	106-44-5	None available	None available	None available	None available	6.0E-01	Cal EPA	1.0E-01	ATSDR

Table 6-1. Toxicity Values for Chronic Exposures (continued)

COPC	CAS Number	Cancer				Noncancer			
		Inhalation		Oral		Inhalation		Oral	
		$(ug/m3)^{-1}$	Reference	$(mg/kg/day)^{-1}$	Reference	(mg/m3)	Reference	(mg/kg/day)	Reference
4-methyl-2-pentanone	108-10-1	N/A	N/A	N/A	N/A	3.0E+00	IRIS	8.0E-02	Withdrawn HEAST
acenaphthylene	208-96-8	N/A	N/A	N/A	N/A	None available	None available	None available	None available
acetaldehyde	75-07-0	2.2E-06	IRIS	1.0E-02	Cal EPA	9.0E-03	IRIS	2.3E-03	route-to-route
acetone	67-64-1	N/A	N/A	N/A	N/A	3.1E+01	ATSDR	9.0E-01	IRIS
acetylene	74-86-2	N/A	N/A	N/A	N/A	None available	None available	None available	None available
acrolein	107-02-8	N/A	N/A	N/A	N/A	2.0E-05	IRIS	5.0E-04	IRIS
alpha-methylstyrene	98-83-9	N/A	N/A	N/A	N/A	2.8E-01	route-to-route	7.0E-02	HEAST
benzene	71-43-2	7.8E-06	IRIS	5.5E-02	IRIS	3.0E-02	IRIS	4.0E-03	IRIS
bis(2-chloroisopropyl) ether	39638-32-9	1.0E-05	Withdrawn HEAST	7.0E-02	Withdrawn HEAST	1.6E-01	route-to-route	4.0E-02	IRIS
carbon disulfide	75-15-0	N/A	N/A	N/A	N/A	7.0E-01	IRIS	1.0E-01	IRIS
chlorobenzene	108-90-7	N/A	N/A	N/A	N/A	5.0E-02	PPRTV	2.0E-02	IRIS
chloroethane	75-00-3	N/A	N/A	N/A	N/A	1.0E+01	IRIS	2.5E+00	route-to-route
chloroform	67-66-3	2.3E-05	IRIS	3.1E-02	Cal EPA	9.7E-02	ATSDR	1.0E-02	IRIS
chloromethane	74-87-3	N/A	N/A	N/A	N/A	9.0E-02	IRIS	2.3E-02	route-to-route
chloromethoxyethane	3188-13-4	N/A	N/A	N/A	N/A	None available	None available	None available	None available
cis-1,2-dichloroethene	156-59-2	N/A	N/A	N/A	N/A	8.0E-03	route-to-route	2.0E-03	IRIS
dichlorodifluoromethane	75-71-8	N/A	N/A	N/A	N/A	1.0E-01	PPRTV	2.0E-01	IRIS
diethyl ether	60-29-7	N/A	N/A	N/A	N/A	8.0E-01	route-to-route	2.0E-01	IRIS
diethyl phthalate	84-66-2	N/A	N/A	N/A	N/A	3.2E+00	route-to-route	8.0E-01	IRIS
di-n-butyl phthalate	84-74-2	N/A	N/A	N/A	N/A	4.0E-01	route-to-route	1.0E-01	IRIS
diphenylamine	122-39-4	N/A	N/A	N/A	N/A	1.0E-01	route-to-route	2.5E-02	IRIS
ethane	74-84-0	N/A	N/A	N/A	N/A	None available	None available	None available	None available
ethanol	64-17-5	N/A	N/A	N/A	N/A	None available	None available	None available	None available
ethene	74-85-1	N/A	N/A	N/A	N/A	None available	None available	None available	None available
ethyl centralite	85-98-3	N/A	N/A	N/A	N/A	None available	None available	None available	None available
ethylbenzene	100-41-4	2.5E-06	Cal EPA	1.1E-02	Cal EPA	1.0E+00	IRIS	1.0E-01	IRIS
HD	505-60-2	4.1E-03	USAPHC	7.7E+00	USAPHC	2.0E-05	IRIS	7.0E-06	USAPHC
hexachlorobutadiene	87-68-3	2.2E-05	IRIS	7.8E-02	IRIS	4.0E-03	route-to-route	1.0E-03	PPRTV
hexachloroethane	67-72-1	1.1E-05	Cal EPA	4.0E-02	IRIS	3.0E-02	IRIS	7.0E-04	IRIS
hexane	110-54-3	N/A	N/A	N/A	N/A	7.0E-01	IRIS	6.0E-02	Withdrawn HEAST
methane	74-82-8	N/A	N/A	N/A	N/A	None available	None available	None available	None available
methyl tert-butyl ether	1634-04-4	2.6E-07	Cal EPA	1.8E-03	Cal EPA	3.0E+00	IRIS	7.5E-01	route-to-route
methylene chloride	75-09-2	1.0E-08	IRIS	2.0E-03	IRIS	6.0E-01	IRIS	6.0E-03	IRIS
monoethanolamine	141-43-5	N/A	N/A	N/A	N/A	None available	None available	None available	None available
naphthalene	91-20-3	3.4E-05	Cal EPA	1.2E-01	Cal EPA	3.0E-03	IRIS	2.0E-02	IRIS
nitrobenzene	98-95-3	4.0E-05	IRIS	1.6E-01	route-to-route	9.0E-03	IRIS	2.0E-03	IRIS

Table 6-1. Toxicity Values for Chronic Exposures (continued)

COPC	CAS Number	Cancer				Noncancer			
		Inhalation		Oral		Inhalation		Oral	
		$(ug/m3)^{-1}$	Reference	$(mg/kg/day)^{-1}$	Reference	(mg/m3)	Reference	(mg/kg/day)	Reference
nitroglycerin	55-63-0	4.3E-06	route-to-route	1.7E-02	PPRTV	4.0E-04	route-to-route	1.0E-04	PPRTV
octane	111-65-9	N/A	N/A	N/A	N/A	None available	None available	None available	None available
pentane	109-66-0	N/A	N/A	N/A	N/A	1.0E+00	PPRTV	2.5E-01	route-to-route
phenanthrene	85-01-8	N/A	N/A	N/A	N/A	None available	None available	None available	None available
phenol	108-95-2	N/A	N/A	N/A	N/A	2.0E-01	Cal EPA	3.0E-01	IRIS
propene	115-07-1	N/A	N/A	N/A	N/A	3.0E+00	Cal EPA	7.5E-01	route-to-route
styrene	100-42-5	N/A	N/A	N/A	N/A	1.0E+00	IRIS	2.0E-01	IRIS
tert-butyl alcohol	75-65-0	N/A	N/A	N/A	N/A	None available	None available	None available	None available
tetracene	92-24-0	N/A	N/A	N/A	N/A	None available	None available	None available	None available
tetrachloroethene	127-18-4	2.6E-07	IRIS	2.1E-03	IRIS	4.0E-02	IRIS	6.0E-03	IRIS
tetryl	479-45-8	N/A	N/A	N/A	N/A	8.0E-03	route-to-route	2.0E-03	PPRTV
thiirane	420-12-2	N/A	N/A	N/A	N/A	None available	None available	None available	None available
thiodiglycol	111-48-8	N/A	N/A	N/A	N/A	2.8E-01	route-to-route	7.0E-02	PPRTV
toluene	108-88-3	N/A	N/A	N/A	N/A	5.0E+00	IRIS	8.0E-02	IRIS
trans-1,2-dichloroethene	156-60-5	N/A	N/A	N/A	N/A	8.0E-02	route-to-route	2.0E-02	IRIS
trichloroethene	79-01-6	4.1E-06	IRIS	4.6E-02	IRIS	2.0E-03	IRIS	5.0E-04	IRIS
vinyl chloride	75-01-4	4.4E-06	IRIS	7.2E-01	IRIS	1.0E-01	IRIS	3.0E-03	IRIS
xylenes	1330-20-7	N/A	N/A	N/A	N/A	1.0E-01	IRIS	2.0E-01	IRIS
aluminum	7429-90-5	N/A	N/A	N/A	N/A	5.0E-03	PPRTV	1.0E+00	PPRTV
ammonia	7664-41-7	N/A	N/A	N/A	N/A	1.0E-01	IRIS	2.5E-02	route-to-route
arsenic, inorganic	7440-38-2	4.3E-03	IRIS	1.5E+00	IRIS	1.5E-05	Cal EPA	3.0E-04	IRIS
cadmium	7440-43-9	1.8E-03	IRIS	1.5E+01	Cal EPA	1.0E-05	ATSDR	5.0E-04	IRIS
chlorine	7782-50-5	N/A	N/A	N/A	N/A	1.4E-04	ATSDR	1.0E-01	IRIS
copper	7440-50-8	N/A	N/A	N/A	N/A	1.6E-01	route-to-route	4.0E-02	HEAST
hydrogen chloride	7647-01-0	N/A	N/A	N/A	N/A	2.0E-02	IRIS	5.0E-03	route-to-route
hydrogen cyanide	74-90-8	N/A	N/A	N/A	N/A	8.0E-04	IRIS	6.0E-04	IRIS
lead	7439-92-1	1.2E-05	Cal EPA	8.5E-03	Cal EPA	None available	None available	None available	None available
nickel	7440-02-0	2.4E-04	IRIS	9.1E-01	Cal EPA	9.0E-05	ATSDR	2.0E-02	IRIS
silver	7440-22-4	N/A	N/A	N/A	N/A	2.0E-02	route-to-route	5.0E-03	IRIS

Notes:
N/A - not applicable. This chemical is not a known, probable, or possible carcinogen.
ATSDR - The Agency of Toxic Substances and Disease Registry (ATSDR) Minimal Risk Levels (MRLs) (ATSDR, 2014).
Cal EPA - California EPA, Office of Environmental Health Hazard Assessment (OEHHA) Toxicity Criteria Database (CalEPA OEHHA, 2015).
CDPHE – Colorado Department of Public Health and Environment Air Screening Concentration – Use of this value deviates from the protocol hierarchy and is used at the request of CDPHE.
IRIS – USEPA Integrated Risk Information System (IRIS) (USEPA, 2015a).
USAPHC – US Army Public Health Command (USAPHC, 2011b).
USEPA Region IX RSL tables (Traditional Tables where TR=1E-06 and THQ=1.0) compile IRIS, ATSDR, and Cal EPA values, as well as the following (USEPA, 2015b).
HEAST - Health Effects Assessment Summary Tables
PPRTV - Provisional Peer Reviewed Toxicity Values
route-to-route – toxicity value was extrapolated from other pathway (converted using adult body weight of 80 kg and 20 m^3/day inhalation rate)

6.2 TOXICITY VALUES FOR ACUTE EXPOSURES

Acute inhalation exposure criteria (AIEC) were selected for each COPC using the hierarchical approach recommended in the HHRAP (USEPA, 2005a) and presented below in order of preference:

- Cal/EPA Acute Reference Exposure Levels (RELs)
- Acute Exposure Guidelines (AEGL-1)
- Level 1 Emergency Response Planning Guidelines (ERPG-1)
- Temporary Emergency Exposure Limits (TEEL-1)
- AEGL-2 values

As directed by the HHRAP (USEPA, 2005a), if an instance occurred when an AEGL-1 value was not available but an AEGL-2 value was available, the AEGL-2 value was selected as the AIEC only when it was a more protective value (i.e., lower in concentration) than an ERPG-2 or TEEL-1 value, if either of these values was available.

Table 6-2 presents the acute toxicity data obtained from all hierarchical sources, as well as the AIEC used to estimate potential acute hazards for each COPC evaluated in this MPHRA.

The USAPHC (USAPHC, 2011a) has derived a 1-hour AEGL-1 value (0.067 mg/m^3) and a 15-minute short-term exposure limit (STEL) value (0.003 mg/m^3) for the acute toxicity of HD. At the request of CDPHE, the more conservative 15-minute STEL value was used for the HD AIEC, as indicated in Table 6-2, even though an AEGL-1 value was available for HD that would have been selected for use based on the hierarchical approach recommended in the HHRAP (USEPA, 2005a). This 15-minute STEL was transformed to a 1-hour average air concentration (0.00075 mg/m^3) using the method provided by USEPA (2005a). The impact of using the more conservative HD STEL instead of the AEGL-1 for acute health affects is assessed in Section 8.

Table 6-2. Toxicity Values for Acute Exposures

COPC	Cal/EPA Acute REL	AEGL-1	AIHA ERPG-1	TEEL-1	AEGL-2	Selected AIEC		
	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	Basis	Ave. Time
1,1,1,2-tetrachloroethane				3.7E+00		3.7E+00	TEEL-1	1-hour
1,1,1-trichloroethane	6.8E+01	1.3E+03	1.9E+03	1.3E+03	3.3E+03	6.8E+01	Cal/EPA Acute REL	1-hour
1,1,2,2-tetrachloroethane				7.0E+00		7.0E+00	TEEL-1	1-hour
1,1-dichloroethane				6.5E+02		6.5E+02	TEEL-1	1-hour
1,1-dichloroethene				1.8E+02		1.8E+02	TEEL-1	1-hour
1,2,3-trichlorobenzene				6.3E+00		6.3E+00	TEEL-1	1-hour
1,2,4-trichlorobenzene				3.4E+00		3.4E+00	TEEL-1	1-hour
1,2,4-trimethyl benzene		6.9E+02			1.8E+03	6.9E+02	AEGL-1	1-hour
1,2-bis(ethylthio)-ethene						None available		
1,2-bis(vinylthio)-ethane						None available		
1,2-dichlorobenzene				3.0E+02		3.0E+02	TEEL-1	1-hour
1,2-dichlorobutane						None available		
1,2-dichloroethane			2.0E+02			2.0E+02	AIHA ERPG-1	1-hour
1,2-dichloropropane				1.4E+02		1.4E+02	TEEL-1	1-hour
1,3-dichlorobenzene				1.6E+01		1.6E+01	TEEL-1	1-hour
1,4-dichlorobenzene				6.0E+01		6.0E+01	TEEL-1	1-hour
1,4-dioxane	3.0E+00	6.1E+01			1.2E+03	3.0E+00	Cal/EPA Acute REL	1-hour
1,4-dithiane						None available		
1,4-oxathiane				1.0E+01		1.0E+01	TEEL-1	1-hour
1-chlorobutane				5.6E+00		5.6E+00	TEEL-1	1-hour
1-hexene				1.7E+02		1.7E+02	TEEL-1	1-hour
2,2-dimethyl-trans-thiirane						None available		
2,3-dimethyl-thiophene						None available		
2,4,6-trinitrotoluene				3.0E-01		3.0E-01	TEEL-1	1-hour
2,4-dichlorophenol			1.3E+00			1.3E+00	AIHA ERPG-1	1-hour
2,4-dinitrotoluene				6.0E-01		6.0E-01	TEEL-1	1-hour
2,6-dinitrotoluene				6.0E-01		6.0E-01	TEEL-1	1-hour
2-butanone	1.3E+01	5.9E+02			8.0E+03	1.3E+01	Cal/EPA Acute REL	1-hour
2-chlorobutane				4.7E-01		4.7E-01	TEEL-1	1-hour
2-chloroethoxyethane				7.5E-01		7.5E-01	TEEL-1	1-hour
2-ethyl 1,3-butadiene						None available		
2-hexanone				4.1E+01		4.1E+01	TEEL-1	1-hour
2-methyl phenol				2.0E+01		2.0E+01	TEEL-1	1-hour
2-methyl-1,3-dithiacyclopentane						None available		
2-methyl-1,3-dithiane						None available		
2-methyl-1,3-oxathiolane						None available		
2-methylnaphthalene				3.0E+00		3.0E+00	TEEL-1	1-hour
3-methyl phenol				2.0E+01		2.0E+01	TEEL-1	1-hour
4-methyl phenol				2.0E+01		2.0E+01	TEEL-1	1-hour
4-methyl-2-pentanone				3.1E+02		3.1E+02	TEEL-1	1-hour
acenaphthylene				1.0E+01		1.0E+01	TEEL-1	1-hour
acetaldehyde	4.7E-01	8.1E+01	1.8E+01		4.9E+02	4.7E-01	Cal/EPA Acute REL	1-hour

Table 6-2. Toxicity Values for Acute Exposures (continued)

COPC	Cal/EPA Acute REL	AEGL-1	AIHA ERPG-1	TEEL-1	AEGL-2	Selected AIEC		
	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	Basis	Ave. Time
acetone		4.7E+02			7.6E+03	4.7E+02	AEGL-1	1-hour
acetylene				6.9E+04		6.9E+04	TEEL-1	1-hour
acrolein	2.5E-03	6.9E-02	1.1E-01		2.3E-01	2.5E-03	Cal/EPA Acute REL	1 hour
alpha-methylstyrene				4.8E+02		4.8E+02	TEEL-1	1-hour
benzene	2.7E-02	1.7E+02	1.6E+02		2.6E+03	2.7E-02	Cal/EPA Acute REL	1-hour
bis(2-chloroisopropyl) ether						None available		
carbon disulfide	6.2E+00	4.0E+01	3.1E+00		5.0E+02	6.2E+00	Cal/EPA Acute REL	1-hour
chlorobenzene		4.6E+01		4.6E+01	6.9E+02	4.6E+01	AEGL-1	1-hour
chloroethane				2.6E+02		2.6E+02	TEEL-1	1-hour
chloroform	1.5E-01			9.8E+00	3.1E+02	1.5E-01	Cal/EPA Acute REL	1-hour
chloromethane			3.1E+02	2.1E+02	1.9E+03	3.1E+02	AIHA ERPG-1	1-hour
chloromethoxyethane						None available		
cis-1,2-dichloroethylene		5.5E+02			2.0E+03	5.5E+02	AEGL-1	1-hour
dichlorodifluoromethane				4.9E+03		4.9E+03	TEEL-1	1-hour
diethyl ether				1.5E+03		1.5E+03	TEEL-1	1-hour
diethyl phthalate				5.0E+00		5.0E+00	TEEL-1	1-hour
di-n-butyl phthalate				1.5E+01		1.5E+01	TEEL-1	1-hour
diphenylamine				3.0E+01		3.0E+01	TEEL-1	1-hour
ethane				3.7E+03		3.7E+03	TEEL-1	1-hour
ethanol			3.4E+03			3.4E+03	AIHA ERPG-1	1-hour
ethene				6.9E+02		6.9E+02	TEEL-1	1-hour
ethyl centralite						None available		
ethylbenzene		1.4E+02			4.8E+03	1.4E+02	AEGL-1	1-hour
HD[a]		6.7E-02			1.0E-01	7.5E-04	STEL (0.003 mg/m^3 adjusted from 15-min to 1-hour)	1-hour
hexachlorobutadiene			1.1E+01			1.1E+01	AIHA ERPG-1	1-hour
hexachloroethane				2.9E+01		2.9E+01	TEEL-1	1-hour
hexane				1.1E+03	1.0E+04	1.1E+03	TEEL-1	1-hour
methane				1.9E+03		1.9E+03	TEEL-1	1-hour
methyl tert-butyl ether		1.8E+02	1.8E+02		2.1E+03	1.8E+02	AEGL-1	1-hour
methylene chloride	1.4E+01	6.9E+02	1.0E+03		1.9E+03	1.4E+01	Cal/EPA Acute REL	1-hour
monoethanolamine				1.5E+01		1.5E+01	TEEL-1	1-hour
naphthalene				7.9E+01		7.9E+01	TEEL-1	1-hour
nitrobenzene				9.1E+00		9.1E+00	TEEL-1	1-hour
nitroglycerin				1.0E-01		1.0E-01	TEEL-1	1-hour
octane				1.4E+03		1.4E+03	TEEL-1	1-hour
pentane				3.5E+02		3.5E+02	TEEL-1	1-hour
phenanthrene				7.6E-01		7.6E-01	TEEL-1	1-hour
phenol	5.8E+00	5.8E+01	3.8E+01		8.8E+01	5.8E+00	Cal/EPA Acute REL	1-hour
propene				8.6E+02		8.6E+02	TEEL-1	1-hour
styrene	2.1E+01	8.5E+01	2.1E+02	8.5E+01	5.5E+02	2.1E+01	Cal/EPA Acute REL	1-hour
tert-butyl alcohol				4.5E+02		4.5E+02	TEEL-1	1-hour

Table 6-2. Toxicity Values for Acute Exposures (continued)

COPC	Cal/EPA Acute REL	AEGL-1	AIHA ERPG-1	TEEL-1	AEGL-2	Selected AIEC		
	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	(mg/m^3)	Basis	Ave. Time
tetracene						None available		
tetrachloroethene	2.0E+01	2.4E+02	6.8E+02		1.6E+03	2.0E+01	Cal/EPA Acute REL	1-hour
tetryl				4.5E+00		4.5E+00	TEEL-1	1-hour
thiirane						None available		
thiodiglycol				2.0E+01		2.0E+01	TEEL-1	1-hour
toluene	3.7E+01	2.5E+02	1.9E+02		2.1E+03	3.7E+01	Cal/EPA Acute REL	1-hour
trans-1,2-dichloroethylene		1.1E+03			4.0E+03	1.1E+03	AEGL-1	1-hour
trichloroethene		7.0E+02	5.4E+02		2.4E+03	7.0E+02	AEGL-1	1-hour
vinyl chloride	1.8E+02	6.4E+02	1.3E+03		3.1E+03	1.8E+02	Cal/EPA Acute REL	1-hour
xylenes	2.2E+01	5.6E+02			4.0E+03	2.2E+01	Cal/EPA Acute REL	1-hour
aluminum				3.0E+00		3.0E+00	TEEL-1	1-hour
ammonia	3.2E+00	2.1E+01	1.7E+01		1.1E+02	3.2E+00	Cal/EPA Acute REL	1-hour
arsenic	2.0E-04			3.0E-02		2.0E-04	Cal/EPA Acute REL	1-hour
cadmium		1.0E-01		1.0E-01	7.6E-01	1.0E-01	AEGL-1	1-hour
chlorine	2.1E-01	1.4E+00	2.9E+00		5.8E+00	2.1E-01	Cal/EPA Acute REL	1-hour
copper	1.0E-01			1.0E+00		1.0E-01	Cal/EPA Acute REL	1-hour
hydrogen chloride	2.1E+00	2.7E+00	4.5E+00	2.7E+00	3.3E+01	2.1E+00	Cal/EPA Acute REL	1-hour
hydrogen cyanide	3.4E-01	2.2E+00			7.8E+00	3.4E-01	Cal/EPA Acute REL	1-hour
lead				1.5E-01		1.5E-01	TEEL-1	1-hour
nickel	2.0E-04			4.5E+00		2.0E-04	Cal/EPA Acute REL	1-hour
silver				1.0E-01		1.0E-01	TEEL-1	1-hour

a. HD acute toxicity value based on the CDC and USACHPPM 15-minute short-term exposure limit (STEL), which provides a more conservative estimate than the 1-hour AEGl-1 value.

Notes:

Cal/EPA Acute REL – California EPA Acute Reference Exposure Level (CalEPA OEHHA, 2015).
AEGL-1 – Acute Exposure Guideline Level 1 (USEPA, 2014b).
AEGL-2 – Acute Exposure Guideline Level 2 (USEPA, 2014b).
AIHA ERPG-1 – American Industrial Hygiene Association Level 1 Emergency Response Planning Guidelines (ERPG) (SCAPA, 2012).
TEEL-1 – United States Department of Energy Temporary Emergency Exposure Limits (SCAPA, 2012).
AEGL-1 and AEGL-2 values for acetone, ethylbenzene, methyl tert-butyl ether, trichloroethene, and cadmium are interim values.