United States
Environmental Protection
Agency

Pesticides and
Toxic Substances
(TS-778)

EPA/560/2-89/002
Version 1.0
July 1989

EPA

Toxic Chemical Release Inventory Risk Screening Guide

Volume 2 - Appendices

EPA/560/2-89/002
July 1989

TOXIC CHEMICAL RELEASE INVENTORY RISK SCREENING GUIDE (VERSION 1.0)

VOLUME 2: APPENDICES

U.S. Environmental Protection Agency
Office of Toxic Substances
Washington, DC 20460

EPA 560/2-89-002

July 1989

Printed on Recycled Paper

APPENDIX A

TITLE III TOXICOLOGICAL POTENCY INDICES

TOXICOLOGICAL POTENCY INDICES

This appendix lists toxicity indices from several EPA sources for chemicals under Section 302 (TPQs), Section 304 (RQs), and Section 313 (TRI). Several official measures of chemical toxicological potency are presented because no single index considers all factors relevant to the characterization of a chemical's toxicity potential. These EPA toxicity indices were selected for inclusion in the guide because they:

- Were developed by expert toxicologists using original scientific papers.
- Are toxicity-based rankings, and do not include factors such as technical feasibility or economics.
- Consider all relevant toxic effects and routes of exposure when taken together.
- Are peer reviewed, EPA-endorsed, and readily available.

For purposes of risk screening, the toxicity values for each index have been aggregated into three toxicological potency groups:

TOXICITY INDEX	TOXICOLOGICAL POTENCY GROUPS		
	Group 1	Group 2	Group 3
TPQ* (lbs)	1, 10, 100	500	1,000, 10,000
RQ** (lbs)	1, 10, 100	1,000	5,000
Rfd mg/kg/day	<0.01	0.01-0.10	≥1.0
Cancer potency	All		
WQC mg/L	<1	1-10	≥10

* Based on acute inhalation toxicity concerns only; use other values for chronic toxicity or ecotoxicity evaluations.

** More than one RQ may be assigned to each chemical, depending on the toxic effect under consideration.

The toxicity value ranges for the EPA toxicity indices were assigned to each of the three toxicological potency groups in the following manner. All carcinogens were placed into Group 1. Since, in the RQ process, carcinogens are allocated to a 1, 10, or 100 pound RQ level (see description of RQ process below), these three RQ levels defined the Group 1 toxicity value range. Chemicals in RQ levels of 1, 10, or 100 pounds for each of the other end effects, i.e., acute toxicity (acute), chronic toxicity (CTX), or aquatic toxicity (AQTX), were assigned to toxicological potency Group 1. Chemicals in the 1,000 pound RQ level were assigned to toxicological potency Group 2, and in the 5,000 pound RQ level to Group 3. Where possible, the value ranges for the measure of toxicity used to assign chemicals to RQ levels for each of the above listed end effects (e.g., LD_{50} and LC_{50} values for acute toxicity) were used as a guide to the determination of Group 1, 2, and 3 toxicity value ranges for the other EPA toxicity indices.

Clearly, the determinations of the appropriate number of toxicological potency groups and the ranges of toxicity values to assign to each group are arbitrary. Other schemes for presenting the relative toxicological potency of chemicals could be developed. Any scheme that attempts to integrate multiple EPA toxicity indices will have inherent flaws due to the different factors, or weighting of factors, considered in the generation of each toxicity index.

Reportable Quantities (RQs)

In the case of an accidental spill or release, the NRC, SERC, and LEPC must be notified if any hazardous chemical is released at a level greater than or equal to its reportable quantity (RQ). This notification is required under CERCLA and Title III. Currently about two-thirds of the Section 313 chemicals have assigned RQs. If a chemical does not yet have an RQ, it may be that these numbers are still under consideration.

There are five levels of RQs: 1, 10, 100, 1,000, and 5,000 pounds. An RQ is assigned to a chemical based on a consideration of the chemical's intrinsic chemical, physical, and toxicological properties. The lowest RQ in any category becomes the primary RQ for that

substance. This primary RQ can be adjusted further upon consideration of the chemical's tendency to degrade in the environment. Although RQ determinations are not a definite indication of how hazardous a chemical will be at its reportable level, they may be used as indicators of a chemical's overall *relative* potential to cause toxicological and/or ecological effects at a given exposure level.

In assigning an overall RQ for a substance, up to six individual RQs are calculated separately for aquatic toxicity, acute mammalian toxicity, chronic toxicity, potential carcinogenicity, reactivity, and ignitability. Four of these are based on health or ecological effects (aquatic toxicity, acute mammalian toxicity, chronic toxicity, and potential carcinogenicity).

The *acute toxicity* of a substance is assessed based on the LD_{50} or LC_{50} of a substance administered by the oral, dermal, or inhalation route. Each of the five RQ levels has an LD_{50} value range for both acute oral and acute dermal toxicity, and an LC_{50} range for acute inhalation toxicity. The RQ level chosen for the acute toxicity category is the lowest of the RQs derived from the available acute toxicity data.

The *chronic toxicity* RQ is determined by a composite score assigned to a substance based on both minimum effective dose levels (oral, dermal, and inhalation) and the severity of the effects caused by repeated or continuous exposure. Teratogenic effects are considered as chronic effects.

The RQ method ranks *carcinogenic potential* through a two-stage combined weight-of-evidence and carcinogenic potency approach. During the first stage, evidence from animal and human studies are evaluated and the substance is assigned to a category according to a set of prescribed rules. The weight-of-evidence categories include Group A (known human carcinogen - evidence in humans is sufficient), Group B (probable human carcinogen - evidence in humans is limited or inadequate, but animal evidence is sufficient), Group C (possible human carcinogen - inadequate or no evidence in humans and animal evidence is limited), Group D (not classifiable), or Group E (evidence of noncarcinogenicity for humans). During the second stage, a quantitative assessment of the animal data (for Groups A, B and

C) is made by estimating the dose of the substance that causes a 10 percent increase in tumor incidence above control levels. This estimated dose is termed the ED_{10}. A potency factor (F) is calculated from the reciprocal of the ED_{10}. Substances are assigned to potency groups of 1 (high), 2, or 3 depending on the magnitude of F. The weight-of-evidence and potency classifications for a given substance are combined through the use of a matrix that allows a designation of potential carcinogens into hazard categories of high, medium, or low resulting in RQs of 1, 10, and 100 pounds respectively.

The *aquatic toxicity* RQ is based on the chemical's toxicity to freshwater fish. Data from acute toxicity (96-hour) tests on a predetermined set of representative species are evaluated. The toxicity range within which the preponderance of LC_{50} values occurs is then translated to specific RQ values using the table below:

Aquatic Toxicity	RQ (Pounds)
LC_{50} <0.1 mg/L	1
0.1 mg/L $\leq LC_{50}$ <1 mg/L	10
1 mg/L $\leq LC_{50}$ <10 mg/L	100
10 mg/L $\leq LC_{50}$ <100 mg/L	1,000
100 mg/L $\leq LC_{50}$ <500 mg/L	5,000

For information about adjustments to RQs, see the Federal Register, May 25, 1983, p. 12552; April 4, 1985, p. 13456; September 29, 1986, p. 34534; March 16, 1987, p. 8140. For a comprehensive description of how RQs are set and used, see: U.S. EPA. 1985. Technical Background Document to Support Rulemaking Pursuant to CERCLA, Section 102, Volumes I, II, and III.

Threshold Planning Quantities (TPQs)

Threshold planning quantities have been set for each of the 366 Extremely Hazardous Substances listed under Title III Section 302. Under Section 302, facilities maintaining any of the Extremely Hazardous Substances at or above their TPQ must inform the SERC. TPQs are based upon a relative rank list of their toxicological risk. In addition to evaluating the chemicals' acute toxicity, the threshold planning system takes into account their tendency to become airborne. Each chemical is assessed on the basis of "level of concern" for toxicity,

and its ability to disperse. (Gases, powdered solids, and volatile liquids rank higher in concern than brick solids and non-volatile liquids of equal toxicity.) These factors are combined to give a ranking score for the chemical. That score is then translated to a TPQ of 1, 10, 100, 500, 1,000, or 10,000 pounds. The lower the number, the higher the concern for acute toxicity and ability to disperse.

One discrepancy is apparent in the toxicity tables (at the end of this Appendix). Eleven chemicals have been assigned to potency Group 1 for acute toxicity under the RQ scheme, and these same chemicals are relegated to potency Group 3 for TPQs. This is because acute toxicity RQs depend solely on animal toxicity data, while TPQs are based on a chemical's potential for becoming airborne as well as its toxicity. These 11 chemicals received low RQs, indicating a relatively high potential to cause toxicological effects. However, these chemicals are less likely than other chemicals to become airborne and disperse in the atmosphere; therefore, they are assigned relatively higher TPQs.

For more information on TPQs, see the Federal Register, April 22, 1987, p. 13377.

Reference Doses (RfDs)

Reference Doses (RfDs) are used in determining the threshold dose below which no observable effects are assumed to occur. They are estimates (with uncertainty spanning perhaps an order of magnitude) of a daily, lifetime human exposure to a substance that is likely to be without appreciable risk of deleterious effects, including effects to sensitive subpopulations. An RfD is a measure of human chronic exposure. RfDs are determined after a thorough review and assessment of all the available health effects data for a chemical. To calculate the RfD, the lowest reliable NOAEL (No-Observed-Adverse-Effect Level), or the highest dose at which no adverse effect was observed in the test species, is determined from the dose-response curve for the toxicant. That value is then divided by a number of uncertainty factors that account for differences between human and animal response, and the uncertainty in extrapolating from the dose-response curve. Reference doses are expressed in units of mg of substance per kg body weight per day (mg/kg/day).

$$RfD = NOAEL/UF$$

Reference doses are useful in quantitative risk assessment since they provide important benchmarks against which to compare exposure. RfDs are not used to assess the carcinogenic potential of a substance because cancer effects are thought to have no threshold. They provide a means to qualitatively compare the overall noncarcinogenic hazard potential of substances: the lower the RfD, the more toxic the chemical.

For more information, see the background document for IRIS, which provides short descriptions of the toxicity values listed in the data base: U.S. EPA. 1987. Integrated Risk Management System: Supportive Documentation, Volume 1. Office of Health and Environmental Assessment, Office of Research and Development.

Cancer Potency

Cancer potency is the expression of the relationship between the tumorigenic response to a carcinogen and the administered dose to the target or test organism. EPA expresses cancer potency using unit risk factors. The unit risk factor translates the estimated cancer potency into a probability of contracting cancer as a result of exposure to a unit dose of a carcinogen over a lifetime (70 years). In general, the lower the cancer potency, the lower the unit risk factor.

Much of EPA's risk assessment is based on information gathered from animal studies, in which a group of animals is given a dose of a substance, and its response to that dose is measured and recorded. The doses and their corresponding responses are plotted on a graph, producing a line called a dose-response curve. This provides a quantitative picture of the effect of a substance at different doses. However, in order to see any changes in body chemistry or physiology, scientists must often administer doses far greater than the dose to which any human may be exposed. To relate the response at high doses to potential effects at low doses, scientists extrapolate, or extend the dose-response curve, to the low end of the dose range, and attempt to predict the response. Extrapolation is based on trends observed at high doses. Often mathematical models are used for this purpose.

To determine the risk posed by carcinogenic substances, EPA uses an extrapolation model called the linear multistage procedure. This model provides a basis for extrapolating from high-dose effects in the curve to the effects potentially posed by low doses. The unit risk factor is the upper bound of the cancer potency of that chemical, obtained from the low-dose-response curve generated by the model. This numerical risk estimate is coupled with the EPA classification of the qualitative weight-of-evidence to more fully characterize the carcinogenic risk of a substance. (See page A-3 for a discussion of EPA weight-of-evidence categories.)

For more information, see the EPA Guidelines for Carcinogen Risk Assessment in the Federal Register, September 24, 1986, p. 33992.

See also: U.S. EPA, National Air Toxics Clearinghouse. 1987. Qualitative and Quantitative Carcinogen Risk Assessment. (EPA 450/5-87-003). The document provides a comprehensive summary of the basic principles and assumptions associated with carcinogen risk assessment, including a discussion of mathematical modeling and the cancer potency factor.

Aquatic Water Quality Criteria (WQC)

Aquatic water quality criteria are estimates of the ambient concentration of a chemical in surface waters (freshwater or marine waters) that will not cause adverse effects to the most sensitive aquatic organisms. These concentrations are based on information concerning the toxicity of the substance and its tendency to bioaccumulate. The numerical criteria address acute and chronic aquatic life effects with two separate criteria concentrations: the Criterion Maximum Concentration (CMC) protects against acute effects, while the Criterion Continuous Concentration (CCC) protects against chronic effects. These concentrations are based on toxicity studies conducted with at least three test organisms, one each representing fish, invertebrate, and plant species. The CMC is a 1-hour maximum exposure, and the CCC gives the maximum average concentration allowable over a 4-day period. Since these are average concentrations, the actual concentration at any time may exceed the criteria; however, the average cannot be exceeded, and the CMC and CCC cannot be exceeded more than once in 3 years. States should take site-specific factors into account to establish a lower frequency for exceeding the criteria, such as the occurrence of large spills or the importance of the indigenous species. States may also choose to calculate their own criteria concentrations based on tests conducted at specific water bodies.

In addition to aquatic water quality criteria, EPA publishes water quality criteria for protection of human health. These are estimates of ambient concentrations of chemicals that will not cause toxicity to humans who drink water or consume fish from that site. For carcinogens, the criteria provide estimates of the incremental cancer risk associated with a particular concentration of the chemical in water. However, because a number of other indices are available to address human health concerns, the human health water quality criteria are not included in this risk screening procedure.

For more information, see the Federal Register, November 28, 1980, p. 79341. Revisions are proposed in the Federal Register, February 7, 1984, p. 4553.

See also: U.S. EPA, Office of Water. Technical Support Document for Water Quality-based Permitting for Toxic Pollutants. The document describes water quality standards, human health hazard assessment, and exposure assessment.

CHEMICAL NAME	CAS #	LIST	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY							AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
			TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Acenaphthene	83329	b								1	2	1
Acenaphthylene	208968	b										
Acetaldehyde	75070	ab		3						2		
Acetaldehyde, trichloro-	75876	b		3								
Acetamide	60355	a										
Acetamide, N-(aminothioxomethyl)-	591082	b		2								
Acetamide, N-(4-ethoxyphenyl)-	62442	b		3				1				
Acetamide, N-9H-fluoren-2-yl-	53963	ab		3				1				
Acetic acid	64197	b		3						2		
Acetic acid, ethyl ester	141786	b		3						3		
Acetic anhydride	108247	b		3						2		
Acetone	67641	ab					2			3		
Acetone thiosemicarbazide	1752303	bc	3*	1				1				
Acetonitrile	75058	ab		3	2	2	1			3		
Acetophenone	98862	b		3		1	2					
Acetyl bromide	506967	b								3		
Acetyl chloride	75365	b								2		
Acrolein	107028	abc	2	1					1	1	1	1
Acrylamide	79061	abc	3*	3								
Acrylic acid	79107	ab		3								
Acrylonitrile	107131	abc	3	2	1			1	1	1	2	2
Acrylyl chloride	814686	bc	1	1								
Adipic acid	124049	b		3						3		
Adiponitrile	111693	bc	3	2								
Alanine, 3-[p-bis(2-chloroethyl)amino]phenyl-,L-	148823	b						1				
Aldicarb	116063	bc	1*	1						1		
Aldrin	309002	abc	2*	2			1	1	1	1	1	
Allyl alcohol	107186	bc	3	2	1					1		
Allyl chloride	107051	ab		2						2		
Allylamine	107119	bc	2	2	1							
Aluminum (fume or dust)	7429905	a										
Aluminum oxide	1344281	a										
Aluminum phosphide	20859738	bc	2	2						1		
Aluminum sulfate	10043013	b								3		
4-Amino-1-methyl benzene	106490	b		3				1				
1-Amino-2-methylanthraquinone	82280	a										
2-Aminoanthraquinone	117793	a										
4-Aminoazobenzene	60093	a										
4-Aminobiphenyl	92671	a										
Aminopterin	54626	bc	2*	1	1			1				

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Amiton	78535	bc	2	1								
Amiton oxalate	3734972	bc	1*	1								
Amitrole	61825	b		3				1				
Ammonia	7664417	abc	2	3	2	2	3			1		
Ammonium acetate	631618	b		3						3		
Ammonium benzoate	1863634	b		3						3		
Ammonium bicarbonate	1066337	b								3		
Ammonium bifluoride	1341497	b			2					3		
Ammonium bisulfite	10192300	b								3		
Ammonium carbamate	1111780	b								3		
Ammonium carbonate	506876	b		3						3		
Ammonium chloride	12125029	b		3						3		
Ammonium citrate, dibasic	3012655	b		3						3		
Ammonium fluoborate	13826830	b								3		
Ammonium fluoride	12125018	b		3	2					3		
Ammonium hydroxide	1336216	b		3						2		
Ammonium nitrate (solution)	6484522	a										
Ammonium oxalate	5972736	b		3						3		
Ammonium oxalate	6009707	b		3						3		
Ammonium oxalate	14258492	b		3						3		
Ammonium picrate	131748	b										
Ammonium silicofluoride	16919190	b		3						2		
Ammonium sulfamate	7773060	b		3						3		
Ammonium sulfate (solution)	7783202	a										
Ammonium sulfide	12135761	b		1						3		
Ammonium sulfite	10196040	b		3						3		
Ammonium tartrate	3164292	b		3						3		
Ammonium tartrate	14307438	b		3						3		
Ammonium thiosulfate	7783188	b								3		
Ammonium vanadate	7803556	b		2								
Amphetamine	300629	bc	3	2	1							
Amyl acetate	628637	b		3						2		
iso-Amyl acetate	123922	b										
sec-Amyl acetate	626380	b										
tert-Amyl acetate	625161	b										
Aniline	62533	abc	3	2						2		
Aniline, 2,4,6-trimethyl-	88051	bc	2	2								
o-Anisidine	90040	a										
p-Anisidine	104949	a										
o-Anisidine hydrochloride	134292	a										

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

			HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY							AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Anthracene	120127	ab										
Antimycin A	1397940	bc	3*	1								
Antu	86884	bc	2*	1						1		
Arsine	7784421	bc	1	2				1				
Arsine, diethyl-	692422	b										
Asbestos	1332214	ab			1			1	1			
Azaserine	115026	b		3				1				
Azinphos-ethyl	2642719	bc	1*	1	1							
Azinphos-methyl	86500	bc	1*	2						1		
alpha-BHC	319846	b		3				1				
beta-BHC	319857	b		3				1				
delta-BHC	319868	b		3						1		
Benz[j]aceanthrylene,1,2-dihydro-3-methyl-	56495	b						1				
Benz[c]acridine	225514	b						1				
Benzal chloride	98873	abc	2	3								
Benzamide	55210	a										
Benz[a]anthracene	56553	b						1				
1,2-Benzanthracene, 7,12-dimethyl-	57976	b		3				1				
Benzenamine, 4-chloro-	106478	b		3						2		
Benzenamine, 4-chloro-2-methyl-,hydrochloride	3165933	b		3				1				
Benzenamine, 2-methyl-, hydrochloride	636215	ab		3				1				
Benzenamine, 2-methyl-5-nitro-	99558	b		3				1				
Benzenamine, 4,4'-methylenebis(2-chloro-	101144	ab						1				
Benzenamine, N,N-dimethyl-4-phenylazo-	60117	ab		3				1				
Benzenamine, 4-nitro-	100016	b		3						3		
Benzenamine, 3-(trifluoromethyl)-	98168	bc	2	2								
Benzene	71432	ab		3	2			1	1	1	2	
Benzene, 1-bromo-4-phenoxy-	101553	b								1		
Benzene, chloro-	108907	ab		3	2	1	2			1		
Benzene, 1-(chloromethyl)-4-nitro-	100141	bc	2*	1				1				
Benzene, 1,2-dichloro-	95501	ab		3	2	2	2		1	1		
Benzene, 1,3-dichloro-	541731	ab			2				1	1		
Benzene, 1,4-dichloro-	106467	abc		3	2	2			1	1		
Benzene, dimethyl-	1330207	ab		3						2		
Benzene, m-dimethyl-	108383	ab										
Benzene, o-dimethyl-	95476	ab										
Benzene, p-dimethyl-	106423	ab										
Benzene, hexachloro	118741	ab		3	1		1	1	1			
Benzene, hexahydro-	110827	ab		3						2		
Benzene, methyl-	108883	ab		3	2					2		

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Benzene, 1-methyl-2,4-dinitro-	121142	ab		3	1			1		2		
Benzene, 1-methyl-2,6-dinitro-	606202	ab		3	1			1		2		
Benzene, 1,2-methylenedioxy-4-allyl-	94597	ab		3				1				
Benzene, 1,2-methylenedioxy-4-propenyl-	120581	b		3				1				
Benzene, 1,2-methylenedioxy-4-propyl-	94586	b		3				1				
Benzene, 1-methylethyl-	98828	ab		3								
Benzene, pentachloro-	608935	b			2					1		
Benzene, pentachloronitro-	82688	ab		3	2			1				
Benzene, 1,2,4,5-tetrachloro-	95943	b		3	3							
Benzene, 1,3,5-trinitro-	99354	b		3								
Benzenearsonic acid	98055	bc	1*	1				1				
1,2-Benzenedicarboxylic acid anhydride	85449	ab		3								
1,2-Benzenedicarboxylic acid,[bis(2-ethylhexyl)]ester	117817	ab		3				1				
1,2-Benzenedicarboxylic acid, diethyl ester	84662	ab		3	3					2		
1,3-Benzenediol	108463	b		3						2		
1,2-Benzenediol,4-[1-hydroxy-2-(methylamino)ethyl]-	51434	b		2								
Benzenesulfonyl chloride	98099	b		1								
Benzidine	92875	ab		3	1		1	1	1	1	2	
Benzimidazole, 4,5-dichloro-2-(trifluoromethyl)-	3615212	bc	2*	2								
1,2-Benzisothiazolin-3-one,1,1-dioxide, and salts	81072	ab						1				
Benzo[k]fluoranthene	207089	b										
Benzo[j,k]fluorene	206440	b		3						1		
Benzoic acid	65850	b		3			3			3		
Benzol[b]fluoranthene	205992	b						1				
Benzonitrile	100470	b		3						2		
Benzo[ghi]perylene	191242	b										
Benzo[a]pyrene	50328	b			1			1	1			
p-Benzoquinone	106514	ab		3						1		
Benzotrichloride	98077	abc	1	2				1				
Benzoyl chloride	98884	ab								2		
Benzoyl peroxide	94360	a										
1,2-Benzphenanthrene	218019	b						1				
Benzyl chloride	100447	abc	2	2				1		1		
Bicyclo[2.2.1]heptane-2-carbonitrile, 5-chloro-6-((((methyla	15271417	bc	2*	2								
Biphenyl	92524	a										
(1,1'-Biphenyl)-4,4'-diamine,3,3'-dichloro-	91941	ab		3				1				
(1,1'-Biphenyl)-4,4'-diamine,3,3'-dimethoxy-	119904	ab		3				1				
(1,1'-Biphenyl)-4,4'-diamine,3,3'-dimethyl-	119937	ab		3				1				
Bis(2-chloroethoxy) methane	111911	b		2								
Bis(2-chloroisopropyl) ether	108601	ab		3	2							

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Bis(chloromethyl) ketone	534076	bc	1*	1				1				
Bis(dimethylthiocarbamoyl)disulfide	137268	b		3						1		
Bis(2-ethylhexyl) adipate	103231	a										
Bitoscanate	4044659	bc	2*	2								
Boron trichloride	10294345	bc	2									
Boron trifluoride	7637072	bc	2	1	1							
Boron trifluoride compound with methyl ether (1:1)	353424	bc	3									
Bromadiolone	28772567	bc	1*	1								
Bromine	7726956	bc	2	3						2		
Bromoacetone	598312	b		2						2		
Bromoform	75252	ab		3	1		2		1	2		
Brucine	357573	b		1						1		
Butadiene	106990	a										
1-Butanamine, N-butyl-N-nitroso-	924163	ab		3				1				
Butanoic acid, 4-[bis(2-chloroethyl)amino] benzene-	305033	b						1				
1-Butanol	71363	ab		3								
2-Butanone	78933	ab		3	2					3		
2-Butanone peroxide	1338234	b		2								
2-Butene, 1,4-dichloro-	764410	b										
Butyl acetate	123864	b		3						2		
iso-Butyl acetate	110190	b										
sec-Butyl acetate	105464	b										
tert-Butyl acetate	540885	b										
Butyl acrylate	141322	a										
sec-Butyl alcohol	78922	a										
tert-Butyl alcohol	75650	a										
Butyl benzyl phthalate	85687	ab					2		1	1		
Butylamine	109739	b		3						2		
iso-Butylamine	78819	b										
sec-Butylamine	513495	b										
sec-Butylamine	13952846	b										
tert-Butylamine	75649	b										
1,2-Butylene oxide	106887	a										
Butyraldehyde	123728	a										
iso-Butyric acid	79312	b										
Butyric acid	107926	b		3						3		
C.I. Acid Blue 9, diammonium salt	2650182	a										
C.I. Acid Blue 9, disodium salt	3844459	a										
C.I. Acid Green 3	4680788	a										
C.I. Basic Green 4	569642	a										

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
C.I. Basic Red 1	989388	a										
C.I. Direct Black 38	1937377	a										
C.I. Direct Blue 6	2602462	a										
C.I. Direct Brown 95	16071866	a										
C.I. Disperse Yellow 3	2832408	a										
C.I. Food Red 5	3761533	a										
C.I. Food Red 15	81889	a										
C.I. Solvent Orange 7	3118976	a										
C.I. Solvent Yellow 3	97563	a										
C.I. Solvent Yellow 14	842079	a										
C.I. Solvent Yellow 34 (Auramine)	492808	ab						1				
C.I. Vat Yellow 4	128665	a										
Calcium carbide	75207	b								3		
Calcium dodecylbenzene sulfonate	26264062	b								2		
Calcium hypochlorite	7778543	b								1		
Cantharidin	56257	bc	1*	2				1				
Captan	133062	ab		3	2					1		
Carbachol chloride	51832	bc	2*	2								
Carbamic acid, ethyl ester	51796	ab		3				1				
Carbamic acid, methyl-, O-(((2,4-dimethyl-1, 3-dithiolan-2-y	26419738	bc	1*	1								
Carbamic acid, methylnitroso-,ethyl ester	615532	b		3				1				
Carbamide, N-ethyl-N-nitroso-	759739	ab		3				1				
Carbamide, N-methyl-N-nitroso-	684935	ab		3				1				
Carbamide, thio-	62566	ab		3				1				
Carbamimidoselenoic acid	630104	b		2								
Carbamoyl chloride, dimethyl-	79447	ab		3				1				
Carbaryl	63252	ab		3						1		
Carbofuran	1563662	bc	1*	1						1		
Carbon disulfide	75150	abc	3	2	1					3		
Carbon oxyfluoride	353504	b		2								
Carbon tetrachloride	56235	ab		3	1		1	1	1	2	3	
Carbonyl sulfide	463581	a										
Carbophenothion	786196	bc	2	1	1							
Catechol	120809	a										
Chloramben	133904	a										
Chlordane	57749	abc	3	2			1	1	1	1	1	1
Chlordane (Technical Mixture and Metabolites)	0	b										
Chlorfenvinfos	470906	bc	2	2	1							
Chlorinated Benzenes	0	b									1	1
Chlorinated Ethanes	0	b										

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

			HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY							AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Chlorinated fluorocarbon (Freon 113)	76131	a										
Chlorinated Naphthalene	0	b									2	
Chlorinated Phenols	0	ab										
Chlorine	7782505	abc	1	2						1	1	1
Chlorine dioxide	10049044	a										
Chlormephos	24934916	bc	2	1								
Chlormequat chloride	999815	bc	1*	2								
Chlornaphazine	494031	b						1				
4-Chloro-m-cresol	59507	b		3								
Chloroacetaldehyde	107200	b		2								
Chloroacetic acid	79118	abc	1*	2	1		1					
2-Chloroacetophenone	532274	a										
Chloroalkyl Ethers	0	b									3	
Chlorodibromethane	124481	b		3	1		2		1			
Chloroethane	75003	ab		3						3		
Chloroethanol	107073	bc	2	2	3							
Chloroethyl chloroformate	627112	bc	3	1								
2-Chloroethyl vinyl ether	110758	b		2	2					3		
Chloroform	67663	abc	3	3			2	1	1	2	3	2
Chloromethyl ether	542881	abc	1	1				1				
Chloromethyl methyl ether	107302	abc	1	2	1			1	1	3		
beta-Chloronaphthalene	91587	b		3								
Chlorophacinone	3691358	bc	1*	1								
4-Chlorophenyl phenyl ether	7005723	b		3								
Chloroprene	126998	a										
Chlorosulfonic acid	7790945	b								2		
Chlorothalonil	1897456	a										
Chloroxuron	1982474	bc	2*	2								
Chlorpyrifos	2921882	b		2						1	1	1
Chlorthiophos	21923239	bc	2	1								
Coke Oven Emissions	0	b										
Colchicine	64868	bc	1*	1	2							
Coumaphos	56724	bc	1*	2						1		
Coumatetralyl	5836293	bc	2*	2								
Creosote	8001589	b		3	3			1	1	1		
p-Cresidine	120718	a										
Cresol(s)	1319773	ab		3	1					1		
m-Cresol	108394	ab					2					
o-Cresol	95487	abc	3*				2					
p-Cresol	106445	ab					2					

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Crimidine	535897	bc	1*	1								
Crotonaldehyde	4170303	bc	3									
Crotonaldehyde, (E)-	123739	bc	3	3						1		
Cupferron	135206	a										
Cyclohexanone	108941	b		3								
Cycloheximide	66819	bc	1*	1								
Cyclohexylamine	108918	bc	3	3	2		2					
Cyclophosphamide	50180	b						1		2		
2,4-D Acid	94757	ab		2	2					1		
2,4-D Esters	94111	b		3	2					1		
2,4-D Esters	94791	b		3	2							
2,4-D Esters	94804	b		3	2							
2,4-D Esters	1320189	b		3	2							
2,4-D Esters	1928387	b		3	2							
2,4-D Esters	1928616	b		3	2							
2,4-D Esters	1929733	b		3	2							
2,4-D Esters	2971382	b		3	2							
2,4-D Esters	25168267	b		3	2							
2,4-D Esters	53467111	b		3	2							
DDD	72548	b		3				1		1		
DDE	72559	b		3				1		1	2	
DDT	50293	b		3			1	1	1	1	1	1
DDT and Metabolites	0	b										
Daunomycin	20830813	b						1				
Decaborane(14)	17702419	bc	2*	1	1							
Decabromodiphenyl oxide	1163195	a										
Demeton	8065483	bc	2	1	1							1
Demeton-S-methyl	919868	bc	2	2								
Di-n-propylnitrosamine	621647	ab		3				1				
Dialifos	10311849	bc	1*	1								
Diallate	2303164	ab		3				1				
2,4-Diaminoanisole	615054	a										
2,4-Diaminoanisole sulfate	39156417	a										
4,4'-Diaminodiphenyl ether	101804	a										
Diaminotoluene	95807	ab		3				1				
Diaminotoluene	496720	b		3				1				
Diaminotoluene	823405	b		3				1				
Diaminotoluene	25376458	abc		3				1				
Diazinon	333415	b		2						1		
Diazomethane	334883	a										

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Dibenz[a,h]anthracene	53703	b						1				
Dibenzofuran	132649	a										
1,2:7,8-Dibenzopyrene	189559	b						1				
Diborane	19287457	bc	1	1								
1,2-Dibromo-3-chloropropane	96128	ab		2				1				
Dibutyl phthalate	84742	ab		3	2					1		
Dicamba	1918009	b		3						2		
Dichlobenil	1194656	b		3						1		
Dichlone	117806	b		3						1		
3,5-Dichloro-N-(1,1-dimethyl-2-propynyl)benzamide	23950585	b		3								
Dichlorobenzene (mixed)	25321226	ab			2					1	2	1
Dichlorobenzidine	0	b										
Dichlorobromomethane	75274	ab		3								
Trans-1,4-dichlorobutene	110576	bc	2	2								
Dichlorodifluoromethane	75718	b		3		2	2			3		
1,1-Dichloroethane	75343	b		3	2	2	2		1	3		
1,2-Dichloroethane	107062	ab		3	2			1	1	3	1	3
Dichloroethyl ether	111444	abc	3	2				1		3		
1,1-Dichloroethylene	75354	ab		2	2		1	1	1	3		
1,2-Dichloroethylene	540590	a										
1,2-trans-Dichloroethylene	156605	b		3	2							
Dichloromethylphenylsilane	149746	bc	3									
Dichloropropane	26638197	b		3						3	3	2
1,1-Dichloropropane	78999	b										
1,2-Dichloropropane	78875	ab		3					1	3		
1,3-Dichloropropane	142289	b										
Dichloropropane - Dichloropropene (mixture)	8003198	b		3	1					1		
Dichloropropene	26952238	b			1					3	2	1
1,3-Dichloropropene	542756	ab		3	1					1		
2,3-Dichloropropene	78886	b										
2,2-Dichloropropionic acid	75990	b		3						3		
Dichlorvos	62737	abc	3	2						1		
Dicofol*	115322	ab		3						1		
Dicrotophos	141662	bc	1	1	1							
Dieldrin	60571	b		2			1	1	1	1	1	1
Diepoxybutane	1464535	abc	2	2				1				
Diethanolamine	111422	a										
Diethyl chlorophosphate	814493	bc	2	2								
Diethyl sulfate	64675	a										
Diethyl-p-nitrophenyl phosphate	311455	b		1								

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Diethylamine	109897	b		3	1					2		
Diethylcarbamazine citrate	1642542	bc	1*	1								
1,4-Diethylene dioxide	123911	ab		3				1		3		
Diethylstilbestrol	56531	b		3				1				
Digitoxin	71636	bc	1*	2								
Diglycidyl ether	2238075	bc	3	1				1				
Digoxin	20830755	bc	1*	1								
1,2-Dihydro-3,6-pyridazinedione	123331	b		3								
Dimefox	115264	bc	2	1								
Dimethoate	60515	bc	2*	2						1		
Dimethyl phosphorochloridothioate	2524030	bc	2	2	1							
Dimethyl phthalate	131113	ab		3								
Dimethyl sulfate	77781	abc	2	1				1		2		
Dimethyl sulfide	75183	bc	1	1	3							
Dimethyl-p-phenylenediamine	99989	bc	1*	1								
Dimethylamine	124403	b		3						2		
alpha,alpha-Dimethylbenzylhydroperoxide	80159	ab		2								
Dimethyldichlorosilane	75785	bc	2	2								
Dimethylhydrazine	57147	abc	3	2				1				
1,2-Dimethylhydrazine	540738	b		2				1				
alpha,alpha-Dimethylphenethylamine	122098	b		3								
2,4-Dimethylphenol	105679	ab		3						1	2	
Dimetilan	644644	bc	2*	2								
4,6-Dinitro-o-cyclohexylphenol	131895	b		2						1		
Dinitrobenzene (mixed)	25154545	b			1					2		
m-Dinitrobenzene	99650	b										
o-Dinitrobenzene	528290	b										
p-Dinitrobenzene	100254	b										
Dinitrocresol	534521	abc	1*	1	1					1		
2,4-Dinitrophenol	51285	ab		2	1					1		
2,5-Dinitrophenol	329715	b										
2,6-Dinitrophenol	573568	b										
Dinitrophenol	25550587	b		2	1					1		
3,4-Dinitrotoluene	610399	b										
Dinitrotoluene	25321146	b			1			1	1	2	1	1
Dinoseb	88857	bc	1*	2						2		
Dinoterb	1420071	bc	2*	2								
Dioctyl phthalate	117840	ab										
Dioxathion	78342	bc	2	1	2							
Diphacinone	82666	bc	1*	1								

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

			HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY							AQUATIC ECOTOXICITY		
			ACUTE			CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
1,2-Diphenylhydrazine	122667	ab		3	1			1	1	1	1	
Diphenylhydrazine	0	b									1	
Diphosphoramide, octamethyl-	152169	bc	1	1								
Dipropylamine	142847	b		3								
Diquat	85007	b		3						2		
Diquat	2764729	b										
Disulfoton	298044	bc	2	1						1		
Dithiazanine iodide	514738	bc	2*	2								
Dithiobiuret	541537	bc	1*	1								
Diuron	330541	b		3						1		
Dodecylbenzenesulfonic acid	27176870	b								2		
Emetine, dihydrochloride	316427	bc	1*	1								
Endosulfan	115297	bc	1*	1			1			1	1	1
Endosulfan and Metabolites	0	b										
alpha-Endosulfan	959988	b		1						1		
beta-Endosulfan	33213659	b		1						1		
Endosulfan sulfate	1031078	b		1						1		
Endothall	145733	b		2								
Endothion	2778043	bc	2*	2								
Endrin	72208	bc	2*	1			1			1	1	1
Endrin aldehyde	7421934	b		1						1		
Endrin and Metabolites	0	b										
Epichlorohydrin	106898	abc	3	2	1			1		2		
EPN	2104645	bc	1*	1	2							
Ergocalciferol	50146	bc	3*	1	1							
Ergotamine tartrate	379793	bc	2*	1	3							
Ethanamine, N-ethyl-N-nitroso-	55185	ab		3				1				
Ethane, 1,2-dibromo-	106934	ab		2				1		2		
Ethane, 1,1,1,2,2,2-hexachloro-	67721	ab		3	2		1	1		1	1	1
Ethane, 1,1'-oxybis-	60297	b		3								
Ethane, 1,1,1,2-tetrachloro-	630206	b						1				
Ethane, 1,1,2,2-tetrachloro-	79345	ab		3	2			1	1	1		2
Ethane, 1,1,2-trichloro-	79005	ab		3			1	1	1	2		2
Ethane, 1,1,1-trichloro-2,2-bis(p-methoxyphenyl)-	72435	ab		3		2	2			1		
1,2-Ethanediylbiscarbamodithioic acid	111546	b		3								
Ethanesulfonyl chloride, 2-chloro-	1622328	bc	2	1				1				
Ethanethioamide	62555	ab						1		3		
Ethanol, 1,2-dichloro-, acetate	10140871	bc	3	1				1				
Ethanol, 2,2'-(nitrosoimino)bis-	1116547	b		3				1				
Ethenamine, N-methyl-N-nitroso-	4549400	ab		2				1				

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Ethene, 1,1,2,2-tetrachloro-	127184	ab		3	2			1		2		
Ethion	563122	bc	3	2						1		
Ethoprophos	13194484	bc	3	1								
2-Ethoxyethanol	110805	ab		3	2	2	2			3		
Ethyl acrylate	140885	ab		3						3		
Ethyl chloroformate	541413	a										
Ethyl 4,4'-dichlorobenzilate	510156	ab		3				1				
Ethyl methacrylate	97632	b		3								
Ethyl methanesulfonate	62500	b						1				
Ethylbenzene	100414	ab		3	3		2			2	3	
Ethylbis(2-chloroethyl)amine	538078	bc	2	2								
Ethylene	74851	a										
Ethylene fluorohydrin	371620	bc	1	1								
Ethylene glycol	107211	a					3					
Ethylene oxide	75218	abc	3	2				1		2		
Ethylenediamine	107153	bc	3	3			2			2		
Ethylenediamine tetraacetic acid (EDTA)	60004	b								3		
Ethyleneimine	151564	abc	2	1				1				
Ethylenethiourea	96457	ab						1		3		
Famphur	52857	b		2								
Fenamiphos	22224926	bc	1*	1								
Fenitrothion	122145	bc	2	1	2							
Fensulfothion	115902	bc	2	1								
Ferric ammonium citrate	1185575	b								2		
Ferric ammonium oxalate	2944674	b								2		
Ferric ammonium oxalate	55488874	b								2		
Ferric chloride	7705080	b		3						2		
Ferric fluoride	7783508	b								1		
Ferric nitrate	10421484	b								2		
Ferric sulfate	10028225	b								2		
Ferrous ammonium sulfate	10045893	b								2		
Ferrous chloride	7758943	b								1		
Ferrous sulfate	7720787	b		3						2		
Ferrous sulfate	7782630	b		3						2		
Fluenetil	4301502	bc	1*	1								
Fluometuron	2164172	a										
Fluorene	86737	b							1			
Fluorine	7782414	bc	2	2								
Fluoroacetamide	640197	bc	1*	1								
Fluoroacetic acid	144490	bc	1*	1								

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

			HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY							AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Fluoroacetyl chloride	359068	bc	1									
Fluorouracil	51218	bc	2*	2	1			1				
Fonofos	944229	bc	2	1								
Formaldehyde	50000	abc	2	2	1			1		2		
Formetanate hydrochloride	23422539	bc	2*	1								
Formic acid	64186	b		3						3		
Formothion	2540821	bc	1	1								
Formparanate	17702577	bc	1*	2								
Fosthietan	21548323	bc	2	1								
Fuberidazole	3878191	bc	1*	2								
Fumaric acid	110178	b		3						3		
Furan	110009	bc	2				1					
Furan, tetrahydro-	109999	b		3								
2-Furancarboxaldehyde	98011	b		3						2		
2,5-Furandione	108316	ab		3						3		
Gallium trichloride	13450903	bc	2*	2								
D-Glucopyranose, 2-deoxy-2-(3-methyl-3-nitrosoureido)-	18883664	b		3				1				
Glycidylaldehyde	765344	b		2				1				
Guanidine, N-nitroso-N-methyl-N'-nitro-	70257	b		2				1				
Haloethers	0	b									1	1
Halomethanes	0	b									3	
Heptachlor	76448	ab		2			1	1	1	1	1	1
Heptachlor and Metabolites	0	b			1							
Heptachlor epoxide	1024573	b		2				1				
Hexachloro-1,3-butadiene	87683	ab		2	2		1	1	1	1	1	1
Hexachlorocyclopentadiene	77474	abc	1	3	1	1	1			1	1	1
Hexachloronaphthalene	1335871	a										
Hexachlorophene	70304	b		2	1							
Hexachloropropene	1888717	b		2								
Hexaethyl tetraphosphate	757584	b		1						1		
Hexamethylenediamine, N,N'-dibutyl-	4835114	bc	2	1								
Hexamethylphosphoramide	680319	a										
Hydrazine	302012	abc	3					1				
Hydrazine sulfate	10034932	a										
Hydrochloric acid (Hydrogen chloride (gas only))***	7647010	abc	2	3						3		
Hydrogen fluoride	7664393	abc	1	2	1					3		
Hydrogen peroxide (Conc >52%)	7722841	bc	3	2	3							
Hydrogen selenide	7783075	bc	1	1				1				
Hydrogen sulfide	7783064	bc	2	3						1		
Hydroquinone	123319	abc	2*	3	2		2					

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Indeno(1,2,3-cd)pyrene	193395	b						1				
Iron, pentacarbonyl-	13463406	bc	1	1								
Isobenzan	297789	bc	1*	1				1				
Isobutyl alcohol	78831	b		3						3		
Isobutyraldehyde	78842	a										
Isobutyronitrile	78820	bc	3	2								
Isodrin	465736	bc	1*	1						1		
Isofluorphate	55914	bc	1	1								
Isophorone	78591	b		3			2		1	3	3	
Isoprene	78795	b			2					2		
Isopropanolamine dodecylbenzene sulfonate	42504461	b								2		
Isopropyl alcohol (mfg.-strong acid processes)	67630	a										
Isopropyl chloroformate	108236	bc	3	2								
Isopropyl formate	625558	bc	2	1								
4,4'-Isopropylidenediphenol	80057	a										
Isopropylmethylpyrazolyl dimethylcarbamate	119380	bc	2	1								
Kepone	143500	b		2				1		1		
Lactonitrile	78977	bc	3	2								
Lasiocarpine	303344	b		3				1				
Leptophos	21609905	bc	2*	2	1			1				
Lewisite	541253	bc	1	2								
Lindane	58899	abc	3*	2			1	1	1	1	1	1
Lithium hydride	7580678	bc	1									
Malathion	121755	b		3						1		1
Maleic acid	110167	b		3						3		
Malononitrile	109773	bc	2*	2								
Maneb	12427382	a										
Mechlorethamine	51752	abc	1	1				1				
Melamine	108781	a										
Mephosfolan	950107	bc	2	1								
Methacrolein diacetate	10476956	bc	3	3								
Methacrylic anhydride	760930	bc	2	2								
Methacrylonitrile	126987	bc	2	2		1	1					
Methacryloyl chloride	920467	bc	1	1								
Methamidophos	10265926	bc	1*	1	2							
Methane, chloro	74873	ab		3	2			1	1	3		
Methane, dibromo-	74953	ab		2						3		
Methane, dichloro-	75092	ab		3	2		2			3		
Methane, iodo-	74884	ab		3				1				
Methane, trichlorofluoro-	75694	b		3		2	2					

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Methanesulfonyl fluoride	558258	bc	3	1								
Methanol	67561	ab		3						3		
Methapyrilene	91805	b		3								
Methidathion	950378	bc	2*	2								
Methiocarb	2032657	bc	2*	2						1		
Methomyl	16752775	bc	2*	2			2			1		
2-Methoxyethanol	109864	a				1	1					
Methyl acrylate	96333	a										
Methyl bromide	74839	abc	3	2						3		
Methyl tert-butyl ether	1634044	a										
Methyl 2-chloroacrylate	80637	bc	2	2				1				
Methyl chloroform	71556	ab		3	2					2		
Methyl chloroformate (Methylchlorocarbonate)	79221	bc	2	2								
Methyl disulfide	624920	bc	1	1								
Methyl isobutyl ketone	108101	ab		3		2	2					
Methyl mercaptan	74931	bc	2	3						1		
Methyl methacrylate	80626	ab		3	2					3		
Methyl phenkapton	3735237	bc	2	2								
Methyl phosphonic dichloride	676971	bc	1	1								
Methyl vinyl ketone	78944	bc	1	1				1				
1-Methylbutadiene	504609	b								2		
4,4'-Methylene bis(N,N-dimethyl) benzenamine	101611	a										
4,4'-Methylene dianiline	101779	a										
Methylhydrazine	60344	abc	2	2								
Methylthiouracil	56042	b		3				1				
Methyltrichlorosilane	75796	bc	2	1								
Metolcarb	1129415	bc	1*	2								
Mevinphos	7786347	bc	2	1						1		
Mexacarbate	315184	bc	2*	2						2		
Michler's ketone	90948	a										
Mitomycin C	50077	bc	2*	2				1				
Molybdenum trioxide	1313275	a										
Monocrotophos	6923224	bc	1*	1	1							
Monoethylamine	75047	b		3						2		
Monomethylamine	74895	b								2		
Muscimol	2763964	bc	3	2								
Mustard gas	505602	abc	2	1	1			1				
N,N-Diethylhydrazine	1615801	b						1				
N,N-Dimethylaniline	121697	a										
N-Nitrosodiphenylamine	86306	ab		3					1	1		

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
N-Nitrosomorpholine	59892	a										
N-Nitrosonornicotine	16543558	a										
N-Nitrosopiperidine	100754	ab		3				1				
N-Nitrosopyrrolidine	930552	b		3				1				
Naled	300765	b		1						1		
Naphthalene	91203	ab		3			2			1	2	1
1,4-Naphthalenedione	130154	b		3								
Naphthenic acid	1338245	b		3						1		
1-Naphthylamine	134327	ab		3						1		
2-Naphthylamine	91598	ab		3				1		1		
Nicotine	54115	bc	1	2						1		
Nicotine sulfate	65305	bc	1*	1								
Nitric acid	7697372	abc	3	2						2		
Nitric oxide	10102439	bc	1	2								
Nitrilotriacetic acid	139139	a										
5-Nitro-o-anisidine	99592	a										
Nitrobenzene	98953	abc	3	3		1	1			2	3	
4-Nitrobiphenyl	92933	a										
Nitrocyclohexane	1122607	bc	2	1								
Nitrofen	1836755	a										
Nitrogen dioxide	10102440	bc	1	2						2		
Nitrogen dioxide	10544726	bc	1	2						2		
Nitroglycerine	55630	ab										
Nitrophenol (mixed)	25154556	b		3						1		
m-Nitrophenol	554847	b										
o-Nitrophenol	88755	ab		3						1		
p-Nitrophenol	100027	ab		3						1		
Nitrophenols	0	b								1	1	1
2-Nitropropane	79469	ab		2				1				
Nitrosamines	0	b								1	2	
Nitrosodimethylamine	62759	abc	3	2				1				
p-Nitrosodiphenylamine	156105	a										
Nitrotoluene	1321126	b								2		
m-Nitrotoluene	99081	b										
o-Nitrotoluene	88722	b										
p-Nitrotoluene	99990	b										
Norbormide	991424	bc	1*	1								
O,O-Diethyl S-methyl dithiophosphate	3288582	b		3								
Octachloronaphthalene	2234131	a										
Organorhodium Complex	0	bc	1*									

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Osmium tetroxide	20816120	ab		2								
Ouabain	630604	bc	1*	1								
Oxamyl	23135220	bc	1*	1	1							
1,2-Oxathiolane, 2,2-dioxide	1120714	ab		3				1				
Oxetane, 3,3-bis(chloromethyl)-	78717	bc	2	1								
Oxydisulfoton	2497076	bc	2	1								
Ozone	10028156	bc	1	1	1							
Paraformaldehyde	30525894	b								2		
Paraldehyde	123637	b		3								
Paraquat	1910425	bc	1*	2	1			1				
Paraquat methosulfate	2074502	bc	1*	2	1			1				
Parathion	56382	abc	1	1	1		1		1	1	1	1
Parathion-methyl	298000	bc	1*	1	1					1		
Pentaborane	19624227	bc	2	1								
Pentachloroethane	76017	b		3				1		1	2	2
Pentadecylamine	2570265	bc	1*	1								
Peracetic acid	79210	abc	2	2								
Perchloromethylmercaptan	594423	bc	2	1								
Phenanthrene	85018	b		3								
Phenol	108952	abc	2*	3	2		2			2	3	2
Phenol, 3-(1-methylethyl)-, methylcarbamate	64006	bc	2*	2								
Phenol, 2,3,4,6-tetrachloro-	58902	b		3	1					1		
Phenol, 2,2'-thiobis[4-chloro-6-methyl-	4418660	bc	1*	1								
Phenol, 2,2'-thiobis(4,6-dichloro-	97187	bc	1*	1								
Phenol, 2,4,6-trichloro	88062	ab		3				1		1		1
Phenol, 2,4,5-trichloro-	95954	ab		3	2					1		
Phenoxarsine, 10,10'-oxydi-	58366	bc	2*	2								
Phenyl dichloroarsine	696286	bc	2	1								
p-Phenylenediamine	106503	a										
Phenylhydrazine hydrochloride	59881	bc	3*	3				1				
2-Phenylphenol	90437	a										
Phenylsilatrane	2097190	bc	1*	1								
Phenylthiourea	103855	bc	1*	1								
Phorate	298022	bc	1	1						1		
Phosacetim	4104147	bc	1*	1								
Phosfolan	947024	bc	1*	1								
Phosgene	75445	abc	1	1						3		
Phosmet	732116	bc	1*	1	1			1				
Phosphamidon	13171216	bc	1	1	1							
Phosphine	7803512	bc	2	1								

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Phosphonothioic acid, methyl-, O-ethyl O-(4-(methylthio)phen	2703131	bc	2	1								
Phosphonothioic acid, methyl-, O-(4-nitrophenyl) O-phenyl es	2665307	bc	2	1								
Phosphonothioic acid, methyl-, S-(2-(bis(1-methylethyl)amino	50782699	bc	1	1								
Phosphoric acid	7664382	ab		3						3		
Phosphoric acid, dimethyl 4-(methylthio) phenyl ester	3254635	bc	2	1								
Phosphorothioic acid, O,O-dimethyl-S-(2-methylthio)ethyl est	2587908	bc	2	2								
Phosphorus	7723140	abc	1	2						1		
Phosphorus oxychloride	10025873	bc	2	2						2		
Phosphorus pentachloride	10026138	bc	2	1								
Phosphorus pentasulfide	1314803	b		3						1		
Phosphorus pentoxide	1314563	bc	1	1								
Phosphorus trichloride	7719122	bc	3	2						2		
Phthalate Esters	0	b		1						1		
Physostigmine	57476	bc	1*	1								
Physostigmine, salicylate (1:1)	57647	bc	1*	1								
2-Picoline	109068	b		3								
Picric acid	88891	a										
Picrotoxin	124878	bc	2*	2								
Piperidine	110894	bc	3	2	1							
Piprotal	5281130	bc	1*	1								
Pirimifos-ethyl	23505411	bc	3	2								
Polychlorinated Biphenyls (PCBs)	1336363	ab						1	1	1	1	1
Polychlorinated Biphenyls - Aroclor 1016	12674112	b						1		1		
Polychlorinated Biphenyls - Aroclor 1221	11104282	b		3				1		1		
Polychlorinated Biphenyls - Aroclor 1232	11141165	b		3				1		1		
Polychlorinated Biphenyls - Aroclor 1242	53469219	b		3				1		1		
Polychlorinated Biphenyls - Aroclor 1248	12672296	b		3				1		1		
Polychlorinated Biphenyls - Aroclor 1254	11097691	b		3				1		1		
Polychlorinated Biphenyls - Aroclor 1260	11096825	b		3				1		1		
Polynuclear Aromatic Hydrocarbons	0	b										
Potassium hydroxide	1310583	b		3						2		
Promecarb	2631370	bc	2*	2								
1-Propanamine	107108	b		3						2		
1-Propanol, 2,3-dibromo-, phosphate (3:1)	126727	ab		3				1				
Propargite	2312358	b		3						1		
Propargyl alcohol	107197	b		2								
Propargyl bromide	106967	bc	1	1				1				
Propiolactone, beta-	57578	abc	2	1				1				
Propionaldehyde	123386	a										
Propionic acid	79094	b		3						3		

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Propionic acid, 2-(2,4,5-trichlorophenoxy)-	93721	b		3						1		
Propionic anhydride	123626	b		3						3		
Propionitrile	107120	bc	2	2								
Propionitrile, 3-chloro-	542767	bc	3							2		
Propiophenone, 4'-amino-	70699	bc	1*	3								
Propoxur	114261	a										
Propyl chloroformate	109615	bc	2	2								
Propylene (Propene)	115071	a										
Propylene oxide	75569	abc	3	3						3		
Propyleneimine	75558	abc	3	2				1				
Prothoate	2275185	bc	1*	1								
Pseudocumene	95636	a										
Pyrene	129000	bc	3*									
Pyrethrins	121211	b		3						1		
Pyrethrins	121299	b		3						1		
Pyrethrins	8003347	b		3						1		
Pyridine	110861	ab		3	1					3		
Pyridine, 4-amino-	504245	bc	2*	2								
Pyridine, 2-methyl-5-vinyl-	140761	bc	2	1								
Pyridine, 4-nitro-, 1-oxide	1124330	bc	2*	1								
Pyriminil	53558251	bc	1*	1								
Quinoline	91225	ab		3						2		
Radionuclides	0	b										
Reserpine	50555	b		3								
Salcomine	14167181	bc	2*	1								
Sarin	107448	bc	1	1	1							
Semicarbazide hydrochloride	563417	bc	3*	1	2							
Silane, (4-aminobutyl)diethoxymethyl-	3037727	bc	3	3								
Sodium	7440235	b								2		
Sodium azide (Na(N3))	26628228	bc	2	2								
Sodium bifluoride	1333831	b			2					3		
Sodium bisulfite	7631905	b								3		
Sodium cacodylate	124652	bc	1*	1								
Sodium dodecylbenzene sulfonate	25155300	b		3						2		
Sodium fluoride	7681494	b		2	2					3		
Sodium fluoroacetate	62748	bc	1*	1								
Sodium hydrosulfide	16721805	b								3		
Sodium hydroxide	1310732	ab		3						2		
Sodium hypochlorite	7681529	b								1		
Sodium hypochlorite	10022705	b								1		

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

			HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY							AQUATIC ECOTOXICITY		
			ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Sodium methylate	124414	b								2		
Sodium nitrite	7632000	b		2	2					1		
Sodium pentachlorophenate	131522	bc	1*	1								
Sodium phosphate, dibasic	7558794	b								3		
Sodium phosphate, dibasic	10039324	b								3		
Sodium phosphate, dibasic	10140655	b								3		
Sodium phosphate, tribasic	7601549	b								3		
Sodium phosphate, tribasic	7758294	b								3		
Sodium phosphate, tribasic	7785844	b								3		
Sodium phosphate, tribasic	10101890	b								3		
Sodium phosphate, tribasic	10124568	b								3		
Sodium phosphate, tribasic	10361894	b								3		
Sodium sulfate (solution)	7757826	a										
Sodium tellurite	10102202	bc	2*	2								
Stannane, acetoxytriphenyl-	900958	bc	2*	2	1					2		
Strychnine	57249	bc	1*	2						1		
Strychnine, sulfate	60413	bc	1*	1								
Styrene	100425	ab		3						2		
Styrene oxide	96093	a										
Sulfotep	3689245	bc	2	1								
Sulfoxide, 3-chloropropyl octyl	3569571	bc	2	2								
Sulfur dioxide	7446095	bc	2	3	1							
Sulfur monochloride	12771083	b								2		
Sulfur tetrafluoride	7783600	bc	1									
Sulfur trioxide	7446119	bc	1	1								
Sulfuric acid	7664939	abc	3	2						2		
Sulfuric acid, Fuming	8014957	b										
2,4,5-T	93765	b		3						2		
2,4,5-T amines	1319728	b								3		
2,4,5-T amines	2008460	b								3		
2,4,5-T amines	3813147	b								3		
2,4,5-T amines	6369966	b								3		
2,4,5-T amines	6369977	b								3		
2,4,5-T esters	93798	b		3						2		
2,4,5-T esters	1928478	b		3						2		
2,4,5-T esters	2545597	b		3						2		
2,4,5-T esters	25168154	b		3						2		
2,4,5-T esters	61792072	b		3						2		
2,4,5-T salts	13560991	b										
2,4,5-TP acid esters	32534955	b								1		

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Tabun	77816	bc	1	1								
Tellurium	13494809	bc	2*	2	2							
Tellurium hexafluoride	7783804	bc	1	1								
Tepp	107493	bc	1	1						1		
Terbufos	13071799	bc	1	1								
Terephthalic acid	100210	a										
2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1746016	b		1				1	1	1		
Tetrachlorvinphos	961115	a										
Tetraethyltin	597648	bc	1	1	1							
Tetranitromethane	509148	bc	2	1								
Thiocarbazide	2231574	bc	3*	1				1				
4,4'-Thiodianiline	139651	a										
Thiofanox	39196184	bc	1*	1								
Thionazin	297972	bc	2	1								
Thiophenol	108985	bc	2	1								
Thiosemicarbazide	79196	bc	1*	1						2		
Thiourea, (2-chlorophenyl)-	5344821	bc	1*	1								
Thiourea, (2-methylphenyl)-	614788	bc	2*	1								
Thorium dioxide	1314201	a										
Titanium tetrachloride	7550450	abc	1	1	1							
o-Toluidine	95534	ab		3				1				
Toxaphene (Camphechlor)	8001352	abc	2*	2				1	1	1	1	1
Triamiphos	1031476	bc	2*	1	2							
Triaziquone	68768	a										
Triazofos	24017478	bc	2	1								
Trichloroacetyl chloride	76028	bc	2	2								
1,2,4-Trichlorobenzene	120821	ab		3	2	1	2			1		
Trichloro(chloromethyl)silane	1558254	bc	1	1								
Trichloro(dichlorophenyl)silane	27137855	bc	2									
Trichloroethylene	79016	ab		3	2			1	1	2	3	3
Trichloroethylsilane	115219	bc	2	2								
Trichloronate	327980	bc	2	2								
Trichlorophenylsilane	98135	bc	2	1								
Trichlorophon	52686	ab		3	1					2		
Triethanolamine dodecylbenzene sulfonate	27323417	b								2		
Triethoxysilane	998301	bc	2	2								
Triethylamine	121448	b		3						2		
Trifluralin	1582098	a										
Trimethylamine	75503	b								2		
Trimethylchlorosilane	75774	bc	3									

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Trimethylolpropane phosphite	824113	bc	1*	1								
Trimethyltin chloride	1066451	bc	2*	2								
Triphenyltin chloride	639587	bc	2*	2	1							
Tris(2-chloroethyl)amine	555771	bc	1	1				1				
Trypan blue	72571	b						1				
Uracil, 5-[bis(2-chloroethyl)amino]-	66751	b		1				1				
Uranyl acetate	541093	b			1					3		
Uranyl nitrate	10102064	b			1					3		
Uranyl nitrate	36478769	b			1					3		
Valinomycin	2001958	bc	3*	1								
Vanadium (fume or dust)	7440622	a					1					
Vanadium pentoxide	1314621	bc	1*	2	2		1			2		
Vanadyl sulfate	27774136	b			3		2			2		
Vinyl acetate monomer	108054	abc	3	3						2		
Vinyl bromide	593602	a										
Vinyl chloride (monomer)	75014	ab		1	2			1	1	3		
Warfarin	81812	bc	2*	1								
Warfarin sodium	129066	bc	1*	1	1							
Xylenol	1300716	b								2		
2,6-Xylidine	87627	a										
Xylylene dichloride	28347139	bc	1*	1				1				
Zineb	12122677	a										
Zirconium nitrate	13746899	b		3						3		
Zirconium potassium fluoride	16923958	b		2						3		
Zirconium sulfate	14644612	b		3						3		
Zirconium tetrachloride	10026116	b		3						3		
Antimony Compounds												
Antimony	7440360	ab					1				2	2
Antimony pentachloride	7647189	b		3						2		
Antimony pentafluoride	7783702	bc	2	1								
Antimony potassium tartrate	28300745	b		3	1		1			2		
Antimony tribromide	7789619	b								2		
Antimony trichloride	10025919	b		3						2		
Antimony trifluoride	7783564	b								2		
Antimony trioxide	1309644	b			2		1			3		

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

			HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY							AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Arsenic Compounds												
Arsenic	7440382	ab					1	1	1			
Arsenic acid	7778394	b										
Arsenic disulfide	1303328	b						1		3		
Arsenic pentoxide	1303282	bc	1*	1	2			1		1	1	1
Arsenic trisulfide	1303339	b			1			1		3	1	1
Arsenous oxide	1327533	bc	1*	1	1			1		1		
Arsenous trichloride	7784341	bc	2	2	1			1		1		
Cacodylic acid	75605	b								3		
Calcium arsenate	7778441	bc	2*	2	1			1		2		
Calcium arsenite	52740166	b			1			1		2		
Potassium arsenate	7784410	b			2			1		2		
Potassium arsenite	10124502	bc	2*	2	1			1		2		
Sodium arsenate	7631892	bc	3*	2	2			1		2		
Sodium arsenite	7784465	bc	2*	2	1			1		2		
Barium Compounds												
Barium	7440393	a				1	2					
Beryllium Compounds												
Beryllium	7440417	ab					1	1	1	2	1	1
Beryllium chloride	7787475	b		2	1			1		2		
Beryllium fluoride	7787497	b		2	1			1		3		
Beryllium nitrate	7787555	b			1			1		3		
Beryllium nitrate	13597994	b			1			1		3		
Cadmium Compounds												
Cadmium	7440439	ab		3			1	1	1		1	1
Cadmium acetate	543908	b			1			1		1		
Cadmium bromide	7789426	b			1			1		1		
Cadmium chloride	10108642	b		2	1			1		1		
Cadmium oxide	1306190	bc	1*	2	1			1				
Cadmium stearate	2223930	bc	3*	1	1			1				

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Chlorophenols												
2-Chlorophenol	95578	b		3			1			1	2	2
2,4-Dichlorophenol	120832	ab		3	2		1			1	2	1
2,6-Dichlorophenol	87650	b		3						1		
Pentachlorophenol	87865	ab		1	2		2			1	1	1
Trichlorophenol	25167822	b						1		1		
2,3,4-Trichlorophenol	15950660	b										
2,3,5-Trichlorophenol	933788	b										
2,3,6-Trichlorophenol	933755	b										
3,4,5-Trichlorophenol	609198	b										
Chromium Compounds												
Ammonium bichromate	7789095	b						1		2		
Ammonium chromate	7788989	b						1		2		
Calcium chromate	13765190	b			1			1		2		
Chromic acetate	1066304	b								2		
Chromic acid	7738945	b			1			1		2		
Chromic acid	11115745	b			1			1		2		
Chromic chloride	10025737	bc	1*	1	3							
Chromic sulfate	10101538	b								2		
Chromium	7440473	ab										
Chromous chloride	10049055	b		3						2		
Lithium chromate	14307358	b						1		2		
Potassium bichromate	7778509	b		3				1		2		
Potassium chromate	7789006	b						1		2		
Sodium bichromate	10588019	b		2				1		2		
Sodium chromate	7775113	b						1		2		
Strontium chromate	7789062	b						1		2		
Cobalt Compounds												
Cobalt	7440484	a										
Cobalt carbonyl	10210681	bc	1*	1								
Cobalt, ((2,2'-(1,2-ethanediylbis (nitrilomethylidyne))bis(6	62207765	bc	1*	1	1							

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY							AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
			TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Cobaltous bromide	7789437	b								2		
Cobaltous formate	544183	b								2		
Cobaltous sulfamate	14017415	b								2		
Copper Compounds												
Copper	7440508	ab					3				1	1
Cupric acetate	142712	b		3	2					1		
Cupric chloride	7447394	b			2					1		
Cupric nitrate	3251238	b			2					1		
Cupric oxalate	5893663	b								1		
Cupric sulfate	7758987	b		3	2					1		
Cupric sulfate ammoniated	10380297	b			2					1		
Cupric tartrate	815827	b			2					1		
Paris green (Cupric acetoarsenite)	12002038	bc	2*	2				1		1		
Cyanide Compounds												
Acetone cyanohydrin	75865	bc	3	2		2	2			1		
Ammonium thiocyanate	1762954	b		3						3		
Barium cyanide	542621	b								1		
Benzene, 2,4-diisocyanatomethyl-	26471625	b										
Benzyl cyanide	140294	bc	2	2								
Calcium cyanamide	156627	a										
Calcium cyanide	592018	b		2						1		
Chlorine cyanide	506774	b		1						1		
Copper cyanide	544923	b								1		
Cyanides (soluble cyanide salts)	57125	b					2			1	1	1
Cyanogen	460195	b		2								
Cyanogen bromide	506683	bc	2*	3						2		
Cyanogen iodide	506785	bc	3*	2								
Cyanophos	2636262	bc	3	2								
Cyanuric fluoride	675149	bc	1	1								
Ethyl thiocyanate	542905	bc	3	2								
Formaldehyde cyanohydrin	107164	bc	3	2								
Hydrocyanic acid	74908	abc	1	1						1		
Isocyanic acid, 3,4-dichlorophenyl ester	102363	bc	2*	1								
Isophorone diisocyanate	4098719	bc	1	1								

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Methacryloyloxyethyl isocyanate	30674807	bc	1	1								
Methyl isocyanate	624839	abc	2	1								
Methyl isothiocyanate	556616	bc	2	2								
Methyl thiocyanate	556649	bc	3									
Methylene bis(phenylisocyanate) (MBI)	101688	a										
Potassium cyanide	151508	bc	1	1						1		
Sodium cyanide (Na(CN))	143339	bc	1	1			2			1		
Toluene 2,4-diisocyanate	584849	abc	2	1						1		
Toluene 2,6-diisocyanate	91087	abc	1									
Glycol Ethers												
Glycol Ethers	0	a										
Lead Compounds												
Acetic acid, lead salt	301042	b		3						3		
Lead	7439921	ab		3					1		1	1
Lead arsenate	7645252	b		2	2			1		3		
Lead arsenate	7784409	b		2	2			1		3		
Lead arsenate	10102484	b		2	2			1		3		
Lead chloride	7758954	b			1					3		
Lead fluoborate	13814965	b		2	1					3		
Lead fluoride	7783462	b			1					2		
Lead iodide	10101630	b			1					3		
Lead nitrate	10099748	b		3	1					3		
Lead phosphate	7446277	b			1			1				
Lead stearate	1072351	b		3						3		
Lead stearate	7428480	b		3						3		
Lead stearate	52652592	b		3						3		
Lead stearate	56189094	b		3						3		
Lead subacetate	1335326	b			1			1				
Lead sulfate	7446142	b			1					3		
Lead sulfate	15739807	b			1					3		
Lead sulfide	1314870	b		3						3		
Lead thiocyanate	592870	b			1					3		
Tetraethyllead	78002	bc	1	2	1					1		
Tetramethyllead	75741	bc	1	3	1			1				

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

				HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY						AQUATIC ECOTOXICITY		
				ACUTE		CHRONIC		CANCER		ACUTE		CHRONIC
CHEMICAL NAME	CAS #	LIST	TPQ	RQ ACUTE	RQ CTX	RFD INHAL	RFD ORAL	RQ PC	CANCER POTENCY	RQ AQTX	WQC ACUTE	WQC CTX
Manganese Compounds												
Manganese	7439965	a				1	2					
Manganese, tricarbonyl methylcyclopentadienyl	12108133	bc	1	1	1							
Potassium permanganate	7722647	b		3						1		
Mercury Compounds												
Fulminic acid, mercury(II)salt	628864	b										
Mercuric acetate	1600277	bc	2*	2	1							
Mercuric chloride	7487947	bc	2*	1	1							
Mercuric cyanide	592041	b		2						1		
Mercuric nitrate	10045940	b			1					1		
Mercuric oxide	21908532	bc	2*	2								
Mercuric sulfate	7783359	b		2						1		
Mercuric thiocyanate	592858	b								1		
Mercurous nitrate	7782867	b		3						1		
Mercurous nitrate	10415755	b		3						1		
Mercury	7439976	ab		1			1			1	1	1
Methoxyethylmercuric acetate	151382	bc	2*	2								
Methylmercuric dicyanamide	502396	bc	2*	2	1							
Phenylmercury acetate	62384	bc	2*	2	1							
Nickel Compounds												
Nickel	7440020	ab		1	1		2	1	1		2	1
Nickel ammonium sulfate	15699180	b			1			1				
Nickel carbonyl	13463393	bc	1	1	1			1		2		
Nickel chloride	7718549	b		3	1			1		3		
Nickel chloride	37211055	b		3	1			1		3		
Nickel cyanide	557197	b			1			1		1		
Nickel hydroxide	12054487	b			1			1		2		
Nickel nitrate	14216752	b			1			1		3		
Nickel sulfate	7786814	b			1			1		3		

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Polybrominated Biphenyls												
Polybrominated Biphenyls (PBBs)	0	a										
Selenium Compounds												
Selenium	7782492	ab		1		1	1				1	1
Selenium dioxide	7446084	b		2	1					2		
Selenium disulfide	7488564	b		3				1				
Selenium oxychloride	7791233	bc	2					1				
Selenous acid	7783008	bc	3*	2	1					2		
Sodium selenate	13410010	bc	1*	1	1			1				
Sodium selenite	7782823	b		1	1					2		
Sodium selenite	10102188	bc	1*	1	1					2		
Silver Compounds												
Potassium silver cyanide	506616	bc	2	2						1		
Silver	7440224	ab		3	2						1	1
Silver cyanide	506649	b		3						1		
Silver nitrate	7761888	b		2						1		
Thallium Compounds												
Acetic acid, thallium(I) salt	563688	b		2	1							
Thallic oxide	1314325	b		2	1		1					
Thallium	7440280	ab		2			1				2	1
Thallium(I) nitrate	10102451	b		2	1		1					
Thallium(I) selenide	12039520	b		2			1					
Thallium sulfate	10031591	bc	1*				1					
Thallous carbonate	6533739	bc	1*	2	1		1					
Thallous chloride	7791120	bc	1*	2	1		1					
Thallous malonate	2757188	bc	1*	2								
Thallous sulfate	7446186	bc	1*	2	1					2		
Zinc Compounds												

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

CHEMICAL NAME	CAS #	LIST	TPQ	HUMAN HEALTH AND TERRESTRIAL ECOTOXICITY: ACUTE RQ ACUTE	ACUTE RQ CTX	CHRONIC RFD INHAL	CHRONIC RFD ORAL	CANCER RQ PC	CANCER POTENCY	AQUATIC ECOTOXICITY: ACUTE RQ AQTX	ACUTE WQC ACUTE	CHRONIC WQC CTX
Zinc	7440666	ab			2		2				1	1
Zinc acetate	557346	b		3	2					2		
Zinc ammonium chloride	14639975	b			2					3		
Zinc ammonium chloride	14639986	b			2					3		
Zinc ammonium chloride	52628258	b			2					3		
Zinc borate	1332076	b			2					2		
Zinc bromide	7699458	b			2					3		
Zinc carbonate	3486359	b			2					2		
Zinc chloride	7646857	b		3	2					3		
Zinc cyanide	557211	b								1		
Zinc fluoride	7783495	b			2					2		
Zinc formate	557415	b			2					2		
Zinc hydrosulfite	7779864	b								2		
Zinc nitrate	7779886	b			2					3		
Zinc phenolsulfonate	127822	b								3		
Zinc phosphide	1314847	bc	2	2						2		
Zinc silicofluoride	16871719	b		3						3		
Zinc sulfate	7733020	b		3	2					2		
Zinc, dichloro(4,4-dimethyl-5((((methylamino) carbonyl)oxy)i	58270089	bc	1*	1								

TOXICITY TABLE NOTES:

TPQ = Threshold Planning Quantity
RQ = Reportable Quantity
AQTX = Aquatic Toxicity
CTX = Chronic Mammalian Toxicity
PC = Potential Carcinogenicity
INHAL = Inhalation

RfD = EPA Reference Dose
WQC = Water Quality Criteria
Acute = Freshwater Fish Acute Toxicity
Chronic = Freshwater Fish Chronic Toxicity

* = Chemicals in TPQ category 3 when exist in brick form

LIST a=§313 (TRI); b=§304 (RQ); c=§302 (TPQ)

APPENDIX B

ATMOSPHERIC CONCENTRATIONS

ATMOSPHERIC CONCENTRATIONS

The accompanying figures illustrate atmospheric concentrations that might be expected to occur as a result of releases from stacks under conditions described below. These figures were generated using the Industrial Source Complex (ISC) - Long-term (LT) and Short-term (ST) models.[1] The ISC models are Gaussian plume models. All Gaussian plume models share the same basic modeling concepts and assumptions. Among them, the following are particularly noteworthy:

- Atmospheric concentrations are directly proportional to emission rate.
- The maximum ground-level concentration is inversely proportional to the square of the effective height of release.
- The effective height is equal to the physical release height plus the plume rise resulting from buoyancy and momentum.
- Continuous emission from the source. Continuous, in this case, means that the duration of emission is equal to or greater than the travel time to the downwind receptor.

The modeling to produce these figures was based on several conservative assumptions. Plume rise was negated by using a gas temperature equal to ambient and by setting the exit velocity to 0.01 meters per second; in these examples, stack height and effective height are equal. Chemical removal due to degradation or deposition was assumed not to occur. The meteorological data used were from the weather station that yielded the highest concentrations, as determined by using data from each of the 302 first-order National Oceanic and Atmospheric Administration (NOAA) stations with ISCLT. Meteorological data from San Bernardino, California, resulted in the highest estimated concentrations, largely because of the predominant westerly wind pattern. It is important to emphasize that the range in model estimates across the United States was less than an order of magnitude. Meteorological data form San Bernardino, hourly values for one year (1964), were also used with the ISCST analysis of the effect of duration of emission on ambient concentration.

The second figure, generated with ISCST, related atmospheric concentrations for four emission rates. This figure represents the maximum (ground level) atmospheric concentration as a function of distance and duration of release for a release of 1 pound per year (lb/yr) from a stack with a 25 m effective height. The emission release of 1 lb/yr was assumed to occur over 5, 21, 90, and 365 days, respectively. The concentration differences between the continual release situation (365 day) and the shorter duration periods reflect both the period of time over which the 1 lb release occurs and the difference in frequency of wind blowing toward the receptor during that time period in contrast to the annual average. This frequency difference is emphasized because we have selected the 5, 21, and 90 consecutive days resulting in the highest concentrations (that result when the wind is blowing most frequently toward the receptor). For instance, a factor of 4 increase in concentration is expected if the 1 lb/yr release occurs in 90 days rather than in 365 Days (365/90). The highest difference observed for 90 consecutive days approximates a factor of 7 because of the predominating winds.

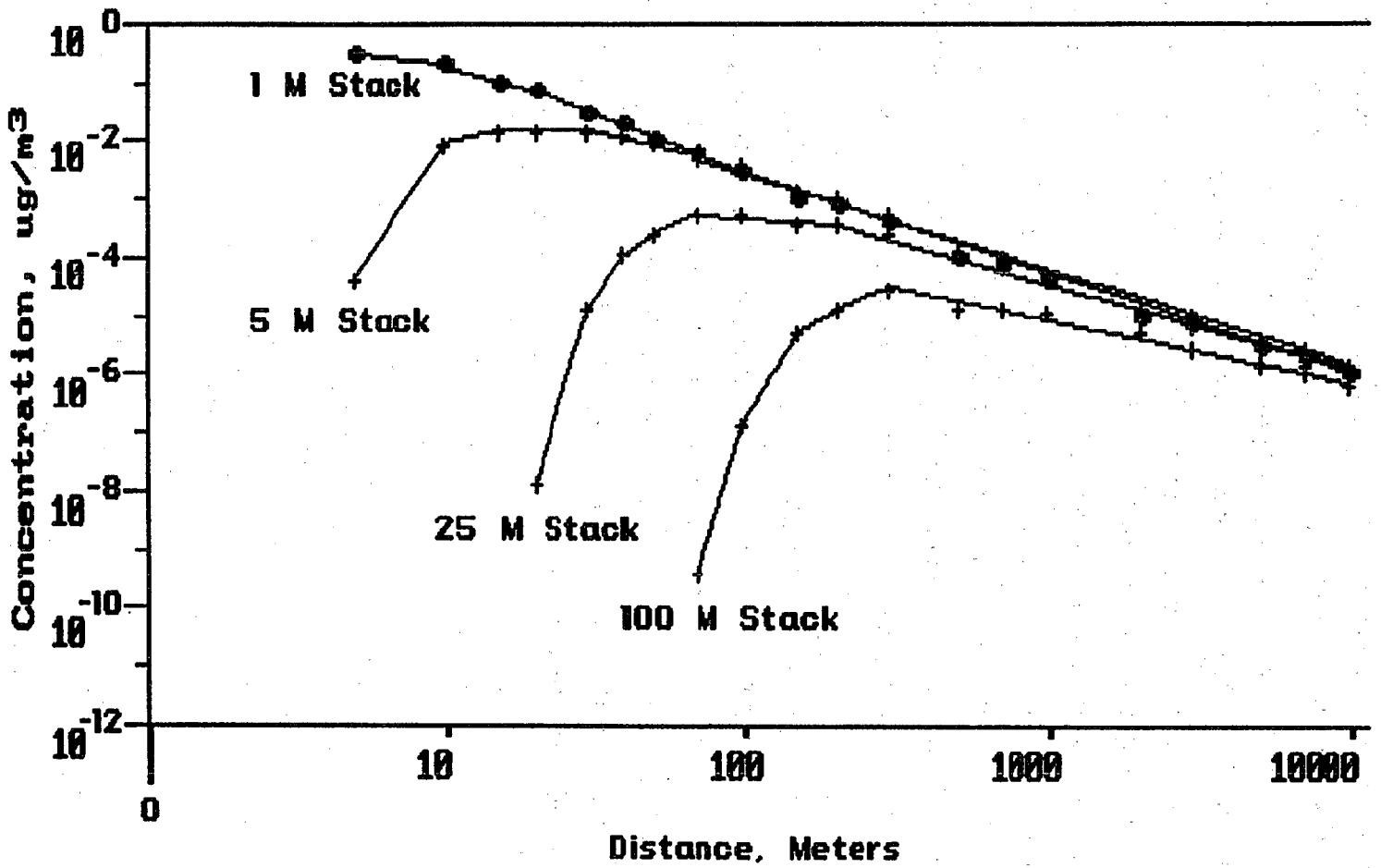
The first, generated with ISCLT, depicts maximum (ground level) concentrations as a function of distance and effective height of release; the stack heights ar 1, 5, 25, and 100 meters, respectively. These annual average concentrations, resulting from a 1 lb/yr release distributed over 365 days, illustrate the effect of release height on ambient concentration. The highest concentrations result from the shortest stacks; but within a few thousand meters the concentration differences are very small.

NOTES

[1]U.S. Environmental Protection Agency. Guideline on Air Quality Models, Revised EPA-450/2-78-027R. 1986.

Concentration vs. Distance for Various

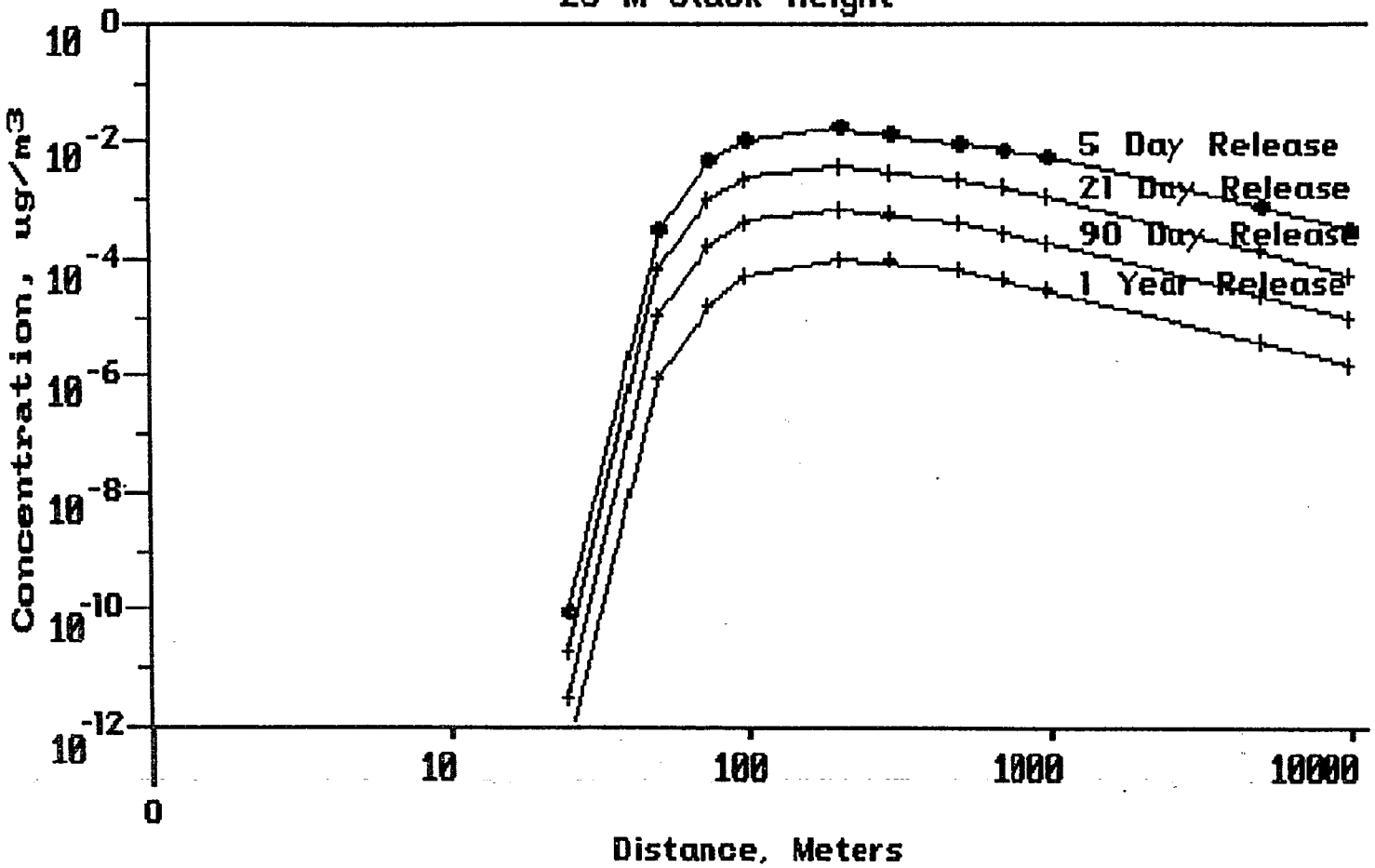
Stack Heights, for a Release of 1lb/Yr



Concentration vs Distance for a Release

of 1 Pound for Various Release Times

25 M Stack Height



APPENDIX C

QUANTITY OF RELEASE

QUANTITY OF RELEASE

Assigning a "high," "medium," or "low" ranking for the quantity of a chemical released is a very subjective judgment. Releases vary widely depending on the chemical, the industry, and the particular facility involved. It is not possible to provide an absolute ranking scale that is applicable in all situations. Rankings of releases are specific to each user of the data and reflect only the relative priorities among releases of concern to that user. For example, a release of 10,000 pounds in a non-industrial area may receive a high priority for further assessment while a similar release in a heavily industrialized area may be judged "a drop in the bucket" and receive a low priority.

Users should therefore consider a number of options for comparing release quantities in devising their own release rankings. For example, rankings can be based strictly on comparisons among local release quantities or on comparisons between local quantities and corresponding national values. A user may want to compare a release to the national average (median) quantity of that chemical released to that environmental medium. The user can also compare the release to local releases of other chemicals in the same industry or to releases of the same chemical from other industries. Similarly, comparisons across environmental media can be made.

There are no hard and fast rules for ranking release quantities; many approaches are equally valid. Users should feel free to experiment with a variety of criteria and rules in developing their own procedures. In the end, users should apply a common sense test to ensure that the chosen approach is rational and accurately reflects the user's priorities.

Tables C1 and C2 provide benchmark values that users may find helpful in devising their own ranking criteria. Table C1 provides median release figures for each chemical within each environmental medium. "Median" in this table is defined as the middle value of all <u>non-zero</u> values listed for the chemical. For example if the TRI data base lists values of 0,0,1,3,5 for a chemical, Table C1 would report 3 as the median value. Table C2 lists the number of TRI reports submitted for each chemical within each industry type (as defined by SIC code).

The report The Toxics Release Inventory: A National Perspective[1] contains a large collection of aggregate statistics that may also serve as useful bases of comparison.

NOTES

[1]U.S. Environmental Protection Agency. June 1989. The Toxics Release Inventory: A National Perspective. EPA 560/4-89-005.

TABLE C1

MEDIAN RELEASE AMOUNTS BY CHEMICAL AND MEDIUM

MEDIAN RELEASE AMOUNTS BY CHEMICAL AND MEDIUM

TRI DATA AS OF 3/18/89 IN POUNDS PER YEAR

MED51	MED52	MED53	MED54	MED55	MED61	MED62*	CAS NUMBER	CHEMICAL
310.0	1600	250	290000	250.0	280	750	000050000	FORMALDEHYDE
315.0	250	250	99000	250.0	131	750	000051285	2,4-DINITROPHENOL
.	.	.	.	.	.	.	000051752	NITROGEN MUSTARD
250.0	1475	935	.	12000.0	250	1000	000051796	URETHANE
9700.0	2	.	.	.	510	618	000052686	TRICHLORFON
500.0	7125	724	.	3400.0	.	9000	000055630	NITROGLYCERIN
1500.0	5128	130	4600	26.0	250	11013	000056235	CARBON TETRACHLORIDE
250.0	250	250	.	250.0	.	284	000056382	PARATHION
135.0	750	.	.	.	.	5306	000057147	1,1-DIMETHYL HYDRAZINE
880.0	4	4	19825	.	2018	111848	000057749	CHLORDANE
250.0	156	250	.	250.0	250	3700	000058899	LINDANE
.	.	.	693	.	.	.	000060093	4-AMINOAZOBENZENE
250.0	137	.	.	.	.	4336	000060344	METHYL HYDRAZINE
616.0	760	.	.	.	.	10100	000060355	ACETAMIDE
1398.0	250	250	10000	250.0	12561	4087	000062533	ANILINE
250.0	250	8045	5400	250.0	388	250	000062566	THIOUREA
250.0	240	.	.	.	1	4282	000062737	DICHLORVOS
250.0	250	124	.	1625.0	124	625	000063252	CARBARYL
250.0	138	250	.	250.0	250	2000	000064675	DIETHYL SULFATE
2100.0	8600	500	58000	750.0	6300	5187	000067561	METHANOL
2107.0	7912	300	500	250.0	750	3000	000067630	ISOPROPYL ALCOHOL
3400.0	9000	1300	37269	250.0	1056	6725	000067641	ACETONE
18900.0	70934	4236	80500	800.0	2195	3000	000067663	CHLOROFORM
250.0	100	8	197	1.0	.	250	000067721	HEXACHLOROETHANE
1469.0	9500	250	1334	250.0	670	2131	000071363	N-BUTYL ALCOHOL
3343.0	2600	250	4300	250.0	250	344	000071432	BENZENE
9684.5	13100	250	250	250.0	250	5625	000071556	1,1,1-TRICHLOROETHANE
1.0	250	2	.	250.0	.	.	000072435	METHOXYCHLOR
12950.0	14200	.	2200	.	.	3080	000074839	BROMOMETHANE
10500.0	10909	250	.	1475.0	250	4236	000074851	ETHYLENE
3326.5	19000	250	65900	250.0	250	750	000074873	CHLOROMETHANE (METHYL CHLORIDE)
250.0	250	.	55	.	.	500	000074884	METHYL IODIDE
1371.5	807	250	76650	250.0	22	384	000074908	HYDROGEN CYANIDE
250.0	2144	250	.	.	2454	188	000074953	METHYLENE BROMIDE
2300.0	7460	195	755	2.0	.	11000	000075003	ETHYL CHLORIDE
5250.0	2938	20	350	366.0	1470	367	000075014	VINYL CHLORIDE (MONOMER)
1900.0	950	250	380000	250.0	250	13175	000075058	ACETONITRILE
6968.0	13000	745	73800	13500.5	17500	771	000075070	ACETALDEHYDE
4901.5	12000	250	3750	250.0	250	6000	000075092	DICHLOROMETHANE
1200.0	85911	250	44750	250.0	1000	850	000075150	CARBON DISULFIDE
1700.0	4000	441	602662	250.0	1300	500	000075218	ETHYLENE OXIDE
1800.0	1600	.	.	.	250	750	000075274	DICHLOROBROMOMETHANE
560.0	1600	163	10200	3.5	250	2600	000075354	VINYLIDENE CHLORIDE
200.0	113	250	250	.	.	1000	000075445	PHOSGENE
250.0	250	.	.	.	250	.	000075558	PROPYLENEIMINE
750.0	930	250	120000	250.0	500	400	000075569	PROPYLENE OXIDE
900.0	750	180	17500	12000.0	58000	3450	000075650	TERT-BUTYL ALCOHOL
14680.0	15160	250	617	566.0	250	5762	000076131	FREON 113
1782.0	4	2	.	.	57	118550	000076448	HEPTACHLOR
900.0	184	16	9913	.	389	45972	000077474	HEXACHLOROCYCLOPENTADIENE
250.0	42	6680	.	.	250	250	000077781	DIMETHYL SULFATE
3600.0	3442	250	.	3.0	2300	1616	000078842	ISOBUTYRALDEHYDE

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MED51	MED52	MED53	MED54	MED55	MED61	MED62*	CAS NUMBER	CHEMICAL
2380.5	42000	3045	5000	144.0	45755	250	000078875	1,2-DICHLOROPROPANE
725.0	765	1325	47000	500.0	250	1111	000078922	SEC-BUTYL ALCOHOL
3412.5	12258	250	11500	250.0	250	7327	000078933	METHYL ETHYL KETONE
1500.0	8600	250	.	4.5	623	7750	000079005	1,2-TRICHLOROETHANE
8027.0	14540	250	470	411.0	250	5000	000079016	TRICHLOROETHYLENE
250.0	250	250	918000	250.0	250	250	000079061	ACRYLAMIDE
250.0	250	250	3120000	250.0	250	661	000079107	ACRYLIC ACID
170.0	250	250	280	.	250	500	000079118	CHLOROACETIC ACID
250.0	250	23	.	.	.	.	000079210	PERACETIC ACID
172.0	250	90	.	2.0	.	4589	000079345	1,1,2,2-TETRACHLOROETHANE
750.0	2626	2050	167501	.	3000	833	000079469	2-NITROPROPANE
250.0	250	250	250	2100.0	250	1261	000080057	4,4'-ISOPROPYLIDENEDIPHENOL
250.0	250	250	31500	135.0	3400	470	000080159	CUMENE HYDROPEROXIDE
250.0	250	250	1300	250.0	250	1780	000080626	METHYL METHACRYLATE
250.0	250	.	.	.	4225	750	000081072	SACCHARIN
.	127	.	.	.	.	7275	000082688	QUINTOZENE
250.0	250	250	.	.	250	1930	000084662	DIETHYL PHTHALATE
250.0	250	250	270000	126.0	250	750	000084742	DIBUTYL PHTHALATE
250.0	250	250	.	250.0	250	1300	000085449	PHTHALIC ANHYDRIDE
250.0	250	500	.	250.0	475	1450	000085687	BUTYL BENZYL PHTHALATE
.	.	.	34000	.	.	.	000086306	N-NITROSODIPHENYLAMINE
7200.0	250	.	.	.	.	.	000087627	2,6-XYLIDINE
227.5	10	8	70	1.0	63	200	000087683	HEXACHLORO-1,3-BUTADIENE
250.0	250	250	8520	255.0	250	1350	000087865	PENTACHLOROPHENOL
.	.	250	15500	.	.	.	000088062	2,4,6-TRICHLOROPHENOL
15709.0	866	250	.	.	63842	12777	000088755	2-NITROPHENOL
250.0	250	250	.	250.0	.	635893	000088891	PICRIC ACID
250.0	250	304	.	250.0	4832	1	000090040	O-ANISIDINE
250.0	250	127	.	250.0	250	250	000090437	2-PHENYLPHENOL
.	400	.	.	.	.	30339	000090948	MICHLER'S KETONE
250.0	250	700	250	250.0	126	1000	000091087	TOLUENE-2,6-DIISOCYANATE
750.0	750	250	6262	750.0	250	1000	000091203	NAPHTHALENE
250.0	250	128	.	100.0	250	250	000091225	QUINOLINE
1.0	1	250	.	.	250	250	000091941	3,3'-DICHLOROBENZIDINE
625.0	380	250	14000	380.0	1692	515	000092524	BIPHENYL
.	1	.	6	.	.	.	000092671	4-AMINOBIPHENYL
250.0	250	475	9625	750.0	750	250	000094360	BENZOYL PEROXIDE
250.0	250	.	.	.	250	.	000094597	SAFROLE
250.0	397	250	.	11715.0	155	1800	000094757	2,4-D
4600.0	1100	250	.	250.0	250	1210	000095476	O-XYLENE
250.0	216	250	.	1600.0	58	11205	000095487	O-CRESOL
619.5	800	250	18000	250.0	250	13879	000095501	1,2-DICHLOROBENZENE
250.0	250	250	250	250.0	6500	8600	000095534	O-TOLUIDINE
2172.5	750	250	127	250.0	250	750	000095636	1,2,4-TRIMETHYLBENZENE
2600.0	67	250	.	.	.	.	000095807	2,4-DIAMINOTOLUENE
127.0	385	390	.	.	.	.	000096093	STYRENE OXIDE
303.0	375	8	.	24.0	250	1048	000096333	METHYL ACRYLATE
.	.	.	.	.	8	2353	000096457	ETHYLENE THIOUREA
.	.	263	.	676.0	.	194	000097563	C.I. SOLVENT YELLOW 3
1395.0	250	.	.	.	.	3800	000098077	BENZOIC TRICHLORIDE
1100.0	750	250	500	250.0	2100	750	000098828	CUMENE
2191.5	129	.	.	.	.	22705	000098873	BENZAL CHLORIDE

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MED51	MED52	MED53	MED54	MED55	MED61	MED62*	CAS NUMBER	CHEMICAL
250.0	250	.	130000	.	250	430	000098884	BENZOYL CHLORIDE
1100.0	250	225	85000	250.0	2300	1750	000098953	NITROBENZENE
.	.	.	.	.	400	.	000099592	5-NITRO-O-ANISIDINE
250.0	250	.	6800	250.0	45600	87625	000100027	4-NITROPHENOL
250.0	250	250	.	500.0	7625	10000	000100210	TEREPHTHALIC ACID
1600.0	750	250	460	250.0	250	1352	000100414	ETHYL BENZENE
2158.5	3000	250	250	250.0	250	3209	000100425	STYRENE (MONOMER)
250.0	250	250	1600	250.0	250	4112	000100447	BENZYL CHLORIDE
300.0	.	.	.	.	.	250	000101144	4,4'-METHYLENE BIS(2-CHLOROANILINE)
.	18173	.	.	.	.	.	000101611	4,4'-METHYLENE BIS(N,N-DIMETHYL) BENZ
250.0	250	250	.	250.0	250	1700	000101688	METHYLENE BIS (PHENYLISOCYANATE)
1475.0	320	91	456000	2.0	5	7343	000101779	4,4'-METHYLENE DIANILINE
250.0	155	292	.	.	210	.	000101804	4,4'-DIAMINODIPHENYL ETHER
250.0	250	825	.	250.0	250	5900	000103231	BIS(2-ETHYLHEXYL) ADIPATE
.	.	40	.	.	.	.	000104949	P-ANISIDINE
250.0	250	80	44658	320.5	1545	487	000105679	2,4-DIMETHYLPHENOL
4050.0	2000	250	.	250.0	250	1250	000106423	P-XYLENE
499.0	250	250	.	250.0	902	7677	000106445	P-CRESOL
750.0	16788	500	19000	370.0	3525	12358	000106467	1,4-DICHLOROBENZENE
132.0	76	1635	74144	2500.0	1800	2000	000106503	P-PHENYLENEDIAMINE
490.0	282	110	.	.	.	120	000106514	QUINONE
2500.0	1062	750	.	.	250	287	000106887	1,2-BUTYLENE OXIDE
275.0	335	250	73000	205.0	250	1750	000106898	EPICHLOROHYDRIN
250.0	250	100	44	250.0	126	250	000106934	1,2-DIBROMOETHANE
4000.0	5108	250	.	250.0	235	540	000106990	1,3-BUTADIENE
250.0	250	281	23200	250.0	250	.	000107028	ACROLEIN
1300.0	266	24233	250	.	145	6007	000107051	ALLYL CHLORIDE
750.0	6100	910	4930	250.0	1125	14201	000107062	1,2-DICHLOROETHANE
860.0	750	250	200000	250.0	250	310	000107131	ACRYLONITRILE
250.0	250	1479	22000	250.0	5000	2500	000107211	ETHYLENE GLYCOL
32.0	39	.	.	.	.	.	000107302	CHLOROMETHYL METHYL ETHER
796.5	2133	250	463560	615.0	250	750	000108054	VINYL ACETATE
1703.0	5500	250	1200	250.0	250	3000	000108101	METHYL ISOBUTYL KETONE
250.0	250	250	250	250.0	250	500	000108316	MALEIC ANHYDRIDE
3750.0	2350	250	.	250.0	250	2600	000108383	M-XYLENE
250.0	250	.	.	250.0	250	3250	000108394	M-CRESOL
250.0	499	250	25000	250.0	250	750	000108781	MELAMINE
3350.0	12568	250	3500	250.0	250	5700	000108883	TOLUENE
750.0	828	250	7732	250.0	3095	5210	000108907	CHLOROBENZENE
565.0	1058	250	72000	250.0	525	1800	000108952	PHENOL
1596.5	2079	375	12000	126.0	3164	13167	000109864	2-METHOXYETHANOL
750.0	4336	250	.	27050.5	460	2100	000110805	2-ETHOXYETHANOL
2761.5	1100	250	250	250.0	250	802	000110827	CYCLOHEXANE
2000.0	276	445	43400	250.0	6430	11953	000110861	PYRIDINE
250.0	250	533	50000	250.0	455	979	000111422	DIETHANOLAMINE
1121.0	250	80	.	2.0	5084	1616	000111444	BIS(2-CHLOROETHYL) ETHER
1.0	.	.	.	.	.	750	000114261	PROPOXUR
11000.0	4750	72	.	1348.5	250	375	000115071	PROPYLENE
.	.	.	.	.	.	1840	000115322	DICOFOL
250.0	677	250	250	250.0	250	3000	000117817	DI (2-ETHYLHEXYL) PHTHALATE
250.0	250	250	.	500.0	152	855	000117840	N-DIOCTYLPHTHALATE
129.0	7	3	522	.	109	39100	000118741	HEXACHLOROBENZENE

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250.0	250	188	.	250.0	79	300	000120127	ANTHRACENE
250.0	250	250	.	250.0	3800	3200	000120718	P-CRESIDINE
250.0	250	9850	.	270.0	145672	250	000120809	CATECHOL
250.0	250	2610	2600	1466.5	750	4843	000120821	1,2,4-TRICHLOROBENZENE
250.0	911	250	2290	12000.0	.	17472	000120832	2,4-DICHLOROPHENOL
250.0	725	110	203000	10.0	770000	41500	000121142	2,4-DINITROTOLUENE
250.0	250	250	.	250.0	5000	8850	000121697	N,N-DIMETHYLANILINE
250.0	250	250	120000	250.0	250	250	000123319	HYDROQUINONE
890.0	1300	1	3400	10.0	.	570	000123386	PROPIONALDEHYDE
9900.0	6600	200	2600	126.0	4231	1450	000123728	BUTYRALDEHYDE
250.0	1274	3700	.	250.0	790	1220	000123911	1,4-DIOXANE
750.0	750	139	48200	.	18125	750	000126998	CHLOROPRENE
3850.0	9768	250	354000	250.0	250	4891	000127184	TETRACHLOROETHYLENE
750.0	250	550	250	250.0	1200	1100	000131113	DIMETHYL PHTHALATE
250.0	250	79	.	250.0	60	456	000132649	DIBENZOFURAN
250.0	250	.	6100	250.0	250	464	000133062	CAPTAN
250.0	250	.	.	.	.	4009	000133904	CHLORAMBEN
168.0	304	.	.	.	.	625	000134327	ALPHA-NAPHTHYLAMINE
140.0	690	339	.	.	348	600	000135206	CUPFERRON
1.5	250	2900	1900000	4300.0	678	170443	000139139	NITRILOTRIACETIC ACID
250.0	250	26	.	250.0	250	500	000140885	ETHYL ACRYLATE
250.0	250	125	.	250.0	250	750	000141322	BUTYL ACRYLATE
.	.	.	.	.	250	250	000151564	ETHYLENEIMINE
250.0	.	.	2000	.	.	250	000156105	P-NITROSODIPHENYLAMINE
12000.0	750	.	.	250.0	.	.	000156627	CALCIUM CYANAMIDE
2921.0	250	.	.	.	.	250	000177817	DI(2-ETHYLHEXYL) PHTHALATE (DEHP)
250.0	250	250	.	500.0	250	1250	000302012	HYDRAZINE
750.0	286895	750	.	.	.	.	000463581	CARBONYL SULFIDE
129.5	10	.	.	.	.	.	000510156	CHLOROBENZILATE
.	250	1656	.	.	.	250	000532274	2-CHLOROACETOPHENONE
139.0	18	601	.	.	143	12740	000534521	4,6-DINITRO-O-CRESOL
500.0	4100	20	346	1.0	.	29390	000540590	1,2-DICHLOROETHYLENE
1425.0	150	.	.	.	.	.	000541413	ETHYL CHLOROFORMATE
522.5	2400	250	.	26.0	14125	250	000541731	1,3-DICHLOROBENZENE
750.0	250	250	.	245.0	.	.	000542756	1,3-DICHLOROPROPYLENE
1.0	.	.	.	.	.	.	000542881	BIS(CHLOROMETHYL) ETHER
1.0	1	.	.	.	1584	250	000569642	C.I. BASIC GREEN 4
250.0	250	250	.	250.0	250	1040	000584849	TOLUENE-2,4-DIISOCYANATE
13250.0	13600	.	.	.	.	.	000593602	VINYL BROMIDE
610.0	410	160	50700	250.0	200000	9800	000606202	2,6-DINITROTOLUENE
.	.	.	.	.	230	.	000615054	2,4-DIAMINOANISOLE
5058.0	103425	.	.	.	.	5425	000624839	METHYL ISOCYANATE
4.0	.	.	.	.	.	3652	000842079	C.I. SOLVENT YELLOW 14
3440.0	6975	.	.	.	.	1169	000961115	TETRACHLORVINPHOS
.	.	.	.	.	.	.	001120714	PROPANE SULTONE
250.0	250	163	250	500.0	750	2925	001163195	DECABROMODIPHENYL OXIDE
250.0	250	646	64750	750.0	11700	4438	001310732	SODIUM HYDROXIDE (SOLUTION)
250.0	250	415	.	250.0	1999	7850	001313275	MOLYBDENUM TRIOXIDE
230.0	1100	.	.	.	.	670000	001314201	THORIUM DIOXIDE
250.0	600	250	647673	250.0	250	5538	001319773	CRESOL (MIXED ISOMERS)
2200.0	11000	250	387	250.0	250	4594	001330207	XYLENE (MIXED ISOMERS)
250.0	250	250	252000	56075.0	250	20550	001332214	ASBESTOS (FRIABLE)

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250.0	1	250	250	250.0	250	12052	001336363	POLYCHLORINATED BIPHENYLS (PCBS)
250.0	1400	448	1362000	46810.0	750	50000	001344281	ALUMINUM OXIDE
250.0	250	6	71	250.0	250	625	001582098	TRIFLURALIN
2800.0	2615	250	6900	250.0	250	750	001634044	METHYL TERT-BUTYL ETHER
250.0	250	240	.	.	353	250	001897456	CHLOROTHALONIL
930.5	250	.	.	.	1138	7219	002164172	FLUOMETURON
.	.	.	.	.	.	750	002650182	C.I. ACID BLUE 9, DIAMMONIUM SALT
500.0	250	.	.	250.0	750	3950	003844459	C.I. ACID BLUE 9, DISODIUM SALT
250.0	750	12000	1280000	750.0	121100	12000	006484522	AMMONIUM NITRATE (SOLUTION)
250.0	670	250	3	1858.0	250	5500	007429905	ALUMINUM (FUME OR DUST)
250.0	250	250	2245	860.0	250	1827	007439921	LEAD
250.0	250	250	250	968.5	250	1826	007439965	MANGANESE
1000.0	200	23	.	250.0	250	2372	007439976	MERCURY
250.0	250	250	1325	750.0	250	1698	007440020	NICKEL
250.0	250	46	250	250.0	133	250	007440224	SILVER
250.0	54161	925	.	.	.	250	007440280	THALLIUM AND COMPOUNDS
250.0	250	250	8800	3525.5	250	1265	007440360	ANTIMONY
250.0	250	250	.	250.0	33	618	007440382	ARSENIC
250.0	250	250	.	1516.5	250	1318	007440393	BARIUM
250.0	250	250	.	13810.0	750	2850	007440417	BERYLLIUM
250.0	250	250	4220	250.0	250	250	007440439	CADMIUM
250.0	250	250	245	750.0	250	1852	007440473	CHROMIUM AND COMPOUNDS
250.0	250	227	.	350.0	250	539	007440484	COBALT
250.0	250	250	17675	750.0	250	1420	007440508	COPPER
250.0	275	250	.	647.0	.	4449	007440622	VANADIUM (FUME OR DUST)
250.0	250	250	5000	2400.0	250	3438	007440666	ZINC (FUME OR DUST)
750.0	250	25	.	750.0	.	44403	007550450	TITANIUM TETRACHLORIDE
250.0	250	250	54250	250.0	1203	6575	007647010	HYDROCHLORIC ACID
250.0	250	1400	1109	2266.5	7482	5040	007664382	PHOSPHORIC ACID
250.0	250	703	15220	250.0	250	14650	007664393	HYDROGEN FLUORIDE
1442.0	2000	9200	178000	750.0	4648	1400	007664417	AMMONIA
250.0	250	750	39000	260.0	2318	8500	007664939	SULFURIC ACID
250.0	250	470	8081	250.0	1542	10000	007697372	NITRIC ACID
250.0	250	375	.	1400.0	4551	1600	007723140	PHOSPHORUS (YELLOW OR WHITE)
250.0	250	1300000	2500000	16052.0	221566	11910	007757826	SODIUM SULFATE (SOLUTION)
250.0	250	425	.	3338.5	250	250	007782492	SELENIUM
250.0	750	918	250	2397.5	750	800	007782505	CHLORINE
250.0	250	90000	40365000	4000.0	160000	2200	007783202	AMMONIUM SULFATE (SOLUTION)
.	.	.	139000	.	.	.	010034932	HYDRAZINE SULFATE
250.0	68000	2600	.	9849.0	500	6870	010049044	CHLORINE DIOXIDE
.	750	.	.	.	64796	176200	012122677	ZINEB
250.0	250	.	.	.	7720	500	012427382	MANEB
250.0	500	155	250	39305.0	2854	10960	025321226	DICHLOROBENZENE (MIXED ISOMERS)
960.0	250	250	28000	250.0	150000	20000	025376458	DIAMINOTOLUENE (MIXED ISOMERS)
250.0	250	250	.	.	250	250	039156417	2,4-DIAMINOANISOLE SULFATE
250.0	250	250	700	550.0	250	1281	ANTIMONY	ANTIMONY COMPOUNDS
250.0	250	250	55000	750.0	250	250	ARSENIC C	ARSENIC COMPOUNDS
250.0	250	250	250	1701.0	250	2334	BARIUM CO	BARIUM COMPOUNDS
1.0	126	10	.	.	2	3653	BERYLLIUM	BERYLLIUM COMPOUNDS

*MEDIA CODES:

MED51 = FUGITIVE AIR
MED52 = STACK AIR
MED53 = SURFACE WATER (DIRECT REL)
MED54 = UNDERGROUND INJECTION
MED55 = LAND (ON SITE)
MED61 = OFF-SITE POTW TRANSFER (INDIRECT REL)
MED62 = OTHER OFF-SITE TRANSFER

MEDIAN RELEASE AMOUNTS BY CHEMICAL AND MEDIUM

TRI DATA AS OF 3/18/89 IN POUNDS PER YEAR

MED51	MED52	MED53	MED54	MED55	MED61	MED62*	CAS NUMBER	CHEMICAL
250.0	250	250	.	600.0	250	3093	CADMIUM C	CADMIUM COMPOUNDS
65.0	50	3653	10082	.	2100	352835	CHLOROPHE	CHLOROPHENOLS
250.0	250	250	310	2400.0	250	1121	CHROMIUM	CHROMIUM COMPOUNDS
250.0	250	250	.	250.0	250	951	COBALT CO	COBALT COMPOUNDS
250.0	250	250	742	500.0	250	1000	COPPER CO	COPPER COMPOUNDS
250.0	250	250	610500	250.0	250	300	CYANIDE C	CYANIDE COMPOUNDS
750.0	4800	250	53000	250.0	750	2325	GLYCOL ET	GLYCOL ETHERS
250.0	250	250	250	750.0	250	1722	LEAD COMP	LEAD COMPOUNDS
250.0	250	250	2300000	2850.0	250	5210	MANGANESE	MANGANESE COMPOUNDS
250.0	250	126	16	125.5	8	2000	MERCURY C	MERCURY COMPOUNDS
250.0	1000	250	56000	750.0	250	3800	MIXTURES	
250.0	250	250	1200	1525.0	250	1840	NICKEL CO	NICKEL COMPOUNDS
.	.	.	.	.	.	.	POLY BROM	POLY BROMINATED BIPHENYLS
250.0	2803	44861	31807	250.0	250	500	SELENIUM	SELENIUM COMPOUNDS
250.0	250	250	250	500.0	164	1043	SILVER CO	SILVER COMPOUNDS
.	.	470000	.	.	.	.	SULFURIC	SULFURIC ACID
.	250	.	.	.	.	.	THALLIUM	THALLIUM COMPOUNDS
.	.	.	.	.	51	.	ZINC	ZINC
250.0	250	250	250	3391.5	250	4052	ZINC COMP	ZINC COMPOUNDS

*MEDIA CODES:

MED51 = FUGITIVE AIR
MED52 = STACK AIR
MED53 = SURFACE WATER (DIRECT REL)
MED54 = UNDERGROUND INJECTION
MED55 = LAND (ON SITE)
MED61 = OFF-SITE POTW TRANSFER (INDIRECT REL)
MED62 = OTHER OFF-SITE TRANSFER

TABLE C2

TOXIC CHEMICAL RELEASE INVENTORY SUBMISSIONS BY SIC CODES *

SIC	Industry Group
20	Food
21	Tobacco
22	Textiles
23	Apparel
24	Lumber and wood
25	Furniture
26	Paper
27	Printing and publishing
28	Chemicals
29	Petroleum and coal
30	Rubber and plastics
31	Leather
32	Stone, clay, and glass
33	Primary metals
34	Fabricated metals
35	Machinery (excluding electrical)
36	Electrical and electronic equipment
37	Transportation equipment
38	Instruments
39	Miscellaneous manufacturing

* N in Table means number of TRI reports received

CATEGORY	Standard Industrial Classification Code																					total	
	non-20-39	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	N	% of total
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N		
	19	31		1		23	23	10	7	67	3	21		40	30	63	19	24	20	6	5	412	0.56
N/A																			1			1	0.00
NA	2	2		12		11	3	4	1	16	5	12		10	27	20	7	10	2	2	7	153	0.21
000020008 ANTIMONY COMPOUNDS		1		10	1	1		5		77	9	32		10	18	3	2	3	1	1		174	0.23
000020019 ARSENIC COMPOUNDS	3					152	1			25	2	2		3	16	1						205	0.28
000020020 BARIUM COMPOUNDS	6	1		4	1		2	3		170	12	27		79	15	15	9	13	33	2	3	395	0.53
000020031 BERYLLIUM COMPOUNDS												1		1	5			1				8	0.01
000020042 CADMIUM COMPOUNDS				2						41	1	11		1	14	3		4	5			82	0.11
000020053 CHLOROPHENOLS								1		11	1			1								14	0.02
000020064 CHROMIUM COMPOUNDS	7			4	1	162	4	8	3	197	44	17	16	58	107	78	28	24	68	8	4	838	1.13
000020075 COBALT COMPOUNDS										50	17	9		6	9	2	9	3	11	1		117	0.16
000020086 COPPER COMPOUNDS	7	13		2		126	3	6	5	180	13	9		8	128	68	21	65	29	5	10	698	0.94
000020097 CYANIDE COMPOUNDS	3						4	1		45	2	3			42	194	7	21	21	2	14	359	0.48
000020100 (NON MONO ETHYLS, NON MONOMETHYLS)	22	3	1	13		6	22	24	32	424	21	19	11	17	20	171	33	77	97	12	8	1,033	1.39
000020111 LEAD COMPOUNDS	11	2		2			2	3	1	143	66	38		28	103	25	5	77	24	1	2	533	0.72
000020122 MANGANESE COMPOUNDS	2	13		2		2	1	3		97	14	1	4	45	87	18	9	20	13	5	2	338	0.46
000020133 MERCURY COMPOUNDS										12	2			1		2		4				21	0.03
000020144 NICKEL COMPOUNDS	4	3					5	1		92	36	6		10	94	79	11	18	35	5	7	406	0.55
000020166 SELENIUM COMPOUNDS		2								6	1	1			1					1		12	0.02
000020177 SILVER COMPOUNDS									1	6				1	8	5	1		2	8		32	0.04
000020188 THALLIUM COMPOUNDS														1								1	0.00
000020199 ZINC COMPOUNDS	9	29		6	1	5	3	30	1	354	60	166		33	134	116	13	38	73	14	11	1,096	1.48
000050000 FORMALDEHYDE	20	9		18		98	14	45	1	360	10	23		46	30	29	10	21	7	8	1	750	1.01
000051285 2,4-DINITROPHENOL										10					2							12	0.02
000051752 NITROGEN MUSTARD															1							1	0.00
000051796 URETHANE				1						2		3				3			4			13	0.02
000052686 TRICHLORFON										2					1							3	0.00
000055630 NITROGLYCERIN										9				5		4			1		1	20	0.03
000056235 CARBON TETRACHLORIDE	2									62	22			4	2	2				2		96	0.13
000056382 PARATHION										10												10	0.01
000057147 1,1-DIMETHYL HYDRAZINE										1									1			2	0.00
000057749 CHLORDANE		1								3												4	0.01
000058899 LINDANE										3								1				4	0.01
000060093 4-AMINOAZOBENZENE										1												1	0.00
000060344 METHYL HYDRAZINE										1									1			2	0.00
000060355 ACETAMIDE										1						1		1				3	0.00
000062533 ANILINE										59	1								1			61	0.08
000062566 THIOUREA						3		1		14					3	1		5		6		33	0.04
000062737 DICHLORVOS		1	2							2												5	0.01
000063252 CARBARYL										20												20	0.03
000064675 DIETHYL SULFATE									1	20												21	0.03
000067561 METHANOL	45	22	4	46		42	157	180	23	890	66	61	5	34	59	66	81	102	119	39	13	2,054	2.77
000067630 ISOPROPYL ALCOHOL (MANUFACTURING, S	5	4		5		1	9	8	18	18	1	4	1	1	14	5	3	11	4	1		113	0.15
000067641 ACETONE	51	11	2	16	4	38	107	142	19	608	15	271	43	38	22	102	43	192	284	44	61	2,113	2.85
000067663 CHLOROFORM	4	1						96		56	1			2					1	1	1	163	0.22
000067721 HEXACHLOROETHANE										11					6	2						19	0.03
000071363 N-BUTYL ALCOHOL	19	7		3		28	89	13	11	297	5	21	11	13	17	212	28	22	95	6	12	909	1.23
000071432 BENZENE	19	7				3			1	138	189	2	3	9	30	3	5	1	71	2		483	0.65
000071556 1,1,1-TRICHLOROETHANE	70	5	1	61	6	7	24	64	41	396	49	232	10	52	212	554	302	482	347	115	87	3,117	4.20
000072435 METHOXYCHLOR										4												4	0.01

(CONTINUED)

	Standard Industrial Classification Code																					total	
	non-20-39	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39		
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	% of total
CATEGORY																							
000074839 BROMOMETHANE	1	7	1							10												19	0.03
000074851 ETHYLENE	2									125	99			1	19							246	0.33
000074873 CHLOROMETHANE	1		1							70	1	3				2		1	2			81	0.11
000074884 METHYL IODIDE										1												1	0.00
000074908 HYDROGEN CYANIDE										28	3	1		1	3				1			37	0.05
000074953 METHYLENE BROMIDE		1					1			5												7	0.01
000075003 CHLOROETHANE	1									38		3										42	0.06
000075014 VINYL CHLORIDE										44		2			1			2			1	50	0.07
000075058 ACETONITRILE	3	1			1					48	1	1		1		1				4		61	0.08
000075070 ACETALDEHYDE	1	3				1		1		47										1		54	0.07
000075092 DICHLOROMETHANE	31	10		10	2	9	16	12	10	464	6	195	13	42	50	109	65	145	170	32	36	1,427	1.92
000075150 CARBON DISULFIDE			1					1		64	10	7		1	1						1	86	0.12
000075218 ETHYLENE OXIDE	6	13	1	2				1		121	1	8		1			1			38	2	195	0.26
000075274 DICHLOROBROMOMETHANE										4								2			1	7	0.01
000075354 VINYLIDENE CHLORIDE								1		14		2				1	1	1		1		21	0.03
000075445 PHOSGENE										37						3						40	0.05
000075558 PROPYLENEIMINE										1												1	0.00
000075569 PROPYLENE OXIDE	5	10						1		99				1					1	1		118	0.16
000075650 TERT-BUTYL ALCOHOL	1					1		1		34	5	1	3	4	1	1	1		1	1		55	0.07
000076131 FREON 113	12	2	1					1	2	64	3	23	3	10	27	95	123	398	134	124	24	1,046	1.41
000076448 HEPTACHLOR										1												1	0.00
000077474 HEXACHLOROCYCLOPENTADIENE										3												3	0.00
000077781 DIMETHYL SULFATE	1								1	24	1											27	0.04
000078842 ISOBUTYRALDEHYDE						1	1			15					1							18	0.02
000078875 1,2-DICHLOROPROPANE										8	4									1		13	0.02
000078922 SEC-BUTYL ALCOHOL	2					1	3	3	2	39	2	1		1	3	7	2	2	7			75	0.10
000078933 METHYL ETHYL KETONE	38	7	1	36	1	58	166	105	41	482	35	217	37	40	56	295	69	100	249	32	56	2,121	2.86
000079005 1,1,2-TRICHLOROETHANE										16	1	1	3	4	5	2	4	4	5	5		50	0.07
000079016 TRICHLOROETHYLENE	19			7		1	5	4	9	64	7	27	3	29	58	278	91	131	76	25	38	872	1.18
000079061 ACRYLAMIDE	1		1	1				2		45								1				51	0.07
000079107 ACRYLIC ACID	1		1					4		128	1	2				1	1				1	140	0.19
000079118 CHLOROACETIC ACID	1			1						32							1					35	0.05
000079210 PERACETIC ACID		4								6												10	0.01
000079345 1,1,2,2-TETRACHLOROETHANE										14								1			1	16	0.02
000079469 2-NITROPROPANE		1						1		9		2				1						14	0.02
000080057 4,4'-ISOPROPYLIDENEDIPHENOL								3		48	1		1	1		1		1	4			60	0.08
000080159 CUMENE HYDROPEROXIDE										20	3	7		1	3	1	2					37	0.05
000080626 METHYL METHACRYLATE	3		1	1		3		2		134	1	25	3	5	1				4	5	1	189	0.25
000081072 SACCHARIN (MANUFACTURING ONLY, NO P		1								1						1					1	4	0.01
000082688 QUINTOZENE										2												2	0.00
000084662 DIETHYL PHTHALATE										20		6	3	3		2		1	5			40	0.05
000084742 DIBUTYL PHTHALATE	3		1			2	1	2	7	63	1	15		4	3	4		1	4	2		113	0.15
000085449 PHTHALIC ANHYDRIDE								2	1	157		2		1		1		1		1	1	167	0.23
000085687 BUTYL BENZYL PHTHALATE	2	2		1				2		50	2	18		1	3	1	1		8	1	9	101	0.14
000086306 N-NITROSODIPHENYLAMINE										1												1	0.00
000087627 2,6-XYLIDINE										1												1	0.00
000087683 HEXACHLORO-1,3-BUTADIENE										8												8	0.01
000087865 PENTACHLOROPHENOL						49				6							1	1				57	0.08
000088062 2,4,6-TRICHLOROPHENOL										2												2	0.00
000088755 2-NITROPHENOL										3										1		4	0.01

(CONTINUED)

	Standard Industrial Classification Code																					total	
	non-20-39	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39		
CATEGORY	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	% of total
000088891 PICRIC ACID										3												3	0.00
000090040 O-ANISIDINE										6												6	0.01
000090437 2-PHENYLPHENOL										11							1	1				13	0.02
000090948 MICHLER'S KETONE										2								1				3	0.00
000091087 TOLUENE-2,6-DIISOCYANATE	3			4			1	2		36		78						5	5		2	136	0.18
000091203 NAPHTHALENE	13	1		1		89	2	4	2	92	85	5	3	10	31	13	4	4	15		2	376	0.51
000091225 QUINOLINE						13				8	1				9							31	0.04
000091941 3,3'-DICHLOROBENZIDINE										13												13	0.02
000092524 BIPHENYL	3	1	1	35		23		2		78	15	1			9					2		170	0.23
000092671 4-AMINOBIPHENYL										1												1	0.00
000094360 BENZOYL PEROXIDE	1	1						1		31		4				1			2	1	1	43	0.06
000094597 SAFROLE										2												2	0.00
000094757 2,4-D	3	2								24											1	30	0.04
000095476 O-XYLENE	2	1		1		1	5	1	1	30	29	14			3		1	2	1	3		95	0.13
000095487 O-CRESOL						1				21					1					1		24	0.03
000095501 1,2-DICHLOROBENZENE								1		27				2		1		6		2		39	0.05
000095534 O-TOLUIDINE										12												12	0.02
000095636 1,2,4-TRIMETHYLBENZENE	7	4		2		1	2	3	1	38	117			1	10	5	2		4		1	198	0.27
000095807 2,4-DIAMINOTOLUENE										2												2	0.00
000096093 STYRENE OXIDE										1								1				2	0.00
000096333 METHYL ACRYLATE	1		1					1		55		1				1				1		61	0.08
000096457 ETHYLENE THIOUREA			1							1		2										4	0.01
000097563 C.I. SOLVENT YELLOW 3										1												1	0.00
000098077 BENZOIC TRICHLORIDE										5												5	0.01
000098828 CUMENE	2						1	3		41	43	1			2	1			1			95	0.13
000098873 BENZAL CHLORIDE										3												3	0.00
000098884 BENZOYL CHLORIDE										21												21	0.03
000098953 NITROBENZENE										14	1									1		16	0.02
000099592 5-NITRO-O-ANISIDINE					1																	1	0.00
000100027 4-NITROPHENOL										6												6	0.01
000100210 TEREPHTHALIC ACID				1		1		1		47												50	0.07
000100414 ETHYLBENZENE	12	2		2		6	6	4	1	165	147	7	3	17	16	6	6	7	28	1		436	0.59
000100425 STYRENE	9		2	1		5	10	6		329	17	217	3	23	14	17	15	22	135	6	24	855	1.15
000100447 BENZYL CHLORIDE		1								41							1					43	0.06
000101144 4,4'-METHYLENEBIS(2-CHLOROANILINE)(										1		3										4	0.01
000101611 4,4'-METHYLENEBIS(N,N-DIMETHYL)BENZ																	1					1	0.00
000101688 METHYLENEBIS(PHENYLISOCYANATE)	2			2		10	2	3		55		45	3	3	27	12	20	6	28	2	13	233	0.31
000101779 4,4'-METHYLENEDIANILINE										13		1				4		1				19	0.03
000101804 4,4'-DIAMINODIPHENYL ETHER										3		1										4	0.01
000103231 BIS(2-ETHYLHEXYL) ADIPATE	1	1		1			1			21	1	12			2				1	1	1	43	0.06
000104949 P-ANISIDINE										1												1	0.00
000105679 2,4-DIMETHYLPHENOL										5	3											8	0.01
000106423 P-XYLENE	2							1		19	26	1		1	3	1			2	2		58	0.08
000106445 P-CRESOL										16				1								17	0.02
000106467 1,4-DICHLOROBENZENE										15								1			1	17	0.02
000106503 P-PHENYLENEDIAMINE	1									7	2				3							13	0.02
000106514 QUINONE										5		1										6	0.01
000106887 1,2-BUTYLENE OXIDE							1			9	1				2	1			1			15	0.02
000106898 EPICHLOROHYDRIN		3					1	3		61	3	1				1	1	1	5	1		81	0.11
000106934 1,2-DIBROMOETHANE	1							1		9	32											43	0.06

(CONTINUED)

CATEGORY	Standard Industrial Classification Code																					total	
	non-20-39	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39		
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	% of total
000106990 1,3-BUTADIENE	1			1				1		85	54	1						1			1	145	0.20
000107028 ACROLEIN										12												12	0.02
000107051 ALLYL CHLORIDE										16												16	0.02
000107062 1,2-DICHLOROETHANE	3			1				1	1	66	39	1	4	4		1	2			3		126	0.17
000107131 ACRYLONITRILE		1	1					2		90		3			1			1		1		100	0.13
000107211 ETHYLENE GLYCOL	29	24	1	33		6	4	22	11	559	64	24	4	35	100	53	38	46	118	22	8	1,201	1.62
000107302 CHLOROMETHYL METHYL ETHER										4												4	0.01
000108054 VINYL ACETATE	3	1	1	2				8		123		1	3	4		1	1					148	0.20
000108101 METHYL ISOBUTYL KETONE	16	3		6		26	62	19	4	245	7	57	13	26	17	104	20	17	73	11	14	740	1.00
000108316 MALEIC ANHYDRIDE	2	1		1				1		164	1	3		1								174	0.23
000108383 M-XYLENE	2			2			1	2		20	24	1		1	6	4	2	1	1	2		69	0.09
000108394 M-CRESOL						1			1	10					1			1				14	0.02
000108781 MELAMINE				3		2	2	2	2	44	1	13		1		5	1	3	1		2	82	0.11
000108883 TOLUENE	76	12	3	37	5	103	258	154	109	954	187	236	50	45	81	288	126	122	261	32	76	3,215	4.34
000108907 CHLOROBENZENE	2				1			1		51	1		3	10					2	1	1	73	0.10
000108952 PHENOL	6	1		4	2	33	1	22		209	55	25	5	45	99	11	8	24	16	2	4	572	0.77
000109864 2-METHOXYETHANOL	2			1		1		2	2	26	14	13	3	2		4	2	8	1	5	1	87	0.12
000110805 2-ETHOXYETHANOL	4			1			1	6	6	38		1	9	9	1	20	5	4	16	2		123	0.17
000110827 CYCLOHEXANE	10	6						1	1	82	140	2		3	2	13	1		13	1	1	276	0.37
000110861 PYRIDINE				1						23		1			1					2		28	0.04
000111422 DIETHANOLAMINE	2		1	4				1	4	127	77	6	3	1	4	3	24	4	27	2		290	0.39
000111444 BIS(2-CHLOROETHYL) ETHER	1									5												6	0.01
000114261 PROPOXUR										6												6	0.01
000115071 PROPYLENE	3	1	1	4				3		106	122	4		6	15	11	13	1	16			306	0.41
000115322 DICOFOL	1									1												2	0.00
000117817 DI(2-ETHYLHEXYL) PHTHALATE (DEHP) 2	2			11	1	4	28	7	5	71	3	98	1	3	2	11	1	9	19	4	7	287	0.39
000117840 N-DIOCTYL PHTHALATE	1			1	1	3		1	2	27		17			1	1			3	1	2	61	0.08
000118741 HEXACHLOROBENZENE										8												8	0.01
000120127 ANTHRACENE	1					77				22	16				18			1				135	0.18
000120718 P-CRESIDINE										5												5	0.01
000120809 CATECHOL								6		3												9	0.01
000120821 1,2,4-TRICHLOROBENZENE				17						24	1							11	1	2	2	58	0.08
000120832 2,4-DICHLOROPHENOL	1									5												6	0.01
000121142 2,4-DINITROTOLUENE										9						3						12	0.02
000121697 N,N-DIMETHYLANILINE										16		1							2	1		20	0.03
000123319 HYDROQUINONE	5								5	33		1					3	1		12	2	62	0.08
000123386 PROPIONALDEHYDE										14												14	0.02
000123728 BUTYRALDEHYDE	1									15	1	1										18	0.02
000123911 1,4-DIOXANE	1						1	1		28	2	4		2		3	2	1	1	2		48	0.06
000126998 CHLOROPRENE										10		4			1		1					16	0.02
000127184 TETRACHLOROETHYLENE	20	2		25	3	1	1	12	23	119	5	32	5	18	44	113	32	85	77	13	17	647	0.87
000131113 DIMETHYL PHTHALATE			1							19		5	3	4	2	3		1	18	1		57	0.08
000132649 DIBENZOFURAN						77				15					14							106	0.14
000133062 CAPTAN				1						20												21	0.03
000133904 CHLORAMBEN										3												3	0.00
000134327 ALPHA-NAPHTHYLAMINE										3		1										4	0.01
000135206 CUPFERRON								1		3												4	0.01
000139139 NITRILOTRIACETIC ACID				1						12								1	1			15	0.02
000140885 ETHYL ACRYLATE	2		2					1		84	1	4		1		1				2		98	0.13
000141322 BUTYL ACRYLATE	3						1	2		134		4			1	3			1	3		152	0.20

(CONTINUED)

CATEGORY	Standard Industrial Classification Code																					total	
	non-20-39	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39		
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	% of total
000151564 ETHYLENEIMINE						1										1						2	0.00
000156105 P-NITROSODIPHENYLAMINE										2												2	0.00
000156627 CALCIUM CYANAMIDE										1					2							3	0.00
000177817 DI-(2-ETHYLHEXYL) PHTHALATE (DEHP)										2		1										3	0.00
000302012 HYDRAZINE	2			1						34	3				5	1			3		1	50	0.07
000463581 CARBONYL SULFIDE										20	2											22	0.03
000510156 CHLOROBENZILATE										2												2	0.00
000532274 2-CHLOROACETOPHENONE										1												1	0.00
000534521 4,6-DINITRO-O-CRESOL										8												8	0.01
000540590 1,2-DICHLOROETHYLENE										9	1		1									11	0.01
000541413 ETHYL CHLOROFORMATE										5												5	0.01
000541731 1,3-DICHLOROBENZENE										6												6	0.01
000542756 1,3-DICHLOROPROPYLENE										4	1											5	0.01
000542881 BIS(CHLOROMETHYL) ETHER										2												2	0.00
000569642 C.I. BASIC GREEN 4	1			1				2		2												6	0.01
000584849 TOLUENE-2,4-DIISOCYANATE	5	1		3			2	3		86	2	95		1	3	4	1	7	6	1	4	224	0.30
000593602 VINYL BROMIDE										2												2	0.00
000606202 2,6-DINITROTOLUENE										6												6	0.01
000615054 2,4-DIAMINOANISOLE										1												1	0.00
000624839 METHYL ISOCYANATE	2							1		5		1			2				1			12	0.02
000842079 C.I. SOLVENT YELLOW 14									1					1								2	0.00
000961115 TETRACHLORVINPHOS										3						1						4	0.01
001120714 PROPANE SULTONE		1														1						2	0.00
001163195 DECABROMODIPHENYL OXIDE				7	1			2		17	1	18									1	47	0.06
001310732 SODIUM HYDROXIDE (SOLUTION)	131	1,142	14	248	18	122	24	392	33	1,651	187	75	21	68	418	1,059	187	600	319	83	66	6,858	9.25
001313275 MOLYBDENUM TRIOXIDE	1				1			1		19	22			2	19	2	1					68	0.09
001314201 THORIUM DIOXIDE										1												1	0.00
001319773 CRESOL (MIXED ISOMERS)	2									40	23	3		1	18	1		9				97	0.13
001330207 XYLENE (MIXED ISOMERS)	54	8	1	42	2	77	217	49	43	801	172	91	20	41	109	366	170	205	256	24	48	2,796	3.77
001332214 ASBESTOS (FRIABLE)	2	1						6		47	31	3		17	9	4	2	1	29	1	2	155	0.21
001336363 POLYCHLORINATED BIPHENYLS	8	4	1	2		2		15	1	20	2	5	1	8	29	7	4	18	16	2		145	0.20
001344281 ALUMINUM OXIDE	28	5	2	16		4		41	4	215	124	39	2	216	321	87	78	48	73	7	7	1,317	1.78
001582098 TRIFLURALIN	1									15												16	0.02
001634044 METHYL TERT-BUTYL ETHER	2	1								13	52				1				14			83	0.11
001897456 CHLOROTHALONIL										6												6	0.01
002164172 FLUOMETURON										2												2	0.00
002650182 C.I. ACID BLUE 9, DIAMMONIUM SALT										2												2	0.00
003844459 C.I. ACID BLUE 9, DISODIUM SALT										5												5	0.01
006484522 AMMONIUM NITRATE (SOLUTION)	12	2	1	3		1		11		130	7		1	6	6	2		2	1		1	186	0.25
007429905 ALUMINUM (FUME OR DUST)	2						2	1	2	41	4	3		10	135	50	14	17	28	4	5	318	0.43
007439921 LEAD	12	8		2			4	4	3	46	44	22		15	206	107	25	88	74	7	10	677	0.91
007439965 MANGANESE	4	5					7	2	2	22	6	2	1	37	235	111	48	22	43	4	1	552	0.74
007439976 MERCURY	2							1		22	2			2	2	1		6		1		39	0.05
007440020 NICKEL	6	17		1		1	11	1	1	55	24	10		4	228	224	56	44	61	7	12	763	1.03
007440224 SILVER	2								1	7	4			1	21	9	4	4	2	2	2	59	0.08
007440280 THALLIUM											3								2			5	0.01
007440360 ANTIMONY	3			6				2		19	8	6		5	30	5	1	30	6		4	125	0.17
007440382 ARSENIC	8	1				49		1		14	2	2		2	15	4	1	1	2	1	1	104	0.14
007440393 BARIUM	3			1			1			24	9	5		20	19	7	5	6	17	1	2	120	0.16
007440417 BERYLLIUM											1				8	1			1			11	0.01

(CONTINUED)

	Standard Industrial Classification Code																					total	
	non-20-39	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39		
	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	N	% of total
CATEGORY																							
007440439 CADMIUM	1								2	9	2	4			27	21	3	4	4	1	2	80	0.11
007440473 CHROMIUM	12	2		2		65	7	8	3	58	28	12	20	28	241	174	78	23	70	11	3	845	1.14
007440484 COBALT	2	4				1	1			21	9	1		2	38	19	6	4	12	1	2	125	0.17
007440508 COPPER	23	4			1	42	2	3	12	78	10	20		11	452	223	87	227	88	19	32	1,334	1.80
007440622 VANADIUM (FUME OR DUST)										3	6				14	4	2		3			32	0.04
007440666 ZINC (FUME OR DUST)	11	8		1		2	2	4	1	107	17	14		13	159	154	7	33	31	5	11	580	0.78
007550450 TITANIUM TETRACHLORIDE	1									32	1				5		1					40	0.05
007647010 HYDROCHLORIC ACID	54	138		18	1	12	15	149	7	825	40	41		42	226	709	85	341	147	45	24	2,919	3.94
007664382 PHOSPHORIC ACID	41	483	2	15		12	11	153	2	551	59	11	3	35	98	237	59	138	135	17	8	2,070	2.79
007664393 HYDROGEN FLUORIDE	6	1						2	1	92	61			17	92	83	5	88	35	2	1	486	0.66
007664417 AMMONIA	64	593	8	55	1	20	2	178	4	747	107	17	9	46	197	113	59	104	61	32	27	2,444	3.30
007664939 SULFURIC ACID	78	335	10	93	6	21	14	251	23	1,271	151	72	32	63	428	939	171	614	294	63	46	4,975	6.71
007697372 NITRIC ACID	26	116	1		2	3	3	26	25	305	5	18		11	156	490	41	249	161	37	25	1,700	2.29
007723140 PHOSPHORUS (YELLOW OR WHITE)	2									34	2		1		9	6	4	2	5	1		66	0.09
007757826 SODIUM SULFATE (SOLUTION)	19	52		159	9	7	1	153	1	517	71	20	9	13	76	113	19	117	33	19		1,408	1.90
007782492 SELENIUM		4								5	2				5	2					1	19	0.03
007782505 CHLORINE	49	342	2	58	2	5	1	231	2	554	117	18		9	162	93	18	44	27	13	8	1,755	2.37
007783202 AMMONIUM SULFATE (SOLUTION)	5	13		52	1	9		9		135	5	4	21	22	23	4		7		2	2	314	0.42
010034932										1												1	0.00
010049044		18		1				86		6	2											113	0.15
012122677										2									1			3	0.00
012427382	1									8						1						10	0.01
025321226	2			1						10		1		1				1			1	17	0.02
025376458										9												9	0.01
039156417																1						1	0.00
999999999						4		5		24				1	3				2	1	1	41	0.06
total	1,418	3,608	78	1,262	77	1,778	1,385	2,906	594	21745	3,626	3,154	433	1,759	6,287	8,815	2,587	5,538	5,001	1,137	967	74,155	100.00

APPENDIX D

ENVIRONMENTAL FATE CHARACTERISTICS OF TRI CHEMICALS

ENVIRONMENTAL FATE CHARACTERISTICS OF SARA §313 CHEMICALS

The following table highlights SARA Section 313 chemicals whose environmental fate properties tend to raise or lower concern of exposure in the medium of release. Transport or transformation processes that would tend to retain a chemical in the medium to which it was released, thus increasing the potential for exposure via that medium, are noted with a plus (+). Processes that would tend to enhance elimination of the chemical from the medium to which it was released, thus reducing the potential for exposure, are noted with a minus (-). Chemicals that have processes that fall in between these extremes are left blank. In general, this exercise was done only for the organic chemicals, since data for the inorganics and metals is often lacking and methods for estimating transport and transformation for these chemicals are less developed. These chemicals were assigned NA (not applicable) in the table. However, this is not to imply that one should not be concerned by exposure to metals. Metals will persist, may build up in concentration with time, and may lead to considerable exposure. In addition to the metals, some chemicals were not evaluated at all (e.g., ammonium salts, nitric oxide) and these were assigned NE (not evaluated) in the table.

Transport Processes

The three transport processes that are considered are volatilization (Vol in the table), leaching and soil mobility (L/SM), and bioconcentration (Bioc). The transformation processes that are considered are Abiotic Air, Abiotic Water, Biotic Water, and Biotic Soil. The potential for removal in a biological treatment plant is also considered. The criteria used to categorize the chemicals is discussed below for each process.

Volatility is strongly determined by the Henry's Law constant of the substance, which is the ratio of the chemical concentration in air to the concentration in water at equilibrium. The Henry's Law constant can be estimated by dividing the vapor pressure by the water solubility. Chemicals that have high Henry's Law constants will tend to volatilize relatively rapidly from water (lowering concern for water exposure). Chemicals with low values will volatilize slowly from water (retaining or raising exposure concern). Chemicals with a Henry's Law constant of

$\geq 10^{-2}$ atm-m^3/mol were considered to be extremely volatile (assigned minus (-) in the table) and chemicals with a value $\leq 10^{-6}$ atm-m^3/mol were considered to be relatively non-volatile (assigned plus (+)).

The degree of leaching or soil mobility will depend on a variety of environmental factors, such as organic content, pH, temperature, and clay content. However, the soil adsorption coefficient of a neutral organic chemical normalized to the organic carbon content of the soil or sediment (Koc) has been shown to correlate well with the relative mobility of a chemical in soil or the tendency of the chemical to partition to sediment. Where measured Koc values are not available, estimates can be provided from the octanol/water partition coefficient or water solubility. For the purpose of characterizing the soil mobility of the SARA 313 chemicals, it was assumed that chemicals with a log Koc of $\geq$ 4.5 would leach very slowly (assigned minus (-) in the table since their level of concern for exposure would be lower since the chemical would be more tightly bound) and values of $\leq$ 1.5 would readily leach, thereby increasing its potential to enter ground water (assigned plus (+) in the table). Consumption of ground-water or surface waters fed by ground water sources is probably the most significant source of exposure from release to soil.[2]

The bioconcentration factor (BCF) is the ratio of the concentration of a chemical in an aquatic organism to the concentration in the water at equilibrium. Chemicals with high BCFs possess a potential for concentrations to build up in the food chain, such as in fish and birds. This would affect the chemical's potential for human exposure (via fish consumption) as well as the chemical's environmental impacts. When measured BCF values are not available, BCFs can be estimated from the water solubility or octanol/water partition coefficient with the assumption that the chemical is not rapidly metabolized by the aquatic organism. Chemicals with BCFs $\geq$ 1000 were chosen as having significant potential for bioconcentration (assigned plus (+) in the table) and chemicals with a value $\leq$ 250 were considered to have a low potential to bioconcentrate (assigned minus (-) in the table).[3]

Transformation Processes

There are many abiotic degradation processes that result in the transformation of chemicals that enter the atmosphere. Some of the most important processes are reaction with hydroxyl radical, reaction with ozone (mostly important for chemicals with double or triple bonds), direct photolysis, and hydrolysis in the gas phase. By far the most important is the hydroxyl radical reaction. The hydroxyl radical rate constant, obtained either experimentally or by estimation from structure, can be combined with a 24-hr average hydroxyl radical concentration ($8 \times 10^{+5}$ molecules/cm^3 at 25 °C) to give an average half-life. Rate constants for hydrolysis and direct photolysis can also be used to calculate half-lives, but since atmospheric rate constants are generally not available for the SARA 313 chemicals, scientific judgment was used. Other processes were not considered because of time constraints and because they are generally less important.[4]

Chemicals estimated to have a half-life of $\geq$ 1 year in the atmosphere were determined to be relatively persistent (assigned plus (+) in the table because of increased concern of exposure) and chemicals with a half-life of $\leq$ 1/2 day were considered to be of low persistence (assigned minus (-) in the table because of decreased concern of exposure). Chemicals having these relatively rapid rates still may remain in the environment long enough to result in significant exposure, depending upon the environmental conditions encountered, such as wind speed and distance to receptor populations.

In water, abiotic degradation processes include hydrolysis, direct photolysis, and indirect photoreaction involving the transformation of the chemical in the presence of dissolved humic acids and sunlight. The same criteria (i.e., t 1/2 $\leq$ 1/2 day and $\geq$ 1 year) used for the atmosphere were used for assigning high and low concern for exposure to chemicals in water that are affected by abiotic processes.[5]

Estimating the significance of biotic transformations in water or soil is perhaps the most difficult because of the widely varying conditions found in the environment (different microbial populations, varying nutrients, etc.) and the lack of appropriate experimental data. In general, the estimates are based upon a combination of screening biodegradation studies and the "rules

of thumb" for correlations between structure and biodegradability (e.g., the addition of chlorine to a molecule will increase its persistence). These estimates were based upon the assumption of aerobic conditions (applicable to surface waters and soils, but not to some ground waters and sediments) and ultimate degradation. Chemicals were assigned a fast biodegradation category (minus (-) in the table) if it was felt that they would completely degrade in 1 to 7 days. Slow biodegradation (plus (+) in the table) was more difficult to judge, but was thought to require many months to years for ultimate degradation.[6]

The biological treatment column in the table indicates whether a chemical is rapidly removed during biological wastewater treatment (assigned -P for removal by physical/chemical processes and -B for biodegradation), slowly removed by any process (assigned plus (+) in the table), or intermediate between these two extremes (blank in the table). In general, chemicals that were considered to biodegrade fast in water and soil also were felt to biodegrade fast under biological treatment conditions. Chemicals that were assigned a plus in the table, and hence were not readily removed in treatment, were generally quite water soluble (log Kow generally less than 1.5), non-volatile (Henry's Law constant less than 10^{-5} atm-m^3/mol, and were considered to be very resistant to biodegradation in a typical biological treatment plant.[7]

NOTES

[1] Lynch, David. Computer Database of Physical/Chemical Properties for SARA 313 Chemicals. U.S. Environmental Protection Agency, Office of Toxic Substances, Exposure Evaluation Division. March 1989.

[2] Lynch, David. Computer Database of Physical/Chemical Properties for SARA 313 Chemicals. March 1989.

[3] Lynch, David. Computer Database of Physical/Chemical Properties for SARA 313 Chemicals. March 1989.

[4] Leifer, Asa. Abiotic Fate of SARA Title III Chemicals in the Aqueous Phase in Natural Water Bodies in the Environment. U.S. Environmental Protection Agency, Office of Toxic Substances. March 1989.

[5] Leifer, Asa. Abiotic Fate of SARA Title III Chemicals in the Aqueous Phase in Natural Water Bodies in the Environment. U.S. Environmental Protection Agency, Office of Toxic Substances. March 1989.

[6] Boethling, Robert. Screening Assessment of Biodegradability in Soil and Water. U.S. Environmental Protection Agency, Office of Toxic Substances, Exposure Evaluation Division. March 1989.

[7] Boethling, Robert. Screening Assessment of Biodegradability in Soil and Water. U.S. Environmental Protection Agency, Office of Toxic Substances, Exposures Evaluation Division. March 1989.

Environmental Fate Properties of SARA 313 Chemicals

Chemical	Cas No.	PS	TRANSPORT Vol	L/SM	Bioc	TRANSFORMATION Persistence Abiotic Air	Abiotic H2O	Biotic H2O	Biotic Soil	Biol Treat
Acetaldehyde	75-07-0	L			-			+	+	-B
Acetamide	60-35-5	S	+	+	-		+	+	+	-B
Acetamide, N-9H-fluoren-2-yl-	53-96-3	S		+			+			
Acetone	67-64-1	L	+	+						
Acetonitrile	75-05-8	L	+	+		+	+			
Acrolein	107-02-8	L	+			-	-	+	+	-B
Acrylamide	79-06-1	S	+		-	-?	+	+	+	-B
Acrylic acid	79-10-7	L	+		-	-?	+	+	+	-B
Acrylonitrile	107-13-1	L		+	-		+?			
Aldrin	309-00-2	S		-	+	-	+			
Allyl chloride	107-05-1	L	-		-			-	-	-P
Aluminum (fume or dust)	7429-90-5	S	NA	NA	NA	NA	NA	NA	NA	NA
Aluminum oxide	1344-28-1	S	NA	NA	NA	NA	NA	NA	NA	NA
1-Amino-2-methylanthraquinone	82-28-0	S	+		+	-?	-?			
2-Aminoanthraquinone	117-79-3	S	+		+	-	-?			
4-Aminoazobenzene	60-09-3	S	+		-	-?	-?			
4-Aminobiphenyl	92-67-1	S	+		-	-				
Ammonium nitrate (solution)	6484-52-2	S*	NE	NE	NE	NE	NE	NE	NE	NE
Ammonium sulfate (solution)	7783-20-2	L	NE	NE	NE	NE	NE	NE	NE	NE
Aniline	62-53-3	L			-	-	-?			
o-Anisidine	90-04-0	L			-		-?			
p-Anisidine	104-94-9	S	+		-	-	-?			
o-Anisidine hydrochloride	134-29-2	S*			-					
Anthracene	120-12-7	S				-	-	+		
Antimony	7440-36-0	S	NA	NA	NA	NA	NA	NA	NA	NA
Antimony and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Arsenic	7440-38-2	S	NA	NA	NA	NA	NA	NA	NA	NA
Arsenic and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Asbestos	1332-21-4	S				+	+			
Barium and compounds	7440-39-3		NA	NA	NA	NA	NA	NA	NA	NA
Barium Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Benzal chloride	98-87-3	L			-	-	-			
Benzamide	55-21-0	S	+	+	-		+	+	+	-B
Benzenamine, 2-methyl-, hydrochloride	636-21-5	S			-	-?				
Benzenamine, 4,4'-methylenebis(2-chloro-	101-14-4	S				-	-?			
Benzenamine, N,N-dimethyl-4-phenylazo-	60-11-7	S	+		+	-?	+?			
Benzene	71-43-2	L		+	-		+			
Benzene, chloro-	108-90-7	L					+			
Benzene, 1,2-dichloro-	95-50-1	L					+			
Benzene, 1,3-dichloro-	541-73-1	L					+			
Benzene, 1,4-dichloro-	106-46-7	S			-		+			
Benzene, dimethyl-	1330-20-7	L					+			
Benzene, m-dimethyl-	108-38-3	L			-	-	+			
Benzene, o-dimethyl-	95-47-6	L			-		+			
Benzene, p-dimethyl-	106-42-3	L			-		+			
Benzene, hexachloro	118-74-1	S			+	-?	-?	-	-	-P
Benzene, hexahydro-	110-82-7	L	-		-		+			-P
Benzene, methyl-	108-88-3	L			-		+			
Benzene, 1-methyl-2,4-dinitro-	121-14-2	S	+		-					+
Benzene, 1-methyl-2,6-dinitro-	606-20-2	S	+		-					
Benzene, 1,2-methylenedioxy-4-allyl-	94-59-7	L			-	-?				
Benzene, 1-methylethyl-	98-82-8	L	-		-		+			-P
Benzene, pentachloronitro-	82-68-8	S				-?	-?	-	-	-P
1,2-Benzenedicarboxylic acid anhydride	85-44-9	S	+		-	-?	-?			-B
1,2-Benzenedicarboxylic acid,[bis(2-ethylhexyl)]ester	117-81-7	L		-	-	-	+?			-P
1,2-Benzenedicarboxylic acid, diethyl ester	84-66-2	L	+		-	-?	+?			
Benzidine	92-87-5	S	+	-	-	-				
1,2-Benzisothiazolin-3-one,1,1-dioxide, and salts	81-07-2	S			-		+?			
p-Benzoquinone	106-51-4	S		+	-	-?	-?			-B
Benzotrichloride	98-07-7	L			-	-	-			
Benzoyl chloride	98-88-4	L			-	-	-			
Benzoyl peroxide	94-36-0	S			-	-				-B
Benzyl chloride	100-44-7	L			-		-?			
Beryllium	7440-41-7	S	NA	NA	NA	NA	NA	NA	NA	NA
Beryllium and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Biphenyl	92-52-4	S					+			
(1,1'-Biphenyl)-4,4'-diamine,3,3'-dichloro-	91-94-1	S	+	-		-	-			
(1,1'-Biphenyl)-4,4'-diamine,3,3'-dimethoxy-	119-90-4	S	+		-	-	-?			+

Environmental Fate Properties of SARA 313 Chemicals

Chemical	Cas No.	PS	TRANSPORT Vol	L/SM	Bioc	TRANSFORMATION Persistence Abiotic Air	Abiotic H2O	Biotic H2O	Biotic Soil	Biol Treat
(1,1'-Biphenyl)-4,4'-diamine,3,3'-dimethyl-	119-93-7	S	+		-	-	-?			
Bis(2-chloroisopropyl) ether	108-60-1	L*			-					
Bis(2-ethylhexyl) adipate	103-23-1	L			+	-	+?			
Bromoform	75-25-2	L			-		+			
Butadiene	106-99-0	G	-		-	-				-P
1-Butanamine, N-butyl-N-nitroso-	924-16-3	L			-	-?	-			+
1-Butanol	71-36-3	L			-		+	+	+	-B
2-Butanone	78-93-3	L		+	-	-?	-?			
Butyl acrylate	141-32-2	L			-	-?	+?	+	+	-B
sec-Butyl alcohol	78-92-2	L		+	-		+	+	+	-B
tert-Butyl alcohol	75-65-0	S			-		+			+
Butyl benzyl phthalate	85-68-7	L*				-	+?			
1,2-Butylene oxide	106-88-7	L		+	-			+	+	-B
Butyraldehyde	123-72-8	L		+	-	-		+	+	-B
C.I. Acid Blue 9, diammonium salt	2650-18-2	S								+
C.I. Acid Blue 9, disodium salt	3844-45-9	S								+
C.I. Acid Green 3	4680-78-8	S				-	-?			+
C.I. Basic Green 4	569-64-2	S			-	-?	-?			-P
C.I. Basic Red 1	989-38-8	S*				-	-?			
C.I. Direct Black 38	1937-37-7	S*				-	-?			+
C.I. Direct Blue 6	2602-46-2	S*					-?			+
C.I. Direct Brown 95	16071-86-6	S*								
C.I. Disperse Yellow 3	2832-40-8	S*				-	-?			
C.I. Food Red 5	3761-53-3	S*				-	-			
C.I. Food Red 15	81-88-9	S			-	-?	-?			
C.I. Solvent Orange 7	3118-97-6	S				-	-?			
C.I. Solvent Yellow 3	97-56-3	S	+			-				
C.I. Solvent Yellow 14	842-07-9	S	+		+	-	-?			
C.I. Solvent Yellow 34 (Auramine)	492-80-8	S	+			-	-?			
C.I. Vat Yellow 4	128-66-5	S			+	-	-			-P
Cadmium	7440-43-9	S	NA	NA	NA	NA	NA	NA	NA	NA
Cadmium and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Calcium cyanamide	156-62-7	S	NA	NA	-	NA	NA	NA	NA	NA
Captan	133-06-2	S			-	-	-			
Carbamic acid, ethyl ester	51-79-6	S	+	+	-		+?	+	+	-B
Carbamide, N-ethyl-N-nitroso-	759-73-9	S		+	-	-?	-?			+
Carbamide, N-methyl-N-nitroso-	684-93-5	S			-	-?	-?			+
Carbamide, thio-	62-56-6	S	+	+	-	-?	+			
Carbamoyl chloride, dimethyl-	79-44-7	L			-	-	-			
Carbaryl	63-25-2	S	+		-					
Carbon disulfide	75-15-0	L	-		-		+			
Carbon tetrachloride	56-23-5	L	-		-	+	+	-	-	-P
Carbonyl sulfide	463-58-1	G	-		-	+	+			-P
Catechol	120-80-9	S	+		-	-	-?	+	+	-B
Chloramben	133-90-4	S	+		-					
Chlordane	57-74-9	L		-	+		+	-	-	-P
Chlorinated fluorocarbon (Freon 113)	76-13-1	L	-		-	+	+	-	-	-P
Chlorinated Phenols	0									
Chlorine	7782-50-5	G				-	-			
Chlorine dioxide	10049-04-4	G				-	-			
Chloroacetic acid	79-11-8	S	+		-					
2-Chloroacetophenone	532-27-4	S			-					
Chloroethane	75-00-3	G			-					
Chloroform	67-66-3	L			-		+			
Chloromethyl ether	542-88-1	L			-	-	-			+
Chloromethyl methyl ether	107-30-2	L			-	-	-			-P
Chloroprene	126-99-8	L	-		-		+?			
Chlorothalonil	1897-45-6	S						-	-	-P
Chromium	7440-47-3	S	NA	NA	NA	NA	NA	NA	NA	NA
Chromium and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Cobalt	7440-48-4	S	NA	NA	NA	NA	NA	NA	NA	NA
Cobalt Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Copper	7440-50-8	S	NA	NA	NA	NA	NA	NA	NA	NA
Copper and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
p-Cresidine	120-71-8	S	+		-	-	-?			
Cresol(s)	1319-77-3	S				-	-?	+	+	
m-Cresol	108-39-4	L	+		-	-	-?	+	+	-B
o-Cresol	95-48-7	S			-	-	-?	+	+	-B

Environmental Fate Properties of SARA 313 Chemicals

Chemical	Cas No.	PS	TRANSPORT Vol	L/SM	Bioc	TRANSFORMATION Persistence Abiotic Air	Abiotic H2O	Biotic H2O	Biotic Soil	Biol Treat
p-Cresol	106-44-5	S	+		-	-	-?	+	+	-B
Cupferron	135-20-6	S				-?	-?			
Cyanide and Compounds	0		NE	NE	NE	NE	NE	NE	NE	NE
2,4-D Acid	94-75-7	S	+		-					
Decabromodiphenyl oxide	1163-19-5	S*				-?	-?	-	-	-P
Di-n-propylnitrosamine	621-64-7	L		+	-	-?	-			
Diallate	2303-16-4	S			-		-			-P
2,4-Diaminoanisole	615-05-4	S	+	+	-	-	-?			
2,4-Diaminoanisole sulfate	39156-41-7	S								+
4,4'-Diaminodiphenyl ether	101-80-4	S	+		-	-	-?			
Diaminotoluene	95-80-7	S	+	+	-	-	-?			+
Diaminotoluene	25376-45-8	S				-	-?			+
Diazomethane	334-88-3	G			-	-	-			
Dibenzofuran	132-64-9	S			+	-	+			
1,2-Dibromo-3-chloropropane	96-12-8	L			-		+			
Dibutyl phthalate	84-74-2	L			-	-?	+?			
Dichlorobenzene (mixed)	25321-22-6	L					+			
Dichlorobromomethane	75-27-4	L	-		-		+			-P
1,2-Dichloroethane	107-06-2	L					+			
Dichloroethyl ether	111-44-4	S			-					+
1,1-Dichloroethylene	75-35-4	L	-		-		+			
1,2-Dichloroethylene	540-59-0	L					+			-P
2,4-Dichlorophenol	120-83-2	S			-		-?			
1,2-Dichloropropane	78-87-5	L		+	-					
1,3-Dichloropropene	542-75-6	L	-	+	-	-				
Dichlorvos	62-73-7	L			-		+?			
Dicofol*	115-32-2	S		-	+		+?	-	-	-P
Diepoxybutane	1464-53-5	L*						+	+	-B
Diethanolamine	111-42-2	S	+	+	-	-	+	+	+	-B
Diethyl sulfate	64-67-5	L			-		+?	+	+	-B
1,4-Diethylene dioxide	123-91-1	L		+	-	-	+			+
Dimethyl phthalate	131-11-3	L	+		-		+?			
Dimethyl sulfate	77-78-1	L		+	-		+?	+	+	-B
alpha,alpha-Dimethylbenzylhydroperoxide	80-15-9	S	+	+	-	-	-			
Dimethylhydrazine	57-14-7	L		+	-	-	-?	+	+	-B
2,4-Dimethylphenol	105-67-9	S		+	-	-	-?			
Dinitrocresol	534-52-1	S	+		-		-?			+
2,4-Dinitrophenol	51-28-5	S	+		-		-?			
Dioctyl phthalate	117-84-0	L	+		+	-	+			-P
1,2-Diphenylhydrazine	122-66-7	S	+		-	-	-?			
Epichlorohydrin	106-89-8	L		+	-					
Ethanamine, N-ethyl-N-nitroso-	55-18-5	L			-	-?	-			+
Ethane, 1,2-dibromo-	106-93-4	L			-		+?			
Ethane, 1,1,1,2,2,2-hexachloro-	67-72-1	S			-	+	+	-	-	-P
Ethane, 1,1,2,2-tetrachloro-	79-34-5	L			-		+	-	-	
Ethane, 1,1,2-trichloro-	79-00-5	L			-		+			
Ethane, 1,1,1-trichloro-2,2-bis(p-methoxyphenyl)-	72-43-5	S		-	+	-	+?			-P
Ethanethioamide	62-55-5	S		+	-		+			
Ethenamine, N-methyl-N-nitroso-	4549-40-0	S*				-	-?			
Ethene, 1,1,2,2-tetrachloro-	127-18-4	L	-		-		+			-P
2-Ethoxyethanol	110-80-5	L	+	+	-		+	+	+	-B
Ethyl acrylate	140-88-5	L		+	-	-?	+?	+	+	-B
Ethyl chloroformate	541-41-3	L			-					+
Ethyl 4,4'-dichlorobenzilate	510-15-6	L	+		-		+?			
Ethylbenzene	100-41-4	L	-		-		+			-P
Ethylene	74-85-1	G	-		-		+	+	+	-P
Ethylene glycol	107-21-1	L	+	+	-		+	+	+	-B
Ethylene oxide	75-21-8	G		+	-			+	+	-B
Ethyleneimine	151-56-4	L		+	-			+	+	-B
Ethylenethiourea	96-45-7	S	+		-	-?	-?			
Fluometuron	2164-17-2	S	+		-		+?			
Formaldehyde	50-00-0	G	+		-	-	-?	+	+	-B
2,5-Furandione	108-31-6	S			-	-?	-?	+	+	-B
Glycol Ethers	0									
Heptachlor	76-44-8	S			+	-		-	-	-P
Hexachloro-1,3-butadiene	87-68-3	L		-	+	+	+?	-	-	-P
Hexachlorocyclopentadiene	77-47-4	L	-			-?	-	-	-	-P
Hexachloronaphthalene	1335-87-1	S*								-P

Environmental Fate Properties of SARA 313 Chemicals

Chemical	Cas No.	PS	TRANSPORT Vol	L/SM	Bioc	TRANSFORMATION Persistence Abiotic Air	Abiotic H2O	Biotic H2O	Biotic Soil	Biol Treat
Hexamethylphosphoramide	680-31-9	L	-		-					
Hydrazine	302-01-2	L			-	-	-?	+	+	-B
Hydrazine sulfate	10034-93-2	S						+	+	
Hydrochloric acid (Hydrogen chloride (gas only))***	7647-01-0	G	NE	NE	NE	NE	NE	NE	NE	NE
Hydrocyanic acid	74-90-8	G		+	-	+?	+			
Hydrogen fluoride	7664-39-3	G	NE	NE	NE	NE	NE	NE	NE	NE
Hydroquinone	123-31-9	S	+	+	-	-	-			-B
Isobutyraldehyde	78-84-2	L		+	-	-	-?	+	+	-B
Isopropyl alcohol (mfg.-strong acid processes)	67-63-0	L		+	-		+	+	+	-B
4,4'-Isopropylidenediphenol	80-05-7	S			-	-	-?			
Lead	7439-92-1	S	NA	NA	NA	NA	NA	NA	NA	NA
Lead and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Lindane	58-89-9	S			+		+			
Maneb	12427-38-2	S								
Manganese and compounds	7439-96-5	S	NA	NA	NA	NA	NA	NA	NA	NA
Manganese Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Mechlorethamine	51-75-2	L	+		-	-				
Melamine	108-78-1	S				-				+
Mercury	7439-97-6	S	NA	NA	NA	NA	NA	NA	NA	NA
Mercury and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Methane, chloro	74-87-3	G			-		+?			
Methane, dibromo-	74-95-3	L		+	-		+			
Methane, dichloro-	75-09-2	L		+	-		+			
Methane, iodo-	74-88-4	L			-	-?	-?			
Methanol	67-56-1	L		+	-		+	+	+	-B
2-Methoxyethanol	109-86-4	L	+	+	-		+	+	+	-B
Methyl acrylate	96-33-3	L		+	-	-?	+?	+	+	-B
Methyl bromide	74-83-9	G			-					
Methyl tert-butyl ether	1634-04-4	L		+	-		+			
Methyl chloroform	71-55-6	L	-		-	+	+			-P
Methyl isobutyl ketone	108-10-1	L		+	-	-?	-?			
Methyl isocyanate	624-83-9	L			-	-?	-	+	+	
Methyl methacrylate	80-62-6	L		+	-	-	+	+	+	-B
4,4'-Methylene bis(N,N-dimethyl) benzenamine	101-61-1	S	+		+	-				
Methylene bis(phenylisocyanate) (MBI)	101-68-8	S			-	-	-			
4,4'-Methylene dianiline	101-77-9	S	+		-	-	-?			
Methylhydrazine	60-34-4	L		+	-	-	-?	+	+	-B
Michler's ketone	90-94-8	S	+		-	-?				
Molybdenum trioxide	1313-27-5	S	NA	NA	NA	NA	NA	NA	NA	NA
Mustard gas	505-60-2	L			-		-?			
N,N-Dimethylaniline	121-69-7	L			-	-	+?			
N-Nitrosodiphenylamine	86-30-6	S			-	-?	-?			
N-Nitrosomorpholine	59-89-2	S	+	+	-	-?	-			+
N-Nitrosonornicotine	16543-55-8	S*				-?	-			+
N-Nitrosopiperidine	100-75-4	L	+	+	-	-?	-			+
Naphthalene	91-20-3	S								
1-Naphthylamine	134-32-7	S	+		-	-	-?			
2-Naphthylamine	91-59-8	S	+		-	-	-?			
Nickel	7440-02-0	S	NA	NA	NA	NA	NA	NA	NA	NA
Nickel and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Nitric acid	7697-37-2	L								
Nitrilotriacetic acid	139-13-9	S	+		-		+			
5-Nitro-o-anisidine	99-59-2	S	+		-	-	-?			+
Nitrobenzene	98-95-3	L			-		+			
4-Nitrobiphenyl	92-93-3	S					+			
Nitrofen	1836-75-5	S								
Nitroglycerine	55-63-0	L	+		-					
o-Nitrophenol	88-75-5	S			-					
p-Nitrophenol	100-02-7	S	+		-		-?			
2-Nitropropane	79-46-9	L		-	-		+			
Nitrosodimethylamine	62-75-9	L	+	+	-	-?	-			+
p-Nitrosodiphenylamine	156-10-5	S				-	-?			
Octachloronaphthalene	2234-13-1	S*				-?	-?	-	-	-P
Osmium tetroxide	20816-12-0	S	NA	NA	NA	NA	NA	NA	NA	NA
1,2-Oxathiolane, 2,2-dioxide	1120-71-4	L*				-	-			
Parathion	56-38-2	L				-				
Pentachlorophenol	87-86-5	S	+			+?	-			-P
Peracetic acid	79-21-0	L		+	-	-	-	+	+	-B

Environmental Fate Properties of SARA 313 Chemicals

Chemical	Cas No.	PS	TRANSPORT Vol	L/SM	Bioc	TRANSFORMATION Persistence Abiotic Air	Abiotic H2O	Biotic H2O	Biotic Soil	Biol Treat
Phenol	108-95-2	S	+	+	-	-	-?	+	+	-B
Phenol, 2,4,6-trichloro	88-06-2	S								
Phenol, 2,4,5-trichloro-	95-95-4	S			+					
p-Phenylenediamine	106-50-3	S	+		-	-	+?			
2-Phenylphenol	90-43-7	S			-	-	-?			
Phosgene	75-44-5	G			-	-	-			-P
Phosphoric acid	7664-38-2	S								
Phosphorus	7723-14-0	S								
Picric acid	88-89-1	S	+		-	+?				
Polybrominated Biphenyls (PBBs)	0	S								-P
Polychlorinated biphenyls (PCBs)	1336-36-3	L						-	-	-P
1-Propanol, 2,3-dibromo-, phosphate (3:1)	126-72-7	L			-		+			-P
Propiolactone, beta-	57-57-8	L		+	-	-	-	+	+	-B
Propionaldehyde	123-38-6	L		+	-	-		+	+	-B
Propoxur	114-26-1	S	+		-					
Propylene (Propene)	115-07-1	G	-		-	-	+			-P
Propylene oxide	75-56-9	L		+	-			+	+	-B
Propyleneimine	75-55-8	L		+	-					
Pseudocumene	95-63-6	L				-	+			-P
Pyridine	110-86-1	L		+	-		+			
Quinoline	91-22-5	L			-					
Selenium	7782-49-2	S	NA	NA	NA	NA	NA	NA	NA	NA
Selenium and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Silver	7440-22-4	S	NA	NA	NA	NA	NA	NA	NA	NA
Silver and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Sodium hydroxide	1310-73-2	S	NA	NA	NA	NA	NA	NA	NA	NA
Sodium sulfate (solution)	7757-82-6	L	NA	NA	NA	NA	NA	NA	NA	NA
Styrene	100-42-5	L			-	-	+			
Styrene oxide	96-09-3	L	-		-					-P
Sulfuric acid	7664-93-9	L	NE	NE	NE	NE	NE	NE	NE	NE
Terephthalic acid	100-21-0	S	+		-	-	+	+	+	-B
Tetrachlorvinphos	961-11-5	S	+			-				
Thallium	7440-28-0	S	NA	NA	NA	NA	NA	NA	NA	NA
Thallium and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
4,4'-Thiodianiline	139-65-1	S	+		-	-	-			
Thorium dioxide	1314-20-1	S	NA	NA	NA	NA	NA	NA	NA	NA
Titanium tetrachloride	7550-45-0	L	NA	NA	NA	NA	NA	NA	NA	NA
Toluene 2,4-diisocyanate	584-84-9	L			-	-?	-			
Toluene 2,6-diisocyanate	91-08-7	L*			-	-?	-			
o-Toluidine	95-53-4	L			-	-	-?			
Toxaphene (Camphechlor)	8001-35-2	S				+?	+	-	-	-P
Triaziquone	68-76-8	S			-	-?	-?			+
1,2,4-Trichlorobenzene	120-82-1	L			+		+			-P
Trichloroethylene	79-01-6	L	-		-		+			
Trichlorophon	52-68-6	S	+	+	-					
Trifluralin	1582-09-8	S			+	-	-	-	-	-P
Vanadium (fume or dust)	7440-62-2	S	NA	NA	NA	NA	NA	NA	NA	NA
Vinyl acetate monomer	108-05-4	L	+		-	-?		+	+	-B
Vinyl bromide	593-60-2	G			-		+			+
Vinyl chloride (monomer)	75-01-4	G	-		-		+			
2,6-Xylidine	87-62-7	L			-	-	-?			
Zinc	7440-66-6	S	NA	NA	NA	NA	NA	NA	NA	NA
Zinc and Compounds	0		NA	NA	NA	NA	NA	NA	NA	NA
Zineb	12122-67-7	S	NA	NA	NA	NA	NA	NA	NA	NA

NOTES:

+ Chemicals of high level of concern for exposure because of the stated process (volatilization and soil adsorption low, bioconcentration high, and rate of transformation slow or low removal during biological treatment)

- Chemicals of low level of concern for exposure because of the stated process (volatilization and soil adsorption high, bioconcentration low, and rate of transformation fast)

PS Physical State

L	liquid	L*	Liquid based on scientific judgement
S	solid	S*	Solid based on scientific judgement
G	gas	G*	Gas based on scientific judgement

Vol Volatilization

L/SM Leaching/ Soil Mobility

Bioc Bioconcentration

H2O Water

+? Uncertain at the persistent boundary (t1/2 >/= 1 year) [1 year<t1/2>1 year]
-? Uncertain half-life at the reactive boundary (t1/2=1/2day) [1/2 day>t1/2>1/2 day]
-B Low concern of exposure because chemical is rapidly biodegraded during treatment
-P Low concern of exposure because chemical is physically removed during biological treatment

NA Not Applicable but the elemental portion will persist

NE Not Evaluated

APPENDIX E

RELEASE GUIDANCE:

TYPES, FREQUENCY, CONTROLS, AND ESTIMATION METHODS

RELEASE GUIDANCE: TYPES, FREQUENCY, CONTROLS, AND ESTIMATION METHODS

The matrices in this appendix present information on air releases, wastewater releases, solid and nonaqueous liquid releases, and occupational exposures for 38 categories of Section 313 chemicals. The information provided includes:

- Types of releases.
- Release frequency.
- Controls in use.
- Release estimation method.

Additional offsite and onsite information is provided for solid and nonaqueous liquid releases. The occupational exposure matrices contain information on types of exposure, exposure frequency, and controls in use. A listing of the chemicals in each subcategory (and a description of each chemical) is provided at the bottom of each matrix. The information provided in these matrices is currently in draft stage and under review at the Agency.

Page	Category	Subcategory
E-4	Adhesive uses	Solvent-based adhesive Water-based adhesive
E-5	Agricultural chemicals	Agricultural chemical Consumptive intermediate in agricultural chemical manufacture
E-7	Catalyst uses	Gas Liquid Solid
E-8	Chemical processing solvents	Processing solvent
E-9	Cleaning/degreasing solvents	Metal degreasing Textile cleaning
E-10	Coating and printing uses	Solvent in inks Solvent in coatings Solid in inks Solid in coatings
E-12	Consumptive intermediates	Gas Liquid Solid
E-15	Disinfectants and repellants	Liquid Solid
E-16	Dye and pigment chemicals	Dye/pigment Dye additive Consumptive intermediate in dye/pigment manufacture Dye carrier solvent
E-18	Electronic uses	Component etching Solvent
E-19	Explosives	Explosive constituent Consumptive intermediate in explosive manufacture
E-20	Food uses	Food additive Food processing
E-21	Fuel components	Fuel additive Nuclear fuel Rocket fuel
E-22	Heat exchange chemicals, lubricants, and hydraulic fluids	Additive Hydraulic/heat exchange fluid Lubricant
E-23	Laboratory uses	Indicator/stain Laboratory reagent or solvent Research chemical Other

Page	Category	Subcategory
E-25	Manufacture of the chemical	Gas Volatile liquid Low volatile liquid Solid Water solution
E-29	Other uses	Gas Liquid Solid
E-31	Paint and varnish removers	Solvent in paint and varnish removers
E-32	Pesticides, insecticides, herbicides, and fungicides	Solid Liquid Consumptive intermediate in pesticides, etc. manufacture
E-35	Pharmaceutical uses	Consumptive intermediate in pharmaceutical manufacture Solvent in pharmaceutical manufacture Pharmaceutical product
E-37	Photographic uses	Developer Consumptive intermediate in photographic dye manufacture Solvent in photographic film manufacture
E-38	Polymer, plastic, and resin uses	Consumptive intermediate in polymer, etc. manufacture Liquid additive Solid additive Resin carrier solvent
E-40	Pulp, paper, and textile processing	Pulp processing Paper processing Textile processing
E-41	Water treatment chemicals	Corrosion inhibitor Disinfectant Neutralization

RELEASE INFORMATION - ADHESIVE USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Solvent-based adhesive	Evaporation from mixing tank during adhesive formation	Intermittent	Enclosed system, condenser, scrubber	1) Engineering estimate 2) Monitoring data	Process upsets, spills	Sporadic	None	Engineering estimate	None	Disposal of residue in drums, mixing tanks	Sporadic	None	Engineering estimate based on plant disposal records	Sampling	Routine	None
														Maintenance	Intermittent	Personal protective equipment
														Production	Continuous	Enclosure, local exhaust ventilation
	Storage (breathing losses)	Continuous	Unknown	Engineering estimate	None	N/A	None	N/A	None	None	N/A	None	N/A	None	N/A	None
	Transfer	Routine	Unknown	Engineering estimate using EPA/ API methods	None	N/A	None	N/A	None	None	N/A	None	N/A	Transfer operation	Routine	Personal protective equipment
	Evaporation during adhesive application	Continuous	Condenser	Mass balance based on usage of the chemical	Spills	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Production	Continuous	General ventilation, local exhaust ventilation
														Maintenance	Sporadic	Personal protective equipment
Water-based adhesive	None	N/A	None	N/A	Cleaning of mixing tank	Intermittent	None	Engineering estimate	None	None	N/A	None	N/A	Cleaning of tank	Intermittent	Personal protective equipment
					Cleaning of adhesive application equipment	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Production	Continuous	General ventilation
														Maintenance	Sporadic	Personal protective equipment

Subcategory	Chemical	Comment
Solvent-based adhesive	Butyl acrylate	Used in solvent-based adhesives
	Butyl benzyl phthalate	Used as an additive in the packaging industry
	Dimethyl sulfate	Polyurethane adhesive component
	Methyl ethyl ketone	Solvent in adhesives
	Methyl isobutyl ketone	Solvent in adhesives
	Methyl methacrylate	Dental adhesive, bone cement
	Toluene	Solvent for adhesives
	Toluene-2,4-disocyanate	Sealant
	1,1,1-Trichloroethane	Miscellaneous solvent adhesive uses
Water-based adhesive	Ethyl acrylate	Water emulsion vehicle in adhesives
	Melamine	Used in adhesives, resins for gluing lumber, plywood

RELEASE INFORMATION - AGRICULTURAL CHEMICALS

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Agricultural chemical	Process vents	Intermittent	Scrubber, adsorption, absorption, incineration	Engineering estimate	Process wastewater	Continuous	Neutralization, ion exchange, lagoons, aeration	1) Monitoring data 2) Engineering estimate	None	Disposal of still bottoms, off-spec product, solids from lagoon	Routine	Recovery of metals	Engineering estimate from plant disposal records	Handling of agriculture chemicals	Routine	Local exhaust ventilation, personal protective equipment
	Storage vents	Continuous	Scrubber	Engineering estimate using EPA/ API methods												
	Transfer losses	Routine	Unknown	Engineering estimate using EPA/ API methods												
	Fugitive	Continuous	Inspection/maintenance	Emission factor with some composition, leak-rate, component count measurement												
	Releases during application	Continuous	Unknown	Engineering estimate based on volatility of the liquid product or percent particulates remaining airborne	Run-off	Intermittent	None	Engineering estimate	Releases during application	None	Continuous	None	Mass balance based on usage and quantity released to other sources	Exposure during application	Routine	Personal protective equipment (gloves)
Consumptive intermediate in agricultural chemical manufacture	Process vents	Intermittent	Unknown	Engineering estimate	Process upsets, spills	Sporadic	Unknown	Engineering estimate based on plant records on upsets and spills	None	Disposal of still bottoms and off-spec products	Sporadic	Unknown	1) Engineering estimate 2) Mass balance	Handling of chemical prior to consumption	Intermittent	Closed-loop transfer, personal protective equipment
	Storage vents	Continuous	Unknown	Engineering estimate using EPA/ API methods												
	Transfer losses	Routine	Unknown	Engineering estimate using EPA/ API methods												
	Fugitive	Continuous	Inspection/maintenance	Emission factor with some composition, leak-rate, component count measurement												

Subcategory	Chemical	Comment
Agricultural chemical	Ammonium nitrate (solution)	Direct fertilizer application
	Ammonium sulfate (solution)	Nitrogen fertilizer
	Quintozene	Seed dressing agent
Consumptive intermediate in agricultural chemical manufacture	Ammonia	Fertilizer and fertilizer intermediate
	Bromomethane	Miscellaneous uses such as intermediate for manufacture of agricultural chemicals
	Chloromethane	Production of agricultural chemicals
	Maleic anhydride	Derivative for agricultural chemicals
	2-Methoxyethanol	Plant growth regulator raw material
	Nitric acid	Ammonium nitrate fertilizer
	Phosphoric acid	Manufacture of wet process H2PO4 for phosphate fertilizers
	Sulfuric acid	Manufacture of wet process H2PO4 for phosphate fertilizers

RELEASE INFORMATION - CATALYST USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Gas	Storage and handling losses	Continuous	Inspection/maintenance	Engineering estimate using EPA/ API method	None	N/A	None	N/A	None	None	N/A	None	N/A	Leak	Sporadic	None
Liquid	Handling losses prior to addition to reaction vessel or during reclamation of catalyst	Intermittent	Closed-loop transfer	Engineering estimate using EPA/ API method	None	N/A	None	N/A	None	Disposal of spent catalyst	Intermittent	Reclamation of catalyst	Engineering estimate from plant records	Handling of catalyst prior to or after use	Intermittent	Personal protective equipment
Solid	Loss of catalyst during catalyst regeneration (e.g., by oxidation)	Routine	Particulate controls such as scrubber	Engineering estimate	None	N/A	None	N/A	None	Disposal of spent catalyst	Intermittent	Regeneration of catalyst	Engineering estimate from plant records	Handling of catalyst	Intermittent	Personal protective equipment

Subcategory	Chemical	Comment
Gas	Chloromethane	Catalyst solvent used in the manufacture of butyl rubber
Liquid	Acetonitrile	Used in catalyst and metal complex catalysts
	Allyl chloride	Used in resin catalysts
	1,2-Dichloropropane	Catalyst reclamation
	Titanium tetrachloride	Catalyst used for organic synthesis
Solid	Aluminum oxide	Used in miscellaneous catalysts
	Ethylene thiourea	Accelerator for epichlorohydrin
	Osmium tetroxide	Used as an oxidant in catalytic oxidation

RELEASE INFORMATION - CHEMICAL PROCESSING SOLVENTS

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Processing solvent	Release during separation of solvent from product	Continuous	Process enclosure, condenser, carbon adsorber, flare	Mass balance based on usage less releases by other sources	Process upset, spills	Sporadic	Aeration, biological treatment of wastewater	Engineering estimate from plant records of upsets, and spills	None	Waste solvent	Intermittent	Solvent reclamation	Engineering estimate from plant disposal records	Inhalation and dermal exposure	Routine	Local exhaust ventilation, personal protective equipment

Subcategory	Chemical	Comment
Processing solvent	Acetone	Solvent for cellulose acetate
	Acetonitrile	Solvent for distillation of butadiene
	Bis(2-chloro-1-methylethyl) ether	Solvents for fats, waxes, etc.
	Bis(2-chloroethyl) ether	Solvents for fats, waxes, etc.
	tert-Butyl alcohol	Chemical solvent
	Chlorobenzene	TDI processing solvent
	Cyclohexane	Solvent uses
	1,2-Dichlorobenzene	TDI processing solvent and other solvent uses
	1,2-Dichloroethylene	Extraction solvent
	Ethylbenzene	Solvent applications
	Freon 113	Inert solvent
	Hexachloronaphthalene	Solvent
	Isopropyl alcohol	General solvent
	Methanol	Solvent
	Methyl isobutyl ketone	Solvent for extraction
	Methylene bromide	Solvent
	2-Nitropropane	Industrial solvent
	1,2,4-Trichlorobenzene	Solvent in (ClCN)3 production
	1,1,2-Trichloroethane	Solvent in manufacture of chlorinated rubbers
	Trichloroethylene	Industrial solvent

RELEASE INFORMATION - CLEANING/DEGREASING SOLVENTS

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Metal degreasing	Liquid drag out	Routine	Drain rack, increased drain time	1) Engineering estimate 2) Emission factor	Water condensate from refrigerated condenser released to sewer	Routine	None	Engineering estimate	None	Spent solvent disposal	Intermittent	Solvent reclamation	Engineering estimate based on plant disposal records	Handling of solvent and parts to be cleaned	Routine	Refrigerated condensers, local exhaust ventilation, personal protective equipment
	Evaporation from deagreaser	Continuous	Raised freeboard, lid, refrigerated condensers, carbon adsorbtion	1) Engineering estimate 2) Emission factor												
Textile cleaning	Dryer vent	Continuous	Carbon adsorber, refrigerated condenser	1) Mass balance based on chemical usage 2) Emission factor	Water condensate from refrigerated condenser released to sewer	Routine	None	Engineering estimate	None	Disposal of filter canister or diatomaceous earth filter material	Intermittent	None	Engineering estimate based on plant disposal records	Leaks in washer or dryer	Continuous	Inspection/maintenance
														Handling of cleaned clothes	Routine	None
	Fugitive	Continuous	Inspection/maintenance	Emission factor										Spotting of clothes	Intermittent	Local exhaust ventilation

Subcategory	Chemical	Comment
Metal degreasing	Chlorobenzene	Degreasing solvent
	Chloroform	Degreasing solvent
	Cresol (mixed isomers)	Cleaning compound component
	Dichloromethane	Vapor degreasing and cold degreasing solvent
	1,4-Dioxane	Stabilizer in chlorinated cleaning solvents
	Freon 113	Degreasing solvent
	Tetrachloroethylene	Degreasing solvent
	Nitrolotriacetic acid	Metal cleaning (plating) solvent
	Sodium hydroxide (solution)	Metal degreasing
	Thiourea	Silver tarnish remover
	1,1,1-Trichloroethane	Vapor degreasing and cold degreasing solvent
	Trichloroethylene	Vapor degreasing and cold degreasing solvent
Textile cleaning	Bis(2-chloro-1-methylethyl) ether	Spotting and cleaning solutions
	Freon 113	Dry cleaning solvent
	Tetrachloroethylene	Dry cleaning solvent

RELEASE INFORMATION - COATING AND PRINTING USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Solvent in inks	Evaporation during ink formulation	Continuous	Lid on mixing tank	Engineering estimate based on solvent losses during formulation	For water-based inks only there is potential for release during tank cleaning	Intermittent	None	Engineering estimate	None	Disposal of off-spec ink	Sporadic	None	Plant disposal records	Tank cleaning and maintenance	Intermittent	General ventilation, personal protective equipment
	Evaporation during drying and curing of inks	Continuous	Vapor recovery, carbon adsorption, incineration	Engineering estimate based on ink usage, composition and control efficiency	For water-based inks only there is potential for release during press cleanup	Routine	None	Engineering estimate	None	Waste solvent from press cleaning	Intermittent	Solvent recovery	Plant disposal records	Press operator	Continuous	General ventilation
														Press cleaning and maintenance	Routine	General ventilation, personal protective equipment
Solvent in coatings	Evaporation during coating formulation	Continuous	Lid on mixing tank	Engineering estimate based on solvent losses during formulation	For water-based coatings only there is potential for release during tank cleaning	Intermittent	None	Engineering estimate	None	Disposal of off-spec coating	Sporadic	None	Plant disposal records	Tank cleaning and maintenance	Intermittent	General ventilation, personal protective equipment
	Evaporation during drying and curing of coatings	Continuous	In factory application - vapor recovery, carbon adsorption, incineration	Factory application - engineering estimate based on usage, composition and control efficiency	For water-soluble coatings only there is potential for release during application equipment cleanup	Routine	None	Engineering estimate	None	Waste solvent from cleaning of application equipment	Intermittent	Solvent recovery	Plant disposal records	Coating application	Continuous	Paint spray booth, other local exhaust ventilation, personal protective equipment
			Non-factory application - no controls	Non-factory application: based on 100% usage										Equipment cleaning	Routine	Paint spray booth, other local exhaust ventilation, personal protective equipment
Solid in inks	None	N/A	N/A	N/A	For water-based inks only there is potential for release during press equipment cleanup	Routine	None	Engineering estimate	None	Pigment in waste solvent from cleaning of press or application equipment	Intermittent	None	Plant disposal records	Ink application	Continuous	Personal protective equipment

RELEASE INFORMATION - COATING AND PRINTING USES

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Solid in coatings	None	N/A	N/A	N/A	For water-based coatings only there is potential for release during application equipment cleanup	Routine	None	Engineering estimate	None	Pigment in waste solvent from cleaning of application equipment	Intermittent	None	Plant disposal records	Coating application	Continuous	Personal protective equipment

Subcategory	Chemical	Comment
Solvent in inks	Dibutyl phthalate	Printing ink ingredient
	2-Ethoxyethanol	Used in inks
	2-Methoxyethanol	Used in inks
	Methyl ethyl ketone	Printing inks solvent
	Methyl isobutyl ketone	Solvent for inks
Solvent in coatings	Acetone	Solvent in coatings
	Acetonitrile	Miscellaneous uses in coating compounds
	Butyl acrylate	Used in coatings and inks
	n-Butyl alcohol	Solvent in coatings formulations
	Cresol (mixed isomers)	Wire enamel solvent
	o-Cresol	Wire enamel solvent
	p-Cresol	Wire enamel solvent
	1,4-Dioxane	Solvent in paints, etc.
	2-Ethoxyethanol	Used in coatings
	Ethyl acrylate	Used in inks
	Ethyl acrylate	Used in coatings
	Isopropyl alcohol	Solvent in coatings
	2-Methoxyethanol	Used in coatings
	Methyl acrylate	Used in coatings
	Methyl ethyl ketone	Coatings solvent
	Methyl isobutyl ketone	Solvent for coatings
	Methyl methacrylate	Protective coatings
	Toluene-2,4-diisocyanate	Used in coatings
	Xylene (mixed isomers)	Solvent in paints and coatings
Solid in inks	Michler's ketone	Initiators in UV-cured inks
	Titanium dioxide	Whitener and opacifier for inks
	Toluene	Solvent for inks
Solid in coatings	Acetamide	Antacid and plasticizer in coatings (lacquers)
	Aluminum (fume or dust)	Used in paints
	Titanium dioxide	Whitener and opacifier for coatings, paper, and paperboard
	Toluene	Solvent for coatings
	2,4,5-Trichlorophenol	Anti-microbial agent in paint

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Gas	Process vents	Intermittent	Scrubber, flare	Engineering estimate	None likely; if product is gas dissolved in water, spills could be released to water	Sporadic	None; aeration used for treatment of other chemicals would also remove the gases; for acids, neutralization is also used	Plant records of spills of gas in water solutions	None	None	N/A	None	N/A	Sampling	Routine	Closed-loop sampling
														Maintenance	Intermittent	Personal protective equipment
	Storage pressure relief vents	Sporadic	None	Engineering estimate												
	Fugitive emissions	Continuous	Inspection/maintenance	Emission factor with some composition/ leak rate/ component count measurement												
Liquid	Process vents	Intermittent	Scrubber, condenser	1) Engineering estimate 2) Monitoring data 3) Emission factor	Process upset, spills	Sporadic	Surface impoundment or lagoon with biological treatment, aeration, or POTW	Engineering estimate based on plant records of upsets and spills	None	Disposal of still bottoms, off-spec product	Sporadic	Solvent recovery, incineration	Engineering estimate from plant disposal records	Transfer operations	Routine	Closed-loop transfer, personal protective equipment
														Maintenance	Intermittent	Personal protective equipment
	Transfer losses	Routine	Closed-loop transfer, vapor recovery for volatile liquids only	1) Engineering estimate using EPA/ API method 2) Emission factor												
	Fugitive emissions	Continuous	Inspection/maintenance for volatile liquids only	1) Emission factor with some composition/ leak rate/ component count measurement												
Solid	Dusting during material transfer	Intermittent	Fabric filter	Engineering estimate	If solid in water solution, spills could be released to sewer	Sporadic	None	Engineering estimate	None	Disposal of unreacted waste	Sporadic	None	Engineering estimate from plant disposal records	Dusting during material transfer	Intermittent	Local exhaust ventilation, personal protective equipment (gloves)

Subcategory	Chemical	Comment
Gas	Ammonia	Polymer, explosive, and animal feed intermediate
	Carbonyl sulfide	Herbicide intermediate
	Chlorine	Chemical intermediate
	Chloromethane	Production of methyl cellulose, quaternary amines, tetramethyl lead
	Diazomethane	Synthesis of pyrazolines & methyl alkyl sulfates and alkykation reactions of hydroperoxides
	Ethylene	Manufacturing of ethylene oxide, ethylene dichloride, etc.
	Ethylene oxide	Manufacturing of ethylene glycol, ethanolamines, etc.
	Hydrogen fluoride	Manufacturing of fluorocarbon, fluoride, and aluminum fluoride products
	Propylene	Manufacturing of acrylonitrile, propylene oxide, cumene, etc.
	Propylene oxide	Manufacturing of propylene glycol, glycol ethers, di propylene glycol, and isopropanolamines
Liquid	Acetaldehyde	Intermediate for a variety of chemicals
	Acetone	Intermediate for Bisphenol A, MIBK, etc.
	Acrolein	Intermediate for a variety of chemicals
	Acrylonitrile	Intermediate for adiponitrile and acrylamide
	Allyl chloride	Medical, polymer, and agricultural intermediate
	Aniline	Production of MDI, rubber processing chemicals
	o-Anisidine hydrochloride	Intermediate for guaiacol
	o-Anisidine	Intermediate for guaiacol
	Benzal chloride	Benzaldehyde intermediate
	Benzene	Chemical intermediate
	Benzoyl chloride	Variety of intermediate uses
	Bis (2-chloro-1-methylethyl) ether	Intermediate for other biphenols
	n-Butyl alcohol	Variety of intermediate uses
	sec-Butyl alcohol	Variety of intermediate uses
	tert-Butyl alcohol	Rubber and cosmetic intermediate
	1,2-Butylene oxide	Polymer intermediate
	Butyraldehyde	Variety of uses
	Carbon disulfide	Polymer and chemical intermediate
	Carbon tetrachloride	Production of Fluorocarbon 11 and 12, ethylene dichloride, perchloroethylene
	Chlorobenzene	Variety of intermediate uses
	Chloroform	Fluorocarbon 22, ethylene dichloride production
	Chloromethyl methyl ether	Ion exchange resin intermediate
	Cresol (mixed isomers)	Cresylic acid production
	o-Cresol	Variety of uses
	Cumene	Polymer and chemical intermediate
	Cumene hydroperoxide	Phenol and acetone intermediate
	Cyclohexane	Nylon intermediate
	1,2-Dibromoethane	Intermediate in plant growth regulator
	1,3-Dichlorobenzene	m-Chlorophenol intermediate, intermediate in the production of isocyanates
	1,2-Dichloroethane	Ethyl chloride production, production of chlorinated solvents, vinylidene chloride, etc.
	1,2-Dichloroethylene	Chlorinated ethylene intermediate
	1;2-Dichloropropane	Intermediate for chlorinated solvents
	1,3-Dichloropropylene	D-D mixture (poison) intermediate
	Diethyl sulfate	Alkylation reaction intermediate
	Dimethyl sulfate	Alkylating agent to produce methyl derivatives of thiols, etc.
	N,N-Dimethylaniline	Synthesis of vanillin, and used in alkyating agents
	Epichlorohydrin	Glycerine manufacturing
	2-Ethoxyethanol	Organic synthesis
	Ethylbenzene	Styrene monomer intermediate
	Formaldehyde	Production of hexamethylene-triamine, pentaerythritol, 1,4-butadiene, trimethylpropane, phthalic anhydride, solid urea, acetylene chemicals, MDI, etc.
	Hexachlorocyclopentadiene	Flame retardant, insect, and resin intermediate
	pentadiene	resin intermediate
	Hydrogen cyanide	Manufacturing of adiponitrile, methyl methacrylate, etc.
	Isopropyl alcohol	Manufacturing of acetone, etc.
	Methanol	Manufacturing of formaldehyde, methyl and butyl ethers, acetic acid, chloromethanes, etc.
	Methyl acrylate	Film and polymer intermediate

Subcategory	Chemical	Comment
Liquid	Nitrobenzene	Derivative of aniline
	Phosgene	Toluene disocyanate production, methylene disocyanate production
	Propionaldehyde	Manufacturing of propionic acid
	Pyridine	Manufacturing of piperidine, quaternary salts, etc.
	Quinoline	Manufacturing of dihydroquinolines, quinophthalones
	Safrole	Heliotropin intermediate
	Sodium hydroxide (solution)	Manufacturing of sodium salts, sodium chlorite, sodium chloroacetate, sodium cyanide,
	Sodium hydroxide (solution)	sodium formate, etc.
	Styrene oxide	Manufacturing of betaphenethyl alcohol
	Tetrachloroethylene	Manufacturing of fluorocarbons
	Titanium tetrachloride	Manufacturing of metals, organics, and inorganics contaning titanium
	Toluene	Benzoic acid, benzaldehyde production, manufacturing of benzene and TDI
	1,1,2-Trichloroethane	Manufacturing of 1,1-dichloroethylene
	1,2,4-Trimethylbenzene	Manufacturing of trimetallic anhydride
	Vinyl acetate	Manufacturing of ethylene/vinyl acetate
	Vinylidene chloride	Tetrachloroethylene/trichloroethylene production, raw material to produce refrigerant 426
	Xylene (mixed isomers)	Manufacturing p-xylene, o-xylene, and m-xylene
	m-Xylene	Manufacturing of isophthalic acid
	o-Xylene	Manufacturing of phthalic anhydride
	p-Xylene	Manufacturing of tetephthalic acid
	2,6-Xylidine	Manufacturing of lidocaine, and bipivacaine
Solid	Acetamide	Raw material in organic synthesis
	Aluminum oxide	Aluminum metal intermediate
	Benzamide	Benzonitrile intermediate
	Biphenyl	Intermediate for other biphenyls
	Calcium cyanamide	Cyanamide and calcium cyanide intermediate
	Catechol	Variety of uses
	Chloroacetic acid	Variety of uses
	m-Cresol	Pharmaceutical and flavors, rubber intermediate
	p-Cresol	Variety of intermediate uses
	4,4'-Diaminodiphenyl ether	Polymer intermediate
	Diaminotoluene (mixed isomers)	TDI intermediate
	1,4-Dichlorobenzene	Production of 1,2,4-trichlorobenzene
	1,2-Diphenylhydrazine	Benzidine intermediate
	Hexachlorobenzene	Manufacturing of pentachlorophenol
	4,4'-Isopropylidenediphenol	Manufacturing of tetrabromobisphenol A
	Maleic anhydride	Manufacturing of fumeric and maleic acids
	4,4'-Methylenedianiline	Manufacturing of methyl isocyanates
	Molybdenum trioxide	Manufacturing of molybenum compounds
	Naphthalene	Derivative for phthalic anhydride, synthesis of tanning agents
	5-Nitro-o-anisidine	Manufacturing of diazo compounds
	4-Nitrophenol	Derivative for acetomenophen
	p-Nitrosodiphenylamine	Manufacturing of vinyl monomer, polymer inhibitor
	Octachloronaphthalene	Manufacturing of tetrachloro-
	Osmium tetroxide	Potassium osmate production
	Phenol	Caprolactum production, manufacturing of bisphenol A, alkyl phenols, xyenols, and aniline
	Phosphorus (yellow or white)	Manufacturing of pentasulfide, phosphorus trichloride, potassium, calcium, and sodium phosphates
	Picric acid	Manufacturing of picamic acid and inhibitor in chloroprene storage
	Quinone	Manufacturing of hydroquinone
	2,4,5-Trichlorophenol	Variety of uses

RELEASE INFORMATION - DISINFECTANTS AND REPELLANTS

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Liquid	Volatilization during mixing of disinfectant/ repellant	Routine	Process enclosure	Engineering estimate	If product is water-based, spills can be released to water	Sporadic	None	Plant records of spills	None	Disposal of off-spec product	Sporadic	None	Engineering estimate from plant disposal records	Volatilization during mixing	Routine	Process enclosure
	Application of disinfectant/ repellant	Routine	None	Engineering estimate	None	N/A	None	N/A	None	None	N/A	None	N/A	Inhalation and dermal exposure	Routine	Personal protective equipment
Solid	Processing of solid into product form	Continuous	None	Engineering estimate	None	N/A	None	N/A	None	Disposal of off-spec product	Sporadic	None	Engineering estimate from plant records	Dusting of product during handing	Intermittent	Local exhaust ventilation, personal protective equipment (gloves)

Subcategory	Chemical	Comment
Liquid	Dibutyl phthalate	Insect repellent
	Dimethyl phthlate	Insect (mosquito) repellent
	Peracetic acid	Disinfectant and antiseptic in research
	Sodium hydroxide (solution)	Disinfectant
Solid	o-Cresol	Active ingredient in disinfectants
	Hexachloroethane	Moth repellent
	Naphthalene	Moth repellent

RELEASE INFORMATION - DYE AND PIGMENT CHEMICALS

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Dye/pigment	Release of particulates during transfer of powder dye/pigment	Intermittent	Use of separate room to store and mix dyes	Engineering estimate	For water-based dyes potential release from cleanup and spills	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Exposure to dye powder prior to mixing	Intermittent	Use of separate room with ventilation to store and mix dyes
														Dermal exposure to dye/pigment after mixing	Sporadic	Personal protective equipment
Dye additive	Release during handling of addditive prior to formulation of dye	Intermittent	Same as those used to control dye or pigment	Engineering estimate	For water-based dyes potential release from cleanup and spills	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Exposure to additive prior to mixing	Intermittent	Personal protective equipment
														Dermal exposure to additive after mixing	Sporadic	Personal protective equipment
Consumptive intermediate in dye/pigment manufacture	Release during handling of chemical during production of dye/pigment prior to dye/pigment formation	Routine	Similar to consumptive intermediate category with controls based on physical state of the chemical	Engineering estimate	Spills of chemical prior to consumptive use to produce dye/pigment	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Exposure to chemical prior to consumptive use to produce dye/pigment	Sporadic	Personal protective equipment
Dye carrier solvent	Release during drying of dye	Continuous	Condenser	Mass balance based on usage of the chemical less quantity re-covered from condenser and quantity retained in textile	If water soluble may be released during cleaning operations or during textile drying	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Cleaning and other maintenance	Intermittent	Personal protective equipment

Subcategory	Chemical	Comment
Dye/pigment	Acetonitrile	Textile dyeing
	Aluminum oxide	Pigment use
	C.I. Acid Blue 9, diammonium salt	Acid dye for wool, silk, nylon, and leather; intermediate for production of pigments, food dye
	C.I. Acid Blue 9, disodiumsalt	Acid dye for wool, silk, nylon, and leather; intermediate for production of pigments, food dye
	C.I. Acid Green 3	Acid dye for many applications and pigment intermediate
	C.I. Basic Green 4	Basic dye for many applications and pigment intermediate
	C.I. Basic Red 1	Basic dye for many applications and pigment intermediate
	C.I. Disperse Yellow 3	Dispersion dye
	C.I. Food Red 15	Dye
	C.I. Food Red 5	Dye and pigment intermediate
	C.I. Solvent Orange 7	Solvent dye

Subcategory	Chemical	Comment
Dye/pigment	C.I. Solvent Yellow 14	Solvent dye
	C.I. Solvent Yellow 3	Solvent dye
	C.I. Solvent Yellow 34	Solvent dye
	C.I. Vat Yellow 4	Dye for cotton, silk, wool, and paper
	Catechol	Oxidation base for fur and hair dye preparations
	3,3'-Dimethoxybenzidine	Pigment
	Direct Black 38	Dye
	Direct Blue 6	Dye
	Direct Brown 95	Dye
Dye additive	Biphenyl	Accelerant in formulation of dye carriers for textile dyeing
	2,4-Diaminoanisole sulfate	Oxidation base for fur dyeing; previously used in hair dyes
	2,4-Diaminoanisole	Oxidation base for fur dyeing and dye intermediates
	2,4-Diaminotoluene	Developer for direct dyes and dye and pigment intermediate
	N,N-Dimethylaniline	Used in dyes
	4-Nitrophenol	Used in dyestuffs
Consumptive intermediate in dye/pigment manufacture	1-Amino-2-methylanthraquinone	Dye intermediate
	2-Aminoanthraquinone	Anthraquinone dye intermediate
	4-Aminoazobenzene	Solvent dye intermediate
	4-Aminobiphenyl	Once used as dye intermediate
	Aniline	Used in the production of dyes and pigments
	o-Anisidine hydrochloride	Dye intermediate
	o-Anisidine	Dye intermediate
	p-Anisidine	Dye and liquid crystal intermediate
	Benzoic trichloride	Dye intermediate
	C.I. Acid Blue 9, diammonium salt	Acid dye for wool, silk, nylon, and leather; intermediate for production of pigments, food dye
	C.I. Acid Blue 9, disodiumsalt	Acid dye for wool, silk, nylon, and leather; intermediate for production of pigments, food dye
	C.I. Acid Green 3	Acid dye for many applications and pigment intermediate
	C.I. Basic Green 4	Basic dye for many applications and pigment intermediate
	C.I. Basic Red 1	Basic dye for many applications and pigment intermediate
	C.I. Food Red 5	Dye and pigment intermediate
	p-Cresidine	Dye intermediate
	2,4-Dichlorophenol	Dye intermediate
	4-Dimethylaminoazobenzene	Used in Solvent Yellow 2 manufacture
	3,3'-Dimethylbenzidine	Manufacture of yellow, orange, and red dyes
	2,4-Dinitrophenol	Dye intermediate
	2,6-Dinitrotoluene	Dye intermediate
	4,4'-Methylenebis (N,N-dimethyl) benzenamine	Dye intermediate
	4,4'-Methylenedianiline	Dye intermediate
	Michler's ketone	Dye intermediate
	alpha-Naphthylamine	Dye intermediate
	beta-Naphthylamine	Azo dye intermediate
	5-Nitro-o-anisidine	Manufacturing of diazo compounds
	p-Nitrosodiphenylamine	Dye intermediate
	p-Phenylenediamine	Dye delveloping and hair dye, Violet 3, and Direct Black intermediate
	Sulfuric acid	Used to manufacture inorganic dyes
	4,4'-Thiodianiline	Mordant Yellow 16 intermediate
	Titanium tetrachloride	Used to manufacture titanium dioxide pigments
	o-Toluidine	Dye intermediate
	2,6-Xylidine	Dyestuffs intermediate
Dye carrier solvent	Acetamide	Dye solvent for textiles
	Diethyl phthalate	Dye carrier to acelerate drying
	Dimethyl phthalate	Dye carrier

RELEASE INFORMATION - ELECTRONIC USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Component etching	Process and storage vents	Intermittent	Scrubber	Mass balance based on usage	Spills, water rinse after etching	Sporadic	Neutralization	pH measurement	None	Disposal of waste acids	Intermittent	Neutralization	Engineering estimate based on plant disposal records	Handling of chemicals prior to use	Intermittent	Closed-loop transfer, personal protective equipment
Solvent	Evaporation of solvent during use	Continuous	Condenser or carbon adsorber	Mass balance based on solvent usage	Spills	Sporadic	None	1) Monitoring data 2) Emission factors	None	None	N/A	None	N/A	Handling of solvents prior to use	Intermittent	Personal protective equipment
														Evaporation of solvents during use	Continuous	None
Other	Handling losses	Intermittent	Unknown	Engineering estimate	None	N/A	None	N/A	None	None	N/A	None	N/A	Handling of chemical prior to use	Intermittent	Personal protective equipment

Subcategory	Chemical	Comment
Component etching	Chlorine	Etching compound
	Formaldehyde	Etching compound
	Hydrochloric acid	Etching compound
	Hydrogen fluoride	Etching compound
	Nitric acid	Etching compound
	Phosphoric acid	Etching compound
	Sodium hydroxide (solution)	Etching compound
	Sulfuric acid	Etching compound
Solvent	Acetone	Solvent used in semiconductor manufacturing
	Aniline	Solvent used in semiconductor manufacture
	Chlorobenzene	Solvent used in semiconductor manufacture
	Chloroform	Solvent used in semiconductor manufacture
	Chloromethane	Solvent used in semiconductor manufacture
	Dichloromethane	Solvent
	2-Ethoxyethanol	Solvent used in printed circuit boards
	Freon 113	Solvent
	Methanol	Solvent used in semiconductor manufacture
	2-Methoxyethanol	Solvent used in printed circuit boards
	Methyl ethyl ketone	Solvent used in semiconductor manufacture
	Methyl ethyl ketone	Solvent used in semiconductor manufacture
	Tetrachloroethylene	Solvent
	Toluene	Solvent used in photoresist film
	1,1,1-Trichloroethane	Solvent
	Trichloroethylene	Solvent
	Xylene (mixed isomers)	Solvent used in photoresist film
Other	Bromoform	Q/A programs in electronics
	Hexachloronaphthalene	Component in electrical encapsulating compounds and capacitor impregnants

RELEASE INFORMATION - EXPLOSIVES

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Explosive constituent	None	N/A	None	N/A	None	N/A	None	N/A	None	Disposal of off-spec product	Intermittent	Detonation	Engineering estimate	None	N/A	N/A
Consumptive intermediate in explosive manufacture	Handling losses prior to use in explosives	Intermittent	Depends on physical state of the chemical	Engineering estimate	Spills	Sporadic	None	Engineering estimate from plant records of spills	None	None	N/A	None	N/A	Depends on physical state of chemical	Intermittent	Personal protective equipment

Subcategory	Chemical	Comment
Explosive constituent	Aluminum (fume or dust)	Powder used in explosives manufacture
	Nitroglycerine	Dynamite and smokeless gun powder
	Picric acid	Secondary high explosive
Consumptive intermediate in explosive manufacture	Acetamide	Antacid in explosives manufacture
	Nitric acid	Manufacture of ammonium nitrate explosives

RELEASE INFORMATION - FOOD USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Food additive	Release during handling of liquid additives	Intermittent	Closed-loop transfer systems	Engineering estimate	None	N/A	None	N/A	None	None	N/A	None	N/A	Handling of additive prior to food use	Intermittent	Personal protective equipment
Food processing	Process vents	Intermittent	Absorber, condenser, scrubber	1) Engineering estimate 2) Monitoring data 3) Emission factor	Spills	Sporadic	Unknown	Engineering estimate based on plant records of spills	None	Disposal of process waste	Sporadic	None	Engineering estimate based on plant disposal records	Handling of chemical prior to use in process	Intermittent	Personal protective equipment
	Storage vents	Continuous	Absorber	Engineering estimate using EPA/ API methods												
	Transfer losses	Routine	Solvent recovey system	1) Engineering estimate using EPA/ API methods 2) Emission factor												

Subcategory	Chemical	Comment
Food additive	Dieporybutane Saccharin	Prevents microbial spoilage Sweetener
Food processing	Dichloromethane Hydrochloric acid	Used in spices and beer hops and coffee extraction solvent Food processing

RELEASE INFORMATION - FUEL COMPONENTS

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Fuel additive	Storage losses	Continuous	Condenser, flare, absorber	Engineering estimate using EPA/ API method	Fuel spills	Sporadic	None	Plant records of spills	None	None	N/A	None	N/A	Transfer operations	Routine	Closed-loop transfer, personal protective equipment
	Transfer losses	Routine	Floating roof tank, vent to flare or condenser	Engineering estimate using EPA/ API method												
Nuclear fuel	None	N/A	None	N/A	None	N/A	None	N/A	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown	Unknown
Rocket fuel	Storage losses	Continuous	Unknown	Engineering estimate using EPA/ API method	None	N/A	None	N/A	None	None	N/A	None	N/A	Transfer operations	Routine	Closed-loop transfer, personal protective equipment
	Transfer losses	Routine	Closed-loop transfer	Engineering estimate using EPA/ API method												

Subcategory	Chemical	Comment
Fuel additive	tert-Butyl alcohol	High octane blending component in gasoline
	1,2-Dibromoethane	Gasoline additive
	2-Methoxyethanol	Anti-icing fuel additive
	Methyl tert-butyl ether	High octane additive
	Toluene	Octane-boosting component
Nuclear fuel	Thorium dioxide	Fuel in nuclear reactors
Rocket fuel	Aluminum (fume or dust)	Constituent in rocket fuels
	Dibutyl phthalate	Propellant plasticizer
	1,1-Dimethyl hydrazine	Rocket fuel propellant
	Methyl hydrazine	Rocket propellant
	Nitroglycerin	Propellant

RELEASE INFORMATION - HEAT EXCHANGE CHEMICALS, LUBRICANTS, AND HYDRAULIC FLUIDS

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Additive	Dusting during handling prior to addition to fluid	Intermittent	None	Engineering estimate	Washing of spills, leaks down sewer	Intermittent	None	Engineering estimate	None	Collection for disposal or recycle	Intermittent	Use to recover heat value	Plant disposal records	Dermal exposure	Sporadic	Personal protective equipment (gloves)
Hydraulic/heat exchange fluid	Leaks	Sporadic	Absorbants to collect liquid spills	Engineering estimate	Washing of spills, leaks down sewer	Intermittent	None	Engineering estimate	None	Collection for disposal or recycle	Intermittent	Recycle by filtration and/or distilation; use to recover heat value	Plant disposal records	Inhalation or dermal exposure	Sporadic	Personal protective equipment (gloves)
Lubricant	Spills, leaks	Sporadic	Absorbants to collect spills	Engineering estimate	Washing of spills, leaks down sewer	Intermittent	None	Engineering estimate	None	Collection for disposal or recycle	Intermittent	Recycle by filtration and/or distilation; use to recover heat value	Plant disposal records	Dermal exposure	Sporadic	Personal protective equipment (gloves)

Subcategory	Chemical	Comment
Additive	Hexachloroethane	Formulation of extreme pressure lubricants
	Maleic anhydride	Lube oil additives
	4,4'-Methylenedianiline	Antioxidant in lube oils
	Octachloronaphthalene	Cutting oil coolants
	2-Phenylphenol	Disinfectant in cutting oils
Hydraulic/heat exchange fluid	Biphenyl	Heat transfer and hydraulic fluid
	Bis(2-ethylhexyl) adipate	Hydraulic fluid
	sec-Butyl alcohol	Hydraulic brake fluid
	Ethylene glycol	Antifreeze
	Freon 113	Refrigerant
	Polychlorinated biphenyls	Insulating fluid in transformers and hydraulic fluids
Lubricant	Bis(2-ethylhexyl) adipate	Lubricant
	Chloromethane	Production of lubricants

RELEASE INFORMATION - LABORATORY USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Indicator/stain	None	N/A	None	N/A	Disposal down sanitary drain	Sporadic	None	Estimate based on usage records	None	None	N/A	None	N/A	Potential dermal exposure	Sporadic	Personal protective equipment (gloves)
Laboratory reagent or solvent	Released from lab hood	Sporadic	None	Mass balance based on usage less quantity consumed in reaction, disposed of down sanitary sewer or disposed of as solid waste	Disposal down sanitary drain	Sporadic	None	Mass balance based on usage less quantity released from lab hood or disposed of as solid waste	None	Disposal of lab waste	Intermittent	None	Engineering estimate from lab records	Inhalation or dermal exposure during usage	Intermittent	Laboratory hood, personal protective equipment (gloves)
Research chemical	Released from lab hood	Sporadic	None	Mass balance based on usage less quantity consumed in reaction, disposed of down sanitary sewer or disposed of as solid waste	Disposal down sanitary drain	Sporadic	None	Mass balance based on usage less quantity consumed in reaction, released from lab hood, or disposed of as solid waste	None	Disposal of lab waste	Sporadic	None	Engineering estimate from lab records	Inhalation or dermal exposure during use	Sporadic	Laboratory hood, personal protective equipment (gloves)

Subcategory	Chemical	Comment
Indicator/stain	C.I. Acid Blue 9, diammonium salt	Indicator, biological stain
	C.I. Acid Blue 9, disodium salt	Indicator, biological stain
	C.I. Acid Green 3	Indicator and biological stain
	C.I. Solvent Yellow 3	Biological stain
Laboratory reagent or solvent	Acetonitrile	Solvent in HPLC
	p-Anisidine	Analytical reagent
	Bromoform	Lab reagent
	C.I. Solvent Yellow 3	Analytical reagent
	Catechol	Analytical reagent
	Chloromethyl methyl ether	Reagent
	Hydrazine sulfate	Analytical testing of blood
	Thioacetamide	Lab chemical
Research chemical	2-Acetylaminofluorene	No commercial use
	Benzidine	Research chemical
	Bis(chloromethyl)ether	No commercial use
	Dichlorobromomethane	No commercial use
	Diepoxybutane	Reasearch reagent

RELEASE INFORMATION - LABORATORY USES

Subcategory	Chemical	Comment
Research chemical	Hexamethylphosphoramide	Research use
	4-Nitrobiphenyl	No commercial use
	2-Nitrophenol	No commercial use
	N-Nitroso-N-ethylurea	Research use
	N-Nitroso-N-methylurea	Research use
	N-Nitrosodi-n-butylamine	Research use
	N-Nitrosodi-n-propylamine	Research use
	N-Nitrosodiethylamine	Research use
	N-Nitrosodimethylamine	Research use
	N-Nitrosomethylvinylaniline	Research use
	N-Nitrosomorpholine	Research use
	N-Nitrosonornicotine	Research use
	N-Nitrosopiperidine	Research use
	Quinoline	Analytical reagent
	1,1,2,2-Tetrachloroethane	Analytical reagent
	o-Toluidine hydrochloride	Research use
	Triaziquone	No commercial use
	2,4,6-Trichlorophenol	Research use
	Tris (2,3-dibromopropyl) phosphate	No commerical use
	Urethane	Biochemical research

RELEASE INFORMATION - MANUFACTURE OF THE CHEMICAL

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Gas	Process vents	Intermittent	Flare, scrubber	1) Engineering estimate 2) Monitoring data	Not likely; if product is gas dissolved in water spills could be released to water	Sporadic	Aeration used for treatment of other chemicals would also remove these gases	Plant records of spills of gas in water solutions	None	None	N/A	None	N/A	Sampling	Routine	Closed-loop sampling
														Maintenance	Intermittent	Personal protective equipment
	Storage pressure relief valves	Sporadic	Vent to flare	Engineering estimate												
	Fugitive emissions	Continuous	Inspection/maintenance	Emission factor with some composition/ leak rate/ component count												
Volatile liquid	Process vents	Intermittent	Condenser, flare, absorber, scrubber	1) Engineering estimate 2) Monitoring data 3) Emission factor	Process upset, spills	Sporadic	Surface impoundment or lagoon with biological treatment, aeration, or POTW	Engineering estimate based on plant records of upsets and spills	None	Disposal of still bottoms, off-spec product	Sporadic	Solvent recovery, incineration	Engineering estimate from plant disposal records	Sampling	Routine	Closed-loop sampling
														Maintenance	Intermittent	Personal protective equipment
														Transfer operations	Routine	Closed-loop transfer, personal protective equipment
	Storage vents	Continuous	Floating roof tanks, vent to flare or condenser	1) Engineering estimate using EPA/ API method 2) Emission factor												
	Transfer losses	Routine	Closed-loop transfer, vapor recovery	1) Engineering estimate using EPA/ API method 2) Emission factor												
	Fugitive emissions	Continuous	Inspection/maintenance	1) Emission factor with some composition/ leak rate, component count measure-ments												

RELEASE INFORMATION - MANUFACTURE OF THE CHEMICAL

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Low volatile liquid	Process vents	Sporadic	Condenser, flare, absorber, scrubber	1) Engineering estimate 2) Monitoring data	Process upsets, spills	Sporadic	Surface impoundment, lagoon with biological treatment, aeration, or POTW	Engineering estimate based on plant records of upsets and spills		Disposal of still bottoms, off-spec product	Sporadic	Solvent recovery, incineration	Engineering estimate from plant disposal records	Sampling	Routine	Closed-loop sampling
														Maintenance	Intermittent	Personal protective equipment
														Transfer operations	Routine	Closed-loop transfer, personal protective equipment
	Storage vents	Continuous	Because of low volatility, probably no controls	Engineering estimate from EPA/ API method												
	Transfer losses	Routine	Because of low volatility, probably no controls	Engineering estimate from EPA/ API method												
	Fugitive emissions	Continuous	None	Engineering estimate based on comparison with volatile chemicals adjusted for difference in vapor pressure												
Solid	Release of particulates during drying and packaging	Continuous	Fabric filter, scrubber	Engineering estimate	Release from water based manufacturing processes or from scrubber wastewater	Continuous	Settling tanks, filtration	1) Monitoring data 2) Engineering estimate	Process waste	Process waste	Intermittent	None	Engineering estimate	Dusting of product during packaging	Routine	Local exhaust ventilation, personal protective equipment
Water solution	Mixing of chemical and water to form solution	Sporadic	Control of dusting prior to mixing with water	Engineering estimate	Spills of chemical in water solution	Sporadic	None	Plant records of spills	None	None	N/A	N/A	N/A	Dermal exposure to solution	Sporadic	Personal protective equipment

RELEASE INFORMATION - MANUFACTURE OF THE CHEMICAL

Subcategory	Chemical			
Gas	Ammonia	Chlorine dioxide	Ethylene	Mustard gas
	1,3-Butadiene	Chloroethane	Ethylene oxide	Propylene
	Carbonyl sulfide	Chloromethane	Freon 113	Vinyl bromide
	Chlorine	Diazomethane	Hydrogen fluoride	Vinyl chloride
Volatile liquid	Acetaldehyde	Chloromethyl methyl ether	Hexachloro-1,3-butadiene	Propionaldehyde
	Acetone	Chloroprene	Hexachlorocyclopentadiene	beta-Propriolactone
	Acetonitrile	Cresol (mixed isomers)	Hexamethylphosphoramide	Propylene oxide
	Acrolein	m-Cresol	Hydrazine	Propyleneimine
	Acrylic acid	Cumene	Hydrochloric acid	Pyridine
	Acrylonitrile	Cumene hydroperoxide	Hydrogen cyanide	Quinoline
	Allyl chloride	Cyclohexane	Isobutyraldehyde	Safrole
	Aniline	1,2-Dibromoethane	Isopropyl alcohol	Styrene
	Benzal chloride	Dichlorobenzene (mixed isomers)	Methanol	Styrene oxide
	Benzene	1,2-Dichlorobenzene	2-Methoxyethanol	1,1,2,2-Tetrachloroethane
	Benzoic trichloride	1,3-Dichlorobenzene	Methyl acrylate	Tetrachloroethylene
	Benzoyl chloride	Dichlorobromomethane	Methyl ethyl ketone	Titanium tetrachloride
	Benzyl chloride	1,2-Dichloroethane	Methyl hydrazine	Toluene
	Bis(2-chloro-1-methyl ethyl) ether	1,2-Dichloroethylene	Methyl iodide	Toluene-2,6-diisocyanate
	Bis(2-chloroethyl) ether	Dichloromethane	Methyl isobutyl ketone	o-Toluidine hydrochloride
	Bis(2-ethylhexyl) adipate	1,2-Dichloropropane	Methyl isocyanate	o-Toluidine
	Bis(chloromethyl) ether	1,3-Dichloropropylene	Methyl methacrylate	1,2,4-Trichlorobenzene
	Bromoform	Diepoxybutane	Methyl tert-butyl ether	1,1,1-Trichloroethane
	Bromomethane	1,1-Dimethyl hydrazine	Methylene bromide	1,1,2-Trichloroethane
	Butyl acrylate	Dimethyl sulfate	Nitric acid	Trichloroethylene
	n-Butyl alcohol	N,N-Dimethylaniline	Nitrobenzene	1,2,4-Trimethylbenzene
	sec-Butyl alcohol	Dimethylcarbamyl chloride	Nitrogen mustard	Vinyl acetate
	tert-Butyl alcohol	1,4-Dioxane	Nitroglycerin	Vinylidene chloride
	1,2-Butylene oxide	Epichlorohydrin	2-Nitropropane	Xylene (mixed isomers)
	Butyraldehyde	2-Ethoxyethanol	N-Nitrosodiethylamine	m-Xylene
	Carbon disulfide	Ethyl acrylate	N-Nitrosomethylvinylaniline	o-Xylene
	Carbon tetrachloride	Ethylbenzene	Peracetic acid	p-Xylene
	Chlorobenzene	Ethyleneimine	Phosgene	2,6-Xylidine
	Chloroform	Formaldehyde		
Low volatile liquid	o-Anisidine hydrochloride	Dibutyl phthalate	N-Nitrosodi-n-butylamine	Polychlorinated biphenyls
	o-Anisidine	Diethyl phthalate	N-Nitrosodi-n-propylamine	Propane sultone
	p-Anisidine	Diethyl sulfate	N-Nitrosodimethylamine	Sulfuric acid
	Butyl benzyl phthalate	Dimethyl phthalate	N-Nitrosonornicotine	Toluene-2,4-diisocyanate
	Di-(2-ethylhexyl) phthalate	n-Dioctyl phthalate	N-Nitrosopiperidine	Tris (2,3-dibromopropyl) phosphate
	2,4-Diaminoanisole sulfate	Ethylene glycol	Phosphoric acid	

RELEASE INFORMATION - MANUFACTURE OF THE CHEMICAL

Subcategory	Chemical			
Solid	Acetamide	Cupferron	Hydroquinone	N-Nitrosomorpholine
	2-Acetylaminofluorene	Decabromodiphenyl oxide	4,4'-Isopropylidenediphenol	Octachloronaphthalene
	Acrylamide	2,4-Diaminoanisole	Maleic anhydride	Osmium tetroxide
	Aluminum (fume or dust)	4,4'-Diaminodiphenyl ether	Melamine	Pentachlorophenol
	Aluminum oxide	Diaminotoluene (mixed isomers)	Methylenebis (phenylisocyanate)	Phenol
	1-Amino-2-methylanthraquinone	2,4-Diaminotoluene	4,4'-Methylenebis (2-chloroaniline)	p-Phenylenediamine
	2-Aminoanthraquinone	3,3'-Dichlorobenzidine	4,4'-Methylenebis (N,N-dimethyl) benzenamine	2-Phenylphenol
	4-Aminoazobenzene	2,4-Dichlorophenol	4,4'-Methylenedianiline	Phosphorus (yellow or white)
	4-Aminobiphenyl	Diethanolamine	Michler's ketone	Phthalic anhydride
	Anthracene	3,3'-Dimethoxybenzidine	Molybdenum trioxide	Picric acid
	Asbestos	4-Dimethylaminoazobenzene	Naphthalene	Quinone
	Benzamide	3,3'-Dimethylbenzidine	alpha-Naphthylamine	Saccharin
	Benzidine	2,4-Dimethylphenol	beta-Naphthylamine	Terephthalic acid
	Benzoyl peroxide	2,4-Dinitrophenol	Nitrilotriacetic acid	Thioacetamide
	Biphenyl	2,4-Dinitrotoluene	5-Nitro-o-anisidine	4,4'-Thiodianiline
	Calcium cyanamide	2,6-Dinitrotoluene	4-Nitrobiphenyl	Thiourea
	Catechol	1,2-Diphenylhydrazine	2-Nitrophenol	Thorium dioxide
	Chloroacetic acid	Ethylene thiourea	4-Nitrophenol	Titanium dioxide
	2-Chloroacetophenone	Hexachlorobenzene	N-Nitroso-N-ethylurea	Triaziquone
	p-Cresidine	Hexachloroethane	N-Nitroso-N-methylurea	2,4,5-Trichlorophenol
	o-Cresol	Hexachloronaphthalene	N-Nitrosodiphenylamine	2,4,6-Trichlorophenol
	p-Cresol	Hydrazine sulfate	p-Nitrosodiphenylamine	Urethane
Water solution	Ammonium nitrate (solution)	Ammonium sulfate (solution)	Sodium hydroxide (solution)	Sodium sulfate (solution)

RELEASE INFORMATION - OTHER USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Gas	Storage leaks	Sporadic	None	Engineering estimate from plant records of leaks	None	N/A	None	N/A	None	None	N/A	None	N/A	Storage leaks	Intermittent	None
Liquid	Handling losses	Routine	Unknown	Engineering estimate	Uses too diverse to generalize	Unknown	Unknown	Unknown	Uses too diverse to generalize	Unknown	Unknown	Unknown	Unknown	Exposure from handling of chemical	Intermittent	Personal protective equipment (gloves)
Solid	Handling losses	Routine	Unknown	Engineering estimate	Uses too diverse to generalize	Unknown	Unknown	Unknown	Uses too diverse to generalize	Unknown	Unknown	Unknown	Unknown	Exposure from handling of chemical	Intermittent	Personal protective equipment (gloves)

Subcategory	Chemical	Comment
Gas	Chlorine dioxide	Odor control agent
	Hydrogen fluoride	Nuclear uses
	Mustard gas	Used in warfare
	Vinyl bromide	Fiber flame retardant
Liquid	Acetonitrile	Stabilizer for chlorinated solvents
	Ammonium sulfate (solution)	Caprolactum manufacturing
	Bis(2-chloro-1-methyl ethyl) ether	Extractant
	Bromoform	Fluid for ore separation
	tert-Butyl alcohol	Denaturated for alcohol mixtures
	1,2-Butylene oxide	Acid scavenger for chlorinated compounds
	N,N-Dimethyl aniline	Used in sealants
	2-Ethoxyethanol	Extraction chemical
	Hexachloro-1,3-butadiene	Manufacture of pinhole free films
	Hydrochloric acid	Steel pickling, chemical manufacturing
	Hydrogen cyanide	Chelating agent
	Isobutyraldehyde	Corrosion inhibitor
	Isopropyl alcohol	Various cosmetic uses
	Methyl ethyl ketone	Used in magnetic tapes
	Methyl iodide	Methylating agent
	Methylene bromide	Gauge fluid
	Nitric acid	Manufacturing of adipic acid, TDI, nitrobenzeneaniline
	Propane sultone	Derivatizing agent
	Propyleneimine	Specialty chemical derivatives
	Quinoline	Corrosion inhibitor
	Sodium hydroxide (solution)	Refining of vegetable oils, pH control, alkaline bottle washing formulations, washing napththalene, stabilization of sodium hydrochloric, petroleum refining, etc.
	Sodium sulfate (solution)	Glass mill reparing
	Sulfuric acid	Copper leaching, alkylation of isobutane, inorganic chemicals, industrial organic chemicals
	Titanium tetrachloride	Smoke screen devices for the military
	1,2,4-Trichlorobenzene	Wood preservative agent against insects
	1,1,1-Trichloroethane	Solvent in aerosol dispensing products
Solid	Acetamide	Soldering flux, stabilizer, accelerator, and plasticizer in leather and films, antacid in cosmetic industry
	Aluminum (fume or dust)	Powdered aluminum alloys used in manufacturing of bushing, gears, tool, and machine parts

Subcategory	Chemical	Comment
Solid	Aluminum oxide	Flame retardant fillers, absorbents, ceramics, etc.
	Anthracene	Oil for wood, and making screens, etc.
	Arsenic	Glass production
	Asbestos	Cements, flooring, roofing, packing, insulation, etc.
	Benzoyl peroxide	Bleaching agent
	Calcium cyanamide	Used in steel nitridation and desulfurization
	Catechol	Leather tanning agent
	Cupferron	Reagent chemical for chelating metals
	Decabromodiphenol oxide	Flame retardant
	Diethanolamine	Acid absorption and corrosion inhibitor
	3,3'-Dimethoxybenzidine	Coupling agent also used in warfare
	Hexachlorobenzene	Adds blue color to polytechnics
	Hexachloroethane	Degreaser in Al and Mg metals manufacturing and chain transfer agents
	Hexachloronapthalene	Gauge and instrument fluid, electroplating stop-off chemical
	Hydrazine sulfate	Soldering flux, refining rare metals
	4,4'-Methylenedianiline	Iron corrosion inhibitor
	Osmium tetroxide	Used in aqua regia refining
	Picric acid	Oxidizer in fireworks
	Saccharin	Cosmetics
	Thorium dioxide	Incandescent agent in gas lighting
	2,4,5-Trichlorophenol	Perservative for rubber gaskets

RELEASE INFORMATION - PAINT AND VARNISH REMOVERS

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Solvent in paint and varnish removers	Release during formulation	Continuous	Closed lid on mixing tank	Engineering estimate	Spills	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Inhalation and dermal exposure	Continuous	Lid on mixing tank, local exhaust ventilation, personal protective equipment
	Evaporation during application	Continuous	None	1) Emission factors 2) Mass balance based on usage less quantity released to water or solid waste	Spills	Sporadic	None	1) Emission factors 2) Mass balance based on usage less quantity released to water or solid waste	None	Disposal of old paint	Intermittent	Incineration	Engineering estimate based on plant disposal	Inhalation and dermal exposure	Continuous while stripping	General ventilation, local exhaust ventilation, personal protective equipment

Subcategory	Chemical	Comment
Solvent in paint and varnish removers	Acetone	Paint, varnish, and nail polish remover
	Bis(2-chloro-1-methyl ethyl) ether	Paint and varnish remover
	Dibutyl phthalate	Nail polish remover
	Dichloromethane	Paint stripper
	2-Ethoxyethanol	Paint and varnish remover
	2-Nitropropane	Paint and varnish remover
	Sodium hydroxide (solution)	Paint remover

RELEASE INFORMATION - PESTICIDES, INSECTICIDES, HERBICIDES, AND FUNGICIDES

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Solid	Release of particulates during drying and packaging	Continuous	Filtration, scrubber	Engineering estimate	Release form water based manufacturing processes or scrubber wastewater	Continuous	Settling tanks, filtration	1) Monitoring data 2) Engineering estimate	None	Process waste	Intermittent	None	Engineering estimate	Handling of pesticides, insecticides, herbicides, fungicides produced	Routine	Process enclosure, local exhaust ventilation, personal protective equipment
	Releases during aerial spray application	Continuous	None	Engineering estimate based on usage and percent of chemical remaining airborne	Run-off, and over spray into water sources	Intermittent	None	Engineering estimate	Releases during application	None	Continuous	None	Mass balance based on usage and quantity released to other sources	Exposure during spraying	Routine	Personal protective equipment
	Releases during other application methods	Continuous	Electrostatic charge on dusting machine,	Engineering estimate based on volatility of the liquid product or percent particulates remaining airborne	Run-off	Intermittent	None	Engineering estimate	Releases during application	None	Continuous	None	Mass balance based on usage and quantity released to other sources	Exposure during spraying	Routine	Personal protective equipment
Liquid	Process vents	Intermittent	Unknown	Engineering estimate	Process upsets, spills	Sporadic	Unknown	Engineering estimate based on plant records on upsets and spills	None	Disposal of still bottoms and off-spec product	Sporadic	Unknown	Engineering estimate from plant disposal records	Handling of pesticides, insecticides, herbicides, fungicides produced	Routine	Process enclosure, local exhaust ventilation, personal protective equipment
	Storage vents	Continuous	Unknown	Engineering estimate using EPA/ API methods												
	Transfer losses	Routine	Closed-loop transfer	Engineering estimate using EPA/ API methods												
	Fugitive	Continuous	Inspection/maintenance	Emission factor with some composition, leak-rate, component count measurement												

RELEASE INFORMATION - PESTICIDES, INSECTICIDES, HERBICIDES, AND FUNGICIDES

	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
Subcategory	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Liquid	Released during aerial spray application	Continuous	None	Engineering estimate based on usage and percent of chemical remaining airborne	Run-off, and over spray into water sources	Intermittent	None	Engineering estimate	Releases during application	None	Continuous	None	Mass balance based on usage and quantity released to other sources	Exposure during spraying	Routine	Personal protective equipment
	Released during other application methods	Continuous	Electrostatic charge on dusting machine,	Engineering estimate based on volatility of the liquid product or percent particulates remaining airborne	Run-off	Intermittent	None	Engineering estimate	Releases during application	None	Continuous	None	Mass balance based on usage and quantity released to other sources	Exposure during spraying	Routine	Personal protective equipment
Consumptive intermediate in pesticides, etc. manufacture	Process vents	Intermittent	Unknown	1) Engineering estimate 2) Monitoring data 3) Emission factor	Process upsets, spills	Sporadic	Unknown	Engineering estimate based on plant records on upsets and spills	None	Disposal of still bottoms and off-spec product	Sporadic	Unknown	1) Engineering estimate 2) Mass balance	Handling of chemical prior to reaction	Intermittent	Closed-loop transfer, personal protective equipment
	Storage vents	Continuous	Unknown	Engineering estimate												
	Transfer losses	Routine	Unknown	Engineering estimate using EPA/ API methods												
	Fugitive	Continuous	Inspection/maintenance	Emission factor with some composition, leak-rate, component count measurement												

Subcategory	Chemical	Comment
Solid	Aldrin	Insecticide for moth control only
	Calcium cyanamide	Herbicide and soil treatment for soilborne diseases
	Captan	Fungicide
	Carbaryl	Insecticide
	Chloramben	Herbicide manufacture
	Chlorothalonil	Fungicide, mildewcide
	2,4-D	Herbicide

Subcategory	Chemical	Comment
Solid	1,4-Dichlorobenzene	Moth control agent
	Dicofol	Acaricide
	4,6-Dinitro-o-cresol	Herbicide
	Fluometuron	Herbicide
	Heptachlor	Termite insecticide
	Hydrazine sulfate	Biocide for fungi and molds
	Lindane	Insecticide
	Maneb	Fungicide
	Methoxychlor	Insecticide
	Nitrofen	Herbicide
	Propoxur	Insecticide
	Quintozene	Soil fungicide
	Tetrachlorvinphos	Insecticide (houseflies)
	Toxaphene	Insecticide
	Trichlorfon	Insecticide
	Trifluralin	Herbicide
	Zineb	Fungicide
Liquid	Bromomethane	Soil and space fumigant
	Chlordane	Insecticide, no longer produced
	Chlorobenzilate	Acaricide
	Diallate	Herbicide
	1,2-Dibromo-3-chloropropane	Pineapple pesticide
	1,2-Dibromoethane	Fumigant
	Dichlorvos	Insecticide
	Ethyl chloroformate	Herbicide
	Ethyleneimine	Insecticide and cotton treatment
	Hexamethylphosphoramide	Insect chemosterilant (experimental)
	Isobutyraldehyde	Insecticide
	Parathion	Insecticide
	1,2,4-Trichlorobenzene	Herbicide and soil treatment for termites
Consumptive intermediate in pesticides, etc. manufacture	Aniline	Pesticide production
	Arsenic	Pesticide production
	Benzoic trichloride	Herbicide intermediate
	Chlorobenzene	Solvent in pesticides formulation
	Diazomethane	Fungicide intermediate
	Dibenzofuran	Fungicide intermediate
	Dichlorobenzene (mixed isomers)	Acaricide raw material
	1,2-Dichlorobenzene	3-Dichloroaniline herbicide
	2,4-Dichlorophenol	Herbicide raw material
	1,1-Dimethyl hydrazine	Raw material for pesticides
	Dimethylcarbamyl chloride	Raw material for insecticides and herbicides
	1,4-Dioxane	Raw material for insecticide
	Hydrazine	Used in herbicide and plant growth regulators
	Methyl acrylate	Raw material for herbicide
	Methyl hydrazine	Raw material for wild oat herbicide
	Methyl isocyanate	Raw material for insecticides and herbicides
	Methylene bromide	Raw material for insecticides and nematocides
	Naphthalene	Derivative for insecticides
	alpha-Naphthylamine	Raw material for herbicides
	2-Nitropropane	Raw material for pesticides
	Phosgene	Herbicide, pesticide production
	Pyridine	Manufacture of paraquat and chlorpyrifos
	Quinoline	Derivative in herbicides and insecticides
	Quinone	Chloroneb manufacture
	Safrole	Raw material for insecticides

RELEASE INFORMATION - PHARMACEUTICAL USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Consumptive intermediate in pharmaceutical manufacture	Process	Intermittent	Some processes may vent to condensers or carbon adsorber	Engineering estimate	Process upset, spills	Sporadic	None	Engineering estimate based on plant records of upsets and spills	None	Disposal of reaction waste or off-spec product	Sporadic	None	Engineering estimate from plant disposal records	Transfer operations	Routine	Closed-loop transfer, personal protective equipment
	Storage and transfer losses	Continuous	Some tanks may vent to condenser or carbon adsorber	Engineering estimate using EPA/ API methods												
Solvent in pharmaceutical manufacture	Release during drying of pharma-ceuticals	Continuous	Condenser	1) Mass balance based on usage of the chemical less quantity re-covered from condenser and quantity retained in pharm. 2) Emission factor	None	N/A	None	N/A	None	None	N/A	None	N/A	Cleaning and other main-tenance	Sporadic	Personal protective equipment
														Production worker	Intermittent	General ventilation
Pharmaceutical product	Particulate losses during drying and handling of product	Continuous	None	Engineering estimate	None	N/A	None	N/A	None	Disposal of off-spec product	Sporadic	None	Engineering estimate from plant disposal records	Product handing operations	Intermittent	Local exhaust ventilation, personal protective equipment

Subcategory	Chemical	Comment
Consumptive intermediate in pharmaceutical manufacture	Aniline	Pharmaceutical intermediate
	Bromomethane	Pharmaceutical intermediate
	2-Chloroacetophenone	Pharmaceutical intermediate
	Chloroethane	Pharmaceutical intermediate
	p-Nitrosodiphenylamine	Intermediate for pharmaceuticals
	Osmium tetroxide	Intermediate to manufacture glucorticoids and androgen
	Quinoline	Derivatives used for synthetic medicinals
	Urethane	Intermediate for pharmaceuticals
Solvent in pharmaceutical manufacture	Acetone	Solvent in pharmaceutical manufacture
	Acetonitrile	Recovable reaction medium in pharmaceuticals
	Carbon tetrachloride	Solvent in pharmaceutical manufacture
	Chloroform	Solvent in pharmaceutical manufacture
	Isopropyl alcohol	Solvent in pharmaceutical manufacture

Subcategory	Chemical	Comment
Pharmaceutical product	Acetamide	Antidote for monofluoroacetamide poisoning
	Benzoyl peroxide	Active acne ingredient
	Calcium cyanamide	Antialcoholic drug
	2-Ethoxyethanol	Anesthetics
	Hexachloroethane	Anthelmintic in veterinary medicine
	Nitrogen mustard	Cancer chemotherapy
	Nitroglycerin	Vasodilator
	beta-Propiolactone	Influenza vaccine
	Saccharin	Pharmaceuticals

RELEASE INFORMATION - PHOTOGRAPHIC USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Developer	Evaporation of developer during use	Continuous	None	Engineering estimate	Potential disposal of developer down sanitary sewer	Routine	None	Mass balance based on usage, percent chemical in developer, and consumption in developing process	None	Disposal of used developer as waste	Routine	Possible reaction of developer and fixer prior to disposal	Engineering estimate	Dermal exposure of hands in developer	Routine	Personal protective equipment (gloves)
														Evaporation of developer	Continuous	Local exhaust ventilation
Consumptive intermediate in photographic dye manufacture	Released during handling of chemical during production of dye prior to dye formulation	Routine	Similar to chemical intermediate category with controls based on physical state of the chemical	Engineering estimate	Spills of chemical prior to consumptive usage	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Exposure of chemical prior to consumptive use	Sporadic	Personal protective equipment
Solvent in photographic film manufacture	Evaporation of solvent during film making process	Continuous	Condenser or carbon adsorber	Mass balance based on solvent usage records	None	N/A	None	N/A	None	None	N/A	None	N/A	Potential exposure from leaks in solvent evaporation/ reclamation system	Sporadic	Leak repair

Subcategory	Chemical	Comment
Developer	Catechol	Developer
	Hydroquinone	Developer
	p-Phenylenediamine	Color developer
Consumptive intermediate in photographic dye manufacture	Acetonitrile	Reaction solvent in photographic dye manufacture
	Aniline	Raw material for photographic dyes
Solvent in photographic film manufacture	Dichloromethane	Solvent in photographic film manufacture and photoresist stripping

RELEASE INFORMATION - POLYMER, PLASTIC, AND RESIN USES

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Consumptive intermediate in polymer, etc. manufacture	Process	Intermittent	Some processes may use condenser, flare, adsorber	1) Engineering estimate 2) Emission factor	Process upsets, spills	Sporadic	Some facilities may have surface impoundment or lagoon with biological treatment, aeration or POTW	Engineering estimate based on plant records of upsets and spills	None	Disposal of reactor waste	Sporadic	None	Engineering estimate based on plant disposal records	Maintenance of chemical storage	Intermittent	Personal protective equipment
	Storage	Continuous	Some tanks may vent to flare or condenser	1) Engineering estimate 2) Emission factor										Transfer operations	Routine	Closed-loop transfer, personal protective equipment
	Fugitive	Continuous	None	1) Engineering estimate 2) Emission factor												
Liquid additive	Release during handing	Intermittent	Closed transfer systems	Engineering estimate	Spills	Sporadic	None	N/A	None	None	N/A	None	N/A	Potential inhalation or dermal exposure during handing	Intermittent	Closed-loop transfer, personal protective equipment
Solid additive	Potential dusting during handing	Intermittent	None	Engineering estimate	None	N/A	None	N/A	None	None	N/A	None	N/A	Potential dusting during handing	Intermittent	Personal protective equipment
Resin carrier solvent	Release during drying after extrusion	Continuous	Condenser, carbon adsorber	Mass balance based on usage of the chemical less quantity recovered	None	N/A	None	N/A	None	None	N/A	None	N/A	Production worker	Intermittent	General ventilation
														Maintenance worker	Sporadic	Personal protective equipment

Subcategory	Chemical	Comment
Consumptive intermediate in polymer, etc. manufacture	Acrylamide	Monomer use (polyacrylamides)
	Acrylic acid	Monomer
	Acrylonitrile	Monomer, acrylic fibers, ABS resins, nitrile rubber
	1,3-Butadiene	Polymer and rubber intermediate
	Butyl acrylate	Monomer for emulsion polymers and acrylic elastomers
	Chloroprene	Monomer for polychloroprene
	1,4-Dichlorobenzene	Derivative for polyphenylene sulfide resins
	1,2-Dichloroethane	Vinyl monomer
	1,2-Dichloropropane	Derivative for ion-exchange resins
	3,3'-Dimethylbenzidine	Polyurethane elastomers
	Epichlorohydrin	Epoxy resins, epichlorohydrin elastomers
	Ethyl acrylate	Monomer for acrylic resins
	Ethylene	Derivative LDPE, HDPE
	Ethylene glycol	Polyester manufacture, PET materials
	Ethyleneimine	Monomer for polyaziridine and polymer modifier
	Formaldehyde	
	Isobutyraldehyde	Used in the manufacture of resins and rubber

Subcategory	Chemical	Comment
Consumptive intermediate in polymer, etc. manufacture	4,4'-Isopropylidenediphenol	Epoxy and polycarbonate resins
	Maleic anhydride	Polyurethane resins and copolymer use
	Melamine	Used in laminates, molding compounds, textile treatment resins
	Methyl methacrylate	Plastic sheets and moldings, extrusion compounds
	Methylenebis (phenylisocyanate)	Derivative of plastics and elastomers and urethane resins
	Phenol	Nylon to manufacture phenolic resins
	Phosgene	Polycarbon resins
	Quinone	Manufacture of unsaturated polyesters
	Styrene	Polystyrene, ABS resins, polyester resins, SBR rubber
	Sulfuric acid	Synthetic plastics and rubber
	Terephthalic acid	Polyester fibers, polyethylene tetrephthalate polymer films and plastics
	Toluene-2,4-diisocyanate	Polyurethanes
	Toluene-2,6-diisocyanate	Polyurethanes
	Vinyl acetate	Polyvinyl chloride copolymer, polyvinyl emulsions
	Vinyl chloride	PVC manufacture
	Vinylidene chloride	
Liquid additive	Bis(2-ethylhexyl) adipate	Plasticizer for various polymers
	Butyl benzyl phthalate	Plasticizer for vinyl, vinyl acetate, and other polymers
	Cumene hydroperoxide	Polymerization initiator
	Di-(2-ethylhexyl)	Plasticizer for PVC and others
	Diepoxybutane	Polymer curative
	Diethyl phthalate	Plasticizer for PVC
	Dimethyl phthalate	Plasticizer
	n-Dioctyl phthalate	Plasticizer for PVC and other plastics and elastomers
	1,4-Dioxane	Plasticizer
	2-Ethoxyethanol	Plasticizer
	Hydrazine	Blowing agent in foamed plastics
	Peracetic acid	Epoxy resins, plasticizers and bleaching agent for nylon and acrylic fibers
	Propylene oxide	Urethane polyols
	Quinoline	Imparts ion exchange capacity in polymers
	Sodium hydroxide (solution)	Rubber latex stabilizer
Solid additive	Benzoyl peroxide	Initiator and cross link agent in polymer manufacture
	Biphenyl	Plasticizer in PVC
	3,3'-Dichlorobenzidine	Coupling agent, curing agent
	Diethanolamine	Polyurethane crosslinker, rubber curing agent
	2,4-Dinitrotoluene	Chain extender, monomer, and plasticizer
	2,6-Dinitrotoluene	Chain extender, monomer
	Ethylene thiourea	Accelerator and vulcanizer in rubber
	Hexachloroethane	Plasticizer
	Hexachloronapthalene	Components in electrical encapsulating compounds
	Hydroquinone	Polymerization inhibitor, anti-oxidants, curing agent
	4,4'-Methylenebis (2-chloroaniline)	Curing agent and insulator in epoxy systems
	4,4'-Methylenedianiline	Rubber antioxidant, resin intermediate
	alpha-Naphthylamine	Rubber antioxidant
	p-Nitrosodiphenylamine	Inhibitor in production of styrene
	p-Phenylenediamine	Aramid fibers, thermoplastics, antioxidant for polyolefin plastics, rubber oxidant
	Phthalic anhydride	Phthalic ester plasticizers, polyesters, alkyd resins
	Titanium dioxide	Plastics
	2,4,5-Trichlorophenol	Preservative in polymer manufacture
Resin carrier solvent	Acetonitrile	Solvent for polymers
	Dichloromethane	Extrusion of triacetate fiber, blowing agent, and bonding agent
	Freon 113	Blowing agent for polyurethane foams
	Nitrobenzene	Polyester solvent
	2-Phenylphenol	Dye stuff carrier for polyester fibers

RELEASE INFORMATION - PULP, PAPER, AND TEXTILE PROCESSING

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Pulp processing	Release from pulping process	Routine	Vent to scrubber or boiler	Engineering estimate	Process wastewater	Routine	Aeration, biological treatment	Engineering estimate	Disposal of process wastes	None	Routine	Incineration in waste boilers	Engineering estimate	Release from process and process waste	Routine	Personal protective equipment
	Wastewater aeration	Continuous	None	1) Engineering estimate 2) Emission factor	None	N/A	None	N/A								
Paper processing	Handling of chemical prior to paper use	Sporadic	None	Engineering estimate	None	N/A	None	N/A	None	None	N/A	None	N/A	Handling of chemical prior to paper use	Intermittent	Personal protective equipment
Textile processing	Release from textile process (liquids)	Continuous	Condenser	Engineering estimate	Process wastewater	Routine	Aeration, biological treatment	Engineering estimate	None	None	N/A	None	N/A	Release from process and process waste	Routine	Personal protective equipment

Subcategory	Chemical	Comment
Pulp processing	Chlorine	Bleaching agent in pulp manufacture
	Chlorine dioxide	Bleach for wood pulp
	Chloroform	
	Nitrilotriacetic acid	Pulp processing
	Sodium hydroxide (solution)	Wood pulp, groundwood pulp bleaching, woodboard made from agricultural residues
	Sodium sulfate (solution)	Kraft pulping agent
	Sulfuric acid	Pulp processing
Paper processing	Acetamide	Humectant for paper
	Acrolein	Slimicide in paper
	Chlorine	Bleaching agent in paper manufacture
	Melamine	Used in paper coatings
	Nitrilotriacetic acid	Paper processing
	2-Phenylphenol	Preservative in timber and paper
	Sulfuric acid	Paper processing
	2,4,5-Trichlorophenol	Antimicrobial-paper
Textile processing	Aniline	Intermediate in the production of fibers
	Bis(2-chloro-1-methyl ethyl) ether	Textile processing component
	Bis(2-chloroethyl) ether	Textile scouring agent
	Chlorine dioxide	Bleach for textile
	Diethanolamine	Used in textile specialities
	Nitrilotriacetic acid	Textile treatment
	Sodium hydroxide (solution)	Textile processing
	Tetrachloroethylene	Textile processing
	2,4,5-Trichlorophenol	Antimicrobial-textile
	Vinyl bromide	Used with vinyl chloride to impregnate or laminate fibers

RELEASE INFORMATION - WATER TREATMENT CHEMICALS

Subcategory	Air releases				Wastewater releases				Solid and nonaqueous liquid releases					Occupational exposures		
	Types of releases	Release frequency	Controls in use	Release estimation method	Types of releases	Release frequency	Controls in use	Release estimation method	Onsite land release	Offsite transfer	Release or transfer frequency	Onsite treatment methods	Release estimation method	Types of exposures	Exposure frequency	Controls in use
Corrosion inhibitor	Water cooling tower	Continuous	None	1) Emission factor 2) Engineering estimate	Boiler blowdown	Intermittent	None	Engineering estimate	None	None	N/A	None	N/A	Spills of the chemical	Sporadic	None
Disinfectant	Storage pressure relief valves (acids)	Sporadic	Vent to scrubber	Engineering estimate	Potential release during upset conditions	Sporadic	None	Engineering estimate based on usage of the chemical	None	None	N/A	None	N/A	Potential dermal exposure	Sporadic	Personal protective equipment (gloves)
Neutralization	Storage pressure relief valves (acids)	Sporadic	Vent to scrubber	Engineering estimate	Spills or upset condition	Sporadic	None	Engineering estimate	None	None	N/A	None	N/A	Potential dermal exposure	Sporadic	Personal protective equipment

Subcategory	Chemical	Comment
Corrosion inhibitor	Hydrazine	Corrosive protection for boilers, hot-water systems, and in oil-well casings
	Nitrolotriacetic acid	Boiler water treatment chemical
Disinfectant	Chlorine	Disinfectant
	Chlorine dioxide	Disinfectant
Neutralization	Hydrochloric acid	Neutralization
	Sodium hydroxide (solution)	Neutralization

APPENDIX F

CASE STUDY

RISK SCREENING CASE STUDY

INTRODUCTION

This case study applies the risk screening procedure to a community in which release data are reported on 14 chemicals and one chemical class emitted from three facilities. It illustrates a qualitative procedure for identifying the relative toxicological potency of specific chemicals and chemical classes, plausible exposure pathways, relative environmental levels of chemicals, and the highest priority potential risk scenarios for followup investigation. The case study also shows how information on the Facility Worksheets and Relative Risk Worksheets is recorded and evaluated at each step of the risk screening procedure.

THE SCENARIO

Three companies reporting substantial SARA 313 releases are located in a 300-acre industrial park near Chemical Town, USA. Table 1 contains the name of each reporting facility in the Chemical Town Industrial Park Complex and its total annual releases of listed toxic chemicals. The information presented in this table is based largely on data from actual TRI submissions, but the names of the facilities are fictitious. These companies have permits for discharging some of the chemicals to air and water. Other chemicals may be regulated under various industry- or waste stream-specific provisions.

A map of the area (Figure 1) shows that the industrial park is bisected by a two-lane road and a rail line. Notice that there appears to be an additional one to three facilities in the industrial complex which may be contributing to the area's toxic chemical burden but were not required to report under Section 313 of SARA.

With some assistance from the Census data at the local planning agency and a nearby airport, demographic and meteorological charts such as those presented in Table 2 and Figure

2 could be generated. In addition, a local health official would normally have a general knowledge of local topography, land uses, population distribution, and the approximate location of schools, hospitals, and other institutions in the vicinity of the reporting facilities. The known data from these sources are summarized below.

According to Table 2, Chemical Town is a small city of approximately 2,000 people. It is located about 4 km from the industrial park. Two smaller communities (each with less than 100 people living in them) are located closer to the industrial park, and a large city of some 250,000 people (Anywhere, USA) is located about 20 km away in an adjacent county.

The land use is predominantly semi-rural, with houses clustered along major roads. A large hospital is located in Chemical Town, along with several schools, none closer than 4 km from the complex. A small wildlife refuge is located along a canal, south/southwest of the industrial park.

Prevailing winds, usually gentle and steady, are from the west and northwest, generally toward Chemical Town, and not in the direction of Anywhere. None of the facilities have smokestacks which are higher than 10 meters.

The average yearly rainfall in the area is about 35 inches, spaced relatively evenly throughout the fall, winter, and spring. The industrial park lies on clay/loam soil near the banks of a large river (Local River), which receives the park's waterborne releases. The mean flow rate of Local River near Chemical Town is about 45,400 million liters/day (MLD). This flow rate is comparable to the Mississippi River in Minnesota, or the upper regions of the Susquehanna River in Pennsylvania, and is larger than the Potomac River near Washington, D.C. No drinking water utility intakes are located downstream of these release points, although several small community wells lie within 10 km of the industrial park. Although the water table is shallow, no drinking water is drawn from the top aquifer layer. This segment of the Local River is not used for recreation.

THE RISK SCREENING PROCESS

There are some situations in which risk screening is unnecessary. Any chemicals that meet the following criteria may be exempted from the risk screening process: (1) the chemical is the subject of a chemical-specific permit or emission standard; and (2) the requirements specified in the permit or standard are ones that can be compared to the TRI data (i.e., total pounds of chemical per year into air, water, or land from all facility operations).

Although many TRI chemical releases are at least indirectly controlled by air, water, or land disposal regulations, few are the subject of chemical-specific release permits or standards. Most EPA regulations specify ambient levels of chemicals (e.g., concentrations in community air or drinking water). Those release-based regulations that do exist are usually for classes of chemicals (e.g., volatile organic compounds). The few release-based permits or standards that are chemical-specific also are industry- and process-specific. Therefore, the comparison of TRI data to existing EPA standards will not be straightforward.

For example, benzene is the only one of the chemicals released to air in this case study for which there is an EPA air emission standard, a National Emission Standard for Hazardous Air Pollutant (NESHAP). Both the XYZ Refining Corp. and Chemicals Unlimited release benzene into the air. NESHAPs are both industry- and process-specific. Therefore, to determine whether the TRI benzene releases reported by these facilities are subject to and in compliance with the benzene NESHAP, it is necessary to know whether the companies are among the industries subject to the NESHAP; which processes are regulated; and what percentage of the TRI releases are emitted from these processes.

For purposes of this case study, it is assumed that no relevant and applicable emission standards, against which the TRI releases can be readily compared, exist on any of the chemicals released from the Chemical Town Industrial Park facilities.

COLLECTING AND RECORDING DATA ON FACILITY WORKSHEETS

The risk screening procedure presents a step-by-step approach to organizing and recording exposure and toxicological potency information used for relative risk ranking. For each facility, the risk screener fills out three worksheets - the Facility Worksheet on Site-Specific Data; the Facility Worksheet on Chemical-Specific Data; and the Relative Risk Worksheet. The worksheets are prepared for releases into each environmental medium. The data to be evaluated and recorded on these Worksheets are described below.

Releases to Air

For the **Facility Worksheet On Site-Specific Data** (Site-Specific Exposure Data), the following data should be characterized and recorded as indicated. Refer to the filled-out Facility Worksheet On Site-Specific Data on page F-17 to see how these data are recorded.

1. *Site Location.* The facility location is the most specific data available on the location from which chemicals are released. The Chemical Town Industrial Park is located north of the intersection of Routes 2 and 7. The risk screening procedure suggests grouping facilities where releases are close together. Since all reporting facilities are within one-half mile of each other and no residences, wells, or recreational areas are located in between, grouping is appropriate.

2. *Radius of Inner Zone.* Since facilities have been grouped, the locations of their probable releases to air also should be grouped. The screening procedure suggests that the user record an Inner Zone with a radius of 1 mile on the Facility Worksheet for Site-Specific Data unless there is reason not to do so. In this case, there are no apparent reasons to select an alternative radius. Draw the Inner Zone on the area map (Figure 1).

3. *Populations of Interest.* Two small populations reside within the Inner Zone: a cluster of 51 residents SSE; and another cluster of 12 residents WNW of the Chemical Town

Industrial Park. Record these populations under "Species Name" along with information about their size on the Facility Worksheet for Site-Specific Data. The presence of sensitive subpopulations within either cluster of residents is unknown. Therefore, record "data gap" under "Sensitive Subpopulations" on the Worksheet.

The Outer Zone is defined as those areas beyond the Inner Zone that contain populations of interest that are likely to be exposed. Since the predominant wind pattern in the area is in the ESE direction, across the industrial park toward Chemical Town, the Outer Zone should be skewed in this direction. Although the exact shape and size of the preliminary Outer Zone cannot be illustrated with certainty, it could reasonably be assumed to encompass all of Chemical Town. In addition, the wildlife refuge along the canal might also be considered to be within the Outer Zone (Figure 1).

4. *Potential Exposure Routes.* Contact with air is expected to occur through breathing.

5. *Exposure Factors (Site-Specific)*

a. *Wind Direction.* Since the prevailing winds are in the ESE direction, the cluster of 51 residents and the residents in Chemical Town are in the most downwind direction of the release site. A "+(WD)" is recorded under Exposure Factors for these two populations.

b. *Release Height.* Since none of the facilities have smokestacks higher than 10 meters, release heights will be relatively low. Therefore, populations of interest closest to the facility are more likely to be exposed than those further away. No notation is made for release height on the Facility Worksheet.

For the **Facility Worksheet on Chemical-Specific Data**, the following data should be characterized and recorded as indicated. Refer to the filled-out Facility Worksheet on Chemical-Specific Data on page F-18 to see how these data are recorded.

A. *TOXICOLOGICAL POTENCY*

The next step is to identify the chemicals released from the industrial complex facilities of highest toxicological potency for the populations of interest. The risk screening procedure directs the user to consider the expressions of toxicological potency from as many of the EPA toxicity indices presented in Appendix A of the Guide as are relevant to the populations of interest. Therefore, the screener should examine all the expressions of toxicological potency relevant to humans and terrestrial organisms (i.e., the acute RQ, chronic RQ, and potential carcinogenicity RQ; the EPA reference dose; and cancer potency). Table 3 summarizes the information from Appendix A in the Guide for the case study chemicals.

Unless the specific exposure scenario warrants otherwise, the lowest group number (most toxic) among the relevant end effects for which the chemical has been scored on Table 3 should be selected for entry onto the Facility Worksheet. For chemical classes, judgment must be used in selecting the most appropriate chemicals to represent the toxicological potency of the class. Consideration should be given to what chemicals in the class are likely to be released based on the facility's industrial operations.

Following the above guidance, benzene, carbon tetrachloride, pyridine and lead compounds should be listed as Group 1 chemicals under "Toxicological Potency" on the Worksheet. Group 2 chemicals include chlorine, dichlorobenzene, hydrochloric acid, sulfuric acid, 1,2,4-trichlorobenzene, and toluene. No toxicological potency data exist on 1,2,4-trimethylbenzene. All of the lead compounds are in Group 1 for toxicity relevant to humans (chronic toxicity or cancer). For later reference, note those chemicals for which acute toxicity is the effect of greatest concern (i.e., lowest group number).

B. *CHEMICAL-SPECIFIC EXPOSURE DATA*

1. *Quantity of Release.* The risk screening procedure suggests that quantities of release for each chemical (aggregated for grouped facilities releasing the same or similar chemical) be assigned "high," "medium," or "low." Appendix C suggests that the user

develop an approach to ranking release quantities that accurately reflects the user's priorities. One approach is to compare the reported release quantities for facilities in Chemical Town Industrial Park (Table 1) and determine where significant breaks in volume occur. For example, aggregated release quantities of 400 pounds or less can be considered "low"; between 400 and 22,493 pounds can be considered "medium"; and more than 22,493 pounds can be considered "high." Using these categories, record "L" under Release Quantity for lead, sulfuric acid, and hydrochloric acid; "M" for chlorine, 1,2,4 trichlorobenzene, toluene, and pyridine; and "H" for benzene, carbon tetrachloride, and dichlorobenzene.

Another approach is to compare the release quantities to national median releases to air (Appendix C, Table C1). Where the release quantity for a particular facility is at least an order of magnitude greater than the national median (fugitive and stack combined), the user can flag the chemical with a (+) under Release Quantity. Some chemicals may be assigned to the "medium" category for release quantity but may be flagged with a (+); such chemicals may warrant the same level of concern as those designated as "high" if exposure factors are also flagged (see below).

2. *Exposure Factors (Chemical-Specific).*

a. *Environmental Transformation.* According to Appendix D, both carbon tetrachloride and lead compounds are likely to be persistent in air. Fallout or rainout from the air of either or both of these compounds may result in significant soil or water concentrations in the area and exposures via other routes. Record a "+(ET)" under carbon tetrachloride and lead compounds on the Facility Worksheet.

b. *Release Rate.* Three chemicals, chlorine, sulfuric acid, and hydrochloric acid, were listed exclusively for their acute toxicity concerns. Although their overall release volumes may not be high, any of these chemicals could present risks of concern if the annual releases occur in a few large "pulses." Insufficient information on the nature of industrial processes at either MNO Chemical Corp. (chlorine and hydrochloric acid releases to air)

or Chemicals Unlimited (chlorine and sulfuric acid releases to air) are available to use the Release Guidance in Appendix D. The screener can "flag" this concern on the Facility Worksheet with a "+(RR)?" for these chemicals and note the additional information needed under Data Gaps.

Releases to Other Media

There are other releases to surface water and land from facilities in the industrial park. For these releases, no populations of interest have been identified in the scenario. There are no drinking water intakes or recreation uses on this segment of the Local River and no drinking water is drawn from the top aquifer. Therefore, for risk screening purposes, releases to surface water or land are not likely to result in direct exposures to populations of interest. However, there could be indirect entry to air from other media. Examine the procedures for evaluating Releases to Surface Water and Releases to Land in the risk screening procedure in Section III of the Guide. Notice that under Volatilization (II.B.2.c. for Surface Water and II.B.2.b. for Land) the screener is directed to consider releases to air for highly volatile chemicals. Among the chemicals released from the industrial park facilities, only carbon tetrachloride is listed in Appendix D as having a high rate of migration from water or land into air. Carbon tetrachloride is not released into either media (Table 1).

Setting Priorities for Followup Investigation

The **Relative Risk Worksheet** is used to record the results of the risk ranking performed at this step of the risk screening procedure. Refer to the filled-out Relative Risk Worksheet on page F-19 to see how these results are recorded. The objective of this step is to set risk-based priorities for followup investigation of facilities, chemicals, and populations of interest.

All Facility Worksheets for each medium should be considered together. Since facilities were grouped for purposes of risk screening, there is one set of Facility Worksheets for all facilities. In this case study, since releases to other media are not of potential concern (given

the information available), there is only one set of Facility Worksheets, i.e., for Releases to Air.

INNER ZONE

Of the two populations within the Inner Zone, the 51 residents SSE of the facility are at highest potential risk due to TRI chemical releases from the Chemical Town Industrial Park. This population resides in the prevailing downwind direction of the winds blowing across the industrial park.

Among the chemicals released, the data on the Facility Worksheets suggest that carbon tetrachloride, a Toxicological Potency Group 1 (High Concern) chemical, could also be present at highest potential environmental levels. Carbon tetrachloride is released in high amounts and is persistent. The data on the other Group 1 chemicals suggest that they may be present at lower potential environmental levels. Therefore, potential exposures to carbon tetrachloride of the 51 residents in the Inner Zone are listed under "High Priority Facilities/ Populations/Chemicals" on the Relative Risk Worksheet for purposes of followup investigation.

The 12 residents in the upwind direction of the industrial park are determined to be at less relative risk and listed under the "Moderate Priority Facilities/Populations/Chemicals" on the Relative Risk Worksheet.

Likewise, the potential exposure to the remaining Group 1 chemicals of the 51 residents is considered as "Moderate Priority," relative to their potential exposures to carbon tetrachloride. (NOTE: Even though lead compounds are released in low quantities, lead may accumulate in the soils and result in indirect exposures via land.)

OUTER ZONE

Among the Outer Zone populations of interest, the residents of Chemical Town are within the most plausible exposure pathway due to the prevailing wind patterns in the area. In addition, the size of the population is known and substantial, and potentially sensitive

subpopulations are known to exist. Therefore, residents of Chemical Town are listed as a "Moderate Priority" on the Relative Risk Worksheet. Additional information on the wildlife refuge populations of interest and an understanding of agency program priorities would be required to assign the wildlife refuge to a followup priority category.

FOLLOWUP ACTIVITIES

With the information on the Relative Risk Worksheet and under "Data Gaps" on the Facility Worksheets, the risk screener can assign followup risk-based priorities for further action. These might include:

1. Obtain copies of the EPA Fact Sheets on the Group 1 chemicals, and perhaps 1,2,4 trimethylbenzene (the chemical without Toxicological Potency data), to learn more about the nature of their potential toxicities and other potential sources of these chemicals in the environment (both natural and anthropogenic).

2. Use Roadmaps to identify Federal and State standards and other information sources on the Group 1 chemicals (Appendix H).

3. Determine the existence of potentially sensitive subpopulations within the two populations of interest in the Inner Zone.

4. Determine the populations of interest in the wildlife refuge.

5. Through discussions with facility contacts listed on Toxic Chemical Release Reporting Form, determine whether "burst" releases occurred for chlorine, hydrochloric acid, or sulfuric acid.

6. Through discussions with the facility contact of Chemicals Unlimited, determine the accuracy of the carbon tetrachloride release estimates.

7. Obtain the services of an expert risk assessment modeler to: (1) assist in obtaining the additional data on carbon tetrachloride, (e.g., chemical properties, releases, and toxicity), and meteorological conditions necessary to estimate potential environmental concentrations; and (2) quantitatively estimate the potential risks of injury from potential carbon tetrachloride exposures to populations of interest (see Appendix G).

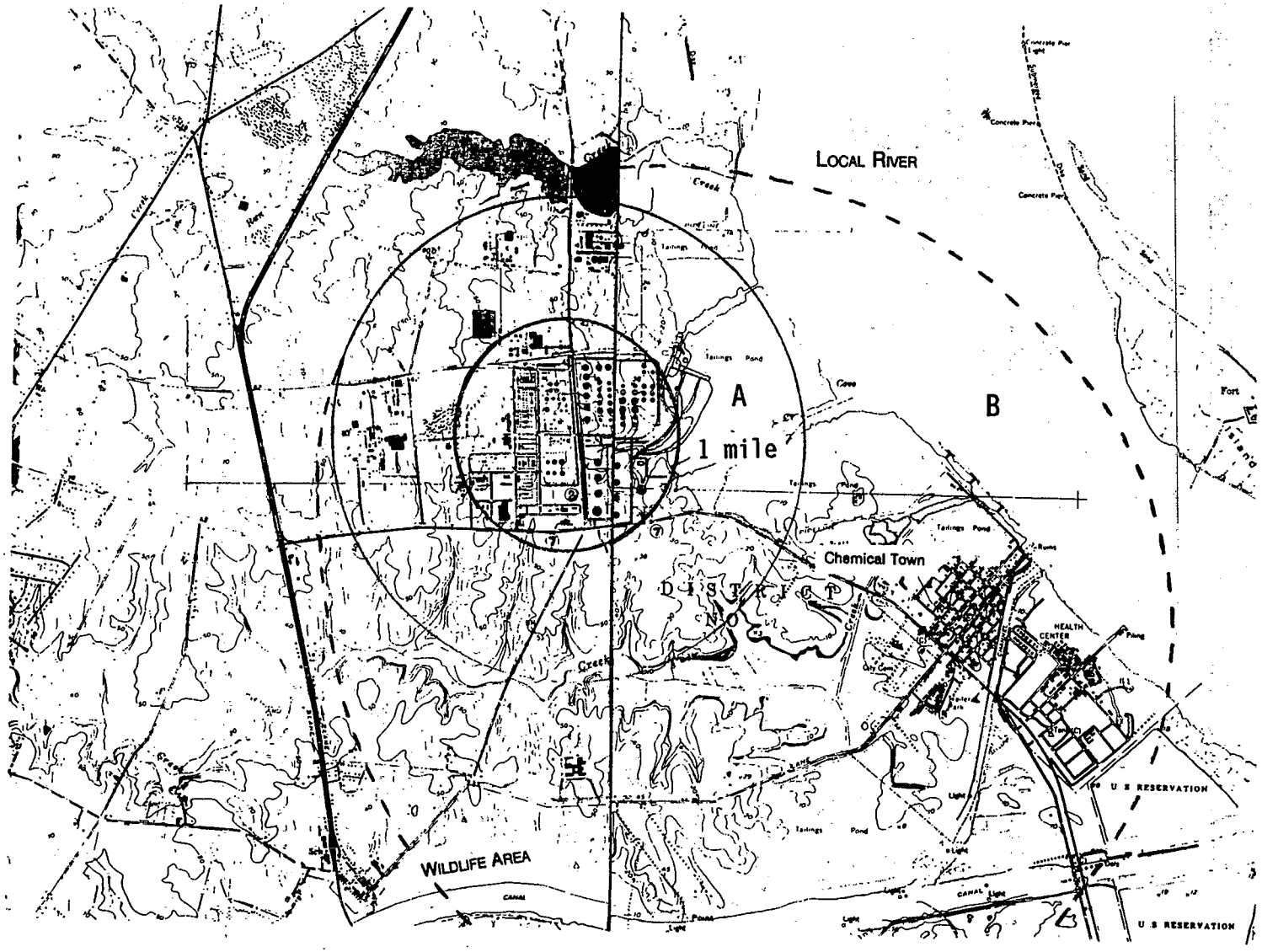
8. Consider carbon tetrachloride a probable worst case compound in your decision on the need to do additional quantitative risk assessment.

9. Compare potential exposures and risks resulting from the industrial park chemical releases with estimates of exposures or risks from other sources of chemicals in the area, (e.g., benzene emissions at gas stations, tetrachloroethylene releases from dry-cleaned clothes, chloroform in chlorinated drinking water, volatile organic compound emissions from waste water treatment plants, etc. (see References, Section III).

Table 1: Chemical Releases by Plant Site

Facility and Chemicals	Media and Annual Release Amount (lb)		
	Air	Water	Land
1. XYZ Refining Corp			
Benzene	23,600	500	5,600
Toluene	18,000	500	23,000
1,2,4 Trimethylbenzene	5,100		
Sodium Sulfate		6,300,000	
Chlorine		8,300	
Diethanolamine		58,000	
Ethylene Glycol		22,000	
Lead Compounds	300		3,300
2. MNO Chemical Corp			
Chlorine	9,000	2,900	
Hydrochloric Acid	200		
Sodium Sulfate		3,800,000	
3. Chemicals Unlimited			
Ammonia		7,360	
Chlorine	13,493		
Benzene	17,916	314	600
1,2,4 Trichlorobenzene	17,357	196	83
Dichlorobenzene	35,098	952	290
Carbon Tetrachloride	57,800		
Sulfuric Acid	400		
Pyridine	10,980	154	

Figure 1: Site Map



A = Inner Zone
B = Outer Zone

Table 2: 1983 Estimated Population Surrounding the Chemical Town Industrial Complex

Kilometers from Site

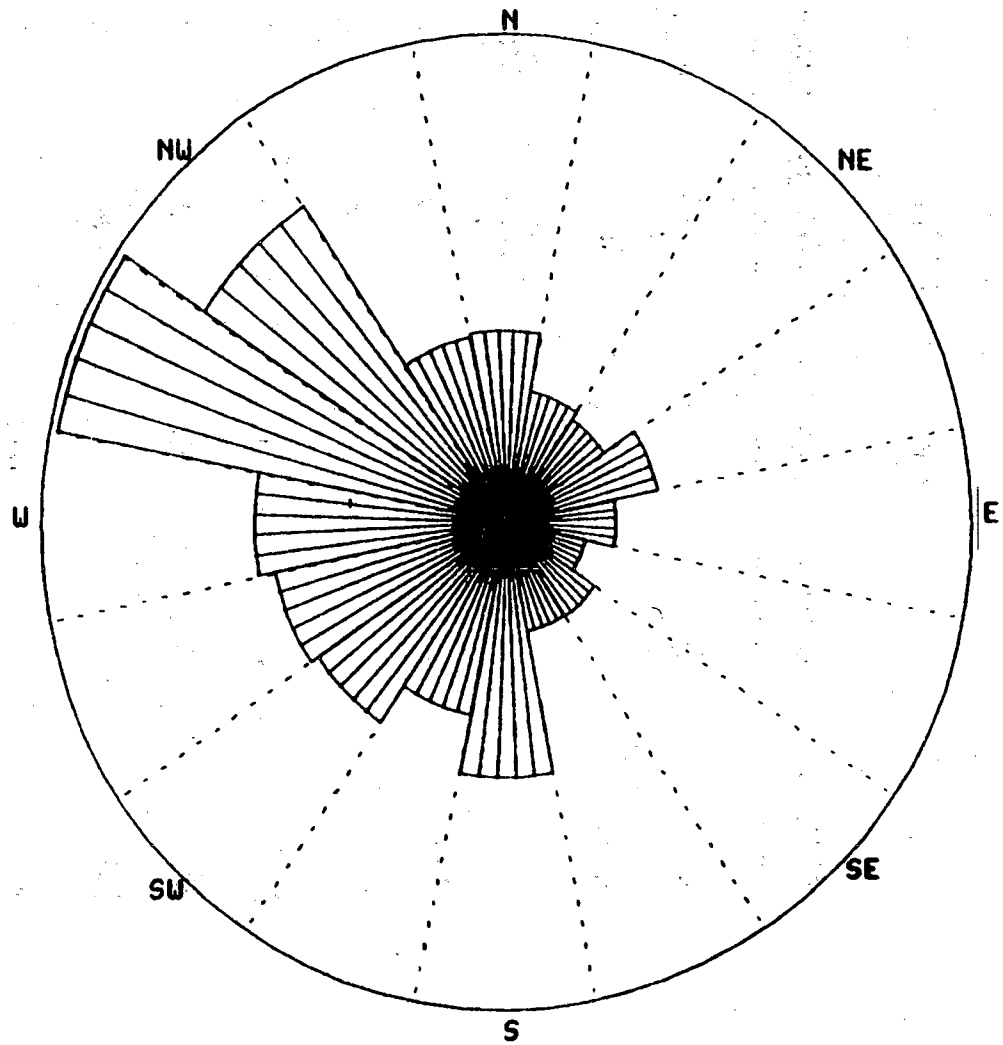
SECTOR	0.00-2.00	2.00-5.00	5.00-7.50	7.50-10.0	SECTOR TOTALS
N	0	0	1484	9357	10841
NNE	0	0	0	6885	6885
NE	0	0	1258	2188	3446
ENE	0	0	0	0	0
E	0	0	0	0	0
ESE	0	937	0	0	937
SE	0	942	0	0	942
SSE	51	0	445	0	496
S	0	1205	0	0	1205
SSW	0	0	0	0	0

Figure 2: Wind Rose

STAR STATION ANYWHERE, USA 1960-1964

PLOT TYPE = WIND DIRECTION

SECTOR	(FREQUENCY)
N	5.875E-02
NNE	4.093E-02
NE	3.818E-02
ENE	4.977E-02
E	3.519E-02
ESE	2.572E-02
SE	3.401E-02
SSE	3.345E-02
S	7.712E-02
SSW	5.899E-02
SW	7.220E-02
WSW	7.508E-02
W	8.030E-02
WNW	1.466E-01
NW	1.159E-01
NNW	5.781E-02



This map shows the frequency with which the wind blows from the indicated direction.

TABLE 3: Toxicity Data for Chemicals

			Human Health or Terrestrial Toxicity						Aquatic Ecotoxicity		
CHEMICAL NAME	CAS#	LIST[1]	Acute TPQ	Chronic RQ Acute	RQ CTX	Cancer RfD	RQ PC	Acute Unit Risk	RQ Aqtx	WQC Acute	WQC Chronic
Ammonia	7664417	a,b,c	2	3	2				1	x	x
Benzene	71432	a,b		3	2		1	1	1	2	
Carbon Tetrachloride	56235	a,b		3	1	1	1	1	2	3	
Chlorine	7782505	a,b,c	1	2					1	1	1
Dichlorobenzene	25321226	a,b,c	1	2						2	1
Diethanolamine	111422	a									
Ethylene Glycol	107211	a				3					
Hydrochloric Acid	7647010	a,b,c	2	3					3		
Pyridine	110861	a,b		3	1	1			3		
Sodium Sulfate	7757826	a									
Sulfuric Acid	7664939	a,b,c	3	2					2		
1,2,4 Trichlorobenzene	120821	a,b		3	2	2			1		
1,2,4 Trimethylbenzene	95636	a									
Toluene	108883	a,b		3	2	2			2	3	
(Lead Compounds)											
Lead	7439921	a,b		3		y	1	1		1	1
Lead acetate	301042	b		3	1		1		3		
Lead chloride	7758954	b			1				3		
Lead nitrate	10099748	b		3	1				3		
Lead phosphate	7446277	b			1		1				

[1] a=§313; b=§304 (RQ); c=§302 (TPQ)
x Criteria are pH and temperature dependent -- see WQC document.
y Causes non-cancer effects, but EPA is not able to estimate values at this time.

TPQ = Threshold Planning Quantity
RQ = Reportable Quantity
Aqtx = Aquatic Toxicity
CTX = Chronic Mammalian Toxicity
PC = Potential Carcinogenicity
RfD = EPA Reference Dose
Unit Risk = EPA Cancer Potency Factor
WQC = Water Quality Criteria
Acute = freshwater fish acute toxicity
Chronic = freshwater fish chronic toxicity

I. FACILITY WORKSHEET
Site-Specific Data

For Releases to: *Air*
(Medium -- Air, Surface Water or POTW, Land)

From Site: (1) *Chem. Town Industrial Park/N intersec. 2 and 7*
(Name and Location of Release Site)

	(3) POPULATIONS OF INTEREST			(4) POTENTIAL EXPOSURE ROUTE			(5) EXPOSURE FACTORS
	Species Name	Size	Sensitive Subpopulations	Medium Uses	(from Site of Release) Direction	Distance (miles)	
INNER ZONE OF EXPOSURE EVALUATION							
(2) Radius of Inner Zone *1 mile* (e.g. Air: 1 mi)							
1.	*Residents*	*51*	*data gap*	*breathing*	*SSE*	--	*+(WD)*
2.	*Residents*	*12*	*data gap*	*breathing*	*WNW*	--	
3.							
4.							
OUTER ZONE OF EXPOSURE EVALUATION							
5.	*Chemical Town residents*	*2,000+*	*several schools, hospitals*	*breathing*	*SE*	*2-3*	*+(WD)*
6.	*Wildlife refuge*	*data gap*	*data gap*	*breathing*	*SSW*	*2.5*	
7.							
8.							

DATA GAPS

1. *Uncertainty regarding the existence of sensitive subpopulations.*
2. *Uncertainty regarding the existence of sensitive subpopulations.*
6. *Species, including sensitive species, not known.*

II. FACILITY WORKSHEET

Chemical-Specific Data

For Releases to: *Air*
(Medium -- Air, Surface Water or POTW, Land)

From Site: (1) *Chem. Town Industrial Park/N intersec. 2 and 7*
(Name and Location of Release Site)

A. TOXICOLOGICAL POTENCY Chemical Name	B. EXPOSURE DATA (1) Release Quantity (vs. ntl. median)	(2) Exposure Factors[1]		C. DATA GAPS
GROUP 1 (HIGH CONCERN)				
A. *Benzene*	*H*			
B. *Carbon Tetrachloride*	*H*	+	+*(ET)*	
C. *Pyridine*	*M*			
D. *Lead Compounds*	*L*		+*(ET)*	
GROUP 2 (MODERATE CONCERN)				
E. *Chlorine*	*M*	+	+*(RR)?*	*Insufficient information to estimate release rates*
F. *Dichlorobenzene*	*H*	+		
G. *Hydrochloric Acid*	*L*		+*(RR)?*	"
H. *Sulfuric Acid*	*M*		+*(RR)?*	"
I. *Chlorine*	*M*		+*(RR)?*	
J. *1,2,4 Tricholorobenzene*	*M*	+		
K. *Toluene*	*M*			

OTHER DATA GAPS

1,2,4 Trimethyl benzene -- insufficient toxicological potency data

[1]Exposure Factor Symbols

AD = Adsorption	DI = Dilution	RH = Release Height	TR	=	Treatment
AQ = Aquifer Depth	ET = Environ Transformation	RR = Release Rate	VO	=	Volatilization
BC = Bioconcentration	LE = Leaching	SO = Soil	WD	=	Wind Direction
CO = Contaminant	RF = Rainfall	TB = Treatability	WE	=	Wind Erosion

Others:

III. RELATIVE RISK WORKSHEET

For Releases to: *Air*
(Medium -- Air, Surface Water or POTW, Land)

PLAUSIBLE EXPOSURE PATHWAY			POTENTIAL ENVIR LEVELS	TOX POTENCY
Release Site Location	Population of Interest	Medium Uses	Chemical Names	Chemical Names
HIGH PRIORITY FACILITIES/POPULATIONS/CHEMICALS				
1. *Chem. Town Indus. Park*	*51 residents*	*breathing*	*B*	*B*
2.				
3.				
4.				
MODERATE PRIORITY FACILITIES/POPULATIONS/CHEMICALS				
5. *Chem. Town Indus. Park*	*51 residents*	*breathing*		*A, C, D*
6. *Chem. Town Indus. Park*	*12 residents*	*breathing*	*B*	*A, B, C, D*
7. *Chem. Town Indus. Park*	*Chemical Town*	*breathing*	*B*	*A, B, C, D*

APPENDIX G

SYSTEMS AND MODELS FOR EVALUATING RISKS OF ENVIRONMENTAL POLLUTANTS

SYSTEMS AND MODELS FOR EVALUATING RISKS OF ENVIRONMENTAL POLLUTANTS

Chemical Scoring System for Hazard and Exposure Assessment (CSSHEA)

CSSHEA is a qualitative ranking system used by the EPA Office of Toxic Substances (OTS) to screen and prioritize chemicals for further assessment. It is a first-cut, rapid way of evaluating a large number of chemicals to assist in focusing resources at later stages of assessment. CSSHEA incorporates both hazard and exposure potential.

For each chemical, two scientists with relevant expertise separately score eleven exposure and hazard parameters on a scale of 0 to 9. To score, the scientists review a source document, such as an EPA Health and Environmental Effects Document (HEED), that summarizes the relevant human, animal, genotoxic, and environmental data on the chemical. Scorers use objective criteria to assign a numerical score when data are available, or analog/structure-activity relationships in the absence of data. Scorers may raise or lower a score based on professional judgment, and must provide a rationale for each assigned score. If scores differ by more than one point, the scientists must resolve the difference.

At OTS, any chemical with at least one hazard parameter and one exposure parameter of 8 or 9 is assigned a high priority for further assessment. Only a small portion of the Section 313 chemicals have been scored by OTS. The main obstacle to using this system for Section 313 data evaluation is that a source document (that reviews and summarizes the literature) is essential to scoring. Also, nationwide, averaged data are used to estimate exposure for the ranking system; Section 313 data would require consideration of facility-specific emissions.

For more information, contact:

Office of Toxic Substances
U.S. EPA, TS-792
401 M Street, S.W.
Washington, D.C. 20460

Graphical Exposure Modeling System (GEMS)

The U.S. EPA Office of Toxic Substances developed the Graphical Exposure Modeling System (GEMS) as an interactive information management tool designed to assist in a quick and meaningful analysis of environmental problems. GEMS, as an operating environment, ties together several previously discrete tools into a coordinated system that allows for multiple types of analyses. These tools include enviromental fate and transport models, chemical property estimation techniques, statistical analyses, and graphical and mapping programs. Under development since 1981, GEMS has several uses, such as chemical property estimation, data management, geographic data analysis and mapping, and statistical analysis. GEMS can be accessed by telephone from virtually anywhere in the United States and requires no previous knowledge of computer programming to operate.

The GEMS data base supports most types of environmental data useful for exposure assessments of toxic substances. One of the features that makes GEMS so powerful is the ready availability of data for use with the models and mapping procedures. These data include industrial facility discharge data, meteorological data, chemical property data, water supply data, ground-water data, soil textural data, and census data. GEMS User's Guide provides descriptions of each data set.

In order to meet the growing demands of EPA modelers for access to the features of GEMS, a Personal Computer (PC) version of the Graphical Exposure Modeling System (PCGEMS) has been developed. PCGEMS has many of the same features as GEMS but is accessible at a local level on a desk top computer.

For more information, contact:

Russell Kinerson
Modeling Section Chief
Exposure Assessment Branch
U.S. EPA
401 M St., S.W.
Washington, D.C. 20460

Hazard Ranking System (HRS)

The HRS is the principal mechanism for placing sites on the National Priority List (NPL). The HRS considers chemical toxicity characteristics and both site- and chemical-specific exposure parameters to provide a relative potential risk ranking of sites. The HRS evaluates relative risk over four pathways - ground water, surface water, air, and onsite. This approach assigns values to factors related to, or indicative of, risk for each pathway. The factors are grouped into three factor categories - targets, likelihood of release, and waste characteristics. Factor category scores are multiplied together within each pathway and normalized to obtain a pathway score. Pathway scores are combined to give an overall HRS site score.

Factors considered under targets for each offsite migration pathway - ground water, surface water, and air - include population size, sensitive populations, target distance, media uses (i.e., ground-water use for the ground-water pathway; drinking water, food, recreational, and environmental threat for the surface water pathway; and land use for the air pathway). Factors considered under likelihood of release for the ground-water pathway are depth to aquifer/hydraulic conductivity, net precipition, sorptive capacity, and containment. For the surface water pathway, the factors considered are overland flow (containment, runoff, and distance to surface water) and potential to release by flood. For the air pathway, the potential to release (source type, source mobility, and source containment) is considered. Factors considered under waste characteristics for all three offsite pathways include toxicity, hazardous waste quantity, mobility, and persistence.

The risk screening procedure described in this guide is a simplified version of the HRS adapted to the TRI release scenarios. The HRS could be used as a "level II" screen of potential risks associated with TRI releases. Additional site- and chemical-specific data would be required.

For more information, contact:

Office of Emergency and Remedial Response
U.S. EPA, OS-230
401 M St., S.W.
Washington, D.C. 20460

Hazard Analysis Model

The Hazard Analysis Model was developed by EPA's Office of Toxic Substances to help Local Emergency Planning Committees (LEPCs) assess the lethal hazards related to potential airborne releases of hazardous substances, particularly the extremely hazardous substances listed under Section 302 of Title III of SARA.

The analysis process is applied first with screening assumptions, and then with planning assumptions. Reporting facilities may be screened using credible best- or worst-case assumptions. The screening helps planners prioritize facilities so that a more detailed hazard analysis can be conducted for facilities that pose the greatest risk should a release occur. These facilities could then be visited to get more information and input data. After the initial screening, a reevaluation and adjustment of the quantity released and/or the rate of release of chemical can be made. Reevaluation and adjustment of variables - wind speed and air stability, selection of a higher level of concern - can also be performed.

After the analysis process, the likelihood of a hazard occurrence and the severity of consequences are assessed as high, medium, or low. An emergency response plan, required under Title III of SARA, can be formulated based on the information gleaned through this process.

This model has been primarily used for assessing accidental (generally short-term) releases of extremely hazardous substances. While some of the Section 313 chemicals will also be listed under Section 302, many of the Section 313 chemicals will be much less toxic and will be released over a longer period of time. Therefore, this system may not answer all of the emergency planners' questions.

For more information, contact:

Office of Toxic Substances
U.S. EPA, TS-792
401 M Street, S.W.
Washington, D.C. 20460

Modified Hazardous Air Pollutant Prioritization System (MHAPPS)

MHAPPS is a qualitative computerized system used by the EPA Office of Air Quality Planning and Standards (OAQPS) to rank hazardous air pollutants for further assessment. The system prioritizes substances by scoring them in eight factors that reflect the concerns of EPA air programs: oncogenicity, mutagenicity, reproductive and developmental toxicity, effects other than acute lethality, acute lethality, potential for airborne release, bioaccumulation, and existing standards. Worksheets formatted on a PC are used to compile the relevant data from seven standard references, including the Registry of Toxic Effects of Chemical Substances (RTECS) and the Merck Index. Based on these data, scores for each of the eight factors are calculated separately using specific criteria, and the scores of closely related factors are then normalized and combined to give five group scores. Finally, the group scores are weighted (to account for their relative importance), normalized, and combined to give an overall score that is used to give the substance a relative ranking score. The main obstacle to using MHAPPS for Section 313 assessment is that the system can be used only to prioritize chemicals released into the air.

OAQPS is currently developing a ranking system that will prioritize groups of emissions sources (source categorizing) rather than individual compounds. This system will employ the current MHAPPS health effects scoring system but will replace the factor for exposure potential with exposure data specific to airborne releases.

For more information, contact:

Office of Air Quality Planning and Standards
U.S. EPA, MD-10
Research Triangle Park, NC 27711

Remedial Action Priority System (RAPS)

The Remedial Action Priority System (RAPS) was developed by the U.S. Department of Energy (DOE) to help DOE prioritize its hazardous waste sites for further investigation and possible remedial action. RAPS is a computer model designed to estimate health risk from sites containing hazardous or radioactive waste. The health risks are estimated for the entire exposed individual assuming long-term average conditions of exposure (70 years). Currently, RAPS does not consider environmental risks; however, it could be modified to include an exposure and effects submodel for environmental receptors.

RAPS estimates human health risks from a site in four stages: source definition, transport, exposure, and health effects. RAPS uses contaminant transport and exposure models to produce an estimate of the health effects associated with a site, and explicitly bases the overall score for each site on an index of health effects. Users can choose from among 22 transport-exposure models in RAPS, including source definition submodel, atmospheric transport submodel, overland transport submodel, ground-water transport submodel, surface-water transport submodel, and exposure assessment submodel.

An obstacle to using RAPS for Section 313 assessment is that the system requires RfDs and cancer potency factors (q_1*s) for the chemicals being assessed. A substantial number of 313 chemicals do not have these "toxicity scores." RAPS also requires a large amount of data that will be expensive and time-consuming to collect.

For more information, contact:

U.S. Department of Energy
Office of Environment, Safety, and Health
Office of Environmental Guidance and Compliance
Washington, DC 20545

Human Exposure Model (HEM)

The Human Exposure Model (HEM) produces quantitative expressions of public exposure and carcinogenic risk to ambient air concentrations of pollutants emitted from stationary sources. Used by the EPA Office of Air Quality Planning and Standards (OAQPS), HEM is a screening method that provides rough, but not necessarily conservative, estimates of exposure and risk.

The HEM contains (1) an atmosphere dispersion model (Gaussian); (2) multiple-year meteorological data (STAR) at 314 airports across the United States; and (3) a population distribution estimate based on 1980 U.S. Bureau of Census data (by block/group/enumeration of district). Based on emission and stack parameters and frequency of wind direction, wind speed, and atmospheric stability classes, HEM estimates the magnitude and distribution of ambient air concentrations of the pollutant in the vicinity of the source.

If the user wishes to use a dispersion model other than the one contained in HEM, HEM can accept the concentrations from the alternative model if they are put into the appropriate format. Based upon the source location and the radial distance specified, HEM numerically combines the distribution of pollutant concentrations with the number of people estimated to reside near the source to produce quantitative expressions of public exposure to the pollutant. If the pollutant of interest is one for which a cancer potency estimate has been derived and this potency has been input to HEM, public cancer risk is calculated.

The HEM also contains an area source model that is often used to estimate exposure and risks from mobile sources or sources too numerous to model individually. The area source model can be used in limited geographical areas, e.g., parts of cities, entire counties, entire cities. The modified HEM also addresses population mobility, indoor/outdoor relationships; and population cohort analysis such that risks to specified sensitive subpopulations can be estimated.

For more information, contact:

Office of Air Quality Planning and Standards
U.S. EPA, MD-10
Research Triangle Park, NC 27711

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APPENDIX H

ROADMAPS

ROADMAP TO INFORMATION ON SARA SECTION 313 CHEMICALS

This appendix describes EPA's SARA Section 313 Roadmap Data Base, summarizes in tabular format selected information in this data base, and describes a number of data bases and documents containing information on the Section 313 chemicals.

EPA's SARA Section 313 Roadmap Data Base

EPA has developed a data base of sources of information on the chemicals listed in Section 313 of the Superfund Amendments and Reauthorization Act (SARA); this data base is intended to assist users of Section 313 Toxic Release Inventory (TRI) data to perform exposure and risk assessments of these chemicals. The data base includes, for each chemical, the following types of information:

- Federal regulations that apply to the chemical, along with relevant regulatory levels;
- States that have drinking water standards or recommendations, along with relevant regulatory levels, as reported in the Summary of State and Federal Drinking Water Standards and Guidelines by the Federal-State Toxicology and Regulatory Alliance Committee (FSTRAC);
- States that have ambient air information, including ambient air standards or guidelines, pollutant research information, source testing information, monitoring data, emissions inventory information, and permitting information, as reported in the National Air Toxics Information Clearinghouse (NATICH);
- States that have water monitoring information, as reported in the Storage and Retrieval Systems (STORET); and
- General sources of information, including on-line data bases, and documents from EPA and other sources. Expanded descriptions of these information sources are provided.

The Section 313 Roadmap data base is a menu-driven data base for use on an IBM personal computer (or compatible computer). The full data base, with synonym search capability, requires a hard disk and 2.3 megabytes of storage to run. (A second version of

the data base, without synonym search capability, may be run from a floppy diskette drive or a hard disk with 1 megabyte of storage.) The system also requires DOS (version 2.1 or greater) and 512K of internal memory. Users can search the data base by Chemical Abstract Service (CAS) number, chemical substance name (as listed in Section 313), or synonym to obtain information and references on a specific chemical. In addition, lists of chemicals with certain characteristics (e.g., carcinogenicity) or to which certain regulations apply (e.g., CERCLA) can be obtained. The data base can also be searched by State. The user can obtain a list of chemicals for which a specific State has air information, drinking water standards or guidelines, or water monitoring information. Lists of contacts can also be obtained by State. Expanded descriptions of the information sources are provided on a separate disk. The user can choose a reference from a menu and view or print the expanded description. The data base is currently being updated (4/89).

Information Presented in this Appendix

The following exhibits present summaries of some of the information in the Section 313 data base:

- Exhibit 1 presents Federal regulatory levels, standards, and recommendations that apply to each of the chemicals; a brief description of each regulation or recommendation is included following the table.
- Exhibit 2 shows States with ambient air standards or acceptable concentration levels and/or drinking water standards and guidelines for each chemical.
- Exhibit 3 lists all the information sources referenced in the data base, a description of each, and information on access.

The tables in Exhibits 1 and 2 cannot be obtained directly from the Section 313 data base; however, data base users can obtain all the information on these tables, both for individual chemicals and, using the search capability, for lists of chemicals. Exhibit 3 is printed directly from the data base.

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
50000	Formaldehyde	1000#	500	1.000 ppm	1.000 ppm					X		
51285	2,4-Dinitrophenol	10					X			X	X	
51752	Nitrogen mustard		10*									
51796	Urethane (Ethyl carbamate) (monomer)	1#								X		
52686	Trichlorfon	100										
53963	2-Acetylaminofluorene	1#								X	X	
55185	N-Nitrosodiethylamine	1#								X	X	
55210	Benzamide											
55630	Nitroglycerin	10			0.050 ppm					X		
56235	Carbon tetrachloride	5000#		2.000 ppm	5.000 ppm		X	5ug/L	0 mg/l	X	X	0.07(P)
56382	Parathion	1#	100	0.100 mg/m3	0.100 mg/m3					X	X	
57125	Cyanide compounds	10		5.000 mg/m3	5.000 mg/m3					X	X	
57147	1,1-Dimethyl hydrazine	1#	1,000	0.500 ppm	0.500 ppm					X		
57578	beta-Propiolactone		500*		0.500 ppm							
57749	Chlordane	1#	1,000	0.500 mg/m3	0.500 mg/m3		X	(P)	(P)	X	X	
58899	Lindane	1#	1,000/10,000	0.500 mg/m3	0.500 mg/m3		X	.004mg/L(P)	(P)	X	X	0.4/0.06(P)
59892	N-Nitrosomorpholine										X	
60093	4-Aminoazobenzene											
60117	4-Dimethylaminoazobenzene	1#								X	X	
60344	Methyl hydrazine	10	500							X		
60355	Acetamide											
62533	Aniline	5000	1,000	2.000 ppm	2.000 ppm					X	X	
62555	Thioacetamide	1#								X		
62566	Thiourea	1#								X		
62737	Dichlorvos	10	1,000	1.000 mg/m3	0.100 ppm							
62759	N-Nitrosodimethylamine	1#	1,000				X			X	X	
63252	Carbaryl	100		5.000 mg/m3	5.000 mg/m3							
64675	Diethyl sulfate											
67561	Methanol	5000		200.000 ppm	200.000 ppm					X		
67630	Isopropyl alcohol (manufacturing-strong acid			400.000 ppm	400.000 ppm							

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
67641	Acetone	5000		750.000 ppm	750.000 ppm					X	X	
67663	Chloroform	5000#	10,000	2.000 ppm	10.000 ppm		X			X	X	0.07(P)
67721	Hexachloroethane	1#		1.000 ppm	1.000 ppm		X	(P)		X	X	4.3(P)
68768	Triaziquone											
71363	n-Butyl alcohol	5000								X		
71432	Benzene	1000#		1.000 ppm	10.000 ppm	X	X	5ug/L	0 mg/l	X	X	0.07(P)
71556	1,1,1-Trichloroethane (Methyl chloroform)	1000		350.000 ppm	350.000 ppm		X	200ug/L	2 mg/l	X	X	30.0(P)
72435	Methoxychlor	1		5.000 mg/m3	10.000 mg/m3			0.1mg/L(P)	(P)	X	X	10.0/1.4(P)
74839	Bromomethane (Methyl bromide)	1000	1,000	5.000 ppm	5.000 ppm		X	(P)		X	X	
74851	Ethylene											
74873	Chloromethane (Methyl chloride)	1#		50.000 ppm	50.000 ppm		X	(P)		X	X	
74884	Methyl iodide	1#		2.000 ppm	2.000 ppm					X	X	
74908	Hydrogen cyanide	10	100							X		
74953	Methylene bromide	1000								X	X	
75003	Chloroethane (Ethyl chloride)	100		1000.000 ppm	1000.000 ppm		X	(P)			X	
75014	Vinyl chloride (monomer)	1#		1.000 ppm	5.000 ppm	X	X	2ug/L	0 mg/l	X	X	
75058	Acetonitrile	5000		40.000 ppm	40.000 ppm					X	X	
75070	Acetaldehyde	1000		100.000 ppm	100.000 ppm					X		
75092	Dichloromethane (Methylene chloride)	1000		500.000 ppm R	50.000 ppm		X	(P)		X	X	
75150	Carbon disulfide	100	10,000	4.000 ppm	10.000 ppm					X	X	14.4(P)
75218	Ethylene oxide	1#	1,000	1.000 ppm	1.000 ppm					X		
75252	Bromoform (Tribromomethane)	100		0.500 ppm	0.500 ppm		X			X	X	
75274	Dichlorobromomethane	5000					X				X	
75354	Vinylidene chloride	5000#		1.000 ppm	5.000 ppm		X			X	X	
75445	Phosgene	10	10	0.100 ppm	0.100 ppm					X		
75558	Propyleneimine	1#	10,000	2.000 ppm	2.000 ppm					X		
75569	Propylene oxide	100	10,000	20.000 ppm	20.000 ppm							
75650	tert-Butyl alcohol			100.000 ppm	100.000 ppm							
76131	Chlorinated fluorocarbon (Freon 113)			1000.000 ppm	1000.000 ppm					X		
76448	Heptachlor	1#		0.500 mg/m3	0.500 mg/m3		X	(P)	(P)	X	X	0.001(P)

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
77474	Hexachlorocyclopentadiene	1#	100	0.01 ppm	0.010 ppm		X	(P)		X	X	
77781	Dimethyl sulfate	1#	500	0.100 ppm	0.100 ppm					X		
78842	Isobutyraldehyde											
78875	1,2-Dichloropropane	1000		75.000 ppm	75.000 ppm		X	(P)	(P)	X	X	
78922	sec-Butyl alcohol			100.000 ppm	100.000 ppm							
78933	Methyl ethyl ketone	5000		200.000 ppm	200.000 ppm					X	X	7.2(P)
79005	1,1,2-Trichloroethane	1#		10.000 ppm	10.000 ppm		X	(P)		X	X	1.2(P)
79016	Trichloroethylene	1000#		50.000 ppm	50.000 ppm		X	5ug/L	0 mg/l	X	X	0.07(P)
79061	Acrylamide	5000	1,000/10,000	0.030 mg/m3	0.030 mg/m3			(P)	(P)	X		
79107	Acrylic acid	5000		10.000 ppm	2.000 ppm					X		
79118	Chloroacetic acid		100/10,000*					(P)				
79210	Peracetic acid		500*									
79345	1,1,2,2-Tetrachloroethane	1#		1.000 ppm	1.000 ppm		X			X	X	1.3(P)
79447	Dimethylcarbamyl chloride	1#								X		
79469	2-Nitropropane	1#		10.000 ppm						X		
80057	4,4'-Isopropylidenediphenol											
80159	Cumene hydroperoxide	10								X		
80626	Methyl methacrylate	1000		100.000 ppm	100.000 ppm					X	X	
81072	Saccharin (manufacturing)	1#								X		
81889	C.I. Food Red 15											
82280	1-Amino-2-methylanthraquinone											
82688	Quintozene (Pentachloronitrobenzene)	1#								X	X	
84662	Diethyl phthalate	1000		5.00 mg/m3	5.000 mg/m3		X			X	X	
84742	Dibutyl phthalate	10		5.000 mg/m3	5.000 mg/m3		X			X	X	
85449	Phthalic anhydride	5000		1.000 ppm	1.000 ppm					X		
85687	Butyl benzyl phthalate	100					X				X	
86306	N-Nitrosodiphenylamine	100					X				X	
87627	2,6-Xylidine			5.000 ppm								
87683	Hexachloro-1,3-butadiene	1#		0.02 ppm	0.020 ppm		X	(P)		X	X	
87865	Pentachlorophenol (PCP)	10#		0.500 mg/m3	0.500 mg/m3		X	(P)	(P)	X	X	

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
88062	2,4,6-Trichlorophenol	10#					X			X	X	
88755	2-Nitrophenol	100					X				X	
88891	Picric acid			0.100 mg/m3	0.100 mg/m3							
90040	o-Anisidine			0.500 mg/m3	0.100 ppm							
90437	2-Phenylphenol											
90948	Michler's ketone											
91087	Toluene-2,6-diisocyanate	100	100									
91203	Naphthalene	100		10.000 ppm	10.000 ppm		X			X	X	
91225	Quinoline	5000										
91598	beta-Naphthylamine	1#								X	X	
91941	3,3'-Dichlorobenzidine	1#					X			X	X	
92524	Biphenyl			0.200 ppm	0.200 ppm							
92671	4-Aminobiphenyl										X	
92875	Benzidine	1#					X			X		
92933	4-Nitrobiphenyl											
94360	Benzoyl peroxide			5.000 mg/m3	5.000 mg/m3							
94597	Safrole	1#								X	X	
94757	2,4-D	100		10.000 mg/m3	10.000 mg/m3			0.1mg/L(P)	(P)	X	X	10.0/1.4(P)
95476	o-Xylene	1#		100.000 ppm	100.000 ppm					X	X	
95487	o-Cresol	1000	1,000/10,000	5.000 ppm	5.000 ppm					X	X	
95501	1,2-Dichlorobenzene	100					X	(P)	(P)	X	X	4.3(P)
95534	o-Toluidine	1#		5.000 ppm	2.000 ppm					X	X	
95636	1,2,4-Trimethyl benzene											
95807	2,4-Diaminotoluene	1#								X		
95954	2,4,5-Trichlorophenol	10#								X	X	
96093	Styrene oxide											
96128	1,2-Dibromo-3-chloropropane (DBCP)	1#		1.0 ppb				(P)	(P)	X	X	
96333	Methyl acrylate			10.000 ppm	10.000 ppm							
96457	Ethylene thiourea	1#								X		
97563	C.I. Solvent Yellow 3											

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
98077	Benzoic trichloride (Benzotrichloride)	1#	100							X		
98828	Cumene	5000		50.000 ppm	50.000 ppm					X		
98873	Benzal chloride	5000	500							X		
98884	Benzoyl chloride	1000										
98953	Nitrobenzene	1000	10,000	1.000 ppm	1.000 ppm		X			X	X	
99592	5-Nitro-o-anisidine											
100027	4-Nitrophenol	100					X			X	X	
100210	Terephthalic acid											
100414	Ethyl benzene	1000		100.000 ppm	100.000 ppm		X	(P)	(P)		X	
100425	Styrene (monomer)	1000		50.000 ppm	50.000 ppm			(P)	(P)		X	
100447	Benzyl chloride	100#	500	1.000 ppm	1.000 ppm					X		
100754	N-Nitrosopiperidine	1#								X	X	
101144	4,4'-Methylene bis(2-chloroaniline) (MOCA)	1#		0.020 ppm	0.020 ppm					X		
101611	4,4'-Methylene bis(N,N-dimethyl) benzenamine											
101688	Methylene bis(phenylisocyanate) (MBI)				0.005 ppm							
101779	4,4'-Methylene dianiline				0.100 ppm							
101804	4,4'-Diaminodiphenyl ether											
103231	Bis(2-ethylhexyl) adipate											
104949	p-Anisidine			0.500 mg/m3	0.100 ppm							
105679	2,4-Dimethylphenol	100					X			X	X	
106423	p-Xylene	1#		100.000 ppm	100.000 ppm					X		
106445	p-Cresol	1000#		5.000 ppm	5.000 ppm					X	X	10.0(P)
106467	1,4-Dichlorobenzene	100		75.000 ppm	75.000 ppm		X	75ug/L	.075 mg/l	X	X	10.8(P)
106503	p-Phenylenediamine			0.100 mg/m3	0.100 mg/m3					X	X	
106514	Quinone	10		0.100 ppm	0.100 ppm					X		
106887	1,2-Butylene oxide											
106898	Epichlorohydrin	1000#	1,000	2.000 ppm	2.000 ppm			(P)	(P)	X		
106934	1,2-Dibromoethane (Ethylene dibromide)	1000#		20.000 ppm R				(P)	(P)	X	X	
106990	1,3-Butadiene			1000 ppm R	10.000 ppm							
107028	Acrolein	1	500	0.100 ppm	0.100 ppm		X			X	X	

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
107051	Allyl chloride	1000		1.000 ppm	1.000 ppm						X	
107062	1,2-Dichloroethane (Ethylene dichloride)	5000#		50.000 ppm R	10.000 ppm		X	5ug/L	0 mg/l	X	X	0.40(P)
107131	Acrylonitrile	100#	10,000	2.00 ppm	2.00 ppm		X	(P)		X	X	5.0(P)
107211	Ethylene glycol											
107302	Chloromethyl methyl ether	1#	100							X		
108054	Vinyl acetate	5000	1,000	10.00 ppm	10.000 ppm						X	
108101	Methyl isobutyl ketone	5000		50.000 ppm	50.000 ppm					X	X	
108316	Maleic anhydride	5000		0.250 ppm	0.250 ppm					X		
108383	m-Xylene	1#		100.000 ppm	100.000 ppm					X	X	
108394	m-Cresol	1000		5.000 ppm	5.000 ppm					X	X	10.0(P)
108601	Bis(2-chloro-1-methylethyl) ether	1000					X			X	X	
108781	Melamine											
108883	Toluene	1000		100.000 ppm	100.000 ppm		X	(P)	(P)	X	X	14.4(P)
108907	Chlorobenzene	100		75.000 ppm	75.000 ppm		X	(P)	(P)	X	X	1.4(P)
108952	Phenol	1000	500/10,000	5.000 ppm	5.000 ppm		X			X	X	14.4(P)
109864	2-Methoxyethanol			25.000 ppm R	5.000 ppm							
110805	2-Ethoxyethanol	1#		200.000 ppm R	5.000 ppm					X		
110827	Cyclohexane	1000		300.000 ppm	300.000 ppm					X		
110861	Pyridine	1000		5.000 ppm	5.000 ppm					X	X	5.0(P)
111422	Diethanolamine			3.00 ppm	3.000 ppm							
111444	Bis(2-chlororethyl) ether	1#	10,000	5.0 ppm	5.000 ppm		X			X	X	0.05(P)
114261	Propoxur			0.5 mg/m3	0.500 mg/m3							
115071	Propylene (Propene)											
115322	Dicofol	10										
117793	2-Aminoanthraquinone											
117817	Di(2-ethylhexyl) phthalate (DEHP)	1#		5.000 mg/m3	5.000 mg/m3		X			X	X	
117840	n-Dioctylphthalate	5000					X			X	X	
118741	Hexachlorobenzene	1#					X	(P)		X	X	
119904	3,3'-Dimethoxybenzidine	1#								X		
119937	3,3'-Dimethylbenzidine (o-Tolidine)	1#								X	X	

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
120127	Anthracene	5000					X				X	
120718	p-Cresidine											
120809	Catechol			5.0 ppm	5.000 ppm							
120821	1,2,4-Trichlorobenzene	100					X			X	X	
120832	2,4-Dichlorophenol	100					X			X	X	
121142	2,4-Dinitrotoluene	1000#		1.500 mg/m3	1.500 mg/m3		X	(P)		X	X	
121697	N,N-Dimethylaniline			5.000 ppm	5.000 ppm							
122667	1,2-Diphenyl hydrazine (Hydrazobenzene)	1#					X			X		
123319	Hydroquinone		500/10,000*	2.000 mg/m3	2.000 mg/m3							
123386	Propionaldehyde											
123728	Butyraldehyde											
123911	1,4-Dioxane	1#		25.00 ppm	25.000 ppm					X	X	
126727	Tris(2,3-dibromopropyl) phosphate	1#								X		
126998	Chloroprene			10.000 ppm	10.000 ppm					X	X	
127184	Tetrachloroethylene (Perchloroethylene)	1#		25.000 ppm	50.000 ppm		X	(P)		X	X	
128665	C.I. Vat Yellow 4											
131113	Dimethyl phthalate	5000		5.000 mg/m3	5.000 mg/m3		X			X	X	
132649	Dibenzofuran										X	
133062	Captan	10		5.0 mg/m3	5.000 mg/m3							
133904	Chloramben											
134292	o-Anisidine hydrochloride											
134327	alpha-Naphthylamine	1#								X	X	
135206	Cupferron											
139139	Nitrilotriacetic acid											
139651	4,4'-Thiodianiline											
140885	Ethyl acrylate	1000		5.000 ppm	5.000 ppm					X		
141322	Butyl acrylate			10.000 ppm	10.000 ppm							
151564	Ethyleneimine (Aziridine)	1#	500		0.500 ppm					X		
156105	p-Nitrosodiphenylamine											
156627	Calcium cyanamide			0.500 mg/m3	0.500 mg/m3							

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
302012	Hydrazine	1#	1,000	0.100 ppm	0.100 ppm					X		
309002	Aldrin	1#	500/10,000	0.250 mg/m3	0.250 mg/m3		X			X	X	
334883	Diazomethane			0.200 ppm	0.200 ppm							
463581	Carbonyl sulfide											
492808	C.I. Solvent Yellow 34 (Auramine)	1#								X		
505602	Mustard gas		500*									
510156	Chlorobenzilate	1#										
532274	2-Chloroacetophenone			0.050 ppm	0.050 ppm					X	X	
534521	4,6-Dinitro-o-cresol	10	10/10,000	0.200 mg/m3	0.200 mg/m3		X					
540590	1,2-Dichloroethylene			200.000 ppm	200.000 ppm			(P)	.007 mg/l	X	X	
541413	Ethyl chloroformate									X		
541731	1,3-Dichlorobenzene	100		75.000 ppm			X					
542756	1,3-Dichloropropylene	100		5.0 ppm	1.000 ppm		X	(P)		X	X	
542881	Bis(chloromethyl) ether	1#	100		0.001 ppm					X		
569642	C.I. Basic Green 4									X		
584849	Toluene-2,4-diisocyanate	100	500	0.005 ppm	0.005 ppm					X		
593602	Vinyl bromide			5.0 ppm	5.000 ppm							
606202	2,6-Dinitrotoluene	1000		1.500 mg/m3	1.500 mg/m3		X			X	X	
615054	2,4-Diaminoanisole											
621647	N-Nitrosodi-n-propylamine	1#					X			X	X	
624839	Methyl isocyanate	1##	500	0.020 ppm	0.020 ppm					X		
636215	o-Toluidine hydrochloride	1#								X		
680319	Hexamethylphosphoramide											
684935	N-Nitroso-N-methylurea	1#								X		
759739	N-Nitroso-N-ethylurea	1#								X		
842079	C.I. Solvent Yellow 14											
924163	N-Nitrosodi-n-butylamine	1#								X	X	
961115	Tetrachlorvinphos											
989388	C.I. Basic Red 1											
1120714	Propane sultone	1#								X		

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
1163195	Decabromodiphenyl oxide											
1310732	Sodium hydroxide (solution)	1000			2.000 mg/m3							
1313275	Molybdenum trioxide											
1314201	Thorium dioxide											
1319773	Cresol (mixed isomers)	1000		1.000 ppm	5.000 ppm					X		10.0(P)
1330207	Xylene (mixed isomers)	1000		100.000 ppm	100.000 ppm			(P)	(P)	X	X	
1332214	Asbestos (friable)	1#		0.200 f/cc	2 fibers/cc	X	X	(P)	(P)			
1335871	Hexachloronaphthalene			0.200 mg/m3	0.200 mg/m3							
1336363	Polychlorinated biphenyls (PCBs)	10#					X	(P)	(P)		X	
1344281	Aluminum oxide			5.0 mg/m3	10.000 mg/m3							
1464535	Diepoxybutane	1#	500							X		
1582098	Trifluralin											
1634044	Methyl tert-butyl ether											
1836755	Nitrofen											
1897456	Chlorothalonil											
1937377	C.I. Direct Black 38											
2164172	Fluometuron											
2234131	Octachloronaphthalene			0.100 mg/m3	0.100 mg/m3							
2303164	Diallate	1#								X	X	
2602462	C.I. Direct Blue 6											
2650182	C.I. Acid Blue 9, diammonium salt (DELISTED)											
2832408	C.I. Disperse Yellow 3											
3118976	C.I. Solvent Orange 7											
3761533	C.I. Food Red 5											
3844459	C.I. Acid Blue 9, disodium salt (DELISTED)											
4549400	N-Nitrosomethylvinylamine	1#								X		
4680788	C.I. Acid Green 3											
6484522	Ammonium nitrate (solution)											
7429905	Aluminum (fume or dust)			5.0 mg/m	5.000 mg/m3							
7439921	Lead and compounds	1#		0.050 mg/m3	0.150 mg/m3		X	0.05mg/L(P)	(P)	X	X	5.0/5.0(P)

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
7439965	Manganese and compounds			1.0 mg/m3	1.000 mg/m3							
7439976	Mercury and compounds	1		0.050 mg/m3	0:050 mg/m3	X	X	.002mg/L(P)	(P)	X	X	0.2/0.2(P)
7440020	Nickel and compounds	1#		1.000 mg/m3	1.000 mg/m3		X	(P)			X	
7440224	Silver and compounds	1000		0.010 mg/m3	0.100 mg/m3		X	0.05mg/L(P)			X	5.0/5.0(P)
7440280	Thallium and compounds	1000		0.100 mg/m3	0.100 ppm		X	(P)			X	
7440360	Antimony and compounds	5000		0.500 mg/m3	0.500 mg/m3		X	(P)		X	X	
7440382	Arsenic and compounds	1#		0.500 mg/m3	0.200 mg/m3	X	X	0.05mg/L(P)	(P)	X	X	5.0/5.0(P)
7440393	Barium and compounds			0.500 mg/m3	0.500 mg/m3			1mg/L(P)	(P)	X	X	100.0/100.0(P)
7440417	Beryllium and compounds	1#		0.002 ppm	0.002 mg/m3	X	X	(P)		X	X	
7440439	Cadmium and compounds	1#		0.1 mg/m3 R	0.010 mg/m3		X	.010mg/L(P)	(P)	X	X	1.0/1.0(P)
7440473	Chromium and compounds	1#		1.0 mg/m3	0.500 mg/m3		X	50ug/L(P)	(P)	X	X	5.0/5.0(P)
7440484	Cobalt and compounds			0.050 mg/m3	0.050 mg/m3						X	
7440508	Copper and compounds	5000		0.10 mg/m3	0.200 mg/m3		X	(P)	(P)		X	
7440622	Vanadium (fume or dust)			0.05 mg/m3							X	
7440666	Zinc (fume or dust) and compounds	1000					X				X	
7550450	Titanium tetrachloride		100*									
7647010	Hydrochloric acid	5000	500									
7664382	Phosphoric acid	5000		1.000 mg/m3	1.000 mg/m3							
7664393	Hydrogen fluoride	100	100	3.000 ppm						X		
7664417	Ammonia	100	500		25.000 ppm			(P)				
7664939	Sulfuric acid	1000	1,000	1.000 mg/m3	1.000 mg/m3							
7697372	Nitric acid	1000	1,000	2.000 ppm	2.000 ppm							
7723140	Phosphorus (yellow or white)	1	100	0.100 mg/m3	0.100 mg/m3							
7757826	Sodium sulfate (solution)											
7782492	Selenium and compounds	100		0.200 mg/m3	0.200 mg/m3		X	0.01mg/L(P)	(P)		X	1.0/1.0(P)
7782505	Chlorine	10	100	.5 ppm	0.500 ppm			(P)				
7783202	Ammonium sulfate (solution)											
8001352	Toxaphene	1#	500/10,000	0.50 mg/m3	0.500 mg/m3		X	.005mg/L(P)	(P)	X	X	0.5/0.07(P)
10034932	Hydrazine sulfate											
10049044	Chlorine dioxide			0.100 ppm	0.100 ppm			(P)				

Exhibit 1 - Regulatory Levels and Standards (See notes following table)

CAS	Chemical Name	CERCLA RQ (pounds)	SARA TPQ (pounds)	OSHA PEL (8-hour TWA)	ACGIH TLV (8-hour TWA)	NESHAPS Air Emission Standards	Toxic Pollutant Effluent Standard	Drinking Water Max. Cont. Level	Drinking Water Max. Cont. Level Goal	RCRA Haz. Waste	RCRA App. IX	RCRA Toxicity Characteristic (mg/L)
12122677	Zineb											
12427382	Maneb											
13463677	Titanium dioxide (DELISTED)			5.000 mg/m3	10.000 mg/m3							
16071866	C.I. Direct Brown 95											
16543558	N-Nitrosonornicotine											
20816120	Osmium tetroxide	1000		0.002 mg/m3	0.002 mg/m3					X		
25321226	Dichlorobenzene (mixed isomers)	100								X		
25376458	Diaminotoluene (mixed isomers)	1#								X		
39156417	2,4-Diaminoanisole sulfate											

NOTES:

CERCLA RQ: Under the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) (42 USC 9601 et seq.), releases of listed substances at or above their Reportable Quantities (RQs) must be reported to the National Response Center (NRC.) RQs are set on the basis of aquatic toxicity, acute mammalian toxicity, ignitability, reactivity, chronic toxicity, and carcinogenicity, with possible adjustment on the basis of biodegradation, hydrolysis, and photolysis. # indicates that an adjusted RQ has been proposed; until a final adjustment is made, the statutory (listed) RQ applies. ## indicates that the RQ may be adjusted in a future rulemaking.

SARA TPQ: Under the Superfund Amendments and Reauthorization Act (SARA) Section 302 (40 CFR Section 302), facilities with listed substances in quantities greater than their Threshold Planning Quantities (TPQs) must report to the State Emergency Response Commission. For solids, two quantities may be specified. The lower quantity applies to solids in finely powdered form; if the solid is not finely powdered, the TPQ becomes 10,000 pounds. TPQs are set based on a combination of acute toxicity and ability of the substance to become airborne. * indicates that releases of 1 pound or greater must be reported under SARA Section 304; an RQ has not yet been assigned.

OSHA PEL: The Occupational Safety and Health Administration (OSHA) lists workplace contaminants (29 CFR Section 1910, Subpart Z) and Permissible Exposure Limits (PELs). The PEL is the 8-hour time-weighted average (TWA) not to be exceeded in any 8-hour work shift of a 40-hour work week. PELs were developed to reduce risk of health impairment and to be technologically and economically feasible. Values presented are from the Final Rule of January 19, 1989 (54 FR 2332-2983); values followed by (R) are transitional limits for substances currently in rulemaking. For metals and compounds with more than one PEL (i.e., where different PELs apply to different forms such as fume or dust), the lowest value that appears to be applicable to the metal is presented.

ACGIH TLV: The American Conference of Governmental Industrial Hygienists (ACGIH) lists Threshold Limit Values (TLVs) for chemicals in the workplace. The TLV - time-weighted average (TWA) is the time weighted average concentration limit for a normal 8-hour workday and 40 hours per week, to which nearly all workers may be repeatedly exposed, day after day, without adverse effect (non-regulatory). TLVs are based primarily on acute toxicity and irritation data. For metals and compounds with more than one TLV (i.e., where different TLVs apply to different forms such as fume or dust), the lowest value that appears to be applicable to the metal is presented. Intended changes for 1988-89 are included in the exhibit.

NOTES (continued)

NESHAPS Air Emission Standards (CAA Sec. 112): The Clean Air Act Section 112, National Emission Standards for Hazardous Air Pollutants (NESHAPS) (40 CFR Section 61) lists Hazardous Air Pollutants and includes emission standards and monitoring requirements for plants with listed chemicals.

Toxic Pollutant Effluent Standards (CWA Sec. 307): The Clean Water Act Section 307, Toxic Pollutants, Subpart A, Toxic Pollutant Effluent Standards and Prohibitions (40 CFR Section 129) lists certain substances as Toxic Pollutants. Provisions of the Act apply to certain facilities discharging pollutants into navigable waters.
Drinking Water Max. Cont. Level: The Safe Drinking Water Act, Subpart B (40 CFR Section 141) lists Maximum Contaminant Levels (MCLs) for certain chemicals. The MCL is the maximum permissible level of a contaminant in public drinking water systems. MCLs are based on health factors, but are also required by law to reflect the technological and economic feasibility of removing the contaminant from the water supply. Values in table were supplied by the Office of Drinking Water. A numeric value shows the existing standard. The entry (P) indicates that a new standard is planned. Further information is available through the Safe Drinking Water Hotline: 1-800-426-4791.

Drinking Water Max. Cont. Level Goal: MCLGs developed under the Safe Drinking Water Act are non-enforceable goals based on health factors only, and represent levels which would result in no adverse health effects, with an adequate margin of safety. A numeric value shows the existing guideline. The entry (P) indicates that a new guideline is planned.

RCRA Hazardous Waste: The Resource Conservation and Recovery Act (40 CFR Part 261) lists commercial chemical products that are hazardous wastes when disposed and chemicals that are hazardous waste constituents. An entry in the RCRA Hazardous Waste column indicates that the chemical is in one of these categories.

RCRA Appendix IX: Appendix IX - Ground-Water Monitoring List (40 CFR Part 264) lists chemicals for which monitoring of ground water is required at RCRA hazardous waste sites. o-Xylene and m-Xylene are included as part of total xylene. Ground water containing metallic elements and compounds (e.g., lead and compounds, mercury and compounds) is analyzed for total metal; the listing in Appendix IX is for all forms of the metallic element.

RCRA Toxicity Characteristic: The maximum concentration of contaminants exhibiting the characteristic of Extraction Procedure (EP) toxicity (40 CFR Part 261) is shown in this column. This is the chemical concentration at or above which a solid waste is considered to exhibit the characteristic of EP toxicity. Values followed by (P) were proposed on June 13, 1986 (51 FR 21648).

Exhibit 2 - States with Ambient Air Standards and Drinking Water Standards

CAS	Chemical Name	AZ	CA	CO	CT	FL	IL	IN	KS	KY	MA	ME	MD	MI	MN	MT	NC	ND	NH	NJ	NM	NV	NY	PA	RI	SC	SD	TX	VA	VT	WA	WI	WY
50000	Formaldehyde		W		A			A		A	A	W	W				A	A		W		A	A	A		A	A		A		A		
51285	2,4-Dinitrophenol								W			W																					
51752	Nitrogen mustard																						A			A							
51796	Urethane (Ethyl carbamate) (monomer)																	A					A			A							
52686	Trichlorfon																																
53963	2-Acetylaminofluorene																	A					A										
55185	N-Nitrosodiethylamine																																
55210	Benzamide																																
55630	Nitroglycerin				A	A												A				A	A			A			A				
56235	Carbon tetrachloride		W		A			A			A						A	A				A	A	A	A	A			A				
56382	Parathion		W		A				B			W						A				A	A	A		A			A				
57125	Cyanide compounds	W				A			W														A			A							
57147	1,1-Dimethyl hydrazine				A	A												A				A	A	A		A			A				
57578	beta-Propiolactone				A	A												A				A	A			A			A				
57749	Chlordane	W	W		A	A	W		B		A	W			W			A		W		A	A	A		A			A				
58899	Lindane				A	A			A		A	W						A				A	A	A		A			A				
59892	N-Nitrosomorpholine								A									A								A			A				
60093	4-Aminoazobenzene																																
60117	4-Dimethylaminoazobenzene																	A					A			A							
60344	Methyl hydrazine												A					A				A	A	A		A		A	A				
60355	Acetamide																						A										
62533	Aniline				A				A		A						A	A				A	A		A				A				
62555	Thioacetamide																	A				A				A							
62566	Thiourea																	A				A	A										
62737	Dichlorvos				A													A				A							A				
62759	N-Nitrosodimethylamine								B						W		A	A					A	A		A			A				
63252	Carbaryl		W		A				B			W						A				A		A					A			W	
64675	Diethyl sulfate																	A															
67561	Methanol				A				A		A							A				A					A		A				
67630	Isopropyl alcohol (manufacturing-strong acid				A	A							W					A				A	A				A		A				

A = State has an ambient air standard for this chemical (as reported in NATICH).
W = State has a drinking water standard for this chemical (as reported in FSTRAC).
B = State has both ambient air and drinking water standards for this chemical.

Exhibit 2 - States with Ambient Air Standards and Drinking Water Standards

CAS	Chemical Name	AZ	CA	CO	CT	FL	IL	IN	KS	KY	MA	ME	MD	MI	MN	MT	NC	ND	NH	NJ	NM	NV	NY	PA	RI	SC	SD	TX	VA	VT	WA	WI	WY
67641	Acetone				A	A					B		W					A				A	A				A		A				
67663	Chloroform	W			A		W	A			A			A	W		A					A	A	A	A	A			A				
67721	Hexachloroethane				A				B		A				W			A				A							A				
68768	Triazinone																																
71363	n-Butyl alcohol				A						A							A				A	A				A		A				
71432	Benzene		W		B	W					A	W		A	W		A	A	W	W	W	A	B	A	A	A			A				
71556	1,1,1-Trichloroethane (Methyl chloroform)		W		B			A			B	W			W		A	A		W	W	A	A				A		A				
72435	Methoxychlor	W	W		A				A			W			W			A				A		A					A				
74839	Bromomethane (Methyl bromide)	W			A				B		A							A				A							A				
74851	Ethylene																	A				A		A		A			A				
74873	Chloromethane (Methyl chloride)	W			A				B					A				A				A	A	A					A				
74884	Methyl iodide				A													A				A		A					A				
74908	Hydrogen cyanide				A												A	A				A							A				
74953	Methylene bromide																					A	A			A			A				
75003	Chloroethane (Ethyl chloride)				A	A					A							A				A	A						A				
75014	Vinyl chloride (monomer)	W	W		A	W			B		B	W		A	W		A	A		W	W	A	B	A	W	A	A		A	W			
75058	Acetonitrile				A	A												A				A	A			A			A				
75070	Acetaldehyde				A			A			A			A			A	A				A	A			A			A				
75092	Dichloromethane (Methylene chloride)	W	W		B			A	B		B	W			W		A	A		W	W	A	A	A	A	A	A		A	W			
75150	Carbon disulfide	W			A	A											A	A				A	A			A			A				
75218	Ethylene oxide				A			A									A					A	A	A	A	A	A		A				
75252	Bromoform (Tribromomethane)				A		W						W					A				A							A				
75274	Dichlorobromomethane						W																							W			
75354	Vinylidene chloride		W		A			A	A		A	W			W		A	A		W	W	A	A	A					A	W			
75445	Phosgene				A	A											A	A				A	A			A			A				
75558	Propyleneimine				A													A				A		A					A				
75569	Propylene oxide				A				A		A							A				A	A	A		A			A				
75650	tert-Butyl alcohol																	A															
76131	Chlorinated fluorocarbon (Freon 113; 1,1,2-T				A			A									A	A				A							A			W	
76448	Heptachlor	W	W		A		W		B		A	W			W			A				A	A	A		A			A				

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77474	Hexachlorocyclopentadiene				A			A	W		A						A	A				A	A		A			A					
77781	Dimethyl sulfate				A	A											A					A	A	A		A		A					
78842	Isobutyraldehyde																																
78875	1,2-Dichloropropane	W	W		B				B		B				W			A				A						A					
78922	sec-Butyl alcohol				A													A				A						A					
78933	Methyl ethyl ketone	W			B	A					B	W			W		A	A		W		A	A			A	A						
79005	1,1,2-Trichloroethane	W	W		A	A		A	A		A				W			A			W	A	A	A	A				A				
79016	Trichloroethylene	A	W		B	B		A	A		A	W		A	W		A	A	W	W	W	A	A	A		A	A		A				
79061	Acrylamide				A										W			A				A	A			A	A		A				
79107	Acrylic acid				A													A				A	A						A				
79118	Chloroacetic acid																																
79210	Peracetic acid																																
79345	1,1,2,2-Tetrachloroethane	W			A	A			B		A				W		A	A			W	A	A	A		A			A	W			
79447	Dimethylcarbamyl chloride																	A						A					A				
79469	2-Nitropropane				A													A				A		A	A				A				
80057	4,4'-Isopropylidenediphenol																																
80159	Cumene hydroperoxide																																
80626	Methyl methacrylate				A	A					A	W						A				A	A			A			A				
81072	Saccharin (manufacturing)																																
81889	C.I. Food Red 15																																
82280	1-Amino-2-methylanthraquinone																	A															
82688	Quintozene (Pentachloronitrobenzene)		W									W												A									
84662	Diethyl phthalate				A	A			W									A				A	A			A			A				
84742	Dibutyl phthalate				A				W			W						A				A							A				
85449	Phthalic anhydride				A						A							A				A							A				
85687	Butyl benzyl phthalate					A																	A										
86306	N-Nitrosodiphenylamine								W						W																		
87627	2,6-Xylidine																																
87683	Hexachloro-1,3-butadiene				A	A			W						W			A				A	A	A		A			A				
87865	Pentachlorophenol (PCP)	W	W		A				B		A	W			W		A	A				A	A	A		A	A		A				

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88062	2,4,6-Trichlorophenol								W		A	W			W																		
88755	2-Nitrophenol								W																								
88891	Picric acid				A	A						W						A				A	A			A			A				
90040	o-Anisidine																																
90437	2-Phenylphenol																																
90948	Michler's ketone																	A															
91087	Toluene-2,6-diisocyanate																																
91203	Naphthalene				A	A			W		A							A				A	A			A			A				
91225	Quinoline																						A										
91598	beta-Naphthylamine																	A					A	A		A			A				
91941	3,3'-Dichlorobenzidine								W						W			A					A	A	A	A			A				
92524	Biphenyl				A	A					A							A				A	A		A				A				
92671	4-Aminobiphenyl																	A					A	A		A			A				
92875	Benzidine								W								A	A					A	A	A	A			A				
92933	4-Nitrobiphenyl																	A					A	A		A			A				
94360	Benzoyl peroxide				A													A				A							A				
94597	Safrole																																
94757	2,4-D				W							W			W			A				A		A					A				
95476	o-Xylene		W			A																	A			A			A				
95487	o-Cresol					A		A															A						A				
95501	1,2-Dichlorobenzene	W	W		A			A	W		A	W			W			A		W		A	A						A	W		W	
95534	o-Toluidine				A	A					A							A				A	A		A				A				
95636	1,2,4-Trimethyl benzene																																
95807	2,4-Diaminotoluene																	A					A										
95954	2,4,5-Trichlorophenol								W		A													A									
96093	Styrene oxide																																
96128	1,2-Dibromo-3-chloropropane (DBCP)	W	W		A										W			A						A									
96333	Methyl acrylate				A						A							A				A							A				
96457	Ethylene thiourea				W							W						A						A									
97563	C.I. Solvent Yellow 3																																

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98077	Benzoic trichloride (Benzotrichloride)																	A							A							
98828	Cumene				A													A				A							A				
98873	Benzal chloride																																
98884	Benzoyl chloride																																
98953	Nitrobenzene				A				W		A	W					A	A				A	A			A			A				
99592	5-Nitro-o-anisidine																	A					A		A	A							
100027	4-Nitrophenol								W																								
100210	Terephthalic acid								A																								
100414	Ethyl benzene	W	W		A	A	W		W		A				W			A			W	A	A			A			A	W		W	
100425	Styrene (monomer)	W			A			A	A		A	W			W		A	A				A	A		A				A			W	
100447	Benzyl chloride				A						A						A	A				A	A		A	A			A				
100754	N-Nitrosopiperidine																	A															
101144	4,4'-Methylene bis(2-chloroaniline) (MOCA)				A													A				A		A	A				A				
101611	4,4'-Methylene bis(N,N-dimethyl) benzenamine																	A															
101688	Methylene bis(phenylisocyanate) (MBI)				A													A				A	A			A			A				
101779	4,4'-Methylene dianiline				A				A									A				A	A			A			A				
101804	4,4'-Diaminodiphenyl ether																																
103231	Bis(2-ethylhexyl) adipate																																
104949	p-Anisidine																					A	A			A							
105679	2,4-Dimethylphenol		W						W																								
106423	p-Xylene		W			A																	A			A			A				
106445	p-Cresol					A					A												A						A				
106467	1,4-Dichlorobenzene	W	W		A						A	W			W		A	A		W		A				A			A			W	
106503	p-Phenylenediamine				A	A												A				A	A			A			A				
106514	Quinone				A	A												A				A	A			A			A				
106887	1,2-Butylene oxide													A																			
106898	Epichlorohydrin	W			A			A			A	W			W		A	A				A	A	A	A	A			A				
106934	1,2-Dibromoethane (Ethylene dibromide)	W	W		B			A	W		W	W			W		A				W	A	A	A		A			A		W	W	
106990	1,3-Butadiene				A						A			A			A	A				A							A				
107028	Acrolein	W			A	A			W								A	A				A	A			A			A				

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107051	Allyl chloride				A																												
107062	1,2-Dichloroethane (Ethylene dichloride)		W		B			A			A				W		A	A				A	A					A					
107131	Acrylonitrile	W			B	A		A	W		A						A	A				A	A	A	A	A		A					
107211	Ethylene glycol	W			W						B	W			W		A	A				A	A	A		A	A	A					
107302	Chloromethyl methyl ether																	A		W		A						A					
																		A					A	A				A					
108054	Vinyl acetate				A						A							A				A						A					
108101	Methyl isobutyl ketone				A	A					B						A	A				A	A					A					
108316	Maleic anhydride				A	A					A						A	A				A	A				A	A					
108383	m-Xylene		W			A																	A			A		A					
108394	m-Cresol					A																	A			A		A					
																							A					A					
108601	Bis(2-chloro-1-methylethyl) ether								W																								
108781	Melamine								A																								
108883	Toluene	B	W		B			A	W		B	W			W		A	A			W	A	A		A		A	A	W		W		
108907	Chlorobenzene	W	W			A			W		A	W			W		A	A		W		A	A					A	W		W		
108952	Phenol		W		A	A		A	B		A						A	A				A	A	A		A	A						
109864	2-Methoxyethanol				A	A					A							A				A	A		A			A					
110805	2-Ethoxyethanol				A	A											A	A				A	A					A					
110827	Cyclohexane				A	A					A							A				A	A					A					
110861	Pyridine				A	A		A	A									A				A	A					A					
111422	Diethanolamine				A													A				A						A					
111444	Bis(2-chlororethyl) ether	W							B			W			W			A				A		A				A					
114261	Propoxur		W		A													A				A						A					
115071	Propylene (Propene)																																
115322	Dicofol																							A									
117793	2-Aminoanthraquinone																	A															
117817	Di(2-ethylhexyl) phthalate (DEHP)				A				W		A	W					A	A				A	A	A	A			A					
117840	n-Dioctylphthalate																									A							
118741	Hexachlorobenzene	W							W			W			W			A					A	A									
119904	3,3'-Dimethoxybenzidine																	A					A			A							
119937	3,3'-Dimethylbenzidine (o-Tolidine)																	A										A					

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120127	Anthracene								W																								
120718	p-Cresidine																	A															
120809	Catechol				A													A				A							A				
120821	1,2,4-Trichlorobenzene				A				W									A		W		A	A			A			A				
120832	2,4-Dichlorophenol								W			W		A																			
121142	2,4-Dinitrotoluene				A				W						W			A				A											
121697	N,N-Dimethylaniline				A													A				A											
122667	1,2-Diphenyl hydrazine (Hydrazobenzene)					A			W						W			A					A										
123319	Hydroquinone				A	A							W					A				A	A			A			A				
123386	Propionaldehyde																																
123728	Butyraldehyde				B	A			A		A						A	A				A	A	A		A	A		A				
123911	1,4-Dioxane																	A															
126727	Tris(2,3-dibromopropyl) phosphate																	A															
126998	Chloroprene				A						A						A	A				A				A			A				
127184	Tetrachloroethylene (Perchloroethylene)	W	W		B	W		A	B		B	W		A			A	A	W	W	W	A	A	A	A	A			A	W		W	
128665	C.I. Vat Yellow 4																																
131113	Dimethyl phthalate				A				W									A				A							A				
132649	Dibenzofuran																																
133062	Captan		W		A				A			W						A				A		A									
133904	Chloramben											W												A								W	
134292	o-Anisidine hydrochloride																	A															
134327	alpha-Naphthylamine																						A			A							
135206	Cupferron																	A															
139139	Nitrilotriacetic acid																	A					A										
139651	4,4'-Thiodianiline																																
140885	Ethyl acrylate				A						A							A				A							A				
141322	Butyl acrylate				A																	A							A				
151564	Ethyleneimine (Aziridine)				A	A											A	A				A	A			A							
156105	p-Nitrosodiphenylamine																	A															
156627	Calcium cyanamide				A													A				A							A				

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302012	Hydrazine				A	A					A						A	A				A	A	A	A	A			A				
309002	Aldrin		W		A		W		B									A			W	A		A					A				
334883	Diazomethane				A	A												A				A	A			A			A				
463581	Carbonyl sulfide																									A							
492808	Auramine																	A					A										
505602	Mustard gas																																
510156	Chlorobenzilate																							A									
532274	2-Chloroacetophenone				A	A												A				A	A			A							
534521	4,6-Dinitro-o-cresol				A				W									A				A							A				
540590	1,2-Dichloroethylene	W			A						A									W		A							A	W			
541413	Ethyl chloroformate																																
541731	1,3-Dichlorobenzene		W						W											W												W	
542756	1,3-Dichloropropylene				B				W									A				A							A	W			
542881	Bis(chloromethyl) ether				A	A			W								A	A				A	A	A		A			A				
569642	C.I. Basic Green 4																																
584849	Toluene-2,4-diisocyanate				A												A	A				A	A		A	A			A				
593602	Vinyl bromide				A	A												A				A	A	A		A			A				
606202	2,6-Dinitrotoluene								W																								
615054	2,4-Diaminoanisole																																
621647	N-Nitrosodi-n-propylamine																	A															
624839	Methyl isocyanate				A													A					A				A		A				
636215	o-Toluidine hydrochloride																	A															
680319	Hexamethylphosphoramide																	A					A	A		A			A				
684935	N-Nitroso-N-methylurea																						A										
759739	N-Nitroso-N-ethylurea																	A															
842079	C.I. Solvent Yellow 14																																
924163	N-Nitrosodi-n-butylamine																	A															
961115	Tetrachlorvinphos																																
989388	C.I. Basic Red 1																																
1120714	Propane sultone																	A					A						A				

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1163195	Decabromodiphenyl oxide																																
1310732	Sodium hydroxide (solution)				A													A				A				A	A		A				
1313275	Molybdenum trioxide																																
1314201	Thorium dioxide																	A															
1319773	Cresol (mixed isomers)				A												A	A				A	A			A							
1330207	Xylene (mixed isomers)	W		A	A			A			A						A	A				A	A		A		A						
1332214	Asbestos (friable)				A				W		A				W		A	A				A	A	A		A			A				
1335871	Hexachloronaphthalene				A	A												A				A	A			A			A				
1336363	Polychlorinated biphenyls (PCBs)	W			W				B		A	W			W			A		W	W		B			A			A				
1344281	Aluminum oxide																																
1464535	Diepoxybutane																	A															
1582098	Trifluralin																							A									
1634044	Methyl tert-butyl ether																																
1836755	Nitrofen																							A									
1897456	Chlorothalonil																																
1937377	Direct Black 38																	A															
2164172	Fluometuron																																
2234131	Octachloronaphthalene				A	A												A				A	A			A			A				
2303164	Diallate																																
2602462	Direct Blue 6																	A															
2650182	C.I. Acid Blue 9, diammonium salt (DELISTED)																																
2832408	C.I. Disperse Yellow 3																																
3118976	C.I. Solvent Orange 7																																
3761533	C.I. Food Red 5																																
3844459	C.I. Acid Blue 9, disodium salt (DELISTED)																																
4549400	N-Nitrosomethylvinylamine																																
4680788	C.I. Acid Green 3																																
6484522	Ammonium nitrate (solution)																																
7429905	Aluminum (fume or dust)		W		A				W			W					A	A				A						A				
7439921	Lead and compounds				A				A		A	W			W			A				A		A				A				

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7439965	Manganese and compounds				A		W		W								A	A				A		A	A		A		A				
7439976	Mercury and compounds				A	A			A			W			W	A	A	A				A	A	A		A			A				
7440020	Nickel and compounds				A				B		A				W	A	A	A				A	A	A	A				A				
7440224	Silver and compounds				A							W				A		A				A							A				
7440280	Thallium and compounds				A	A			W									A				A	A	A					A				
7440360	Antimony and compounds				A	A			B									A				A	A	A	A				A				
7440382	Arsenic and compounds				A							W				A	A	A				A	A	A	A	A			A				
7440393	Barium and compounds				A						W	W			W			A				A	A	A	A				A				
7440417	Beryllium and compounds				A				W		A						A	A				A	A						A				
7440439	Cadmium and compounds				A				W		A	W			W	A	A	A				A	A	A	W	A	A		A				
7440473	Chromium and compounds				A						A	W			W	A	A	A				A	A	A	A				A				
7440484	Cobalt and compounds				A	A												A				A	A						A				
7440508	Copper and compounds				A	A			W						W	A		A				A	A						A				
7440622	Vanadium (fume or dust)				A						A											A							A				
7440666	Zinc (fume or dust) and compounds								W							A							A									
7550450	Titanium tetrachloride										A							A				A	A		A	A	A		A				
7647010	Hydrochloric acid										A							A				A				A			A				
7664382	Phosphoric acid				A					A	A							A				A							A				
7664393	Hydrogen fluoride				A					A	A					A		A				A	A		A	A	A		A				
7664417	Ammonia				A	A			A		A					A		A				A	A				A		A				
7664939	Sulfuric acid				A				A		A						A					A				A			A				
7697372	Nitric acid				A	A											A	A				A	A			A	A		A				
7723140	Phosphorus (yellow or white)				A	A												A				A	A						A				
7757826	Sodium sulfate (solution)												W																				
7782492	Selenium and compounds				A	A					A	W			W	A		A				A	A						A				
7782505	Chlorine				A	A			A		A						A	A				A	A			A			A				
7783202	Ammonium sulfate (solution)																																
8001352	Toxaphene				A	A			A			W			W			A				A	A	A		A			A				
10034932	Hydrazine sulfate																	A															
10049044	Chlorine dioxide				A	A						W						A				A	A						A				

A = State has an ambient air standard for this chemical (as reported in NATICH).
W = State has a drinking water standard for this chemical (as reported in FSTRAC).
B = State has both ambient air and drinking water standards for this chemical.

Exhibit 2 - States with Ambient Air Standards and Drinking Water Standards

CAS	Chemical Name	AZ	CA	CO	CT	FL	IL	IN	KS	KY	MA	ME	MD	MI	MN	MT	NC	ND	NH	NJ	NM	NV	NY	PA	RI	SC	SD	TX	VA	VT	WA	WI	WY
12122677	Zineb											W																					
12427382	Maneb											W																					
13463677	Titanium dioxide (DELISTED)				A				A							A												A					
16071866	Direct Brown 95																																
16543558	N-Nitrosonornicotine																	A															
20816120	Osmium tetroxide				A													A				A							A				
25321226	Dichlorobenzene (mixed isomers)																																
25376458	Diaminotoluene (mixed isomers)																																
39156417	2,4-Diaminoanisole sulfate																	A															

A = State has an ambient air standard for this chemical (as reported in NATICH).
W = State has a drinking water standard for this chemical (as reported in FASTRC).
B = State has both ambient air and drinking water standards for this chemical.

Sources: Air standard information from the National Air Toxics Information Clearinghouse (NATICH) Data Base Report on State and Local Agency Air Toxics Activities, July 1988 (information reported voluntarily by State and local agencies). Water standard information from the Summary of State and Federal Drinking Water Standards and Guidelines, published by the Federal-State Toxicology and Regulatory Alliance Committee (FSTRAC), March 1988 (from a survey of State drinking water programs; agencies from 40 states responded to the survey).

Air Quality Criteria Documents (AQCD), Office of Health and Environmental Assessment

Title: Air Quality Criteria Documents.

Publisher: The United States Environmental Protection Agency (EPA)
Environmental Criteria and Assessment Office
Research Triangle Park, NC 27711

Time of Publication: Date varies with each chemical-specific document. The documents are updated every five years.

Type of Publication: Document evaluates and assesses scientific information. AQCDs are used as the scientific basis for setting and implementing National Ambient Air Quality Standards (NAAQS) under Sections 108-110 of the Clean Air Act. Updated and revised every five years.

- Source of Data/Information: Pertinent scientific literature on the health and welfare effects associated with exposure to toxic pollutants.

- QA/QC: Reviewed by the Clean Air Scientific Advisory Committee of the Science Advisory Board in public sessions.

Subject: Health effects associated with chemical exposure.

Type of Information: Primarily concerned with health and welfare effects associated with exposure to specific chemicals. Concentrations which cause such effects are listed. Criteria include information on variable factors (e.g., atmospheric conditions) which may alter the effects of an air pollutant on public health, and types of air pollutants which may interact with the atmosphere to produce an adverse effect on public health. Topics covered in the documents include:

1. The Chemistry and Physics of Specific Pollutants.
2. Analytical Techniques.
3. Sources and Types of Emissions.
4. Environmental Concentrations and Exposure Levels.
5. Atmospheric Chemistry and Dispersion Modeling.
6. Acidic Deposition.
7. Effects on Vegetation.
8. Effects on Visibility, Climate, and Materials.
9. Respiratory, Physiological, Toxicological, Clinical, and Epidemiological Aspects of Human Exposure.

Information on Obtaining the Document: Information on availability of AQCDs can be obtained from:

Office of Health and Environmental Assessment (OHEA) (RD-689), U.S. EPA
401 M Street, S.W.
Washington, D.C. 20460
FTS: 382-7345; (202) 382-7345

Air Quality Criteria Documents (AQCD), Office of Health and Environmental Assessment (Continued)

For copies, contact:

ORD Publications Center, Center for Environmental Research Information
U.S. Environmental Protection Agency
26 West Martin Luther King Avenue
Cincinnati, OH 45268
FTS: 684-7562; (513) 569-7562

or

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

Ambient Water Quality Criteria Documents (WQCD)

Title: Ambient Water Quality Criteria Document

Publisher: Office of Water Regulations and Standards (OWRS), U.S. Environmental Protection Agency

Time of Publication: 11/28/80 to present.

Type of Publication: Documents prepared to assist the Office of Water Regulations and Standards (OWRS) in the implementation at the state level of the water quality standards program under Section 304 of the Federal Water Pollution Control Act.

- Source of Data/Information: Readily available literature
- QA/QC: Internal review by the Criteria and Standards Division, Office of Water Regulations and Standards, Office of Health and Environmental Assessment, and other EPA offices. External review by other Federal and State agencies, special interest groups, and a selected group of individual scientists through a formal public comment period.

Subject: WQCDs are summaries of toxicological data pertaining to chemical substances, with an emphasis on the protection of aquatic life and human health.

Type of Information: The WQCDs contain health assessments, health and exposure advice, recommended maximum permissible pollutant concentrations for the protection of aquatic organisms and human health, and supporting methodology, including the development of the methodology assessing the health impacts of complex mixtures. In addition, bioaccumulation information and listings of the substance's acute and chronic toxicity levels for a wide variety of aquatic animals are included.

Information on Obtaining the Document: Information on the availability of the WQCDs can be obtained from:

Criteria and Standards (WH-585)
U.S. EPA
401 M Street, S.W.
Washington, D.C. 20460
FTS: 475-7315

In addition, WQCDs are available through:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

American Conference of Governmental Industrial Hygienists (ACGIH), Threshold Limit Values and Biological Exposure Indices

Title: Threshold Limit Values and Biological Exposure Indices.

Publisher: The American Conference of Governmental Industrial Hygienists
Cincinnati, OH 45211

Time of Publication: 1988.

Type of Publication: Document listing chemical-specific exposure limits.

- Source of Data/Information: TLVs are based on available information from industrial experience, and from experimental human and animal studies. BEIs are based on epidemiological and field study data, or determined as bioequivalent to a TLV by means of pharmacokinetic analysis of data from controlled human studies.

- QA/QC:

Subject: Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs) for Chemical Substances.

Type of Information: Chemical-specific TLV and BEI exposure limits referring to use of chemical substances in the practice of industrial hygiene and listed as guidelines or recommendations in the control of potential health hazards. TLVs represent conditions under which nearly all workers may be repeatedly exposed to a specific airborne concentration of a chemical substance on a daily basis without adverse effect. BEIs are supplementary to airborne TLVs and represent warning levels of biological response to the chemical. The manual specifies three categories of TLVs:

1. The TLV - Time Weighted Average
2. The TLV - Short Term Exposure Limit
3. The TLV - Ceiling

There are over 400 chemical listings for TLVs and approximately 23 chemical listings for BEIs.

Information on Obtaining the Document: Inquiries or order requests should be directed to:

ACGIH
6500 Glenway Avenue, Building D-7
Cincinnati, OH 45211-4438
(513) 661-7881

AQUIRE, Chemical Information System (on-line data base)

Type: On-line Data Base.

- Source of Data/Information: Studies of chemical effects on freshwater and saltwater organisms.
- QA/QC:

Subject: Effects of chemical substances on freshwater and saltwater organisms.

Producer: The Environmental Protection Agency (EPA), Office of Toxic Substances (OTS).

On-line Service: The Chemical Information System (CIS), available through Chemical Information Systems, Inc., a subsidiary of Fein-Marquart Associates.

Content:

- Type of Data/Information: Source of data on acute, chronic, bio-accumulative, and sublethal effects of chemical substances on freshwater and saltwater organisms (excluding bacteria, birds, and aquatic mammals). Each record in the data base covers a single experiment and includes chemical substance information, description of test organism, study protocol, test results, and bibliographic reference.
- Number of Data Elements: The file contains 68,338 records on 4179 chemical substances.

Search/Index Parameters: Searchable on the CIS by chemical name, CAS registry number, synonym, structure, and substructure.

Time Span: 1970 to date.

Updating: Periodically, as new data become available.

Access Information: An annual subscription fee of $300 to CIS is required (fee is waived for educational institutions and non-profit public libraries worldwide). The fee allows the user access to AQUIRE and approximately 29 additional databases on the CIS. Additional costs include a $10/hour communication charge, a $55/hour charge (average rate - this cost varies upon the particular CIS data base being accessed) for use of the database, and an $.08/day charge to store the user's access password. Costs on months during which the database is not accessed include only the daily charges to store the password. To request subscription applications or further information, contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212

CEPP/SARA Title III Section 302 Profiles

Title: CEPP/SARA Title III Section 302 Chemical Profiles

Publisher: The Environmental Protection Agency (EPA)
Office of Toxic Substances (OTS)
Washington, D.C. 20460

Time of Publication: First produced in 1985; Revised in 1988.

Type of Publication: Catalog of chemical profiles. Chemical reference documents for use in the Chemical Emergency Preparedness Program (CEPP).

- Source of Data/Information: Available literature and common reference sources, both documents and on-line.

- QA/QC:

Subject: Profiles contain a summary of publicly available documented information for chemicals on the EPA list of extremely hazardous substances, such as acute hazard information, chemical properties, and emergency handling techniques.

Type of Information: The information is presented in a format similar to the Occupational Safety and Health Administration's (OSHA) recommended format for a Material Safety Data Sheet (MSDS). The documents contain the following chemical-specific information when available: 1) chemical identity; 2) CAS registry number; 3) synonyms; 4) chemical formula and molecular weight; 5) regulatory information; 6) physical and chemical characteristics; 7) health hazard data; 8) fire and explosion hazard data; 9) reactivity data; 10) use information; 11) precautions for safe handling and use; 12) protective equipment for emergency situations; and 13) emergency first aid treatment guidance. There are 366 chemical profiles (one for each chemical on the SARA list of Extremely Hazardous Substances as of February 1988).

Information on Obtaining the Document: Contact:

Dr. Paul Tobin
Office of Toxic Substances
U.S. EPA
401 M Street, S.W.
Washington, D.C. 20460
(202) 382-3736

Chemical Hazard Information Profiles (CHIP)

Title: Chemical Hazard Information Profiles

Publisher: Office of Toxic Substances (OTS), Office of Pesticides and Toxic Substances, U.S. Environmental Protection Agency.

Time of Publication: 1976-present

Type of Publication: CHIP documents are the first stage in the assessment of risk by OTS for chemicals in the 1977 TSCA Chemical Substance Inventory; they enable OTS to decide the need for further assessment. There are over 200 CHIP documents available.

- Source of Data/Information: Over 50 bibliographic data bases and 100 secondary references are routinely searched during the preparation of CHIP documents. Unpublished data solicited from industry, labor, academia, public interest groups, and other government agencies are also used as sources of information.

- QA/QC: Several levels of management and technical review are performed within the Existing Chemical Assessment Division of the EPA Office of Pesticides and Toxic Substances, Office of Toxic Substances (OTS).

Subject: Health and environmental effects data and exposure-related data.

Type of Information: CHIPs are typically 20-40 pages in length, and contain a summary of readily available health effects, environmental effects, and exposure data. Little or no in-depth critical evaluation or validation of the data is performed. Typically a CHIP document contains chemical-specific information on: chemical identity; physical and chemical properties; worker, consumer, and environmental exposure; health and environmental effects for metabolism, lethality, carcinogenicity, genotoxicity, teratogenicity/ reproductive effects, behavior, growth and development, population effects, and abiotic effects, and; existing standards, regulations, and recommendations.

Information on Obtaining the Document: CHIPs (up to five per request) can be obtained from the TSCA Assistance Office at (202) 554-1404.

Chemical Hazards Response Information System (CHRIS)

Type: Source (Textual-Numeric)

- Source of Data/Information:
- QA/QC:

Subject: Chemistry Properties.

Producer: U.S. Coast Guard.

On-line Service: The Chemical Information System (CIS), available through Chemical Information Systems, Inc., a subsidiary of Fein-Marquart Associates.

Content:

- Type of Data/Information: Contains information for use in spill situations. Includes chemical names and synonyms, molecular formula, biological and fire hazard potential, handling, first aid, and chemical and physical properties. Includes capabilities to present information in a special MSDS format.
- Number of Data Elements: Approximately 75 data fields for over 1000 chemicals.

Search/Index Parameters:

Time Span: Current information.

Updating: Periodically, as new data become available.

Access Information: An annual subscription fee of $300 to CIS is required (fee is waived for educational institutions and non-profit public libraries worldwide). The fee allows the user access to CHRIS and approximately 29 additional databases on the CIS. Additional costs include a $10/hour communication charge, a $55/hour charge (average rate - this cost varies upon the particular CIS data base being accessed) for use of the database, and an $.08/day charge to store the user's access password. Costs on months during which the database is not accessed include only the daily charges to store the password. To request subscription applications or further information, contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212

CHEMTRACK

Type: Database

- Source of Data/Information: Laboratory test results for carcinogenicity.
- QA/QC:

Subject: Carcinogenicity studies

Producer: National Institute of Environmental Health Services, Toxicology Research and Testing Service.

On-line Service: The database is not directly accessible. However, searches and printouts are available free of charge.

Content:

- Type of Data/Information: CHEMTRACK contains data on chemical compounds being tested for toxicity. Data are mostly results of carcinogenicity tests on rats and mice for environmental exposure to chemicals. Retrievable information includes: species of animal, dose of chemical, animal age, results, organs affected, and kinds of tumors. Examples of chemicals tested include compounds in pesticides and over-the-counter drugs.
- Number of Data Elements: Data are available for over 600 chemical compounds.

Search/Index Parameters: Searchable in batch mode only, on virtually all fields.

Time Span: 1973 to present.

Updating: Monthly

Access Information: The database is not directly accessible. However, searches and printouts are available free of charge, by contacting:

National Institute of Environmental Health Services
Toxicology Research and Testing Service
MD 18-01, P.O. Box 12233
Research Triangle Park, NC 27709

(919) 541-3418

Clement Associates, Inc. Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites

Title: Chemical, Physical, and Biological Properties of Compounds Present at Hazardous Waste Sites.

Publisher: United States Environmental Protection Agency (EPA)
Office of Waste Programs Enforcement
Office of Solid Waste and Emergency Response
Washington, D.C. 20460

Time of Publication: September 27, 1985.

Type of Publication: Catalog of chemical profiles.

- Source of Data/Information: Consent decrees, administrative orders, complaint files from OWPE for toxic chemicals at enforcement sites, and secondary and primary literature sources.

- QA/QC: Peer-reviewed by principal scientists and investigators.

Subject: Physical and biological properties of chemicals present at hazardous waste sites.

Type of Information: The catalog records approximately 135 chemicals found at specific waste sites, the media in which the chemicals were detected, and the highest concentration of each chemical in a particular medium. Dichotomous scores also listed for each chemical indicate whether or not the chemical had any of the following characteristics: carcinogenicity, reproductive toxicity/ tetratogenicity, mutagenicity, acute toxicity, chronic toxicity, toxicity to domestic animals, and toxicity to terrestrial and aquatic wildlife. The chemical profiles summarize the chemical, physical, and biological properties of the chemicals detected at hazardous waste sites. Each profile has five sections:

1. Chemical and Physical Properties.
2. Transport and Fate Data.
3. Health Effects Data.
4. Toxicity to Wildlife and domestic Animals.
5. Regulations and Standards.

A summary of information listing the CAS registry number, chemical formula, International Union of Pure and Applied Chemistry (IUPAC) name, synonyms and trade names of the compound, and background information is also included.

Information on Obtaining the Document: For further information on the availability of the chemical profiles, contact:

The United States Environmental Protection Agency (EPA)
Office of Waste Programs Enforcement (OWPE)
Office of Solid Waste and Emergency Response (OSWER)
401 M Street, S.W.
Washington, D.C. 20460
(202) 382-4814

Drinking Water Criteria Documents (DWCD)

Title: Drinking Water Criteria Document

Publisher: Office of Drinking Water (ODW) and Environmental Criteria and Assessment Office, U.S. Environmental Protection Agency.

Time of Publication: Date varies with each chemical-specific document.

Type of Publication: DWCDs are prepared to assist ODW in developing and setting criteria standards under Sections 1412 and 1414 of the Safe Drinking Water Act.

- Source of Data/Information:
- QA/AC:

Subject: Physical properties, toxicology, health effects, environmental fate of chemicals.

Type of Information: Drinking Water Criteria Documents are comprehensive health effects evaluations containing health advisories for short-term exposures and adjusted daily intakes for lifetime exposures which are use in the derivation of recommended maximum contaminant levels (RMCLs) for chemicals in drinking water. Documents include: physical and chemical properties; toxicokinetics and human exposure; health effects in humans and animals; mechanisms of toxicity; quantification of toxicological effects. DWCDs may also include information designed for site-specific use.

Information on Obtaining the Document: DWCD's may be obtained from:

Office of Drinking Water (WH-550)
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington D.C. 20460

Contact the above address to obtain 1-3 copies of specific documents or to obtain a list of available documents. When more than 3 documents are desired, specific requests should be highlighted on the list. The highlighted requests should then be sent to the address given on the list. DWCD's are published in the EPA 600 series (600 refers to the EPA document control number). In addition, most DWCD's are available from:

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

ENVIROFATE, Chemical Information System (on-line data base)

Type: On-line chemical data base.

- Source of Data/Information: Scientific data from published literature.
- QA/QC:

Subject: Behavior of chemicals in the environment.

Producer: EPA, Office of Pesticides and Toxic Substances (OPTS).

On-line Service: The Chemical Information System (CIS), available through Chemical Information Systems, Inc., a subsidiary of Fein-Marquart Associates.

Content:

- Type of Data/Information: Contains information on the environmental fate or behavior (i.e., transport and degradation) of chemicals released into the environment. The selected chemicals are produced in quantities exceeding one million pounds per year. Data include environmental transformation rates (e.g., biodegradation, oxidation) and physical and chemical properties (e.g., water solubility, vapor pressure). Each record represents an individual test or observation, for a given chemical.
- Number of Data Elements: Contains more than 8,000 records of information of approximately 450 chemicals.

Search/Index Parameters: Searchable on the CIS by chemical name, CAS registry number, synonym, structure, and substructure.

Time Span: 1970 to date.

Updating: Periodically, as new data become available.

Access Information: An annual subscription fee of $300 to CIS is required (fee is waived for educational institutions and non-profit public libraries worldwide). The fee allows the user access to AQUIRE and approximately 29 additional databases on the CIS. Additional costs include a $10/hour communication charge, a $55/hour charge (average rate - this cost varies upon the particular CIS data base being accessed) for use of the database, and an $.08/day charge to store the user's access password. Costs on months during which the database is not accessed include only the daily charges to store the password. To request subscription applications or further information, contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212

Exposure Assessments (EA)

Title: Exposure Assessments (EA)

Publisher: United States Environmental Protection Agency (EPA)
Office of Health and Environmental Assessment (OHEA)
Washington, D.C. 20460

Time of Publication: Date varies with each chemical-specific document.

Type of Publication: Documents of varying length and scope analyzing scientific data on chemical substances. They are prepared for the various EPA program and regional offices.

- Source of Data/Information:

- QA/QC: Peer-reviewed by the Office of Health and Environmental Assessment (OHEA), other EPA offices, and individual scientists; may be reviewed in public session by the Environmental Health Committee of EPA's Science Advisory Board.

Subject: Site-specific human exposure assessments.

Type of Information: The documents assess the nature and magnitude of human exposures occurring at a specific site as a result of an industrial operation or the dumping of hazardous materials. Exposure assessments support EPA's regulatory and enforcement programs.

Information on Obtaining the Document: Information on the availability of the Exposure Assessments can be obtained from:

Office of Health and Environmental Assessment (OHEA) (RD-689)
U.S. EPA
401 M Street, S.W.
Washington, D.C. 20460
FTS: 382-7345
(202) 382-7345

For copies, contact:

ORD Publications Center
Center for Environmental Research Information
U.S. Environmental Protection Agency
26 West Martin Luther King Avenue
Cincinnati, OH 45268
FTS: 684-7562
(513) 569-7562

or

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

Federal-State Toxicology and Regulatory Alliance Committee (FSTRAC)

Title: Summary of State and Federal Drinking Water Standards and Guidelines

Publisher: Chemical Communication Subcommittee of FSTRAC, Office of Drinking Water, USEPA

Time of Publication: March 1988

Type of Publication: Reports generated from a database.

- Sources: Forty state drinking water programs which responded to a survey asking for information on drinking water standards and guidelines for specific chemicals.
- QA/QC:

Subject: State and Federal Drinking Water Standards and Guidelines.

Type of Information: The Summary of State and Federal Drinking Water Standards and Guidelines consists of reports generated from a database of survey information. The survey asked for information on current and proposed drinking water standards in all 50 states and Puerto Rico (agencies from 40 states responded). A total of 839 chemical standards or guidelines are included in the reports. The FSTRAC document includes reports on: the survey design; which chemicals are regulated; the maximum concentration level for the standards or guidelines; agency contacts; the factors considered in developing guidelines and standards; and a list of chemicals of concern for developing future standards. The document allows comparison of state standards and their basis of development for the chemicals which are regulated, and examination of the extent of state drinking water programs.

Information on Obtaining the Document: Contact the FSTRAC committee through:

USEPA
Office of Drinking Water (WH-550D)
401 M Street, S.W.
Washington, D.C. 20460

(202) 382-5508

"For Your Information" (FYI Reports)

Title: No title, collection of different reports.

Publisher: Reports submitted voluntarily to the EPA/OTS.

Time of Publication: Differs from report to report.

Type of Publication: Reports are submitted voluntarily to the EPA by chemical manufacturers, processors and distributors, trade associations, labor organizations, Federal, State or local agencies, foreign governments, academia, public interest and environmental groups, as well as by the general public.

- Source of Data/Information: Voluntary submissions of unpublished chemical toxicity and exposure data from a variety of organizations and agencies.
- QA/QC: FYI submissions are reviewed and evaluated as part of the chemical "screening" process within the OTS Existing Chemicals Program (ECP).

Subject: The reports on chemical substances from manufacturers, research institutes, etc. contain data that do not meet the statutory requirements for submission under TSCA but may be pertinent to risk assessment.

Type of Information: In addition to data on human health effects, toxicity (short-term, long term) to mammals, carcinogenicity, reproductive effects, mutagenicity, toxicity to fish, metabolism in animals, the reports also include information on bioaccumulation, biodegradation, possible biological removal, concentrations of the substance in the environment, physical properties, workplace practices and market information of the substance.

Information on Obtaining the Document: Microfiche copies of FYI submissions are available in the OTS Public Reading Room:

EPA
OTS Public Reading Room
Ground Floor, Northeast section
Waterside Mall
401 M Street, S.W.
Washington, D.C. 20460
Tel: (202) 475-6100

Persons wishing to obtain a copy of an FYI may write:

EPA
Freedom of Information
Ms. Jeralene Green (A-101)
Washington, D.C. 20460

For further information regarding FYI submissions, contact:

Jacqueline Favilla (TS-778)
FYI Coordinator
Office of Toxic Substances
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460
(202) 475-8823

"For Your Information" (FYI Reports) (Continued)

The Toxic Substances Control Act Test Submissions database (TSCATS) in the Chemical Information System (CIS) provides an index to information/data submitted to the U.S. EPA under the provisions of TSCA. For further information on TSCATS contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212

GENETOX, Chemical Information System (on-line database)

Type: On-line chemical data base.

- Source of Data/Information: Scientific results data from published primary literature.
- QA/QC:

Subject: Genetic assay studies.

Producer: EPA Office of Pesticides and Toxic Substances (OPTS).

On-line Service: The Chemical Information System (CIS), available through Chemical Information Systems, Inc., a subsidiary of Fein-Marquart Associates.

Content:

- Type of Data/Information: Contains mutagenicity information (e.g., chromosome aberration, DNA repair) on chemicals that were tested against 38 biological systems (e.g., the Ames test). Includes specific indications of type of assay performed, the biological host, type of endpoint measured, and final quantitative results.
- Number of Data Elements: There are over 3,000 chemical records.

Search/Index Parameters: Searchable on the CIS by chemical name, CAS registry number, synonym, structure, and substructure.

Time Span: 1970 to date.

Updating: Periodically, as new data become available.

Access Information: An annual subscription fee of $300 to CIS is required (fee is waived for educational institutions and non-profit public libraries worldwide). The fee allows the user access to AQUIRE and approximately 29 additional databases on the CIS. Additional costs include a $10/hour communication charge, a $55/hour charge (average rate - this cost varies upon the particular CIS data base being accessed) for use of the database, and an $.08/day charge to store the user's access password. Costs on months during which the database is not accessed include only the daily charges to store the password. To request subscription applications or further information, contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212

Hazardous Substances Data Bank, National Library of Medicine TOXNET (on-line data base)

Type: On-line data base.

- Source of Data/Information: Core information is derived from standard texts and monographs, and augmented with information from government documents, technical reports, and primary journal literature.

- QA/QC: Peer reviewed by the Scientific Review Panel (SRP), a committee of experts drawn from the major subject disciplines within the scope of the data base.

Subject: Toxicology.

Producer: Specialized Information Services of the National Library of Medicine, Toxicology Information Program.

On-line Service: DIMDI; National Library of Medicine (NLM) (as part of TOXNET)

Content:

- Type of Data/Information: Contains data on chemical substances that are of known or potential toxicity and to which substantial populations are exposed. The data are categorized into 11 classes of information including:

1. Substance Identification Information.
2. Manufacturing and Use Information.
3. Chemical and Physical Properties.
4. Safety and Handling Information.
5. Toxicity and Biomedical Effects.
6. Pharmacology.
7. Environmental Fate and Exposure Potential Information.
8. Exposure Standards and Regulations.
9. Monitoring and Analysis Methods.
10. Additional References.
11. Express Data (new data).

- Number of Data Elements: Contains 144 data fields on more than 4100 chemical substances.

Search/Index Parameters: Searchable by chemical name or synonym, CAS number, or specific term qualified with category, header, or field mnemonics.

Time Span: Current Information

Updating: Quarterly

Access Information: In order to obtain access privileges, the user must first become an NLM subscriber. The average cost per connect hour is $22.00. Requests for information and applications should be directed to:

MEDLARS Management
National Library of Medicine (NLM)
8600 Rockville Pike
Bethesda, MD 20894
(301) 496-6193

Health Assessment Documents (HAD), Used by the Office of Air Quality Planning and Standards

Title: Health Assessment Documents

Publisher: The United States Environmental Protection Agency (EPA)
Office of Health and Environmental Assessment (OHEA)
Washington, D.C. 20460

Time of Publication: Date varies with each chemical-specific document.

Type of Publication: Comprehensive assessments of the known health data from all exposure routes on particular chemicals or compounds. The documents serve as source documents for Agency use in determining potential health effects.

- Source of Data/Information: Pertinent scientific literature and key studies.
- QA/QC: Peer-reviewed by individual scientists and in public session by the Environmental Health Committee, Environmental Protection Agency (EPA), Science Advisory Board.

Subject: Assessments of known health data from all exposure routes.

Type of Information: Risk Assessments. The scope of the documents have been expanded to cover multimedia data in addition to information used by the Office of Air Quality Planning and Standards to determine the possible listing of a particular compound under Sections 111 or 112 of the Clean Air Act. The documents assess all major sources of the chemical in the environment, general ambient concentrations representing potential human exposure levels, and health effects demonstrated to be associated with exposure of man or lower organisms. Specific topics covered include:

1. Physical and Chemical Properties.
2. Sampling and Analytical Methods.
3. Source in the Environment.
4. Environmental Fate, Transport, and Distribution.
5. Environmental Levels and Exposure.
6. Biological Effects on Man and Other Organisms.

Information on Obtaining the Document: Information on the availability of the HEAs can be obtained from:

Office of Health and Environmental Assessment (OHEA) (RD-689), U.S. EPA
401 M Street, S.W.
Washington, D.C. 20460
(202) 382-7345

For copies, contact:

ORD Publications Center, Center for Environmental Research Information
U.S. Environmental Protection Agency
26 West Martin Luther King Avenue
Cincinnati, OH 45268
FTS: 684-7562; (513) 569-7562

<u>or</u>

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

Health Effects Assessments (HEAs)

Title: Health Effects Assessments (HEAs)

Publisher: The United States Environmental Protection Agency (EPA)
Office of Health and Environmental Assessment
Washington, D.C. 20460

Time of Publication: Date varies with each chemical-specific document.

Type of Publication: Evaluative summaries for making preliminary assessments of adverse health effects of substances of interest to Superfund. They have been superceded by and included in Health and Environmental Effects Documents (HEED). They are extensively peer-reviewed.

Subject: Preliminary assessments of relevant health effects data from published literature and OHEA documents.

Type of Information: HEAs are brief quantitatively oriented, preliminary assessments of relevant health effects data. The documents intend to suggest acceptable exposure levels whenever sufficient data are available. The values presented reflect the relative degree of hazard associated with exposure or risk to the chemical(s) addressed. Topics covered in the documents include:

1. Environmental Chemistry and Fate.
2. Absorption Factors in Humans and Experimental Animals.
3. Toxicity in Humans and Experimental Animals.
4. Carcinogenicity.
5. Regulatory Standards and Criteria.
6. Risk Assessment.

Information on Obtaining the Document: Information on the availability of the HEAs can be obtained from:

Office of Health and Environmental Assessment (OHEA) (RD-689)
U.S. EPA
401 M Street, S.W.
Washingtcn, D.C. 20460
(202) 382-7345

For copies, contact:

ORD Publications Center
Center for Environmental Research Information
U.S. Environmental Protection Agency
26 West Martin Luther King Avenue
Cincinnati, OH 45268
FTS: 684-7562
(513) 569-7562

or

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

Health and Environmental Effects Profiles (HEEP)
Health and Environmental Effects Documents (HEED)

Title: Health and Environmental Effects Profile
Health and Environmental Effects Document

Publisher: Environmental Criteria and Assessment Office (ECAO), Office of Health and Environmental Assessment (OHEA), U.S. Environmental Protection Agency

Time of Publication: Various publication dates

Type of Publication: HEEPs are chemical profiles which aid the Office of Solid Waste in developing waste characterization regulations under Section 3001 of the Resource Conservation and Recovery Act (RCRA). HEEDs are successors to HEEPs and HEAs and serve the needs of all of OSWER. HEEPs and HEEDs are peer-reviewed within ORD, EPA, and by outside experts.

Subject: HEEPs and HEEDs are summaries of literature concerning health hazards associated with environmental exposures to hazardous substances of interest to OSWER.

Type of Information: HEEPs and HEEDs contain data and information on the following topics: chemical identification; environmental fate and transport in water, air, and soil; water, food, inhalation, and dermal exposure processes; pharmacokinetics; health effects, including carcinogenicity, mutagenicity, teratogenicity, chronic toxicity, and other types of effects; aquatic toxicity; existing guidelines and standards; risk assessment; reportable quantity ranking; and weight of evidence and potency factors for carcinogenicity.

Information on Obtaining the Document:

For information about the availability of the OHEA documents, contact:

RCRA Superfund Hotline
(800) 424-9346
(202) 382-3000

Office of Health and Environmental Assessment (OHEA) (RD-689)
U.S. EPA
401 M Street, S.W.
Washington, D.C. 20460
FTS: 382-7345
(202) 382-7345

For copies, contact:

ORD Publications Center
Center for Environmental Research Information
U.S. Environmental Protection Agency
26 West Martin Luther King Avenue
Cincinnati, OH 45268
FTS: 684-7562
(513) 569-7562

or

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

IARC Monographs

Title: IARC Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Humans.

Publisher: World Health Organization for International Agency
for Research on Cancer
150 cours Albert Thomas
69372 Lyon Cedex08
France

Time of Publication: Different from monograph to monograph.

Type of Publication: Series of monographs provide information on carcinogenicity of chemical substances. Most often one monograph per chemical substance group.

- Source of Data/Information: Evidence of carcinogenicity in humans is derived from case reports, descriptive epidemiological studies, and analytical epidemiological studies.

- QA/QC: Articles containing relevant biological data are sent to an expert(s), or are used by IARC staff, to prepare first drafts of the sections on biological effects. The complete drafts are then compiled by IARC staff and sent to all participants of the Working Group (expert review group) for their comments. The Working Group meets for 7 to 8 days to discuss and finalize the texts of the monographs and to formulate the evaluations. After the meeting, the master copy of each monograph is verified by consulting the original literature.

Subject: The objective of the program is to evaluate the carcinogenic risk of chemicals to humans, to produce monographs on individual chemicals, chemical groups, industrial processes and other complex mixtures of chemicals, to elaborate critical reviews of all relevant data (internationally), and to evaluate the data in terms of human health risk.

Type of Information: A monograph in general is divided into four sections:

I. Chemical and Physical Data. (CAS number, chemical abstracts primary name (Ninth Collective Index) and the IUPAC systematic name, synonyms, trade names, structural formula, molecular formula, molecular weight, composition of technical products, impurities, biological effects).

II. Production, Use, Occurrence and Analysis. This section provides information on the extent of past and present human exposure, i.e about synthesis, production, use, occurrence, and analysis of the chemical substance or chemical substance group.

III. Biological Data Relevant to the Evaluation of Carcinogenic Risk to Humans. Includes results of carcinogenicity studies in animals, other relevant biological data (LD50, effects on reproduction, teratogenicity, embryo- and fetotoxicity, placental transfer, information on absorption, distribution, and excretion), and case reports and epidemiological studies of carcinogenicity in humans.

IV. Summary of Data Reported and Evaluation.

The IARC working group selects chemicals (natural and synthetic, including those which occur as mixtures and in manufacturing processes) on the basis of evidence of human exposure or carcinogenicity, or suspicion of risk to humans.

The carcinogenicity studies in experimental animals are assessed and judged to fall into one of four groups: 1. Sufficient evidence (increased incidence of malignant tumors in multiple species or in multiple experiments or an unusual incident degree). 2. Limited evidence (data suggest carcinogenicity, but only in one species or experiment, or at an inadequate dosage level). 3. Inadequate evidence because of qualitative or quantitative limitations (studies can't be evaluated). 4. No evidence.

IARC Monographs (Continued)

The same kind of categorization is done, if there is evidence for carcinogenic activity in short-term tests. Results of tests on DNA damage, on mutation, on chromosomal effects, and on tests for cell transformation are considered.

Information on Obtaining the Document: IARC Monographs are distributed by the:

World Health Organization
Distribution and Sales Service
1211 Geneva 27
Switzerland

Available from booksellers through the network of WHO Sales Agents. A list of these Agents may be obtained by writing to the above address.

Information System for Hazardous Organics in Water (ISHOW)

Type: Numeric Database

- Source of Data/Information: Readily available reference manuals, documents and studies.
- QA/QC:

Subject: Chemical properties.

Producer: Developed by the Structure Activity Research Project of the EPA Environmental Research Laboratory in Duluth, Minnesota, in conjunction with the University of Minnesota. Support provided by the Office of Pesticides and Toxic Substances, U.S. Environmental Protection Agency.

On-line Service: The Chemical Information System (CIS), available through Chemical Information Systems, Inc., a subsidiary of Fein-Marquart Associates.

Content:

- Type of Data/Information: Contains data on chemical properties including: melting point, boiling point, partition coefficient, acid dissociation constant, water solubility, and vapor pressure. Other ISHOW fields include chemical name, chemical abstract registry number, interpretive comments for the physical property value, and bibliographic citation information.

Substances covered are primarily those used, imported, or manufactured in the Great Lakes Watershed and are included on the Toxic Substances Control Act (TSCA) Inventory. Some selected chemicals are covered for their relevance to structure activity studies.

- Number of Data Elements: Over 16,000 records covering over 5400 chemicals.

Search/Index Parameters: Searchable on virtually all fields, including elements in a molecular formula.

Time Span: 1970 to present

Updating: Periodically, as new data become available.

Access Information: An annual subscription fee of $300 to CIS is required (fee is waived for educational institutions and non-profit public libraries worldwide). The fee allows the user access to ISHOW and approximately 29 additional databases on the CIS. Additional costs include a $10/hour communication charge, a $55/hour charge (average rate - this cost varies upon the particular CIS data base being accessed) for use of the database, and an $.08/day charge to store the user's access password. Costs on months during which the database is not accessed include only the daily charges to store the password. To request subscription applications or further information, contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212

EPA's Integrated Risk Information System (IRIS)

Type: Electronic on-line database.

- Source of Data/Information: Health risk assessment and regulatory information on chemical substances (e.g., ODW Health Advisories, Clean Air Act regulations).

- QA/QC: Health risk assessment information on chemicals is included in IRIS only after a comprehensive review of chronic toxicity data by panels composed of U.S. EPA scientists from several Agency Program Offices. The other sections are supplementary information which may be useful in particular risk management situations, but have not yet undergone comprehensive U.S. EPA review.

Subject: Hazard identification and dose-response assessment information for use in EPA risk assessments.

Producer: The Environmental Protection Agency (EPA).

On-line Service: EPA's electronic mail (EMail) system (available through DIALCOM, Inc.). (Expected to be available on TOXNET.)

Content:

- Type of Data/Information: Contains risk assessment and risk management information for noncarcinogenic effects and/or carcinogenic effects of chemical substances. The information is divided into two major components: chronic non-carcinogenic and chronic carcinogenic toxicity, and documentation providing instruction and explanation in support of the system and the chemical files. Each chemical file consists of up to six parts:

1. Oral and Inhalation Reference Doses for Systemic Toxicity.
2. Carcinogenicity Assessments.
3. Summarized Drinking Water Health Advisories.
4. EPA Regulation Summaries.
5. Supplementary Data.
6. Synonyms

- Number of Data Elements: There are approximately 400 chemicals represented.

Search/Index Parameters: Searchable by chemical name or CAS number.

Time Span: Current Information

Updating: Continuously

Access Information: To obtain an IRIS account contact:

Mike Mclaughlin
DIALCOM, Inc.
600 Maryland Avenue, S.W.
Washington, D.C. 20024
(202) 488-0550

The user must pay DIALCOM, Inc. for the cost of accessing IRIS. There is a $25.00 monthly minimum which is applied against a usage fee of $25.00 per hour. In addition to the usage fee, there is a $.05 charge per computer screen accessed.

For more information about the system, call IRIS User Support at (513) 569-7254 or FTS 684-7254.

LOG P and Related Parameters Database

Type: Numeric Database.

- Source of Data/Information: Worldwide scientific literature.
- QA/QC:

Subject: Chemical properties of organic compounds.

Producer: Pomona College Medicinal Chemistry Project.

On-line Service: Technical Database Services, Inc.

Content:

- Type of Data/Information: Provides partition coefficients (log P values) and related data for organic compounds in solvents. Information includes:

1. Chemical and Compound Names.
2. Log P Value.
3. Chemical Abstracts Service (CAS) Registry Number.
4. Molecular Formula.
5. Wiswesser Line Notation (WLN).
6. Acid Dissociation Constant (PKA).
7. Citations to Source Documents.

Data can be used to predict properties (e.g. absorption, solubility) and interactions of substances in chemical and biological procedures and processes. Also includes measured values for stearic, electrical effect, molar refractivity and other parameters for over 3,000 molecular fragments which can be used to predict log P values.

- Number of Data Elements: Contains over 30,000 records with data for over 14,000 organic compounds in approximately 360 solvents.

Search/Index Parameters: Searchable by alphabetical listing or CAS number.

Time Span: 1965 to date.

Updating: About 1,250 records twice per year.

Access Information: Inquiries and subscription requests should be directed to:

Technical Database Services, Inc.
10 Columbus Circle, Suite 2300
New York, NY 10019
(212) 245-0044

Costs include an annual $250.00 on-line subscription fee and a $150.00/hour on-line usage fee (this cost is on a "pay as you use" basis). User's manuals, telephone support, and other support services are included with the subscription.

National Air Toxics Information Clearinghouse (NATICH)

Type: Air Toxics Information Clearinghouse composed of an on-line computerized data base (NATICH) which contains information on potentially toxic air pollutants, hard copy reports of information from the data base, special reports, and a quarterly newsletter.

- Source of Data/Information: Air toxics information submitted by State and local air agencies, and published air toxics information from EPA and other Federal agencies.

- QA/QC: The Clearinghouse has been designed and is being implemented in close coordination with the State and Territorial Air Pollution Program Administrators (STAPPA) and the Association of Local Air Pollution Control Officials (ALAPCO).

Subject: The Clearinghouse contains indexed information on toxic and potentially toxic air pollutants.

Producer: The U.S. Environmental Protection Agency (EPA), Office of Air Quality Planning and Standards.

On-line Service: State and local agencies can access the NATICH data base through EPA Regional Offices. The public can access the NATICH data base through the National Technical Information Service (NTIS).

Content:

- Type of Data/Information: The core of the Clearinghouse is the NATICH data base which contains all of the air toxics (non-criteria air pollutants) information collected from Federal, State, and local agencies, as well as research information from EPA and other organizations. The information collected from State and local air pollution control agencies is organized according to agency, pollutant, and emission source, and includes the following: 1) regulatory program descriptions and contacts; 2) permitting data; 3) acceptable ambient concentrations; 4) ambient air monitoring information; 5) source test data; 6) emissions inventory data; and 7) research and methods development information. Selected preliminary EPA risk assessment results related to air toxics are also included in NATICH. Citations and abstracts are included for published EPA, National Institute for Occupational Safety and Health (NIOSH), and other Federal/International agency documents such as emission factors documents, health assessments, source sampling/ambient monitoring methodologies, and technical monitoring documents.

- Number of Data Elements:

Search/Index Parameters: The information is indexed according to agency, pollutant, emission source, and research information.

Time Span: Current Information.

Updating: As new data become available.

Access Information: Information can be obtained from NATICH in three ways: 1) through direct computer access; 2) by requesting information from EPA regional contacts; or 3) from hardcopy reports and newsletters. NATICH was primarily designed for State and local agencies, but is also available for use by the public. Access to Clearinghouse information is as follows:

STATE/LOCAL AGENCIES:

NATICH data base - through EPA Regional Offices (the list of air toxics contacts can be obtained by contacting the Clearinghouse staff - see address and phone number below).

All reports, newsletters - free, contact the Clearinghouse staff (see address and phone number below).

National Air Toxics Information Clearinghouse (NATICH) (Continued)

PUBLIC:

NATICH data base - through:

The National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4807

Newsletters - free, contact the Clearinghouse staff (see address and phone number below).

All reports - may be purchased from NTIS at (703) 487-4650, or from Radian Corporation at (512) 454-4797, ext. 5224.

The Clearinghouse staff:

John Vandenberg, Beth Hassett, Nancy Riley, Karen Blanchard, or Bob Schnell,

Pollutant Assessment Branch, MD-12
U.S. Environmental Protection Agency
Research Triangle Park, NC 27711
(919) 541-0850 FTS 629-0850

NIOSH Criteria Documents (NIOSHCRIT)

Title: National Institute for Occupational Safety and Health Criteria for a Recommended Standard.

Publisher: National Institute for Occupational Health and Safety (NIOSH)

Time of Publication: 1972 to present.

Type of Publication: Documents which summarize the NIOSH rationale for recommended exposure limits for chemicals presenting human health risks in the workplace. These documents are passed on to the Secretary of Labor for consideration in implementation in developing regulatory standards. As of November 1987, approximately 125 Criteria Documents had been released for public distribution.

- Source of Data/Information: Available research and epidemiologic studies.
- QA/QC: Reviewed by the NIOSH Technical Evaluation and Review Branch, Office of Extramural Coordination and Special Projects. Distributed to NIOSH staff, other government agencies, and the occupational health community, including labor, industry, academia, and public interest groups.

Subject: Occupational exposure information concerning chemicals suspected of presenting a risk to human health in the workplace, including toxicity, carcinogenicity, and other health effects.

Type of Information: Criteria Documents include summaries of research relevant to worker exposure to potentially toxic or cancer-causing substances. Specific types of information include: the NIOSH recommendations for the substance, including environmental standards, labeling, protective clothing and equipment, worker education, work practices and engineering controls, sanitation, and monitoring and recordkeeping requirements; biologic effects of exposure, including toxicity and carcinogenicity potential and historical reports of adverse health effects; environmental sampling and control methods; methodology for the derivation of the exposure standard; and occupational research priorities for the specific substance. Appendices include a Material Safety Data Sheet for the substance (MSDS).

Information on Obtaining the Document: Copies of a limited number of Criteria Documents and a list of available titles may be obtained by writing to:

NIOSH Publications
4676 Columbia Parkway
Cincinnati, OH 45226

Any titles not available through NIOSH can be obtained through the following:

Superintendent of Documents
U.S. Government Printing Office (GPO)
Washington, D.C. 20402

OR

National Technical Information Service (NTIS)
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

NIOSH Current Intelligence Bulletins (NIOSHCIB)

Title: National Institute for Occupational Safety and Health Current Intelligence Bulletin.

Publisher: National Institute for Occupational Health and Safety (NIOSH)

Time of Publication: 1978 to present.

Type of Publication: Documents published periodically by NIOSH. As of November 1987, a total of 49 current intelligence bulletins had been released for public distribution.

- Source of Data/Information:

- QA/QC: Reviewed by the NIOSH Technical Evaluation and Review Branch, Office of Extramural Coordination and Special Projects. Distributed to NIOSH staff, other government agencies, and the occupational health community, including labor, industry, academia, and public interest groups.

Subject: Information received by NIOSH concerning chemicals suspected of presenting a risk to human health in the workplace, including toxicity, carcinogenicity, and other health effects.

Type of Information: Reviews, evaluations, and new information received by NIOSH concerning the toxicity, carcinogenicity, and other health effects of selected chemicals. Current Intelligence Bulletins are produced for chemicals which NIOSH believes require special consideration in the workplace, but for which they have not developed exposure criteria. Their purpose is to disseminate occupational health information to the regulatory and industrial community.

Information on Obtaining the Document: Copies of a complete set of Current Intelligence Bulletins and a list of available titles may be obtained by writing to:

NIOSH Publications
4676 Columbia Parkway
Cincinnati, OH 45226

Office of Drinking Water Health Advisory Program (ODWHAP)

Title: Health Advisory

Publisher: Office of Drinking Water, U.S. Environmental Protection Agency

Time of Publication: The notice of availability of the first set of 49 final EPA Drinking Water Health Advisories (HAs) was published in 1987. See 52 Federal Register 34294 (September 10, 1987). The Office of Drinking Water has also issued draft HAs for an additional 50 pesticides. See the notice of availability, 53 Federal Register 565 (January 8, 1988).

Type of Publication: Non-regulatory advisories for chemical substances. Technical guidance to assist Federal, State, and local officials responsible for public health.

- Source of Data/Information:
- QA/QC:

Subject: Health effects, analytical methodology, and treatment technology information useful in dealing with contamination of drinking water.

Type of Information: Health Advisories provide general information on health effects and water treatment technology for potential water contaminants. They also describe concentrations of contaminants in drinking water at which adverse effects would not be anticipated to occur. A margin of safety is included in these concentrations to protect sensitive members of the population.

Health Advisory recommendations are developed from data describing non-carcinogenic end-points of toxicity. They do not incorporate quantitatively any potential carcinogenic risk from such exposure. For those chemicals which are known or probable human carcinogens according to the proposed Agency classification scheme, non-zero One-day, Ten-day and Longer-term Health Advisories may be derived, with attendant caveats. Health Advisories for lifetime exposures may not be recommended. Projected excess lifetime cancer risks are provided to give an estimate of the concentrations for the contaminant which may pose a carcinogenic risk to humans. These hypothetical estimates usually are presented as upper 95% confidence limits derived from a linearized multistage model which is considered to be unlikely to underestimate the probable true risk.

Information on Obtaining the Document: To obtain copies of a set of HAs, interested parties should contact:

The National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

For copies of individual HAs on particular pesticides, contact the EPA Safe Drinking Water Hotline, (800) 426-4791, or send a written request to:

The Health Advisory Program Coordinator
Office of Drinking Water (WH-550D)
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington D.C. 20460

Oil and Hazardous Materials - Technical Assistance Data System (OHM-TADS)

Type: Source (Textual-Numeric).

- Source of Data/Information: Published literature.
- QA/QC:

Subject: Toxicology

Producer: U.S. Environmental Protection Agency, Emergency Response Division. Created for the Superfund program to aid spill-response teams in the rapid retrieval of chemical-specific information.

On-line Service: The Chemical Information System (CIS), available through Chemical Information Systems, Inc., a subsidiary of Fein-Marquart Associates.

Content:

- Type of Data/Information: Contains specific data pertinent to spill-response efforts related to any substance classified as an oil or hazardous material. Provides technical support for dealing with potential or actual dangers resulting from the discharge of oil or hazardous substances. Specific data include: substance identification (CAS, common and trade names, chemical formula); physical properties; uses; animal and aquatic toxicity; carcinogenicity; persistence; accumulation potential; handling procedures; and suggested methods for disposing of spilled materials.
- Number of Data Elements: Up to 126 data fields for 1402 materials.

Search/Index Parameters:

Time Span:

Updating: Periodically, as new data become available.

Access Information: An annual subscription fee of $300 to CIS is required (fee is waived for educational institutions and non-profit public libraries worldwide). The fee allows the user access to OHM-TADS and approximately 29 additional databases on the CIS. Additional costs include a $10/hour communication charge, a $55/hour charge (average rate - this cost varies upon the particular CIS data base being accessed) for use of the database, and an $.08/day charge to store the user's access password. Costs on months during which the database is not accessed include only the daily charges to store the password. To request subscription applications or further information, contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212

Registry of Toxic Effects of Chemical Substances (RTECS), NIOSH (on-line data base)

Type: On-line bibliographic data base - corresponds to the printed and microfiche RTECS publication available from the U.S. Government Printing Office.

- Source of Data/Information: Primary and secondary literature sources including test results and toxicological reviews.

- QA/QC:

Subject: Chemical toxicity information.

Producer: U.S. Department of Health and Human Services, Public Health Service, National Institute for Occupational Safety and Health (NIOSH).

On-line Service: The Chemical Information System (CIS), available through Chemical Information Systems, Inc., a subsidiary of Fein-Marquart Associates. Also accessible through the National Library of Medicine (NLM).

Content:

- Type of Data/Information: Contains measurements of toxicological effects of chemicals. Each entry contains the CAS and NIOSH/RTECS numbers, chemical names and synonyms, molecular formula, and one or more measures of toxicity, including acute and chronic in vivo data, in vitro mutagenesis data, and skin and eye irritation data. Other information includes: Wiswesser Line Notation, threshold limit values, International Agency for Research on Cancer (IARC) carcinogenic determinations, recommended and existing standards and regulations, National Toxicology Program bioassay status, EPA Toxic Substances Control Act (TSCA) status, and EPA GENE-TOX data.

- Number of Data Elements: Contains over 135,000 toxicological measurements pertaining to approximately 80,000 chemicals.

Search/Index Parameters: Searchable by CAS and NIOSH/RTECS numbers, and by chemical name or synonym. Searchable fields include: animal species, dosage methods, toxicity measures (e.g., LD50), special toxic effects (e.g., carcinogenic), and range of toxicity values.

Time Span: Current Information.

Updating: Quarterly.

Access Information: The database is accessible through the Chemical Information System and through the National Library of Medicine (NLM). An annual subscription fee of $300 to CIS is required (fee is waived for educational institutions and non-profit public libraries worldwide). The fee allows the user access to AQUIRE and approximately 29 additional databases on the CIS. Additional costs include a $10/hour communication charge, a $55/hour charge (average rate - this cost varies upon the particular CIS data base being accessed) for use of the database, and an $.08/day charge to store the user's access password. Costs on months during which the database is not accessed include only the daily charges to store the password. To request subscription applications or further information, contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212

RTECS (Continued)

In order to obtain access privileges with the National Library of Medicine (NLM), the user must first become an NLM subscriber. The average cost per connect hour is $22.00. Requests for information and applications should be directed to:

MEDLARS Management
National Library of Medicine (NLM)
8600 Rockville Pike
Bethesda, MD 20894
(301) 496-6193

Reportable Quantities for Carcinogens in Hazardous Substances (RQCAR)

Title: Reportable Quantity Document

Publisher: Office of Emergency and Remedial Response of the Office of Solid Waste and Emergency Response and Environmental Criteria and Assessment Office (ECAO), U.S. Environmental Protection Agency

Time of Publication:

Type of Publication: Brief data summaries used to establish CERCLA Section 102 RQ levels based on potential carcinogenicity of hazardous substances. Methodology for obtaining and evaluating information is described in the EPA document "Methodology for Evaluating Potential Carcinogenicity in Support of Reportable Quantity Adjustments Pursuant to CERCLA Section 102" numbered OHEA-C-073, December 1986. RQCAR documents are reviewed and revised by scientists in OHEA, by other EPA offices, and by the public before becoming final. Some RQCARs may be included as chapters in Health and Environmental Effects Documents (HEEDs).

Subject: Carcinogenicity data summaries

Type of Information: RQ carcinogenicity documents focus on the information used to classify a substance's weight of evidence (the strength of the case that a substance causes cancer in humans) and carcinogenic potency (the strength of a substance to cause cancer). The information in these documents includes summaries of animal and human cancer studies and the relevant data to assess potency. RQs are summary reports and are not intended to be complete references for health effects; they do not include information on health effects other than cancer.

Information on Obtaining the Document: Individual profiles are available in the CERCLA docket. They may also be available from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

Reportable Quantities for Chronically Toxic Hazardous Substances (RQTOX)

Title: Reportable Quantity Document

Publisher: Office of Solid Waste and Emergency Response and Environmental Criteria and Assessment Office, U.S. Environmental Protection Agency

Time of Publication:

Type of Publication: Brief data summaries used to establish CERCLA Section 102 RQ levels based on the chronic toxicity of chemical substances. Some RQTOX may be included as chapters in Health and Environmental Effects Documents (HEEDs).

- Source of Data/Information: American Conference of Governmental Industrial Hygienists, National Institute for Occupational Safety and Health, a computer search of Chemical Abstracts, and readily available literature

- QA/QC: Peer review within EPA

Subject: Toxicological data summaries

Type of Information: RQ documents contain oral and inhalation toxicological data, including summaries and evaluations of exposure studies, as well as specific information on the derivation of the chemical substance's reportable quantity. RQs vary in length from about 10 pages up to about 150 pages, depending on the amount of readily-available toxicological literature on the particular chemical substance.

Information on Obtaining the Document: Individual profiles are available in the CERCLA docket. They may also be available from:

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

Risk Assessments: Carcinogenicity, Mutagenicity, Teratogenicity, Reproductive Effects (RA; CA; MA; TA; or ReproAssess)

Title: Risk Assessments: Carcinogenicity, Mutagenicity, Teratogenicity, Reproductive Effects (RA; CA; MA; TA; or ReproAssess)

Publisher: United States Environmental Protection Agency (EPA)
Office of Health and Environmental Assessment (OHEA)
Washington, D.C. 20460

Time of Publication: Date varies with each chemical-specific document. The reports are revised and edited based on regulatory office needs and the availability of resources.

Type of Publication: Documents of varying length and scope analyzing scientific data on chemical substances. These evaluations may be individual documents or part of a larger assessment. They are prepared for the various EPA programs and regional offices.

- Source of Data/Information: Pertinent scientific literature and key studies.
- QA/QC: Peer-reviewed by OHEA, other EPA offices, and individual scientists; may be reviewed in public session by the Environmental Health Committee of EPA's Science Advisory Board.

Subject: Assessments of known health effects data from all exposure routes.

Type of Information: The documents analyze scientific data on chemical substances as these data relate to human health. The documents are used by EPA in determining whether a chemical substance is carcinogenic or mutagenic, is a developmental toxicant or affects human reproductive systems, and what risk it poses to the public, particularly in relation to other chemicals. Specific topics covered include:

1. Metabolism.
2. Mutagenicity and Cell Transformation.
2a. Developmental and Reproductive Effects.
3. Carcinogenicity.
4. Other Toxicity.
5. Risk Assessment.

Information on Obtaining the Document: Information on the availability of the Risk Assessments can be obtained from:

Office of Health and Environmental Assessment (OHEA) (RD-689), U.S. EPA
401 M Street, S.W.
Washington, D.C. 20460
FTS: 382-7345; (202) 382-7345

For copies, contact:

ORD Publications Center, Center for Environmental Research Information
U.S. Environmental Protection Agency
26 West Martin Luther King Avenue
Cincinnati, OH 45268
FTS: 684-7562; (513) 569-7562

or

National Technical Information Service
5285 Port Royal Road
Springfield, VA 22161
(703) 487-4600

STORET Water Quality Database

Type: Hierarchical database

- Source of Data/Information: Water quality monitoring stations within the United States or in areas contiguous to the United States. Data is entered by state water quality agencies, EPA regional agencies, or other agencies and organizations (USGS, for example).

- QA/QC: Initial quality control is performed by the agency inputting the data, although no specific data quality objectives have been set. Before data is loaded to the main database files, a STORET program checks it for proper format.

Subject: Water quality monitoring, municipal waste inventory, fish kill, and effluent data.

Producer: U.S. Environmental Protection Agency, Office of Water and Hazardous Material.

On-line Service: Available only through EPA.

Content:

- Type of Data/Information: STORET is used for the storage and retrieval of data relating to the quality of the waterways within and contiguous to the United States. Water quality monitoring strategies are developed by individual states, with guidance by EPA, to fulfill their own particular water quality objectives. The findings of these monitoring activities (the amounts of pollutants found in water supplies) are stored in STORET's Water Quality File. In addition, files exist in the following subject areas: municipal waste; fish kills; effluent data; and flow programs.

- Number of Data Elements: Data exist from monitoring stations on approximately 9,000 to 10,000 pollutants.

Search/Index Parameters: The database in organized by reporting station within the appropriate regional or state water quality agency. STORET is searchable by geographic location (e.g., latitude and longitude, state, county, watershed), parameter code (i.e., pollutant type), or station type (e.g., the station's agency or type of monitoring activity).

Time Span:

Updating: New data are continuously entered by the appropriate agencies, or other users which have access to the data entry program. Historical data are referenced by the year in which the data were collected, but are not archived.

Access Information: Access to STORET is available only through EPA. For information about retrievals, or about starting an account for hookup to the system contact:

STORET User's Assistance
EPA
Waterside Mall
400 M St, S.W.
Washington, D.C.
(202) 426-7792

Individual requests for retrievals may be available through the Freedom of Information Office, at:

EPA
Freedom of Information
401 M Street, S.W.
Washington, D.C. 20460
(202) 382-4048

Toxicity One-Liners

Title: Toxicity One-Liners

Publisher: Office of Pesticide Programs (OPP), United States Environmental Protection Agency (EPA).

Time of Publication: As OPP reviews submissions from registrants for specific chemicals to be released.

Type of Publication: Toxicity test result summary documents for pesticides.

- Source of Data/Information: Submissions of reports with test results on toxicity required by OPP from the registrants (producers of pesticides who want to bring a new product on the market) to OPP/EPA.

- QA/QC: When a Toxicity One-Liner on a specific chemical has been released by OPP it is revised only if the required testing procedures (by OPP) have been improved on or if the criteria on toxicity data have been changed. The revision is done by OPP.

Subject: A Toxicity One-Liner for a specific chemical (pesticide) is a summary list of the test results from submissions of the producers (registrants) to OPP, including categorization from OPP on toxicity and validity of the test results.

Type of Information: Toxicity One-Liners include information on the testing laboratory, kind of study, length of study, material tested, and date the study was finished for each test submitted. Test results include the median lethal dose (LD50) and the median lethal concentration (LC50), lowest observed effect level, and no observed effect level. The toxicity of the chemicals tested is categorized by the OPP according to the categorization in the Code of Federal Regulation, Volume 40, Section 162.10 (CFR 40, 162.10, July 1987) and listed for each submission. The reported test procedures used are evaluated by OPP and classified as being acceptable or not valid for registration purposes.

Information on Obtaining the Document: For copies of the Toxicity One-Liner for a specific chemical, contact:

EPA
Freedom of Information
401 M Street, S.W.
Washington, D.C. 20460
(202) 382-4048

It is possible to access the test results for a specific submission using the EPA Accession Number for chemical identification by requesting in writing to:

Office of Pesticide Programs
401 M Street, S.W.
Washington, D.C. 20460

TSCA Section 8(e) Notices

Title: The Toxic Substances Control Act (TSCA) Section 8(e) Notices.

Publisher: Under Section 8(e) of TSCA, manufacturers, processors and distributors of TSCA-covered chemicals submit notices of substantial risk to EPA. The U.S. EPA, Office of Toxic Substances (OTS) prepares a status report regarding the submitted data.

Time of Publication: Section 8(e) became effective on January 1, 1977, the effective date of TSCA. Since January 1, 1977, a large number of Section 8(e) notices have been received. Notices are submitted as new information is obtained.

Type of Publication:

- Source of Data/Information: Manufacturers, processors and distributors of TSCA-covered chemicals submit notices of substantial risk when they become aware of new data that support a conclusion that a chemical may present a substantial risk of injury to health or the environment.

- QA/QC: Upon receipt of a Section 8(e) submission, OTS prepares a status report which contains a description and preliminary assessment of the submitted information.

Subject: New data on the health and environmental effects of TSCA-covered chemicals.

Type of Information: The Section 8(e) notices cover a wide range of chemical toxicity/exposure information on TSCA-covered chemicals. The OTS status report, which is prepared upon receipt of a submission, contains a description and preliminary assessment of the submitted information, a statement regarding production and use(s) of the chemical(s), and recommendations for appropriate OTS followup action/activities.

Information on Obtaining the Document: All Section 8(e) notices are available in the OTS Public Reading Room, ground floor, Northeast Mall, Waterside Mall, 401 M Street, S.W., Washington, D.C.

The Toxic Substances Control Act Test Submissions database (TSCATS) in the Chemical Information System (CIS) provides an index to information/data submitted to the U.S. EPA under the provisions of TSCA. For further information on TSCATS contact:

The User Support group at 800-CIS-USER (in Maryland: (301) 321-8440)

Chemical Information Systems, Inc.
7215 York Road
Baltimore, MD 21212
For further information regarding TSCA Section 8(e), contact:

David R. Williams (TS-778)
TSCA Section 8(e) Coordinator
Office of Toxic Substances
U.S. Environmental Protection Agency
401 M Street, S.W.
Washington, D.C. 20460
(202) 382-3468

APPENDIX I

EPA HAZARDOUS SUBSTANCE FACT SHEET

HAZARDOUS SUBSTANCE FACT SHEET

United States Environmental Protection Agency
Office of Toxic Substances

URETHANE
Chemical Abstract Service # 51-79-6

A MESSAGE FROM THE ENVIRONMENTAL PROTECTION AGENCY

The Emergency Planning and Community Right To Know Act of 1986 requires the Environmental Protection Agency to establish the Toxic Release Inventory, a national data base containing information on the release of 328 toxic chemicals from manufacturing plants in the United States. This Fact Sheet, prepared by the New Jersey Department of Health, concerns one of these chemicals. EPA is distributing copies of this Fact Sheet in order to help the public understand the potential health effects of exposure to chemical releases identified in the Toxic Release Inventory.

Readers should be aware that determining the health effects of chemicals is a very complex process. These Fact Sheets are summaries of facts about the chemicals. In addition, there may be subtle but important differences in the ways in which the State of New Jersey, EPA, and other scientific institutions might state their conclusions regarding the health effects of particular chemicals according to potential exposures. However, we believe these New Jersey Fact Sheets are very useful sources of summary information.

Since New Jersey wrote these Fact Sheets for workers who may be exposed to the chemicals where they work, several sections of the Fact Sheets are about workplace, rather than community situations. Levels of exposure at work--such as in factories or repair shops--are often much higher than community exposures. In addition, the ways that community residents are exposed may also be different. For example, workers may be exposed to a particular chemical by air and skin contact, but residents may be exposed to the same chemical through their drinking water.

Finally, readers should note most chemicals have not been tested for toxicity in a comprehensive manner. There are scientific gaps in our knowledge about the health effects of most chemicals. These Fact Sheets can only provide information on health effects where testing for toxicity has actually been done or where comparisons with similar chemicals can be drawn. As further scientific knowledge is acquired, additional information will be made available.

April 1989

HAZARDOUS SUBSTANCE FACT SHEET

Contents prepared by the
New Jersey Department of Health
Right to Know Program

Distributed by the United States
Environmental Protection Agency
Office of Toxic Substances

Common Name: URETHANE

CAS Number: 51-79-6
DOT Number: None

RTK Substance number: 1986
Date: 1/31/86

HAZARD SUMMARY

* Urethane can affect you when breathed in and by passing through your skin.
* Urethane is a CARCINOGEN and may be a TERATOGEN—HANDLE WITH EXTREME CAUTION.
* Very high exposures may cause you to feel dizzy, lightheaded and to pass out.
* Very high or repeated exposures can damage the liver, brain and blood forming organs.

IDENTIFICATION

Urethane is a colorless, odorless crystalline material or white powder. It is used as an intermediate for pharmaceuticals, pesticides and in biochemical research and medicine.

REASON FOR CITATION

* Urethane is on the Hazardous Substance List because it is cited by NTP, DEP, CAG and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a CARCINOGEN, a MUTAGEN and a TERATOGEN.
* Definitions are attached.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

No occupational exposure limits have been established for Urethane. This does not mean that this substance is not harmful. Safe work practices should always be followed.

It should be recognized that Urethane can be absorbed through your skin, thereby increasing your exposure.

* Urethane is a PROBABLE CARCINOGEN in humans. There may be <u>no</u> safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where Urethane is handled, used, or stored.
* Wear protective work clothing.
* Wash thoroughly <u>immediately</u> after exposure to Urethane and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of Urethane to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Urethane:**

* Very high levels may cause you to feel dizzy, lightheaded and to pass out.
* Exposure to very high levels can damage the brain and liver.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Urethane** and can last for months or years:

Cancer Hazard

* **Urethane** is a PROBABLE CARCINOGEN in humans. It has been shown to cause lung, stomach and other cancers in animals.
* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

* **Urethane** may be a TERATOGEN in humans since it has been shown to be a teratogen in animals.
* **Urethane** has caused CANCER in the offspring of animals exposed during pregnancy.

Other Long-Term Effects

* Repeated exposure can damage the blood-forming organs (bone marrow suppression).
* **Urethane** can damage the liver and central nervous system.

MEDICAL

Medical Testing

Before beginning employment and at regula times after that, for those with frequen or potentially high exposures, the follow ing are recommended:

* Liver function tests.
* Complete blood count.

If symptoms develop or overexposure i suspected, the following may be useful:

* Exam of the nervous system.

Any evaluation should include a carefu history of past and present symptoms wit an exam. Medical tests that look for damage already done are not a substitute fo controlling exposure.

Request copies of your medical testing You have a legal right to this informatio under OSHA 1910.20.

Mixed Exposures

Because more than light alcohol consumption can cause liver damage, drinking alcohol can increase the liver damage caused by **Urethane**.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically transfer Urethane from drums or other storage containers to process containers.

Good WORK PRACTICES can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by Urethane should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to Urethane.
* On skin contact with Urethane, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted Urethane, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where Urethane is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating or smoking.
* Use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.
* When vacuuming, a high efficiency particulate absolute (HEPA) filter should be used, <u>not</u> a standard shop vacuum.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with Urethane. Wear protective gloves and clothing. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day and put on before work.

Eye Protection

* Eye protection is included in the recommended respiratory protection.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Engineering controls must be effective to ensure that exposure to Urethane does not occur.
* At <u>any</u> exposure level, use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in the positive pressure mode or with a full facepiece, hood, or helmet in the continuous flow mode, or use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in pressure-demand or other positive pressure mode.

HANDLING AND STORAGE

* Prior to working with Urethane you should be trained on its proper handling and storage.
* Urethane must be stored to avoid contact with STRONG OXIDIZERS (such as CHLORINE, BROMINE and FLUORINE), STRONG ACIDS (such as HYDROCHLORIC, SULFURIC and NITRIC), STRONG BASES, CAMPHOR, MENTHOL, SALOL or THYMOL since violent reactions occur.
* Store in tightly closed containers in a cool, well-ventilated area.
* A regulated, marked area should be established where Urethane is handled, used, or stored.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust-releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. Because of this, and because of exposure of children or people who are already ill, community exposures may cause health problems.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

Q: Who is at the greatest risk from reproductive hazards?
A: Pregnant women are at greatest risk from chemicals that harm the developing fetus. However, chemicals may affect the ability to have children, so both men and women of childbearing age are at high risk.

Q: Should I be concerned if a chemical is a teratogen in animals?
A: Yes. Although some chemicals may affect humans differently than they affect animals, damage to animals suggests that similar damage can occur in humans.

>>>>>>>>>>>>>>>>> E M E R G E N C Y I N F O R M A T I O N <<<<<<<<<<<<<<<<

Common Name: URETHANE
DOT Number: None
DOT Emergency Guide code: No Citation
CAS Number: 51-79-6

NJ DOH Hazard rating	
FLAMMABILITY	Not Found
REACTIVITY	Not Found
POISONOUS GASES ARE PRODUCED IN FIRE	

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* Urethane is a COMBUSTIBLE SOLID.
* Use dry chemical, CO_2, water spray, or foam extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE, including *Nitrogen Oxides*.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If Urethane is spilled, take the following steps:

* Restrict persons not wearing protective equipment from area of spill until clean-up is complete.
* Remove all ignition sources.
* Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
* It may be necessary to contain and dispose of Urethane as a HAZARDOUS WASTE. Contact your state Environmental Program for specific recommendations.

FOR LARGE SPILLS AND FIRES immediately call your fire department.

HANDLING AND STORAGE (See page 3)

FIRST AID

POISON INFORMATION

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention.

Skin Contact

* Quickly remove contaminated clothing. Immediately wash contaminated skin with large amounts of water.

If Symptoms Develop

* Remove the person from exposure.
* Begin rescue breathing if breathing has stopped and CPR if heart action has stopped.
* Transfer promptly to a medical facility.

PHYSICAL DATA

Vapor Pressure: 10 mm Hg at 77.8°F (25°C)
Flash Point: 198°F (92.2°C)
Water Solubility: Soluble

CHEMICAL NAME

Carbamic Acid, Ethyl Ester

Not intended to be copied and sold for commercial purposes.

NEW JERSEY DEPARTMENT OF HEALTH
Right to Know Program
CN 368, Trenton, NJ 08625-0368

SARA 313 ECOLOGICAL FACT SHEET

DRAFT

U.S. Environmental Protection Agency
Office of Toxic Substances

Urethane

GENERAL INFORMATION

Urethane (CAS No. 51-79-6) is a granular solid used to make other chemicals, including pesticides and fumigants, and to dissolve other chemicals. It can get into water or soil if released at manufacturing or use sites, or if accidentally spilled.

ACUTE (SHORT-TERM) ECOLOGICAL EFFECTS

Acute toxic effects may include the death of animals, birds, or fish, and death or low growth rate in plants. Acute effects are seen two to four days after animals or plants come in contact with a toxic chemical substance.

Urethane has slight acute toxicity to fish, birds, and animals. It causes damage to plants including death of buds.

CHRONIC (LONG-TERM) ECOLOGICAL EFFECTS

Chronic toxic effects may include shortened lifespan, reproductive problems, lower fertility, and changes in appearance or behavior. Chronic effects can be seen long after first exposure(s) to a toxic chemical.

Urethane has slight chronic toxicity to aquatic life, including fish. No data are available on the long-term effects of urethane on birds or animals.

WATER SOLUBILITY

Urethane is highly soluble in water. Concentrations of 1,000 milligrams and more will mix with a liter of water.

DISTRIBUTION AND PERSISTENCE IN THE ENVIRONMENT

Urethane slightly persistent in water with a half-life of between 2 to 20 days. The half-life of a pollutant is the amount of time it takes for one-half of the chemical to be degraded. About 24% of urethane will eventually end up in air; the rest will end up in the water.

DRAFT

BIOACCUMULATION IN AQUATIC ORGANISMS

Some substances increase in concentration, or bioaccumulate, in living oranisms as they breathe contaminated air, drink contaminated water, or eat contaminated food. These chemicals can become concentrated in the tissues and internal organs of animals and humans.

The concentration of urethane found in fish tissues is expected to be about the same as the average concentration of urethane in the water from which the fish was taken.

APPENDIX J

EPA CHEMICAL PROFILE

EPA CHEMICAL PROFILE

Date: October 31, 1985
Revision: November 30, 1987

CHEMICAL IDENTITY -- CHLORINE

CAS Registry Number: 7782-50-5

Synonyms: Bertholite; Molecular Chlorine

Chemical Formula: Cl_2

Molecular Weight: 70.91

SECTION I -- REGULATORY INFORMATION

CERCLA (SARA) 1986:

Toxicity Value Used for Listing Under Section 302: LC_{50} inhalation (mouse) 0.4 mg/liter/1 hour (*NIOSH/RTECS 1985)

TPQ: 100 (pounds)

RQ: 10 (pounds)

Section 313 Listed (Yes or No): Yes

SECTION II -- PHYSICAL/CHEMICAL CHARACTERISTICS

Physical State: Gas

Boiling Point: -30.3°F, -34.6°C (*Weast 1983)

Specific Gravity (H_2O=1): 1.424 at 15°C (Weiss 1986, p. 252)

Vapor Pressure (mmHg): 7600 at 30°C (*Weast 1983)

Melting Point: -150°F, -101°C (*Weast 1983)

Vapor Density (AIR=1): 2.49 (Sax 1986, p. 32)

Evaporation Rate (Butyl acetate=1): Not Found

Solubility in Water: 0.57 g/100 mL at 30°C (*Weast 1983)

Appearance and Odor: Greenish-yellow gas with suffocating odor (*Merck 1983).

CHLORINE

SECTION III -- HEALTH HAZARD DATA

OSHA PEL: Ceiling 1 ppm, 3 mg/m^3 (OSHA 1984)

ACGIH TLV: TWA 1 ppm (3 mg/m^3); STEL 3 ppm (9 mg/m^3) (*ACGIH 1980)

IDLH: 30 ppm (NIOSH 1987, p. 74)

Other Limits Recommended: Occupational Exposure to Chlorine Recommended Standard: 15-minute ceiling 0.5 ppm (*NIOSH/RTECS 1985); EEGL 3.0 ppm (60 minutes) (NRC 1984b, pp. 5-11)

Routes of Entry: **Inhalation:** Yes (NIOSH/OSHA 1978, p. 64)
Skin: Yes (NIOSH/OSHA 1978, p. 64)
Ingestion: Not Found

Health Hazards (Acute, Delayed, and Chronic): Poisonous; may be fatal if inhaled. Contact may cause burns to skin and eyes (*DOT 1984).

Medical Conditions Generally Aggravated by Exposure: Bronchitis or chronic lung conditions (*ITI 1982).

SECTION IV -- FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used): Not Found
Flammable Limits:
LEL: Not Found
UEL: Not Found

Extinguishing Methods: Will not burn, but most combustible materials will burn in chlorine as they do in oxygen; flammable gases will form explosive mixtures with chlorine (*NFPA 1978). Dry chemical, carbon dioxide, water spray, fog or foam (DOT 1984, Guide 20).

Special Fire Fighting Procedures: Evacuate area endangered by gas. Stay upwind; keep out of low areas. Wear positive pressure breathing apparatus and full protective clothing. Move container from fire area if you can do so without risk. Spray cooling water on containers that are exposed to flames until well after fire is out (DOT 1984, Guide 20). If it is necessary to stop the flow of gas, use water spray to direct escaping gas away from those effecting shut-off (*NFPA 1978).

Unusual Fire and Explosion Hazards: May ignite other combustible materials (wood, paper, oil, etc.). Mixture with fuels may cause explosion. Container may explode in heat of fire. Vapor explosion and poison hazard indoors, outdoors or in sewers (DOT 1984, Guide 20). Hydrogen and chlorine mixtures (5-95%) are exploded by almost any form of energy (heat, sunlight, sparks, etc.) (*NFPA 1978). May combine with water or steam to produce toxic and corrosive fumes of hydrochloric acid (*Environ Canada 1981).

CHLORINE

SECTION IV (continued)

NFPA Flammability Rating: 0

SECTION V -- REACTIVITY DATA

Stability: Unstable:
Stable: Yes (*NFPA 1978)

Conditions to Avoid: Heat and contact with hydrogen gas or powdered metals (*NFPA 1978).

Incompatibility (Materials to Avoid): Plastics and rubber (*NIOSH/OSHA 1981)

Hazardous Decomposition or Byproducts: Emits highly toxic fumes when heated (*Sax 1975).

Hazardous Polymerization: **May Occur:** Not Found
May Not Occur: Not Found

Conditions to Avoid: Not Found

SECTION VI -- USE INFORMATION

Manufacture of chlorinated lime used in bleaching; manufacture of synthetic rubber and plastics; purifying water; detinning and dezincing iron (*Merck 1983).

SECTION VII -- PRECAUTIONS FOR SAFE HANDLING AND USE
(Steps to be Taken in Case Material is Released or Spilled)

Keep unnecessary people away; isolate hazard area and deny entry. Stay upwind; keep out of low areas. Ventilate closed spaces before entering them. Keep combustibles (wood, paper, oil, etc.) away from spilled material. Stop leak of you can do it without risk. Use water spray to reduce vapor but do not put water on leak or spill area. Isolate area until gas has dispersed. (*DOT, 1984)

SECTION VIII -- PROTECTIVE EQUIPMENT FOR EMERGENCY SITUATIONS

For emergency situations, wear a positive pressure, pressure-demand, full facepiece self-contained breathing apparatus (SCBA) or pressure-demand supplied air respirator with escape SCBA and a fully-encapsulating, chemical resistant suit. See the introductory information section at the beginning of the profiles for additional information.

CHLORINE

SECTION VIII (continued)

SUIT MATERIAL PERFORMANCE (Based on EPA/USCG "Guidelines", 1987)
(Chemical Resistance/Amount of Data)

Butyl	POOR/LIMITED*
Butyl/Neoprene	GOOD/LIMITED
CPE	GOOD/LIMITED*
Neoprene	GOOD/LIMITED
Nitrile	POOR/LIMITED*
PE	POOR/MANY
PVC	POOR/MANY
Saranex	GOOD/LIMITED
Viton	GOOD/LIMITED
Viton/Neoprene	GOOD/LIMITED

*Based on qualitative performance information.
**Based on a chemical analog.

SECTION IX -- EMERGENCY TREATMENT INFORMATION

See Emergency First Aid Treatment Guide

Emergency First Aid Treatment Guide for CHLORINE

(7782-50-5)

This guide should not be construed to authorize emergency personnel to perform the procedures or activities indicated or implied. Care of persons exposed to toxic chemicals must be directed by a physician or other recognized authority.

Substance Characteristics:

Pure Form - Greenish-yellow gas.

Odor - Pungent, suffocating.

Commercial Forms - Gas in cylinders; liquid in 100- and 150-pound steel cylinders, tank cars and barges, motor trucks, pipelines.

Uses - Chemical synthesis, swimming pool sanitation, water purification, food processing, shrink proofing, metal processing, batteries, bleaching agent, intermediate for gasoline additives, flame-retardant compounds, refrigerants.

Other Names - Bertholite, molecular chlorine.

Personal Protective Equipment: See Chemical Profile Section VIII.

Emergency Life-Support Equipment and Supplies That May Be Required:

Compressed oxygen, forced-oxygen mask, soap, water, normal saline, D5W, Ringer's lactate, isoproterenol inhaler, sodium bicarbonate.

Signs and Symptoms of Acute Chlorine Exposure:

Warning: *Effects may be delayed. Caution is advised. Chlorine is corrosive and may be converted to hydrochloric acid in the lungs.*

Signs and symptoms of acute exposure to chlorine may include tachycardia (rapid heart rate), hypertension (high blood pressure) followed by hypotension (low blood pressure), and cardiovascular collapse. Pulmonary edema and pneumonia are often seen.

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The eyes, nose, throat, and chest may sting or burn following exposure to chlorine. Cough with bloody sputum, a feeling of suffocation, dizziness, agitation, anxiety, nausea, and vomiting are common. Dermal exposure may result in sweating, pain, irritation, and blisters.

Emergency Life-Support Procedures:

Acute exposure to chlorine may require decontamination and life support for the victims. Emergency personnel should wear protective clothing appropriate to the type and degree of contamination. Air-purifying or supplied-air respiratory equipment should also be worn, as necessary. Rescue vehicles should carry supplies such as chlorine-resistant plastic sheeting and disposable bags to assist in preventing spread of contamination.

Inhalation Exposure:

1. Move victims to fresh air. Emergency personnel should avoid self-exposure to chlorine.

2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.

3. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

4. Transport to a health care facility.

Dermal/Eye Exposure:

1. Remove victims from exposure. Emergency personnel should avoid self-exposure to chlorine.

2. Evaluate vital signs including pulse and respiratory rate, and note any trauma. If no pulse is detected, provide CPR. If not breathing, provide artificial respiration. If breathing is labored, administer oxygen or other respiratory support.

3. Remove contaminated clothing as soon as possible.

4. If eye exposure has occurred, eyes must be flushed with lukewarm water for at least 15 minutes.

5. Wash exposed skin areas for at least 15 minutes with soap and water.

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6. Obtain authorization and/or further instructions from the local hospital for administration of an antidote or performance of other invasive procedures.

7. Transport to a health care facility.

Ingestion Exposure: No information is available.

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