

DELAWARE
EXTREMELY HAZARDOUS SUBSTANCES RISK MANAGEMENT ACT
BASIS AND BACKGROUND DOCUMENT
TOXIC SUBSTANCES

MAY 1989

CTL020548

BACKGROUND AND PURPOSE

Delaware House Bill No. 555 created the Extremely Hazardous Substances Risk Management Act (EHSRMA) with the goal of preventing catastrophic events caused by chemical substances (para. 7703).

Significant concepts defined in the Act include:

- o A Catastrophic Event is an event that will cause death or permanent disability to a person just beyond the facility boundary as the result of a single, short-term exposure (para. 7705(c)).
- o A toxic substances shall be classified as an Extremely Hazardous Substance if its calculated Substance Hazard Index (SHI) exceeds 8000. SHI is calculated by dividing the equilibrium vapor concentration at 20 °C by the Acute Toxicity Concentration (ATC). ATC is defined as the lowest reported concentration that will cause death or permanent disability from a one-hour exposure (para. 7707.(a)). Thus, the SHI is a reflection of both the toxicity and dispersability of the toxic substance.
- o The Sufficient Quantity (SQ) is that amount of an EHS that will cause a catastrophic event (para. 7705.(q)).
- o The consequences of releases of toxic EHSs shall be determined via atmospheric dispersion calculations assuming average atmospheric conditions for Delaware (para. 7705.(m)).
- o Toxic dose/response relationships are to be used assuming average individuals (para. 7707.(q)).
- o SQs are to be calculated assuming a distance of 100 meters between the release point and the facility boundary. SQ's can be adjusted upwards where this separation distance exceeds 100 meters (para. 7708).

It is required that regulations be promulgated to implement this Act (para. 7707). The purpose of this report is to communicate proposed technical bases for the identification of an EHS and the calculation of an SQ for a toxic substance.

DISCUSSION

PREPARATION OF EHS LIST. A list of toxic EHSs has been compiled consistent with the requirements of the Act and is presented as Table 1. Candidate substances came from a list of "Extremely Hazardous Substances" prepared by the U. S. EPA under Section 302 of SARA Title III (USEPA, 1987) and from a list of "Extraordinarily Hazardous Substances" prepared by the New Jersey Department of Environmental

Protection (NJDEP) under the New Jersey Toxic Catastrophe Prevention Act (TCPA) (NJDEP, 1988).

CHOICE OF ATC AND CALCULATION OF SHI: Three sources of toxicity data were surveyed to determine the appropriate ATC values: the American Industrial Hygiene Association (AIHA) Emergency Response Planning Guideline-3 (ERPG-3), the New Jersey Acutely Toxic Concentration (ATC), and the EPA Level of Concern (LOC).

ERPG-3. A group of approximately 25 chemical firms has developed a protocol for preparation of community emergency exposure guidelines. AIHA is providing technical oversight of this effort. Three levels of physiological effect are considered, as shown in Attachment 1. For this study, it has been decided that the ERPG-3, defined as "The maximum airborne concentration below which it is believed that nearly all individuals could be exposed for up to one hour without experiencing or developing life-threatening health effect" is the appropriate value to use as the ATC.

New Jersey ATC. In implementing the TCPA, New Jersey defined their ATC as the lowest of (1) the National Institute for Occupational Safety and Health (NIOSH) Immediately Dangerous to Life and Health (IDLH) concentration, (2) the LC_{10} (defined as the lowest concentration reported to be fatal to humans or animals) or (3) one-tenth of the LC_{50} (the median lethal concentration).

Environmental Protection Agency LOC. The EPA defines the LOC as one-tenth of the IDLH (or an equivalent estimate of the IDLH) (USEPA, 1987). Consequently, the LOCs were multiplied by a factor of 10 before use in this study to place them on a common basis with the ERPG-3 and the NJ ATC.

These three toxicity measures, where available, are given in Table 1 for the various EHSs. All values are reported as parts per million by volume (ppm-v) of vapor. The order of preference in selecting which value to use is: ERPG-3 first (if available), followed by NJ ATC, with EPA LOC last. ERPG-3s are the preferred choice because the protocol used in their development is believed to be based upon the "best science" currently available for establishing emergency response guidelines.

One additional consideration in the calculation of SHI should be noted. The calculation requires the equilibrium vapor concentration calculated from the substance vapor pressure. However, a number of the EHSs are gases above their critical temperatures, and the concept of vapor pressure is not applicable. For these EHSs, a value of 760 mm Hg (atmospheric pressure) has been used as the vapor pressure in the SHI calculation.

The EHSs in Table 1 are ranked in the order of decreasing SHI (Table 2, gives the same data sorted alphabetically by EHS name, and Table 3 lists the toxic substances that fell below the 8000 SHI cut-off).

BASIC APPROACH TO CALCULATION OF SQ'S. The Act stipulates that SQs be determined by using atmospheric modeling techniques (assuming average Delaware atmospheric conditions) with toxic exposure dose/response relationships applied to average populations.

Toxic exposures are typically expressed as a dose which is a function of both the concentration and duration of the toxic cloud (Casarett and Doull, 1986). ATCs were defined above without reference to exposure duration. In point of fact, ERPG-3s are based upon a 60-minute exposure, IDLHs are based upon 30 minutes and LC₁₀'s and LC₅₀'s pertain to exposure times that vary with the laboratory procedure used in their determination. For the methodology described in this report, a constant exposure time (and, therefore, release duration) of 60 minutes was assumed. This was chosen to be consistent with the basis of the ERPG-3s, the ATC measure of choice, and with the basis for the SHI.

Based upon these concepts, the SQ can now be defined as that quantity of material which, if released over the period of one hour under average atmospheric dispersion conditions, would create an airborne vapor concentration just equal to the ATC at the facility boundary. Thus the threshold fatal concentration is conservatively assumed not to reach off-site personnel.

SQs have been calculated based upon the dispersion model discussed below and are summarized on Table 1.

CHOICE OF ATMOSPHERIC DISPERSION MODEL. The neutrally buoyant, Gaussian dispersion model described in Turner's Workbook (Turner, 1970) was selected for use. This is consistent with the approach taken by the NJDEP (Baldini, 1988; Costanza et al., 1987; NJDEP, 1987) and the EPA (EPA, 1987). While vapors produced by some of the EHSSs will be heavier than air at the point of release, they will be rapidly diluted as they disperse. Vapors diluted to near the ATC (on the order of hundreds to a few thousands of ppm-v) will not be appreciably denser than the ambient air. Thus, the use of a neutrally buoyant model is warranted.

The simplification of the general dispersion formula follows that documented by Turner (Turner, 1970). The following equation relates release rate, downwind distance, and vapor concentration:

$$C = Q / (p * s_y * s_z * U)$$

where: C is the vapor cloud concentration at its centerline in g/m³,
 Q is the release rate in g/sec,
 U is the wind speed in m/sec,
 p equals 3.141, and
 s_y and s_z are the dispersion coefficients.

The dispersion coefficients are evaluated as a function of distance downwind from the release point using the equations given on page G-6 of the EPA manual (USEPA, 1987). It has been decided to use the equations for urban conditions. These equations produce dispersion coefficients that are larger than the corresponding open-country (rural) equations and result in lower calculated vapor concentrations at a given distance. However, the urban coefficients are the more appropriate for use in typical industrial and dense residential areas.

DETERMINATION OF AVERAGE ATMOSPHERIC CONDITIONS. The Act permits the use of average atmospheric (meteorological) conditions when calculating dispersion of the release cloud. Three factors define unique atmospheric conditions for dispersion modeling purposes:

- o Wind direction determines the segment of the surrounding population that is exposed to a particular release. Since we are dealing with a hypothetical facility, it is convenient to assume an even population distribution about the facility and, thereby, remove wind direction from further consideration.
- o Wind speed directly affects both the speed with which the cloud travels downwind and the rate of dilution of the cloud.
- o Atmospheric stability is a measure of the turbulence in the atmosphere; the lower the stability, the higher the turbulence, and the more rapid the dispersion of the cloud.

Standard meteorological data sets are available as joint probability distributions of wind speed, direction and atmospheric stability, often as a function of the season of the year. Wind speeds are grouped into six ranges spanning from about 0 up to about 13 m/sec (or about 30 miles/hr). Stability readings are grouped in six classes, assigned the letters A through F. Table 4 summarizes ten years of Wilmington area meteorological data.

It was not initially apparent how the concept of average meteorological conditions could be implemented. While calculation of a weighted-average wind speed would be straightforward, the concept of average stability class was a bit more difficult to grasp. Greater-than-C-but-less-than-D stability was nonsensical. As a result, the following approach was developed:

1. Assume a release rate and a downwind distance (the values assumed are not critical to the analysis). Calculate the concentration resulting from each combination of speed and stability. Table 5 shows the results assuming a release rate of 100 g/sec and a downwind distance of 100 meters.
2. Create a table summarizing the calculated concentration and the fractional probability of occurrence for each wind speed/stability combination.

3. Re-sort the data so that the highest calculated concentration is at the top of the table.
4. Add the probabilities to create cumulative probability distributions both from the bottom up and the top down. Find the wind speed/stability combination that has approximately equal probabilities of worse combinations and better combinations occurring (i.e., higher concentrations and lower concentrations). Ignore combinations with zero probability of occurrence.

Table 6 shows the finished table and illustrates that the "average" meteorological conditions in the Wilmington area are 4.3 m/sec speed and D stability. The cumulative probability of all worse combinations is about 0.42; the cumulative probability of all better combinations is about 0.40, and the probability of the "average" condition is about 0.18.

Thus, the "average" condition is defined as that with equal probability of occurrence of less favorable and more favorable conditions.

SUMMARY OF ASSUMPTIONS. The methodology described in this report requires a number of simplifying assumptions to permit such a generalized approach to the calculation of SQs. The more significant assumptions are summarized here:

- o Continuous, steady-state release for duration of 1 hour,
- o All-vapor release (no liquid pool is formed),
- o Release at ambient temperature,
- o No momentum effects (no initial velocity for release),
- o Ground-level release and receptors,
- o No deposition or reaction of cloud vapor,
- o Neutrally buoyant cloud,
- o Urban dispersion coefficients, and
- o No mitigating design or operating features to limit the rate or duration of the leak or to minimize its transport beyond the facility boundary.

ADJUSTMENT OF SQ FOR SEPARATION DISTANCES. The Act permits increasing the SQ where the actual distance between the release point and the facility boundary exceeds 100 meters. This correction can be easily made within the dispersion calculations. It is proposed that the multipliers given in Table 7 be applied to the base SQs (i.e., those

determined for 100m separation distance) where greater distances exist.

SUMMARY. A methodology has been developed for calculating Sufficient Quantities of toxic Extremely Hazardous Substances as defined in the Extremely Hazardous Substances Risk Management Act. The methodology complies with the requirements of the Act and is based on sound, demonstrated technology.

REFERENCES

Baldini, R., and Komosinsky, P., "Consequence Analysis of Toxic Substance Clouds," Journal of Loss Prevention, Vol. 1, July 1988.

Casarett, L.J., and Doull, J., Toxicology, 3rd edition, Macmillan, New York, 1986.

Costanza, P.A.; Hagen, G.L.; Kalagnanam, R.S.; and Komosinsky, P.J., "Estimation of Catastrophic Quantities of Toxic Chemicals by Atmospheric Dispersion Modeling," Plant/Operations Progress, Vol. 6, No. 4, October 1987.

NJ Department of Environmental Protection, "Basis and Background Document for Proposed New Rule J.J.A.C. 7:31--Toxic Catastrophe Prevention Action Program," NJ Register, June 20, 1988, pp. 1406 and 1407

Turner, D.B., Workbook of Atmospheric Dispersion Estimates, EPA, Research Triangle Park, 1970.

U.S. Environmental Protection Agency, Technical Guidance For Hazards Analysis - Emergency Planning for Extremely Hazardous Substances, U.S. EPA, December 1987.

TABLE 1

LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED BY SHI)

CAS NUMBER	EXTREMELY HAZARDOUS SUBST	MW	VAPOR PRESSURE @ 20-25 DEG C (torr)	SOURCES OF ACUTE TOXICITY CONCENTRATION DATA - ppmv			ACUTE TOXICITY CONC. (ATC) (ppmv)	SUBSTANCE HAZARD INDEX (VP)/ATC	SUFFIC. QUANTITY (LBS)
				EPA LIST	NJTCPA	ERPG-3			
7803-51-2	* PHOSPHINE	34.0	26384	200.00	1.10		1.10	31559809	21
7784-42-1	* ARSINE	77.9	11400	6.00	1.00		1.00	15000000	44
463-51-4	+ KETENE	42.0	9161	25.00	1.70		1.70	7090557	40
7783-80-4	* TELLURIUM HEXAFLUORIDE	241.6	5325	1.00	1.00		1.00	7006579	136
7783-41-7	+ OXYGEN DIFLUORIDE (1)	54.0	760	0.50	0.15		0.15	6666667	5
7783-07-5	* HYDROGEN SELENIDE	81.0	6800	2.00	2.00		2.00	4473684	91
106-96-7	PROPARGYL BROMIDE	119.0	180	0.06			0.06	3947368	4
7783-60-0	SULFUR TETRAFLUORIDE	108.1	5849	20.90	2.00		2.00	3848026	122
10028-15-6	* OZONE (1)	48.0	760	10.00	0.48		0.48	2083333	13
7803-52-3	+ STIBINE	124.8	3000	40.00	3.00		3.00	1315789	211
75-44-5	* PHOSGENE	98.9	1195	2.00	2.00		2.00	786184	112
19624-22-7	* PENTABORANE	63.2	171	3.00	0.30		0.30	750000	11
5714-22-7	+ SULFUR PENTAFLUORIDE	254.1	561	1.00	1.00		1.00	738158	143
13637-63-3	CHLORINE PENTAFLUORIDE	130.3	2300		5.70		5.70	530933	419
675-14-9	CYANURIC FLUORIDE	135.0	120	0.30			0.30	526316	23
75-18-3	DIMETHYL SULFIDE	62.0	404	1.20			1.20	442982	42
10035-10-6	+ HYDROGEN BROMIDE	80.9	16352	50.00	50.00		50.00	430316	2284
13463-39-3	NICKEL CARBONYL	170.1	321	0.500	1.00		1.00	422368	96
7647-01-0	* HYDROGEN CHLORIDE (HCL)	36.5	31527	100.00	100.00		100.00	414829	2061
7783-06-4	* HYDROGEN SULFIDE	34.1	13811	300.00	44.00		44.00	413008	847
78-94-4	METHYL VINYL KETONE	70.1	71	0.20	0.24		0.24	389254	10
7572-29-4	DICHLOROACETYLENE	94.9	500		1.90		1.90	346260	102
19287-45-7	* DIBORANE (1)	27.7	760	40.00	2.90		2.90	344828	45
7782-50-5	* CHLORINE	70.9	5098	25.00	13.70	20.00	20.00	335395	801
506-77-4	CYANOGEN CHLORIDE	61.5	1015		4.80		4.80	278235	167
7616-94-6	+ PERCHLORYL FLUORIDE	102.5	7952	385.00	38.50		38.50	271770	2228
13863-41-7	BROMINE CHLORIDE	115.4	2000		10.00		10.00	263158	652
7637-07-2	* BORON TRIFLUORIDE (1)	67.8	760	100.00	3.86		3.86	259067	148
30674-80-7	METHACRYLOYLOXYETHYL ISOCYANATE	155.0	80	0.43			0.43	244798	38
371-62-0	ETHYLENE FLUOROHYDRIN	64.0	50	0.30			0.30	219298	11
684-16-2	HEXAFLUOROACETONE	166.0	4383		27.50		27.50	209713	2578
7783-79-1	+ SELENIUM HEXAFLUORIDE (1)	193.0	760	5.00	5.00		5.00	200000	545
50-00-0	* FORMALDEHYDE	30.0	3320	100.00	7.50	25.00	25.00	174737	424
814-68-6	ACRYLYL CHLORIDE	91.0	300	2.40			2.40	164474	123
100-00-9	FURAN	68.1	493	4.30	4.30		4.30	150857	165
10102-43-9	* NITRIC OXIDE	30.0	760	100	6.7		6.70	149254	113
7790-91-2	+ CHLORINE TRIFLUORIDE	92.5	1050	20.00	9.60		9.60	143914	501
10102-44-0	* NITROGEN OXIDES(NO, NO2, N2O4, N2O3)	46.0	721	50.00	6.70		6.70	141595	174

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LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED BY SHI)

CAS NUMBER	EXTREMELY HAZARDOUS SUBST	MW	VAPOR PRESSURE @ 20-25 DEG C (torr)	SOURCES OF ACUTE TOXICITY CONCENTRATION DATA - ppmv			ACUTE TOXICITY CONC. (ATC) (ppmv)	SUBSTANCE HAZARD INDEX (VP)/ATC	SUFFIC. QUANTITY (LBS)
				EPA LIST	NJTCPA	ERPG-3			
10049-04-4	+ CHLORINE DIOXIDE	67.5	1060	10.00	10.00		10.00	139474	381
460-19-5	CYANOGEN	52.0	3675		35.00		35.00	138158	1028
75-79-6	METHYLTRICHLOROSILANE	149.0	280	3.00			3.00	122807	252
334-88-3	+ DIAZOMETHANE (1)	42.0	760	10.00	10.00		10.00	100000	237
624-83-9	* METHYL ISOCYANATE	57.1	377	20.00	5.00		5.00	99211	161
1558-25-4	TRICHLORO(CHLOROMETHYL)SILANE	184.0	30	0.40			0.40	98684	42
107-02-8	* ACROLEIN	56.0	223	5.00	5.00	3.00	3.00	97807	95
624-92-0	METHYL DISULFIDE	94.0	22	0.30			0.30	96491	16
594-42-3	* PERCHLOROMETHYL MERCAPTAN	185.9	65	10.00	0.90		0.90	95029	94
20816-12-0	@ OSMIUM TETROXIDE	254.2	7	0.10	0.10		0.10	92105	14
421-20-5	METHYL FLUOROSULFATE	120.1	35		0.50		0.50	92105	34
7719-09-7	THIONYL CHLORIDE	119.0	96		1.75		1.75	72180	118
74-83-9	* METHYL BROMIDE	95.0	1383	2000.00	26.00		26.00	69990	1395
10294-34-5	BORON TRICHLORIDE	117.2	992	20.90	20.00		20.00	65263	1324
79-38-9	TRIFLUOROCHLOROETHYLENE	116.5	4096		86.60		86.60	62234	5697
7782-41-4	* FLUORINE (1)	38.0	760	25.00	17.00		17.00	58824	365
4109-96-0	DICHLOROSILANE	101.0	1142		27.20		27.20	55244	1551
13463-40-6	IRON PENTACARBONYL	196.0	40	1.00			1.00	52632	111
107-30-2	# CHLOROMETHYL METHYL ETHER	80.5	192	5.40	5.50		5.50	45933	250
7789-30-2	BROMINE PENTAFLUORIDE	174.9	343		10.00		10.00	45132	988
542-88-1	# BIS (CHLOROMETHYL) ETHER	115.0	22	0.50	0.70		0.70	41353	45
453-18-9	METHYL FLUOROACETATE	92.1	20		0.67		0.67	39277	35
920-46-7	METHACRYLOYL CHLORIDE	105.0	40	1.40			1.40	37594	83
625-55-8	ISOPROPYL FORMATE	88.0	100	3.90			3.90	33738	194
7446-09-5	* SULFUR DIOXIDE (LIQUID)	64.1	2521	100.00	100.00		100.00	33171	3620
75-78-5	DIMETHYLDICHLOROSILANE	129.0	139	5.70			5.70	32087	415
353-50-4	CARBONYL FLUORIDE	66.0	800		36.00		36.00	29240	1342
74-89-5	METHYLAMINE	31.1	2220		100.00		100.00	29211	1756
7446-11-9	SULFUR TRIOXIDE	80.1	193	9.18	9.00		9.00	28216	407
75-22-1	METHYL CHLOROFORMATE	94.5	100	4.67	4.80		4.80	27412	256
107-44-8	SARIN	140.0	2	0.1			0.10	26316	8
7719-12-2	* PHOSPHOROUS TRICHLORIDE	137.0	96	50.00	5.00		5.00	25263	387
74-90-8	@ HYDROGEN CYANIDE	27.0	613	50	32.3		32.30	24971	492
74-93-1	* METHYL MERCAPTAN	48.1	1267	400.00	67.50		67.50	24698	1833
60-34-4	* METHYL HYDRAZINE	46.1	38	5.00	2.10		2.10	23810	55
10025-78-2	TRICHLOROSILANE	135.5	492		27.20		27.20	23800	2081
7726-95-6	+ BROMINE	159.8	170	10	10		10.00	22368	902
126-98-7	METHYL ACRYLONITRILE	67.1	57	10.95	3.6		3.60	20833	136
7664-39-3	* HYDROGEN FLUORIDE (HF)	20.0	770	20.00	20.00	50.00	50.00	20263	565

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LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED BY SHI)

CAS NUMBER	EXTREMELY HAZARDOUS SUBST	MW	VAPOR PRESSURE @ 20-25 DEG C (torr)	SOURCES OF ACUTE TOXICITY CONCENTRATION DATA - ppmv			ACUTE TOXICITY CONC. (ATC) (ppmv)	SUBSTANCE HAZARD INDEX (VP)/ATC	SUFFIC. QUANTITY (LBS)
				EPA LIST	NJTCPA	ERPG-3			
10086-47-2	TETRAFLUOROHYDRAZINE (1)	104.0	760		50.00		50.00	20000	2936
74-88-4	+ METHYL IODIDE	142.0	333	800	23.2		23.20	18886	1860
75-21-8	* ETHYLENE OXIDE	44.1	1100	800	83.6		83.60	17313	2082
74-87-3	+ METHYL CHLORIDE	50.5	3718	10000	314.6		314.60	15550	8971
107-05-1	+ ALLYL CHLORIDE	76.5	304	300	29		29.00	13793	1253
27137-85-5	TRICHLORO(DICHLOROPHENYL)SILANE	280.0	70	7			7.00	13158	1107
2487-90-3	TRIMETHOXSILANE	122.2	90	7.5	12.5		12.50	9474	863
8014-95-7	OLEUM (65%)	109.2	64		9		9.00	9357	555
75-04-7	+ ETHYLAMINE	45.1	865	4000	123		123.00	9253	3132
7550-45-0	TITANIUM TETRACHLORIDE	189.7	9	1.3	1.29		1.29	9180	138
107-11-9	ALLYLAMINE	57.1	193	13.8	28.6		28.60	8879	922
151-56-4	ETHYLENEIMINE	43.1	166	22.8	25		25.00	8737	608
7664-41-7	* AMMONIA	17.0	6420	500	423	1000.00	1000.00	8447	9599
75-35-1	+ ISOPROPYLAMINE	59.1	460	4000	74.7		74.70	8103	2493
7697-37-2	* NITRIC ACID (94.5%)	63.0	30	100	4.9		4.90	8056	174
10025-87-3	PHOSPHORUS OXYCHLORIDE	153.0	28	4.8			4.80	7675	415

"**" INDICATES EHS FROM EPA LIST. REPORTED VALUE IN EPA LIST COLUMN HAS BEEN REVISED
TO SHOW IDLH VALUE THAT WAS BASIS FOR EPA LOC.

"+" INDICATES IDLH VALUE FROM NIOSH HANDBOOK. EHS NOT INCLUDED ON EPA LIST

"@" INDICATES CALCULATED FROM MG/M3 IDLH VALUE FROM NIOSH HANDBOOK. EHS NOT INCLUDED ON EPA LIST.

"#" INDICATES NO IDLH VALUE IN NIOSH HANDBOOK SINCE LISTED AS NIOSH CARCINOGEN.

(1) THESE SUBSTANCES ARE GASES ABOVE THEIR CRITICAL POINT AT 20 C,
HENCE THERE IS NO VAPOR PRESSURE IN THE TRADITIONAL SENSE. A VAPOR
PRESSURE OF 760 MM Hg WAS ARBITRARILY USED.

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TABLE 2

LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED ALPHABETICALLY)

CAS NUMBER	EXTREMELY HAZARDOUS SUBST	MW	VAPOR PRESSURE @ 20-25 DEG C (torr)	SOURCES OF ACUTE TOXICITY CONCENTRATION DATA - ppmv			ACUTE TOXICITY CONC. (ATC) (ppmv)	SUBSTANCE HAZARD INDEX (VP)/ATC	SUFFIC. QUANTITY (LBS)
				EPA LIST	NJTCPA	ERPG-3			
107-02-8	* ACROLEIN	56.0	223	5.00	5.00	3.00	3.00	97807	95
814-68-6	ACRYLYL CHLORIDE	91.0	300	2.40			2.40	164474	123
107-05-1	+ ALLYL CHLORIDE	76.5	304	300	29		29.00	13793	1253
107-11-9	ALLYLAMINE	57.1	193	13.8	28.6		28.60	8879	922
7664-41-7	* AMMONIA	17.0	6420	500	423	1000.00	1000.00	8447	9599
7784-42-1	* ARSINE	77.9	11400	6.00	1.00		1.00	15000000	44
542-88-1	# BIS (CHLOROMETHYL) ETHER	115.0	22	0.50	0.70		0.70	41353	45
10294-34-5	BORON TRICHLORIDE	117.2	992	20.90	20.00		20.00	65263	1324
7637-07-2	* BORON TRIFLUORIDE (1)	67.8	760	100.00	3.86		3.86	259067	148
7789-30-2	BROMINE PENTAFLUORIDE	174.9	343		10.00		10.00	45132	988
7726-95-6	+ BROMINE	159.8	170	10	10		10.00	22368	902
13863-41-7	BROMINE CHLORIDE	115.4	2000		10.00		10.00	263158	652
353-50-4	CARBONYL FLUORIDE	66.0	800		36.00		36.00	29240	1342
7782-50-5	* CHLORINE	70.9	5098	25.00	13.70	20.00	20.00	335395	801
10049-04-4	+ CHLORINE DIOXIDE	67.5	1060	10.00	10.00		10.00	139474	381
13637-63-3	CHLORINE PENTAFLUORIDE	130.3	2300		5.70		5.70	530933	419
7790-91-2	+ CHLORINE TRIFLUORIDE	92.5	1050	20.00	9.60		9.60	143914	501
107-30-2	# CHLOROMETHYL METHYL ETHER	80.5	192	5.40	5.50		5.50	45933	250
460-19-5	CYANOGEN	52.0	3675		35.00		35.00	138158	1028
506-77-4	CYANOGEN CHLORIDE	61.5	1015		4.80		4.80	278235	167
675-14-9	CYANURIC FLUORIDE	135.0	120	0.30			0.30	526316	23
334-88-3	+ DIAZOMETHANE (1)	42.0	760	10.00	10.00		10.00	100000	237
19287-45-7	* DIBORANE (1)	27.7	760	40.00	2.90		2.90	344828	45
7572-29-4	DICHLOROACETYLENE	94.9	500		1.90		1.90	346260	102
4109-96-0	DICHLOROSILANE	101.0	1142		27.20		27.20	55244	1551
75-18-3	DIMETHYL SULFIDE	62.0	404	1.20			1.20	442982	42
75-78-5	DIMETHYLDICHLOROSILANE	129.0	139	5.70			5.70	32087	415
75-21-8	* ETHYLENE OXIDE	44.1	1100	800	83.6		83.60	17313	2082
75-04-7	+ ETHYLAMINE	45.1	865	4000	123		123.00	9253	3132
371-62-0	ETHYLENE FLUOROHYDRIN	64.0	50	0.30			0.30	219298	11
151-56-4	ETHYLENEIMINE	43.1	166	22.8	25		25.00	8737	608
7782-41-4	* FLUORINE (1)	38.0	760	25.00	17.00		17.00	58824	365
50-00-0	* FORMALDEHYDE	30.0	3320	100.00	7.50	25.00	25.00	174737	424
100-00-9	FURAN	68.1	493	4.30	4.30		4.30	150857	165
684-16-2	HEXAFLUOROACETONE	166.0	4383		27.50		27.50	209713	2578
10035-10-6	+ HYDROGEN BROMIDE	80.9	16352	50.00	50.00		50.00	430316	2284
7647-01-0	* HYDROGEN CHLORIDE (HCL)	36.5	31527	100.00	100.00		100.00	414829	2061
74-90-8	HYDROGEN CYANIDE	27.0	613	50	32.3		32.30	24971	492

CTL020558

LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED ALPHABETICALLY)

CAS NUMBER	EXTREMELY HAZARDOUS SUBST	MW	VAPOR PRESSURE @ 20-25 DEG C (torr)	SOURCES OF ACUTE TOXICITY CONCENTRATION DATA - ppmv			ACUTE TOXICITY CONC. (ATC) (ppmv)	SUBSTANCE HAZARD INDEX (VP)/ATC	SUFFIC. QUANTITY (LBS)
				EPA LIST	NJTCPA	ERPG-3			
7664-39-3	* HYDROGEN FLUORIDE (HF)	20.0	770	20.00	20.00	50.00	50.00	20263	565
7783-07-5	* HYDROGEN SELENIDE	81.0	6800	2.00	2.00		2.00	4473684	91
7783-06-4	* HYDROGEN SULFIDE	34.1	13811	300.00	44.00		44.00	413008	847
13463-40-6	IRON PENTACARBONYL	196.0	40	1.00			1.00	52632	111
625-55-8	ISOPROPYL FORMATE	88.0	100	3.90			3.90	33738	194
75-35-1	+ ISOPROPYLAMINE	59.1	460	4000	74.7		74.70	8103	2493
463-51-4	+ KETENE	42.0	9161	25.00	1.70		1.70	7090557	40
920-46-7	METHACRYLOYL CHLORIDE	105.0	40	1.40			1.40	37594	83
30674-80-7	METHACRYLOYLOXYETHYL ISOCYANATE	155.0	80	0.43			0.43	244798	38
126-98-7	METHYL ACRYLONITRILE	67.1	57	10.95	3.6		3.60	20833	136
74-83-9	* METHYL BROMIDE	95.0	1383	2000.00	26.00		26.00	69990	1395
74-87-3	+ METHYL CHLORIDE	50.5	3718	10000	314.6		314.60	15550	8971
75-22-1	METHYL CHLOROFORMATE	94.5	100	4.67	4.80		4.80	27412	256
624-92-0	METHYL DISULFIDE	94.0	22	0.30			0.30	96491	16
453-18-9	METHYL FLUOROACETATE	92.1	20		0.67		0.67	39277	35
421-20-5	METHYL FLUOROSULFATE	120.1	35		0.50		0.50	92105	34
60-34-4	* METHYL HYDRAZINE	46.1	38	5.00	2.10		2.10	23810	55
74-88-4	+ METHYL IODIDE	142.0	333	800	23.2		23.20	18886	1860
624-83-9	* METHYL ISOCYANATE	57.1	377	20.00	5.00		5.00	99211	161
74-93-1	* METHYL MERCAPTAN	48.1	1267	400.00	67.50		67.50	24698	1833
78-94-4	METHYL VINYL KETONE	70.1	71	0.20	0.24		0.24	389254	10
74-89-5	METHYLAMINE	31.1	2220		100.00		100.00	29211	1756
75-79-6	METHYLTRICHLOROSILANE	149.0	280	3.00			3.00	122807	252
13463-39-3	NICKEL CARBONYL	170.1	321	0.500	1.00		1.00	422368	96
7697-37-2	* NITRIC ACID (94.5%)	63.0	30	100	4.9		4.90	8056	174
10102-43-9	* NITRIC OXIDE	30.0	760	100	6.7		6.70	149254	113
10102-44-0	* NITROGEN OXIDES(NO, NO2, N2O4, N2O3)	46.0	721	50.00	6.70		6.70	141595	174
8014-95-7	OLEUM (65%)	109.2	64		9		9.00	9357	555
20816-12-0	@ OSMIUM TETROXIDE	254.2	7	0.10	0.10		0.10	92105	14
7783-41-7	+ OXYGEN DIFLUORIDE (1)	54.0	760	0.50	0.15		0.15	6666667	5
10028-15-6	* OZONE (1)	48.0	760	10.00	0.48		0.48	2083333	13
19624-22-7	* PENTABORANE	63.2	171	3.00	0.30		0.30	750000	11
594-42-3	* PERCHLOROMETHYL MERCAPTAN	185.9	65	10.00	0.90		0.90	95029	94
7616-94-6	+ PERCHLORYL FLUORIDE	102.5	7952	385.00	38.50		38.50	271770	2228
75-44-5	* PHOSGENE	98.9	1195	2.00	2.00		2.00	786184	112
7803-51-2	* PHOSPHINE	34.0	26384	200.00	1.10		1.10	31559809	21
7719-12-2	* PHOSPHOROUS TRICHLORIDE	137.0	96	50.00	5.00		5.00	25263	387
10025-87-3	PHOSPHORUS OXYCHLORIDE	153.0	28	4.8			4.80	7675	415
106-96-7	PROPARGYL BROMIDE	119.0	180	0.06			0.06	3947368	4

CTL020559

LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED ALPHABETICALLY)

CAS NUMBER	EXTREMELY HAZARDOUS SUBST	MW	VAPOR PRESSURE @ 20-25 DEG C (torr)	SOURCES OF ACUTE TOXICITY CONCENTRATION DATA - ppmv			ACUTE TOXICITY CONC. (ATC) (ppmv)	SUBSTANCE HAZARD INDEX (VP)/ATC	SUFFIC. QUANTITY (LBS)
				EPA LIST	NJTCPA	ERPG-3			
107-44-8	SARIN	140.0	2	0.1			0.10	26316	8
7783-79-1	+ SELENIUM HEXAFLUORIDE (1)	193.0	760	5.00	5.00		5.00	200000	545
7803-52-3	+ STIBINE	124.8	3000	40.00	3.00		3.00	1315789	211
7446-09-5	* SULFUR DIOXIDE (LIQUID)	64.1	2521	100.00	100.00		100.00	33171	3620
5714-22-7	+ SULFUR PENTAFLUORIDE	254.1	561	1.00	1.00		1.00	738158	143
7783-60-0	SULFUR TETRAFLUORIDE	108.1	5849	20.90	2.00		2.00	3848026	122
7446-11-9	SULFUR TRIOXIDE	80.1	193	9.18	9.00		9.00	28216	407
7783-80-4	* TELLURIUM HEXAFLUORIDE	241.6	5325	1.00	1.00		1.00	7006579	136
10086-47-2	TETRAFLUOROHYDRAZINE (1)	104.0	760		50.00		50.00	20000	2936
7719-09-7	THIONYL CHLORIDE	119.0	96		1.75		1.75	72180	118
7550-45-0	TITANIUM TETRACHLORIDE	189.7	9	1.3	1.29		1.29	9180	138
1558-25-4	TRICHLORO(CHLOROMETHYL)SILANE	184.0	30	0.40			0.40	98684	42
27137-85-5	TRICHLORO(DICHLOROPHENYL)SILANE	280.0	70	7			7.00	13158	1107
10025-78-2	TRICHLOROSILANE	135.5	492		27.20		27.20	23800	2081
79-38-9	TRIFLUOROCHLOROETHYLENE	116.5	4096		86.60		86.60	62234	5697
2487-90-3	TRIMETHOXSILANE	122.2	90	7.5	12.5		12.50	9474	863

*** INDICATES EHS FROM EPA LIST. REPORTED VALUE IN EPA LIST COLUMN HAS BEEN REVISED
TO SHOW IDLH VALUE THAT WAS BASIS FOR EPA LOC.

++ INDICATES IDLH VALUE FROM NIOSH HANDBOOK. EHS NOT INCLUDED ON EPA LIST

"a" INDICATES CALCULATED FROM MG/M3 IDLH VALUE FROM NIOSH HANDBOOK. EHS NOT INCLUDED ON EPA LIST.

"#" INDICATES NO IDLH VALUE IN NIOSH HANDBOOK SINCE LISTED AS NIOSH CARCINOGEN.

(1) THESE SUBSTANCES ARE GASES ABOVE THEIR CRITICAL POINT AT 20 C,
HENCE THERE IS NO VAPOR PRESSURE IN THE TRADITIONAL SENSE. A VAPOR
PRESSURE OF 760 MM Hg WAS ARBITRARILY USED.

CTL020560

TABLE 3

LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED BY SHI)

CAS NUMBER	EXTREMELY HAZARDOUS SUBSTANCE	MW	VAPOR	SOURCES OF ACUTE TOXICITY			ACUTE	SUBSTANCE
			PRESSURE	CONCENTRATION DATA - ppmv			TOXICITY	
			@ 20-25 DEG C (torr)	EPA LIST	NJTCPA	ERPG-3	CONC. (ATC) (ppmv)	
75-74-1	TETRAMETHYL LEAD	267.4	22	3.70		3.67	3.67	7888
57-14-7	DIMETHYLHYDRAZINE, 1,1-	60.1	103			17.20	17.20	7879
124-40-3	DIMETHYLAMINE	45.1	1265			201.00	201.00	8281
75-50-3	TRIMETHYLAMINE	59.1	1373			248.60	248.60	7267
10025-87-3	PHOSPHORYL CHLORIDE	153.4	28			4.80	4.80	7675
7783-54-2	NITROGEN TRIFLUORIDE (1)	71.0	1111			200.00	200.00	7309
7664-41-7	AMMONIA	17.0	5372	504.40		423.00	1000.00	7068
75-07-0	ACETALDEHYDE	44.1	748			150.00	150.00	6561
78-85-3	METHACRYLALDEHYDE	70.1	121			25.00	25.00	6368
509-14-8	TETRAINITROMETHANE	196.0	8	5.00		1.80	1.80	5848
79-21-0	PERACETIC ACID	76.0	11	14.51			14.51	998
2699-79-8	SULFURYL FLUORIDE	102.1	1111			302.00	302.00	4841
359-06-8	FLUOROACETYL CHLORIDE	96.0	80	25.52			25.52	4125
998-30-1	TRIETHOXSILANE	164.0	23	7.47			7.47	4052
57-14-7	1,1-DIMETHYLHYDRAZINE	60.1	149	49.00			49.00	4001
327-98-0	TRICHLORONATE	334.0	20	7.34			7.34	3588
107-12-0	PROPIONITRILE	55.0	37	16.48			16.48	2954
7664-39-3	HYDROGEN FLORIDE (70 WTX OR MORE)	20.0	120	19.60		20.00	50.00	3158
7783-70-2	ANTIMONY PENTAFLUORIDE	217.0	7.0	3.05			3.05	3021
7783-55-3	PHOSPHOROUS TRIFLUORIDE (1)	88.0	1111			529.00	529.00	2763
630-080-0	CARBON MONOXIDE (1)	28.0	1111			571.00	571.00	2560
75-77-4	TRIMETHYLCHLOROSILANE	108.7	190	112.40		113.00	113.00	2212
1464-53-5	DIEPOXYBUTANE	86.0	16	9.97			9.97	2111
10035-10-6	HYDROBROMIC ACID (62 WTX OR MORE)	80.9				50.00	50.00	
75-08-1	ETHYL MERCAPTAN	62.1	437			277.00	277.00	2076
10025-67-9	SULFUR MONOCHLORIDE	135.0	7			4.80	4.80	1919
107-13-1	ACRYLONITRILE	53.1	86	499.10		57.60	57.60	1965
57-57-8	PROPIOLACTONE, BETA-	72.1	1.2	2.38			2.38	663
109-61-5	PROPYL CHLOROFORMATE	123.0	24	19.92			19.92	1585
80-63-7	METHYL 2-CHLOROACRYLATE	121.0	12	10.12			10.12	1560
75-94-5	VINYL TRICHLORO SILANE	161.6	54			45.80	45.80	1551
75-54-7	METHYL DICHLOROSILANE	115.0	353			300.00	300.00	1548
98-07-7	BENZOTRICHLORIDE	195.0	1.0	0.88			0.88	1496
109-89-7	DIETHYLAMINE	73.1	190			167.40	167.40	1493
10294-33-4	BORON TRIBROMIDE	250.5	55			50.00	50.00	1447

CTL020561

LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED BY SHI)

CAS NUMBER	EXTREMELY HAZARDOUS SUBSTANCE	MW	VAPOR	SOURCES OF ACUTE TOXICITY			ACUTE	SUBSTANCE
			PRESSURE	CONCENTRATION DATA - ppmv			TOXICITY	
			@ 20-25 DEG C (torr)	EPA LIST	NJTCPA	ERPG-3	CONC. (ATC) (ppmv)	
126-99-8	CHLOROPRENE	88.5	179			166.00	166.00	1419
107-10-8	PROPYLAMINE	59.1	248			231.00	231.00	1413
7647-01-0	HYDROCHLORIC ACID (36 WT% OR MORE)	36.5	106	102.10		100.00	100.00	1388
108-05-4	VINYL ACETATE (MONOMER)	86.0	124	153.84			153.84	1061
7784-34-1	ARSENOUS TRICHLORIDE	181.0	10	13.54			13.54	972
75-15-0	CARBON DISULFIDE	76.0	360	515.79			515.79	918
110-57-6	TRANS-1,4-DICHLOROBUTENE	125.0	6.0	8.62			8.62	915
110-89-4	PIPERIDINE	85.0	40	63.41			63.41	830
123-73-9	CROTONALDEHYDE	70.1	23	140.00	6.60	50.00	50.00	616
78-82-0	ISOBUTYRONITRILE	69.0	50	88.77			88.77	741
107-07-3	CHLOROETHANOL (ETHYLENE CHLOROHYDRIN)	81.0	5.0	9.98			9.98	659
1336-21-6	AMMONIUM HYDROXIDE (28 WT% OR MORE)	35.1	500	504.40	423.00	1000.00	1000.00	658
77-47-4	HEXACHLOROCYCLOPENTADIENE	273.0	0.080	0.18			0.18	586
140-76-1	PYRIDINE, 2-METHYL-5-VINYL-	119.0	1.7	3.91			3.91	572
353-42-4	BORON TRIFLUORIDE COMPOUND WITH....	114.0	20	49.43			49.43	532
91-08-7	TOLUENE 2,6-DIISOCYANATE	174.0	0.50	1.27			1.27	519
108-98-5	THIOPHENOL	110.0	1.0	3.12			3.12	422
77-81-6	TABUN	162.0	0.070	0.23			0.23	406
75-55-8	PROPYLENEIMINE	57.0	149	515.79			515.79	380
98-87-3	BENZAL CHLORIDE	161.0	1.0	3.50			3.50	376
558-25-8	METHANESULFONYL FLUORIDE	98.0	10	35.00			35.00	376
597-64-8	TETRAETHYTIM	235.0	2.0	7.30			7.30	361
627-11-2	CHLOROETHYL CHLOROFORMATE	143.0	9.0	34.27			34.27	346
123-73-9	CROTONALDEHYDE, (E)-	70.0	36	140.00			140.00	338
108-23-6	ISOPROPYL CHLOROFORMATE	123.0	50	199.19			199.19	330
115-26-4	DIMEFOX	154.0	0.36	1.59			1.59	298
75-56-9	PROPYLENE OXIDE	58.1	438	2027.60			2027.60	284
2524-03-0	DIMETHYL PHOSPHOROCHLORIDOTHIOATE	161.0	1.0	4.87			4.87	270
7791-23-3	SELENIUM OXYCHLORIDE	166.0	2.9	14.76			14.76	259
106-89-8	EPICHLOROHYDRIN	93.0	16	100.11			100.11	210
1622-32-8	ETHANESULFONYL CHLORIDE,2-CHLORO-	163.0	0.60	3.76			3.76	210
67-66-3	CHLOROFORM	119.0	160	1008.82			1008.82	209
78-71-7	OXETANE, 3,3-BIS(CHLOROMETHYL)-	155.0	0.50	3.16			3.16	208
107-18-6	ALLYL ALCOHOL	58.0	24	152.07			152.07	206
98-16-8	BENZENAMINE, 3-(TRIFLUOROMETHYL)-	161.0	1.0	6.70			6.70	197

CTL020562

LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED BY SHI)

CAS NUMBER	EXTREMELY HAZARDOUS SUBSTANCE	MW	VAPOR	SOURCES OF ACUTE TOXICITY			ACUTE	SUBSTANCE HAZARD INDEX (VP)/ATC
			PRESSURE	CONCENTRATION DATA - ppmv			TOXICITY	
			@ 20-25 DEG C (torr)	EPA LIST	NJTCPA	ERPG-3	CONC. (ATC) (ppmv)	
12108-13-3	MANGANESE, TRICARBONYL METHYL-....	218.0	0.10	0.67			0.67	195
115-21-9	TRICHLOROETHYLSILANE	164.0	0.60	4.48			4.48	176
62-75-9	NITROSODIMETHYLAMINE	74.0	8.0	62.91			62.91	167
55-91-4	ISOFLUORPHATE	184.0	0.60	4.79			4.79	165
140-29-4	BENZYL CYANIDE	117.0	1.0	9.00			9.00	146
542-76-7	PROPIONITRILE, 3-CHLORO	90.0	2.5	24.50			24.50	134
100-44-7	BENZYL CHLORIDE	127.0	1.0	10.03			10.03	131
541-25-3	LEWISITE	207.0	0.40	5.56			5.56	95
556-64-9	METHYL THIOCYANATE	73.0	20	285.27			285.27	92
107-16-4	FORMALDEHYDE CYANOHYDRIN	57.0	1.8	25.79			25.79	92
7722-84-1	HYDROGEN PEROXIDE (CONC >52%)	34.0	5.0	72.06			72.06	91
78-00-2	TETRAETHYLLEAD	323.0	0.20	3.03			3.03	87
505-60-2	MUSTARD GAS	159.0	0.090	1.54			1.54	77
584-84-9	TOLUENE-2,4-DISOCYANATE	174.0	0	9.90	1.00		1.00	53
78-97-7	LACTONITRILE	71.0	1.7	62.11			62.11	36
108-91-8	CYCLOHEXYLAMINE	99.0	10	395.96			395.96	33
300-62-9	AMPHETAMINE	135.0	0.90	36.30			36.30	33
88-05-1	ANILINE, 2,4,6-TRIMETHYL-	135.0	0.10	5.26			5.26	25
538-07-8	ETHYLBIS(2-CHLOROETHYL)AMINE	170.0	0.20	10.81			10.81	24
814-49-3	DIETHYL CHLOROPHOSPHATE	173.0	0.20	11.33			11.33	23
149-74-6	DICHLOROMETHYLPHENYLSILANE	191.0	0.40	25.65			25.65	21
75-86-5	ACETONE CYANOHYDRIN	85.0	0.50	34.59			34.59	19
542-90-5	ETHYLTHIOCYANATE	87.0	4.0	281.61			281.61	19
51-75-2	MECHLORETHAMINE	156.0	0.60	45.54			45.54	17
77-78-1	DIMETHYL SULFATE	126.0	0.10	9.72			9.72	14
298-02-2	PHORATE	260.0	0.00080	0.09			0.09	11
54-11-5	NICOTINE	162.0	0.040	5.29			5.29	10
107-15-3	ETHYLENEDIAMINE	60.0	15	2000.83			2000.83	10
62-53-3	ANILINE	93.0	0.70	100.11			100.11	9
696-28-6	PHENYL DICHLOROARSINE	223.0	0.030	4.39			4.39	9
10476-95-6	METHACROLEIN DIACETATE	172.0	0.35	62.67			62.67	7
78-34-2	DIOXATHION	457.0	0.010	1.82			1.82	7
111-44-4	DICHLOROETHYL ETHER	143.0	0.70	256.99			256.99	4
98-13-5	TRICHLOROPHENYLSILANE	212.0	0.010	3.81			3.81	3
152-16-9	DIPHOSPHORAMIDE, OCTAMETHYL-	286.0	0.0010	0.69			0.69	2

CTL020563

LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED BY SHI)

CAS NUMBER	EXTREMELY HAZARDOUS SUBSTANCE	MW	VAPOR	SOURCES OF ACUTE TOXICITY			ACUTE	SUBSTANCE HAZARD INDEX (VP)/ATC
			PRESSURE	CONCENTRATION DATA - ppmv			TOXICITY	
			@ 20-25 DEG C (torr)	EPA LIST	NJTCPA	ERPG-3	CONC. (ATC) (ppmv)	
760-93-0	METHACRYLIC ANHYDRIDE	154.0	0.010	7.16			7.16	2
3037-72-7	SILANE,(4-AMINOBTYL)DIETHOXYMETHYL-	205.0	0.060	53.78			53.78	1
2238-07-5	DIGLYCIDYL ETHER	130.0	0.090	84.81			84.81	1
297-97-2	THIONAZIN	248.0	0.0030	3.46			3.46	1
50782-69-9	PHOSPHONOTHIOIC ACID, METHYL-,....	267.0	0.00070	0.83			0.83	1
24934-91-6	CHLORMEPHOS	235.0	0.0056	7.30			7.30	1
7786-34-7	MEVINPHOS	224.0	0.0030	4.38			4.38	1
107-49-3	TEPP	290.0	0.00047	0.84			0.84	1
62-73-7	DICHLORVOS	221.0	0.010	22.17			22.17	1
13071-79-9	TERBULOS	288.0	0.00030	0.85			0.85	0
2636-26-2	CYANOPHOS	243.0	0.0080	25.21			25.21	0
4835-11-4	HEXAMETHYLENEDIAMINE,N,N'-DIBUTYL-	228.0	0.00040	2.36			2.36	0
944-22-9	FONOFOS	246.0	0.00020	1.29			1.29	0
119-38-0	ISOPROPYLMETHYLPYRAZOLYL....	211.0	0.0010	6.50			6.50	0
3254-63-5	PHOSPHORIC ACID, DIMETHYL....	248.0	0.0010	6.92			6.92	0
8065-48-3	DEMETON	258.0	0.00026	1.90			1.90	0
13171-21-6	PHOSPHAMIDON	300.0	0.000025	0.25			0.25	0
298-04-4	DISULFOTON	274.0	0.00018	1.79			1.79	0
21923-23-9	CHLORTHIOFOS	361.0	0.00040	5.29			5.29	0
3689-24-5	SULFOTEP	322.0	0.00017	2.66			2.66	0
10140-87-1	ETHANOL, 1,2-DICHLORO-, ACETATE	157.0	0.0010	17.17			17.17	0
2587-90-8	PHOSPHOROTHIOIC ACID, O,O-DIMETHYL..	216.0	0.0010	22.69			22.69	0
2540-82-1	FORMOTHION	257.0	8.50E-06	0.26			0.26	0
111-69-3	ADIPONITRILE	108.0	0.0010	38.56			38.56	0
98-95-3	NITROBENZENE	125.0	0.0050	196.00			196.00	0
3569-57-1	SULFOXIDE, 3-CHLOROPROPYL OCTYL	239.0	0.00020	8.20			8.20	0
56-38-2	PARATHION	291.0	0.000038	1.68			1.68	0
2497-07-6	OXYDISULFOTON	274.0	0.000060	3.13			3.13	0
919-86-8	DEMETON-S-METHYL	230.0	0.00010	5.33			5.33	0
23505-41-1	PIRIMIFOS-ETHYL	333.0	0.00029	18.39			18.39	0
13194-48-4	ETHOPROPHOS	242.0	0.00035	26.32			26.32	0
141-66-2	DICROTOPHOS	237.0	0.000010	0.93			0.93	0
2703-13-1	PHOSPHONOTHIOIC ACID, METHYL-,....	262.0	0.00010	9.35			9.35	0
131-11-3	DIMETHYL PHTHALATE	194.0	0.010	1174.48			1174.48	0
24017-47-8	TRIAZOLCS	313.0	0.000010	2.19			2.19	0

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LISTING OF EXTREMELY HAZARDOUS SUBSTANCES (SORTED BY SHI)

CAS NUMBER	EXTREMELY HAZARDOUS SUBSTANCE	MW	VAPOR	SOURCES OF ACUTE TOXICITY			ACUTE	SUBSTANCE
			PRESSURE	CONCENTRATION DATA - ppmv			TOXICITY	
			@ 20-25 DEG C (torr)	EPA LIST	NJTCPA	ERPG-3	CONC. (ATC) (ppmv)	
122-14-5	FENITROTHION	277.0	6.00E-06	3.36			3.36	0
2665-30-7	PHOSPHONOTHIOIC ACID, METHYL-,....	309.0	0.000010	6.34			6.34	0
21548-32-3	FOSHIETAN	241.0	6.50E-06	4.78			4.78	0
470-90-6	CHLORFENVINTOS	360.0	4.00E-06	6.81			6.81	0
3735-23-7	METHYL PHENKAPTON	349.0	3.50E-06	7.72			7.72	0
57-74-9	CHLORDANE	410.0	0.000010	29.88			29.88	0
78-53-5	AMITON	269.0	1.00E-06	3.01			3.01	0
563-12-2	ETHION	384.0	1.50E-06	8.29			8.29	0
786-19-6	CARBOPHENOTHION	343.0	3.00E-07	4.86			4.86	0
7664-93-9	SULFURIC ACID	98.0	1.00E-06	20.00			20.00	0
76-02-8	TRICHLOROACETYL CHLORIDE	182.0	1.00E-07	6.06			6.06	0
115-90-2	FENSULFOTHION	308.0	1.00E-08	1.59			1.59	0
84-74-2	DIBUTYL PHTHALATE	278.0	1.00E-06	819.60			819.60	0
950-10-7	MEPHOSFOLAN	269.0	1.00E-10	8.20			8.20	0
117-84-0	DIOCTYL PHTHALATE	391.0	1.00E-08	4079.16			4079.16	0

(1) Note:

These substances are gases above their critical point at 20 degrees C, hence there is no vapor pressure in the traditional sense. A vapor pressure of 1111 mm Hg was arbitrarily used.

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TABLE 4

WILMINGTON METEOROLOGICAL CONDITIONS SUMMARY FOR 1977-1986 D-DAY AND D-NIGHT CATEGORIES COMBINED							
STABILITY CLASS	WIND SPEEDS, M/SEC						
	1.5	2.5	4.3	6.8	9.5	12.5	TOTAL
A	0.00133	0.00250	0.00000	0.00000	0.00000	0.00000	0.00383
B	0.00681	0.01915	0.01646	0.00000	0.00000	0.00000	0.04242
C	0.00621	0.02291	0.06278	0.01410	0.00047	0.00005	0.10652
D	0.01899	0.08708	0.18189	0.21094	0.03241	0.00805	0.53936
EF	0.05376	0.18131	0.07283	0.00000	0.00000	0.00000	0.30790
TOTAL	0.08710	0.31295	0.33396	0.22504	0.03288	0.00810	1.00003

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TABLE 5

CALCULATED CONCENTRATIONS AT VARIOUS WIND SPEED/STABILITY COMBINATIONS

DOWNWIND DISTANCE, M	100
RATE, GRAMS/SEC	100

STABILITY CLASS	DISP. COEF.		WIND SPEEDS, M/SEC					
	SIGMA Y	SIGMA Z	1.5000	2.5000	4.3000	6.8000	9.5000	12.5000
A	31.38	25.17	0.0269	0.0161	0.0094	0.0059	0.0042	0.0032
B	31.38	25.17	0.0269	0.0161	0.0094	0.0059	0.0042	0.0032
C	21.57	20.00	0.0492	0.0295	0.0172	0.0108	0.0078	0.0059
D	15.69	13.79	0.0980	0.0588	0.0342	0.0216	0.0155	0.0118
EF	10.79	7.46	0.2637	0.1582	0.0920	0.0582	0.0416	0.0316

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TABLE 6

DETERMINATION OF AVERAGE METEOROLOGICAL CONDITIONS					
STABILITY CLASS	WIND SPEED M/SEC	C-LINE CONC. G/M3	PROB. OF OCCUR.	PROB. WORSE OCCURS	PROB. BETTER OCCURS
EF	1.5	0.2637	0.05376	0.05376	1.00003
EF	2.5	0.1582	0.18131	0.23507	0.94627
D	1.5	0.0980	0.01899	0.25406	0.76496
EF	4.3	0.0920	0.07283	0.32689	0.74597
D	2.5	0.0588	0.08708	0.41397	0.67314
EF	6.8	0.0582	0.00000	0.41397	0.58606
C	1.5	0.0492	0.00621	0.42018	0.58606
EF	9.5	0.0416	0.00000	0.42018	0.57985
D	4.3	0.0342	0.18189	0.60207	0.57985
EF	12.5	0.0316	0.00000	0.60207	0.39796
C	2.5	0.0295	0.02291	0.62498	0.39796
A	1.5	0.0269	0.00133	0.62631	0.37505
B	1.5	0.0269	0.00681	0.63312	0.37372
D	6.8	0.0216	0.21094	0.84406	0.36691
C	4.3	0.0172	0.06278	0.90684	0.15597
A	2.5	0.0161	0.00250	0.90934	0.09319
B	2.5	0.0161	0.01915	0.92849	0.09069
D	9.5	0.0155	0.03241	0.96090	0.07154
D	12.5	0.0118	0.00805	0.96895	0.03913
C	6.8	0.0108	0.01410	0.98305	0.03108
A	4.3	0.0094	0.00000	0.98305	0.01698
B	4.3	0.0094	0.01646	0.99951	0.01698
C	9.5	0.0078	0.00047	0.99998	0.00052
A	6.8	0.0059	0.00000	0.99998	0.00005
B	6.8	0.0059	0.00000	0.99998	0.00005
C	12.5	0.0059	0.00005	1.00003	0.00005
A	9.5	0.0042	0.00000	1.00003	0.00000
B	9.5	0.0042	0.00000	1.00003	0.00000
A	12.5	0.0032	0.00000	1.00003	0.00000
B	12.5	0.0032	0.00000	1.00003	0.00000

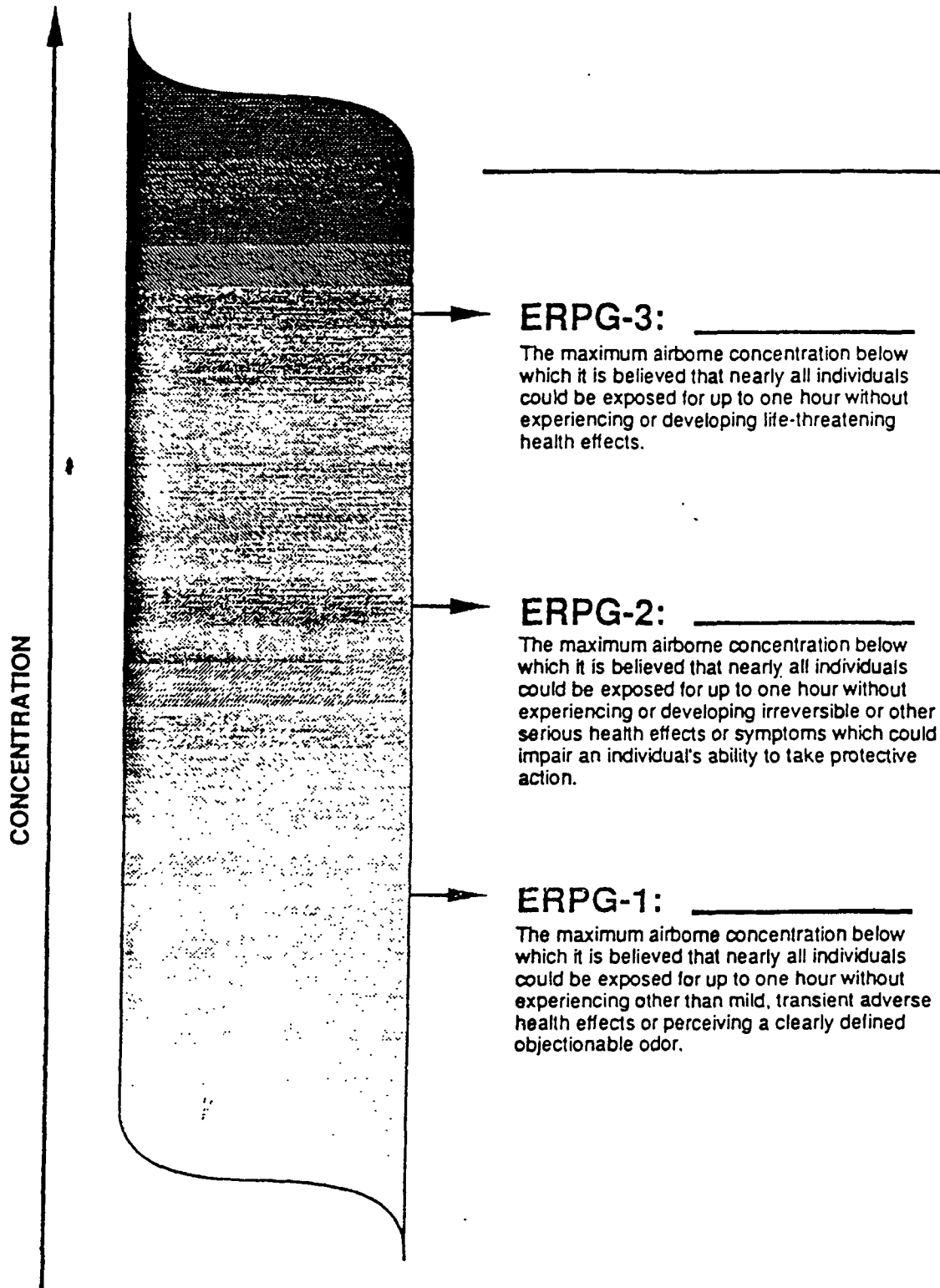
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TABLE 7

SEPARATIONS DISTANCE MULTIPLIERS FOR SUFFICIENT QUANTITIES				
DISTANCE TO PLANT BOUNDARY M	DISPERSION COEFFICIENTS		CONCENTRATION AT DISTANCE RELATIVE TO THAT AT 100 M	SUF. QUANTITY AT DISTANCE RELATIVE TO THAT AT 100 M
	SIGMA Y M	SIGMA X M		
100	10.79	7.46	1.0000	1.00
150	16.03	10.84	0.4631	2.16
200	21.17	14.03	0.2709	3.69
250	26.22	17.06	0.1799	5.56
300	31.18	19.93	0.1295	7.72
350	36.06	22.67	0.0984	10.16
400	40.85	25.30	0.0779	12.84
450	45.57	27.82	0.0635	15.75
500	50.21	30.24	0.0530	18.87
550	54.77	32.57	0.0451	22.17
600	59.27	34.82	0.0390	25.65
650	63.70	37.00	0.0341	29.29
700	68.06	39.11	0.0302	33.08
750	72.36	41.16	0.0270	37.01
800	76.59	43.15	0.0243	41.07
850	80.77	45.08	0.0221	45.25
900	84.89	46.97	0.0202	49.55
950	88.96	48.80	0.0185	53.95
1000	92.97	50.60	0.0171	58.46

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Emergency Response Planning Guidelines



Adapted from Organization Resources Counselors, 1987.