

**Table 3
Waste Stream Hazard Indices
(Continued)**

Chemical	CAS Number	MW	Mole Frac.	Vap. Pres. @ 20°C (psia)	Partial Pressure (psia)	ERPG2 (ppmv)	Hazard Index
xylene	1330207	106.2	0.3	0.1702	0.0510	200.00	0.3
hexachloroethane	67721	236.7	0.3	0.0041	0.0012	5.00	0.2
Furfural	98-01-1	96.1	0.3	0.0201	0.0060	25.00	0.2
isobutyl alcohol	78831	74.1	0.3	0.1740	0.0522	250.00	0.2
Aniline	62-53-3	93.1	0.3	0.0062	0.0019	10.00	0.2
Dichloroethyl ether	111-44-4	143.0	0.3	0.0152	0.0046	25.00	0.2
dichlorobenzene, 1,2 (dichlorobenzene, o)	95501	147.0	0.3	0.0232	0.0070	50.00	0.1
trichlorophenol, 2,4,6	88062	197.5	0.3	0.0193	0.0058	43.33	0.1
acetone	67641	58.1	0.3	3.4806	1.0442	8500.00	0.1
tetrachlorobenzene, 1,2,4,5	95943	215.9	0.3	0.0019	0.0006	5.66	0.1
chlorobenzene	108907	112.6	0.3	0.1697	0.0509	500.00	0.1
Toluidine, o-	95-53-4	107.2	0.3	0.0033	0.0010	10.00	0.1
heavy ends from the purification of toluenedamine in the production of toluenediamine via hydrogenation of dinitrotoluene	95807	122.2	0.3	0.0048	0.0015	15.01	0.1
dichlorophenol, 2,4	120832	163.0	0.3	0.0022	0.0007	7.50	0.1
ethoxy ethanol, 2	110805	90.1	0.3	0.0725	0.0218	250.00	0.1
Hexachlorobutadiene	87-68-3	260.8	0.3	0.0029	0.0009	10.00	0.1
Dichlorobenzene, p- (1,4-)	106-46-7	147.0	0.3	0.0243	0.0073	100.00	0.1
dichlorobenzene, 1,4 (dichlorobenzene, p)	106467	147.0	0.3	0.0247	0.0074	110.00	0.1
Dichlorobenzene, o- (1,2-)	95-50-1	147.0	0.3	0.0220	0.0066	100.00	0.1
Phenol, 2,4-dimethyl-	105679	122.2	0.3	0.0020	0.0006	10.00	0.1
cresol, o	95487	180.2	0.3	0.0048	0.0014	25.00	0.1
cresol	1319773	180.2	0.3	0.0048	0.0014	25.00	0.1

**Table 3
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Chemical	CAS Number	MW	Mole Frac.	Vap. Pres. @ 20°C (psia)	Partial Pressure (psia)	ERPG2 (ppmv)	Hazard Index
2,4-D	94-75-7	221.0	0.3	0.0010	0.0003	5.44	0.1
Cresols (Cresylic acid)	1319-77-3	108.1	0.3	0.0040	0.0012	25.00	0.0
mercury	7439976	200.6	0.3	0.0000	0.0000	0.25	0.0
nitrobenzene	98953	123.1	0.3	0.0029	0.0009	20.00	0.0
phenol	108952	94.1	0.3	0.0068	0.0020	50.00	0.0
cresol, m	108394	180.2	0.3	0.0029	0.0009	25.00	0.0
diethylhexyl phthalate	117817	390.5	0.3	0.0001	0.0000	1.57	0.0
cresol, p	106445	180.2	0.3	0.0022	0.0007	25.00	0.0
Pentachlorophenol	87-86-5	266.4	0.3	0.0001	0.0000	1.36	0.0
diethyl phthalate	84662	222.3	0.3	0.0002	0.0001	2.75	0.0
tetraethyl lead sludge	78002	323.5	0.3	0.0000	0.0000	0.06	0.0
trichlorophenol, 2,4,5	95954	197.4	0.3	0.0004	0.0001	6.19	0.0
dibutyl phthalate	84742	278.3	0.3	0.0015	0.0004	21.96	0.0
pentachlorobenzene	608935	250.3	0.3	0.0003	0.0001	4.88	0.0
ethyl carbamate (urethane)	51796	89.1	0.3	0.0070	0.0021	137.21	0.0
selenium, tetrakis(dimethyldithiocarbamate)	7782492	79.0	0.3	0.0000	0.0000	0.31	0.0
Aminopyridine,4-	504-29-2	94.1	0.3	0.0000	0.0000	0.50	0.0
aldicarb	116063	190.3	0.3	0.0000	0.0000	0.04	0.0
carbaryl	63252	201.2	0.3	0.0001	0.0000	3.04	0.0
p-chloroaniline (benzenamine, 4-chloro-)	106478	127.6	0.3	0.0003	0.0001	9.58	0.0
naphthalene	91203	142.2	0.3	0.0010	0.0003	35.00	0.0
dimethyl phthalate	131113	194.3	0.3	0.0001	0.0000	3.15	0.0
oxamyl	23135220	219.3	0.3	0.0000	0.0000	0.19	0.0

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(Continued)

Chemical	CAS Number	MW	Mole Frac.	Vap. Pres. @ 20°C (psia)	Partial Pressure (psia)	ERPG2 (ppmv)	Hazard Index
Still bottoms from toluene reclamation distillation in the production of disulfoton	298044	274.4	0.3	0.0000	0.0000	<i>0.18</i>	0.0
carbofuran	1563662	221.0	0.3	0.0000	0.0000	<i>0.05</i>	0.0
distillation bottoms from the production of phthalic anhydride from o-xylene	85449	148.1	0.3	0.0000	0.0000	<i>4.95</i>	0.0
acrylamide	79061	71.8	0.3	0.0001	0.0000	<i>20.43</i>	0.0
parathion	56382	291.3	0.3	0.0000	0.0000	<i>0.17</i>	0.0
pentachloronitrobenzene	82688	295.4	0.3	0.0000	0.0000	<i>20.69</i>	0.0
dinoseb (phenol, 2-(1-methylpropyl)-4,6-dinitro-)	88857	240.2	0.3	0.0000	0.0000	<i>0.46</i>	0.0
Phthalic anhydride	85-44-9	148.1	0.3	0.0003	0.0001	<i>162.46</i>	0.0
thallium acetate	563688	263.4	0.3	0.0000	0.0000	<i>0.06</i>	0.0
nitrophenol, P	100027	139.1	0.3	0.0000	0.0000	<i>2.64</i>	0.0
methoxychlor	72435	345.7	0.3	0.0000	0.0000	<i>3.54</i>	0.0
lindane	58899	290.8	0.3	0.0000	0.0000	<i>4.20</i>	0.0
phenylmercury acetate	62384	336.7	0.3	0.0000	0.0000	<i>0.73</i>	0.0
silver cyanide	506649	134.0	0.3	0.0000	0.0000	<i>4.56</i>	0.0
propoxur	114261	209.2	0.3	0.0000	0.0000	<i>2.34</i>	0.0
methomyl	16752775	162.2	0.3	0.0000	0.0000	<i>1.51</i>	0.0
vacuum stripper discharge from the chlordane chlorinator in the production of chlordane	57749	409.8	0.3	0.0000	0.0000	<i>2.98</i>	0.0
toxaphene	8001352	413.8	0.3	0.0000	0.0000	<i>1.18</i>	0.0
dimethoate	60515	229.0	0.3	0.0000	0.0000	<i>3.20</i>	0.0
dimethoxybenzidine, 3,3	119904	212.3	0.3	0.0000	0.0000	<i>4.03</i>	0.0
endrin	72208	380.9	0.3	0.0000	0.0000	<i>0.13</i>	0.0

Table 3
Waste Stream Hazard Indices
(Continued)

Chemical	CAS Number	MW	Mole Frac.	Vap. Pres. @ 20• C (psia)	Partial Pressure (psia)	ERPG2 (ppmv)	Hazard Index
hexachlorophene	70304	406.9	0.3	0.0000	0.0000	1.80	0.0
warfarin and salts, <0.3%	81812	308.3	0.3	0.0000	0.0000	1.59	0.0
methylcholanthrene, 3	56495	268.3	0.3	0.0000	0.0000	0.36	0.0
maleic hydrazide	123331	112.1	0.3	0.0000	0.0000	2.73	0.0
strychnine and salts	57249	334.4	0.3	0.0000	0.0000	0.02	0.0
potassium silver cyanide	506616	199.0	0.3	0.0000	0.0000	2.46	0.0
sodium cyanide	143339	49.0	0.3	0.0000	0.0000	2.49	0.0
thallium(I) sulfate	7446186	504.8	0.3	0.0000	0.0000	0.00	0.0
thallium chloride	7791120	239.8	0.3	0.0000	0.0000	0.20	0.0
sodium azide	26628228	65.0	0.3	0.0000	0.0000	0.11	0.0
1,3,5-trinitrobenzene (R,T)	99354	213.1	0.3	0.0000	0.0000	5.74	0.0
2,4-dinitrophenol	51285	184.1	0.3	0.0000	0.0000	3.98	0.0
4-aminopyridine (4-pyridinamine)	504245	94.1	0.3	0.0000	0.0000	5.20	0.0
aldrin (1,4,5,8-dimethanonaphthalene, 1,2,3,4,10,10-hexa- chloro- 1,4,4a,5,8,8a,-hexahydro-, (1alpha,4alpha,4abeta,5alpha,8alpha,8 abeta)-)	309002	364.9	0.3	0.0000	0.0000	0.67	0.0
aluminum	7429905	27.0	0.3	0.0000	0.0000	45.28	0.0
aluminum phosphide (R,T)	20859738	58.0	0.3	0.0000	0.0000	8.43	0.0
amitrole	61825	84.1	0.3	0.0000	0.0000	29.07	0.0
Aqueous spent antimony catalyst waste from fluoromethanes production	7440360	121.8	0.3	0.0000	0.0000	5.02	0.0
arsenic acid	7440382	74.9	0.3	0.0000	0.0000	0.82	0.0
barium	7440393	137.3	0.3	0.0000	0.0000	4.45	0.0
benzidine	92875	184.2	0.3	0.0000	0.0000	0.46	0.0

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(Continued)

Chemical	CAS Number	MW	Mole Frac.	Vap. Pres. @ 20°C (psia)	Partial Pressure (psia)	ERPG2 (ppmv)	Hazard Index
benzo[a]pyrene	50328	252.3	0.3	0.0000	0.0000	<i>0.97</i>	0.0
beryllium powder	7440417	9.0	0.3	0.0000	0.0000	<i>0.07</i>	0.0
cacodylic acid (hydroxydimethylarsine oxide)	75605	138.0	0.3	0.0000	0.0000	<i>0.89</i>	0.0
cadmium	7440439	112.4	0.3	0.0000	0.0000	<i>0.11</i>	0.0
chlordan, alpha and gamma isomers	57749	409.8	0.3	0.0000	0.0000	<i>2.98</i>	0.0
chlorobenzilate	510156	325.2	0.3	0.0000	0.0000	<i>0.11</i>	0.0
chrysene	218019	240.4	0.3	0.0000	0.0000	<i>0.10</i>	0.0
copper cyanide Cu(CN)	544923	89.6	0.3	0.0000	0.0000	<i>1.64</i>	0.0
creosote	8001589	200.0	0.3	0.0000	0.0000	<i>9.78</i>	0.0
crotonaldehyde (trans-2-butenal)	123739	70.1	0.3	0.0000	0.0000	<i>13.96</i>	0.0
DBCP (1,2-dibromo-3-chloropropane)	96128	236.4	0.3	0.0000	0.0000	<i>0.01</i>	0.0
DDD (dichlorodiphenyldichloroethane)	72548	320.0	0.3	0.0000	0.0000	<i>3.82</i>	0.0
DDT (dichlorodiphenyltrichloroethane)	50293	354.5	0.3	0.0000	0.0000	<i>0.34</i>	0.0
dibenzo[a,h]anthracene	53703	278.4	0.3	0.0000	0.0000	<i>4.39</i>	0.0
dichlorobenzene, m	541731	147.0	0.3	0.0000	0.0000	<i>15.00</i>	0.0
dichlorobenzidine, 3,3	91941	253.1	0.3	0.0000	0.0000	<i>4.00</i>	0.0
dieldrin	60571	381.0	0.3	0.0000	0.0000	<i>0.08</i>	0.0
dimethylaminoazobenzene, p	60117	225.3	0.3	0.0000	0.0000	<i>8.14</i>	0.0
dimethylbenzidine, 3,3'	119937	212.3	0.3	0.0000	0.0000	<i>0.23</i>	0.0
dimethylcarbamoyl chloride	79447	107.6	0.3	0.0000	0.0000	<i>4.00</i>	0.0
dinitrotoluene, 2,4	121142	182.1	0.3	0.0000	0.0000	<i>1.34</i>	0.0
diphenylhydrazine, 1,2	122667	184.3	0.3	0.0000	0.0000	<i>6.63</i>	0.0
endosulfan	115297	407.0	0.3	0.0000	0.0000	<i>0.05</i>	0.0

**Table 3
Waste Stream Hazard Indices
(Continued)**

Chemical	CAS Number	MW	Mole Frac.	Vap. Pres. @ 20°C (psia)	Partial Pressure (psia)	ERPG2 (ppmv)	Hazard Index
filtration, evaporation, and centrifugation solids from the production of ethylene bisdithiocarbamic acid and its salts	96457	102.2	0.3	0.0000	0.0000	<i>17.94</i>	0.0
furan	110009	68.1	0.3	0.0000	0.0000	<i>4.00</i>	0.0
glycidylaldehyde	765344		0.3	0.0000	0.0000	<i>0.50</i>	0.0
heptachlor	76448	373.4	0.3	0.0000	0.0000	<i>0.02</i>	0.0
hexachlorobenzene	118741	284.8	0.3	0.0000	0.0000	<i>0.09</i>	0.0
indeno[1,2,3-cd]pyrene	193395	276.3	0.3	0.0000	0.0000	<i>0.31</i>	0.0
lead	7439921	207.2	0.3	0.0000	0.0000	<i>0.03</i>	0.0
lead acetate	301042	325.3	0.3	0.0000	0.0000	<i>3.01</i>	0.0
lead phosphate	7446277	811.5	0.3	0.0000	0.0000	<i>0.90</i>	0.0
liquids w/ nickel	7440020	58.7	0.3	0.0000	0.0000	<i>4.17</i>	0.0
liquids w/ thallium	7440280	204.4	0.3	0.0000	0.0000	<i>0.24</i>	0.0
manganese dimethyldithiocarbamate	7439965	54.9	0.3	0.0000	0.0000	<i>2.23</i>	0.0
methylenebis(2-chloraniline), 4,4'	101144	267.2	0.3	0.0000	0.0000	<i>0.50</i>	0.0
nitroso-methylurea, N	684935	56.1	0.3	0.0000	0.0000	<i>0.15</i>	0.0
potassium cyanide	151508	65.1	0.3	0.0000	0.0000	<i>1.88</i>	0.0
propane sultone, 1,3	1120714	122.1	0.3	0.0000	0.0000	<i>1.50</i>	0.0
selenium sulfide SeS ₂ (R,T)	7446346	143.1	0.3	0.0000	0.0000	<i>2.14</i>	0.0
silver	7440224	107.9	0.3	0.0000	0.0000	<i>0.11</i>	0.0
thallic oxide	1314325	456.8	0.3	0.0000	0.0000	<i>0.11</i>	0.0
thallium nitrate	10102451	266.4	0.3	0.0000	0.0000	<i>0.55</i>	0.0
thioacetamide	62555	75.1	0.3	0.0000	0.0000	<i>16.28</i>	0.0
thiourea	62566	76.1	0.3	0.0000	0.0000	<i>8.03</i>	0.0

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(Continued)

Chemical	CAS Number	MW	Mole Frac.	Vap. Pres. @ 20°C (psia)	Partial Pressure (psia)	ERPG2 (ppmv)	Hazard Index
zinc phosphide, <10%	7440666	258.1	0.3	0.0000	0.0000	4.74	0.0
2-cyclohexyl-4,6-dinitrophenol	131895	266.3	0.3	0.0000	0.0000		
Acetyl-2-thiourea,1-	591082	118.2	0.3	0.0898	0.0269		
aldicarb sulfone	1646884	222.3	0.3	0.0000	0.0000		
asbestos, asbestos containing waste	1332214	277.1	0.3	0.0000	0.0000		
benomyl	17804352	290.4	0.3	0.0000	0.0000		
Benzal chloride	98-87-3	127.0	0.3	0.0009	0.0003		
Benzoyl chloride	98-88-4	195.5	0.3	0.0027	0.0008		
Butene, 1,4-dichloro-2-	764-41-0	125.0	0.3	0.2694	0.0808		
Carbendazim	10605217	191.2	0.3	0.0040	0.0012		
carbosulfan	55285148	221.3	0.3	0.0000	0.0000		
Chloral (Trichloroacetaldehyde)	75-87-6	147.4	0.3	0.7630	0.2289		
Chloroaniline, p-	106-47-8	127.6	0.3	0.0002	0.0001		
Chloroethyl vinyl ether, 2-	110-75-8	106.6	0.3	0.4778	0.1433		
Chloromethyl methyl ether	107-30-2	80.5	0.3	3.5048	1.0514		
Chlorophenol, 2-	95-57-8	128.6	0.3	0.0182	0.0055		
Chlorophenol, 3-	108-43-0	128.6	0.3	0.0070	0.0021		
Chlorophenol, 4-	106-48-9	128.6	0.3	0.0024	0.0007		
Chloropropane, 1,2-dibromo-3-	96-12-8	236.4	0.3	0.0112	0.0034		
Chloropropionitrile,3-	542-76-7	89.5	0.3	0.0139	0.0042		
copper, bis(dimethylcarbamo-dithioato-S-,S')-,	744508		0.3	0.0000	0.0000		
Cresol, 4,6-dinitro-o-	534-52-1	198.0	0.3	0.0002	0.0001		
Dazomet	533744	162.3	0.3	0.0034	0.0010		
dibenzof[a,l]pyrene	191300	302.4	0.3	0.0000	0.0000		

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dibromo-1-propanol phosphate(3:1), 2,3	96139	697.7	0.3	0.0000	0.0000		
Dichloroethene, 1,1- (Vinylidene chloride)	75-35-4	97.0	0.3	9.6429	2.8929		
Dichlorophenol, 2,6-	87-65-0	163.0	0.3	0.0030	0.0009		
Dichlorophenylarsine (C6H5AsCl2)	696-28-6	222.9	0.3	0.0063	0.0019		
diethyl-p-nitrophenyl phosphate	311455	275.2	0.3	0.0000	0.0000		
dimethylbenz[a]anthracene, 7,12	57976		0.3	0.0000	0.0000		
Dimethylphenol, 2,6-	576-26-1	112.2	0.3	0.0007	0.0002		
Dinitrophenol, 2,4- [(NO2)2C6H3OH]	51-28-5	184.1	0.3	0.0001	0.0000		
Dipropylamine	142847	101.2	0.3	3.2869	0.9861		
endothall	145733	186.2	0.3	0.0000	0.0000		
Ethyl cyanide	107-12-0	55.1	0.3	0.7737	0.2321		
Ethyl methacrylate	97-63-2	114.0	0.3	0.7543	0.2263		
Ethylene thiourea	96-45-7	102.2	0.3	0.0048	0.0014		
Methane, dibromo- (Methylene bromide)	74-95-3	173.9	0.3	0.7544	0.2263		
Methylacetonitrile	75865	85.1	0.3	0.0155	0.0047		
molinat	2212671	187.3	0.3	0.0000	0.0000		
N,N'-diethylhydrazine	616-40-0	88.2	0.3	0.6997	0.2099		
Nitric acid, thallium (1+) salt	10102451	266.4	0.3	0.9284	0.2785		
nitrosodiethanolamine, N	1116547	134.1	0.3	0.0000	0.0000		
nitrosodiethylamine, N	55185	102.1	0.3	0.0000	0.0000		
Nitrosodimethylamine, N-	62-75-9	74.1	0.3	0.1193	0.0358		
nitrosodi-n-butylamine, N	924163	158.3	0.3	0.0000	0.0000		
nitrosopiperidine, N	100754	116.1	0.3	0.0000	0.0000		
nitrosopyrrolidine, N	930552	100.1	0.3	0.0000	0.0000		

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N-Nitroso-N-methylurea	684935	103.1	0.3	0.0106	0.0032		
Organo-arsenic (as Dichloromethylarsine: CH ₃ AsCl ₂)	593-89-5	160.8	0.3	0.1741	0.0522		
Paraldehyde (Paraformaldehyde ?)	30525-89-4	132.3	0.3	0.3884	0.1165		
Pentachloroethane (Pentalin)	76-01-7	202.3	0.3	0.0475	0.0143		
Phosphoric acid, lead (2+) salt (2:3)	7446277	98.0	0.3	0.0006	0.0002		
Picoline, 2- (Methyl pyridine)	109-06-8	93.1	0.3	0.2012	0.0604		
pronamide	23950585	256.1	0.3	0.0000	0.0000		
Propargyl alcohol (1-propyne-3-ol)	107-19-6	56.1	0.3	0.2321	0.0696		
Propen-1-ol, 2- (2-propyne-1-ol)	107197	56.1	0.3	0.2244	0.0673		
Propenoic acid, 2-	79-9-4	74.1	0.3	0.1934	0.0580		
propham	122429	179.2	0.3	0.0001	0.0000		
Reserpine	50-55-5	608.7	0.3	0.0001	0.0000		
Resorcinol	108-46-3	110.1	0.3	0.0001	0.0000		
selenourea	630104	123.0	0.3	0.0000	0.0000		
Tetrachlorobenzene, 1,2,3,4-	634-66-2	215.9	0.3	0.0002	0.0001		
Tetrachlorobenzene, 1,2,3,5-	634-90-2	215.9	0.3	0.0004	0.0001		
tetrachlorophenol	58902	231.9	0.3	0.0000	0.0000		
Tetrachlorophenol, 2,3,4,6-	58-90-2	231.9	0.3	0.0120	0.0036		
Tetrachlorophenol, 2,3,5,6-	935-95-5	231.9	0.3	0.0001	0.0000		
thallium selenite	12039520	283.3	0.3	0.0000	0.0000		
Thiophenol (Benzenethiol, C ₆ H ₅ SH)	108-98-5	110.2	0.3	0.0193	0.0058		
Toluenediamine	95-80-7	122.2	0.3	0.0001	0.0000		
Toxaphene	8001352	414.0	0.3	0.0045	0.0014		

Bold = actual ERPG2
Bold Italic = TEEL2
Italic = IDLH / 10.0

Equation (2) was developed for neutral atmospheric conditions (such as D stability and 5 m/s wind) and tends to overpredict the evaporation under stable conditions (F stability and 1.5 m/s wind). Partial pressures of each chemical were determined by assuming the liquid mixture formed an ideal solution. For an ideal solution, the partial pressure of each chemical is the mole fraction of the chemical multiplied by the chemical's vapor pressure. A liquid temperature of 80• F was assumed for the analysis.

Using the evaporation fluxes calculated with equation 2 and a pool size of 400 ft², pool evaporation rates were computed for several of the chemicals that could be released from a 55-gallon drum.

For those same chemicals, vapor dispersion calculations were made using an area source Gaussian model. This model treats a spill of finite area as a collection of point vapor sources separated in distance and time. Since the Gaussian dispersion parameters are only functions of the downwind distance, the dispersion equation can be integrated in the crosswind direction, yielding a series of line sources. Each line source can have a different time-varying vapor evolution rate. To determine the vapor concentration at a specific distance downwind from the source, the vapor concentrations resulting from the dispersion of each line source are summed.

The vapor dispersion calculations were based on a spill of 55 gallons of a mixture in which the assumed mole fraction of the chemical of interest was 0.3. The results of the calculations are presented in Figure 2. As Figure 2 shows, vapor clouds for chemicals (at an assumed mole fraction of 0.3) with high Hazard Indices could travel large distances before diluting below ERPG-2 values.

Storing the chemicals with the highest Hazard Indices at a mole fraction of 0.3 will likely be unacceptable due to the large area that could be subjected to chemical concentrations above the ERPG-2 level if a spill were to occur. An alternate method is to compute the maximum concentration at which each chemical can be stored and still contain ERPG-2 concentration levels within a specified distance. Environmental Audit, Inc. provided a distance of 200 meters (about 650 feet) as the distance to the closest receptors. Using this distance and Figure 2, a maximum Hazard Index value of 200 was determined to be acceptable for a mole fraction of 0.3. To determine the actual mole fraction at which each chemical could be stored and maintain an ERPG-2 concentration within the 200 m distance, the following equation was used:

$$x_i = 0.3(200) / H_i \tag{3}$$

where: x_i = mole fraction required to keep ERPG - 2 within 200 m.

The results of these calculations are presented in Table 4. Table 4 shows the maximum concentration at which a given chemical could be present within a 55-gallon drum such that, if the contents of the drum were released, the resulting vapor cloud would not exceed the ERPG-2 value at a distance of 200 m from the spill.

The only chemicals listed in Table 4 are those that have a Hazard Index greater than 200 when present at a concentration of 0.3 mole fraction (see Table 1). Chemicals with Hazard Indices of 200 or less (at 0.3 mole fraction) are not included in Table 4 because the desire to limit the vapor cloud concentration to no more than the ERPG-2 value at 200 m does not limit the concentration at which these chemicals can be present within the 55-gallon drums. ERPG-2, TEEL-2, or IDLH/10 values could not be found for several of the chemicals. These chemical have been omitted from Table 4.

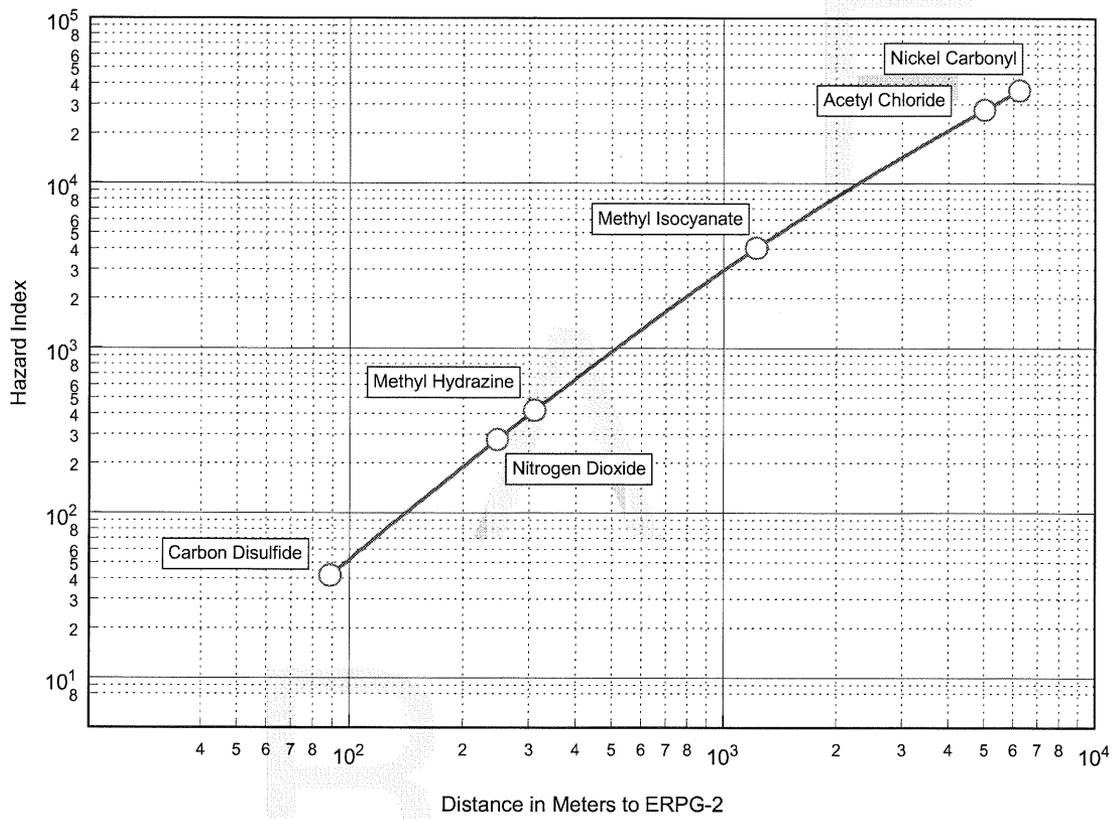


Figure 2
Computed Distance to ERPG-2 vs. Hazard Index

Table 4
Maximum Waste Stream Concentrations

Chemical	CAS Number	MW	Max. Mole Fraction
nickel carbonyl	13463393	170.7	0.0016
acetyl chloride	75365	78.5	0.0021
phosgene	75445	98.9	0.0027
phosphine	7803512	34.0	0.0068
Osmium tetroxide (OsO ₄ , as Os)	20816-12-0	254.2	0.0139
methyl isocyanate	624839	57.1	0.0148
Propenal, 2- (Acrolein)	107-02-8	56.0	0.0231
acrolein (2-Propenal)	107028	56.1	0.0237
chlorine	7782505	70.9	0.0406
methyl chlorocarbonate	792211	94.5	0.0467
Bromine	7726-95-6	159.8	0.0598
fluorine	7782414	38.0	0.0677
hydrogen cyanide	57125	27.0	0.0752
cyanogen	460195	52.0	0.1354
formaldehyde	50000	30.0	0.1354
methyl hydrazine	60344	46.1	0.1426
ethyleneimine	151564	43.1	0.1463
Hydrocyanic acid (Hydrogen cyanide)	74-90-8	27.0	0.1633
nitrogen dioxide	10102440	46.0	0.2144
hydrofluoric acid	7664393	20.0	0.2708

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6.0 FIRE RADIATION CALCULATIONS

A pool fire model was used to calculate the thermal radiation field downwind of three potential pool fires (see Table 2). The weather conditions assumed for these calculations were a wind speed of 10 mph, an air temperature of 70°F, and a relative humidity of 50%. Table 5 summarizes the results of these calculations.

Table 5
Fire Radiation Calculation Results

Area of Pool (ft ²)	Downwind Distance (m) to	
	1,600 Btu/hr-ft ²	500 Btu/hr-ft ²
400	30	44
3,000	53	82
9,500	45	72

The hazard zones for the 9,500 ft² pool fire are shorter than those associated with the 3,000 ft² pool fire because the bigger pool is an oil fire and oil fires are not efficient emitters of radiant energy (a result of soot/smoke produced by incomplete combustion).

7.0 CONCLUSIONS

According to the vapor dispersion calculations, if the contents of a 55-gallon drum were released, receptors located 200 m or more from the drum should not be exposed to more than the ERPG-2 level of any hazardous chemical within the drum, if the concentration of each chemical within the drum is no greater than maximum value listed for it in Table 4.

Fire radiation calculations show that receptors located 200 m or more from the storage tanks, process equipment, and 55-gallon drums will not be exposed to a hazardous level of radiant heat from a pool fire created by the loss of one used oil storage tank, or a gasket failure, or failure of a 55-gallon drum.

REFERENCES

- Christensen, R. A., and R. F. Eilbert (1989). "Aboveground Storage Tank Survey." Entropy Limited, Lincoln, Massachusetts, February, 1989.
- Sooby, W., and J. M. Tolchard (1993), "Estimation of Cold Failure Frequency of LPG Tanks in Europe." Paper presented at the Conference on Risk and Safety Management in the Gas Industry, Hong Kong, October, 1993.
- USNRC (1975), *Reactor Safety Study: An Assessment of Accident Risks in U.S. Commercial Nuclear Power Plants*. WASH 1400, U.S. Nuclear Regulatory Commission, Washington, D.C., October, 1975.