2003 CERCLA PRIORITY LIST OF HAZARDOUS SUBSTANCES THAT WILL BE THE SUBJECT OF TOXICOLOGICAL PROFILES AND SUPPORT DOCUMENT

ATSDR
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES
AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY
DIVISION OF TOXICOLOGY

IN COOPERATION WITH THE
U.S. ENVIRONMENTAL PROTECTION AGENCY

OCTOBER 2003

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The 2003 PRIORITY LIST OF HAZARDOUS SUBSTANCES

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

2003 PRIORITY LIST OF HAZARDOUS SUBSTANCES

2003 RANK	SUBSTANCE NAME	TOTAL POINTS	2001 RANK	CAS #
1	ARSENIC	1663.11	1	007440-38-2
2	LEAD	1531.60	2	007439-92-1
3	MERCURY	1506.66	3	007439-97-6
4	VINYL CHLORIDE	1385.32	4	000075-01-4
5	POLYCHLORINATED BIPHENYLS	1372.92	5	001336-36-3
6	BENZENE	1356.30	6	000071-43-2
7	CADMIUM	1319.32	7	007440-43-9
8	POLYCYCLIC AROMATIC HYDROCARBONS	1317.54	9	130498-29-2
9	BENZO(A)PYRENE	1308.71	8	000050-32-8
10	BENZO(B)FLUORANTHENE	1265.26	10	000205-99-2
11	CHLOROFORM	1228.08	11	000067-66-3
12	DDT, P,P'-	1191.57	12	000050-29-3
13	AROCLOR 1254	1186.98	13	011097-69-1
14	AROCLOR 1260	1176.90	14	011096-82-5
15	DIBENZO(A,H)ANTHRACENE	1163.45	16	000053-70-3
16	TRICHLOROETHYLENE	1161.43	15	000079-01-6
17	CHROMIUM, HEXAVALENT	1151.98	18	018540-29-9
18	DIELDRIN	1148.09	17	000060-57-1
19	PHOSPHORUS, WHITE	1144.87	24	007723-14-0
20	CHLORDANE	1130.53	19	000057-74-9
21	DDE, P,P'-	1130.20	21	000072-55-9
22	HEXACHLOROBUTADIENE	1129.10	20	000087-68-3
23	COAL TAR CREOSOTE	1124.66	22	008001-58-9
24	DDD, P,P'-	1117.38	26	000072-54-8
25	BENZIDINE	1114.82	25	000092-87-5
26	ALDRIN	1111.73	23	000309-00-2
27	AROCLOR 1248	1110.73	27	012672-29-6
28	CYANIDE	1101.40	28	000057-12-5
29	AROCLOR 1242	1095.84	29	053469-21-9
30	TETRACHLOROETHYLENE	1086.31	32	000127-18-4
31	TOXAPHENE	1085.57	31	008001-35-2
32	HEXACHLOROCYCLOHEXANE, GAMMA-	1079.78	33	000058-89-9
33	HEPTACHLOR	1067.53	30	000076-44-8
34	1,2-DIBROMOETHANE	1063.22	36	000106-93-4
35	BENZO(A)ANTHRACENE	1057.49	34	000056-55-3
36	DISULFOTON	1057.16	37	000298-04-4
37	HEXACHLOROCYCLOHEXANE, BETA-	1053.64	35	000319-85-7
38	BERYLLIUM	1044.41	38	007440-41-7
39	ENDRIN	1040.83	40	000072-20-8
40	HEXACHLOROCYCLOHEXANE, DELTA-	1037.91	39	000319-86-8
41	1,2-DIBROMO-3-CHLOROPROPANE	1034.99	41	000096-12-8
42	PENTACHLOROPHENOL	1026.93	43	000087-86-5
43	CARBON TETRACHLORIDE	1024.44	44	000056-23-5

2003 PRIORITY LIST OF HAZARDOUS SUBSTANCES

2003 RANK	SUBSTANCE NAME	TOTAL POINTS	2001 RANK	CAS #
44	HEPTACHLOR EPOXIDE	1023.70	42	001024-57-3
45	AROCLOR 1221	1016.86	46	011104-28-2
46	AROCLOR 1016	1014.42	48	012674-11-2
47	DDT, O,P'-	1013.41	50	000789-02-6
48	DI-N-BUTYL PHTHALATE	1011.31	47	000084-74-2
49	COBALT	1010.49	49	007440-48-4
50	CIS-CHLORDANE	1008.91	51	005103-71-9
51	NICKEL	1006.33	53	007440-02-0
52	ENDOSULFAN SULFATE	1006.02	52	001031-07-8
53	3,3'-DICHLOROBENZIDINE	1004.22	55	000091-94-1
54	ENDOSULFAN	1003.81	54	000115-29-7
55	TRANS-CHLORDANE	1001.83	57	005103-74-2
56	XYLENES, TOTAL	1000.92	56	001330-20-7
57	ENDOSULFAN, ALPHA	996.61	45	000959-98-8
58	DIBROMOCHLOROPROPANE	993.57	59	067708-83-2
59	METHOXYCHLOR	991.86	58	000072-43-5
60	AROCLOR	989.88	61	012767-79-2
61	BENZO(K)FLUORANTHENE	984.26	60	000207-08-9
62	ENDRIN KETONE	979.42	62	053494-70-5
63	ENDOSULFAN, BETA	975.58	63	033213-65-9
64	CHROMIUM(VI) OXIDE	967.84	65	001333-82-0
65	METHANE	959.39	66	000074-82-8
66	ENDRIN ALDEHYDE	954.77	69	007421-93-4
67	AROCLOR 1232	954.26	67	011141-16-5
68	TOLUENE	951.64	68	000108-88-3
69	BENZOFLUORANTHENE	949.82	70	056832-73-6
70	2-HEXANONE	943.72	71	000591-78-6
71	ACROLEIN	941.24	72	000107-02-8
72	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	938.30	64	001746-01-6
73	ZINC	929.40	73	007440-66-6
74	DIMETHYLARSINIC ACID	920.42	74	000075-60-5
75	DI(2-ETHYLHEXYL)PHTHALATE	919.65	75	000117-81-7
76	CHROMIUM	907.31	76	007440-47-3
77	1,1-DICHLOROETHENE	896.92	79	000075-35-4
78	NAPHTHALENE	896.68	77	000091-20-3
79	AROCLOR 1262	893.33	NEW	037324-23-5
80	METHYLENE CHLORIDE	888.52	78	000075-09-2
81	AROCLOR 1240	886.53	80	071328-89-7
82	2,4,6-TRINITROTOLUENE	877.53	81	000118-96-7
83	2,4,6-TRICHLOROPHENOL	875.06	87	000088-06-2
84	GAMMA-CHLORDENE	869.56	175	056641-38-4
85	2,4-DINITROPHENOL	868.88	83	000051-28-5
86	BROMODICHLOROETHANE	868.28	84	000683-53-4

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2003 RANK	SUBSTANCE NAME	TOTAL POINTS	2001 RANK	CAS #
87	1,2-DICHLOROETHANE	868.24	82	000107-06-2
88	HYDRAZINE	862.68	86	000302-01-2
89	BIS(2-CHLOROETHYL) ETHER	858.22	85	000111-44-4
90	THIOCYANATE	847.54	88	000302-04-5
91	HEXACHLOROBENZENE	844.79	100	000118-74-1
92	ASBESTOS	843.81	89	001332-21-4
93	CYCLOTRIMETHYLENETRINITRAMINE (RDX)	840.67	92	000121-82-4
94	CHLORINE	838.86	96	007782-50-5
95	1,1,1-TRICHLOROETHANE	838.61	90	000071-55-6
96	2,4-DINITROTOLUENE	834.45	101	000121-14-2
97	URANIUM	834.01	94	007440-61-1
98	RADIUM-226	833.83	95	013982-63-3
99	ETHYLBENZENE	833.62	91	000100-41-4
100	ETHION	832.47	97	000563-12-2
101	RADIUM	828.32	98	007440-14-4
102	THORIUM	825.74	99	007440-29-1
103	4,6-DINITRO-O-CRESOL	824.39	93	000534-52-1
104	RADON	818.59	104	010043-92-2
105	PENTACHLOROBIPHENYL	817.89	NEW	025429-29-2
106	1,3,5-TRINITROBENZENE	817.85	111	000099-35-4
107	RADIUM-228	815.49	107	015262-20-1
108	CHLOROBENZENE	815.45	105	000108-90-7
109	THORIUM-230	814.97	108	014269-63-7
110	BARIUM	814.90	102	007440-39-3
111	N-NITROSODI-N-PROPYLAMINE	814.43	112	000621-64-7
112	URANIUM-235	813.99	109	015117-96-1
113	URANIUM-234	812.53	113	013966-29-5
114	DIAZINON	812.35	114	000333-41-5
115	FLUORANTHENE	811.22	106	000206-44-0
116	THORIUM-228	809.61	115	014274-82-9
117	RADON-222	809.58	116	014859-67-7
118	HEXACHLOROCYCLOHEXANE, ALPHA-	807.65	110	000319-84-6
119	METHYLMERCURY	807.18	120	022967-92-6
120	POLONIUM-210	806.51	121	013981-52-7
120	STRONTIUM-90	806.51	118	010098-97-2
122	PLUTONIUM-239	806.47	123	015117-48-3
123	PLUTONIUM-238	806.29	124	013981-16-3
124	COAL TARS	806.25	122	008007-45-2
125	CHRYSOTILE ASBESTOS	806.06	119	012001-29-5
126	LEAD-210	806.02	126	014255-04-0
127	CHLORPYRIFOS	805.80	125	002921-88-2
128	PLUTONIUM	804.83	131	007440-07-5
129	RADON-220	804.75	128	022481-48-7

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2003 RANK	SUBSTANCE NAME	TOTAL POINTS	2001 RANK	CAS #
130	AMERICIUM-241	804.12	127	086954-36-1
131	MANGANESE	804.07	138	007439-96-5
132	IODINE-131	803.59	130	010043-66-0
132	TRIBUTYLTIN	803.59	135	000688-73-3
134	HYDROGEN CYANIDE	803.09	139	000074-90-8
135	GUTHION	802.39	134	000086-50-0
136	NEPTUNIUM-237	802.17	132	013994-20-2
137	PLUTONIUM-240	801.68	135	014119-33-6
137	IODINE-129	801.68	NEW	015046-84-1
137	CHLORDECONE	801.68	135	000143-50-0
140	CHRYSENE	801.36	117	000218-01-9
141	COPPER	799.94	129	007440-50-8
142	S,S,S-TRIBUTYL PHOSPHOROTRITHIOATE	796.31	140	000078-48-8
143	BROMINE	787.63	141	007726-95-6
144	POLYBROMINATED BIPHENYLS	787.58	142	067774-32-7
145	DICOFOL	786.09	143	000115-32-2
146	PARATHION	782.82	145	000056-38-2
147	SELENIUM	781.84	144	007782-49-2
148	1,1,2,2-TETRACHLOROETHANE	781.51	103	000079-34-5
149	HEXACHLOROCYCLOHEXANE, TECH. GRADE	773.58	146	000608-73-1
150	N-NITROSODIMETHYLAMINE	772.84	237	000062-75-9
151	1,2,3-TRICHLOROBENZENE	771.10	148	000087-61-6
152	TRICHLOROFLUOROETHANE	769.24	149	027154-33-2
153	TRIFLURALIN	768.72	150	001582-09-8
154	DDD, O,P'-	767.80	152	000053-19-0
155	4,4'-METHYLENEBIS(2-CHLOROANILINE)	765.16	151	000101-14-4
156	HEXACHLORODIBENZO-P-DIOXIN	759.10	153	034465-46-8
157	HEPTACHLORODIBENZO-P-DIOXIN	753.17	154	037871-00-4
158	PENTACHLOROBENZENE	751.95	147	000608-93-5
159	2-METHYLNAPHTHALENE	750.45	155	000091-57-6
160	NITROGEN DIOXIDE	747.82	233	010102-44-0
161	AMMONIA	746.01	160	007664-41-7
162	1,1-DICHLOROETHANE	741.30	156	000075-34-3
163	1,1,2-TRICHLOROETHANE	732.35	157	000079-00-5
164	1,4-DICHLOROBENZENE	731.32	161	000106-46-7
165	ACENAPHTHENE	730.35	158	000083-32-9
166	TRICHLOROETHANE	724.42	164	025323-89-1
167	1,2,3,4,6,7,8,9-OCTACHLORODIBENZOFURAN	723.92	159	039001-02-0
168	HEXACHLOROCYCLOPENTADIENE	718.28	165	000077-47-4
169	HEPTACHLORODIBENZOFURAN	717.32	163	038998-75-3
170	1,2-DIPHENYLHYDRAZINE	712.62	166	000122-66-7
171	2,3,4,7,8-PENTACHLORODIBENZOFURAN	709.06	171	057117-31-4
172	TETRACHLOROBIPHENYL	707.33	168	026914-33-0

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2003 RANK	SUBSTANCE NAME	TOTAL POINTS	2001 RANK	CAS #
173	CRESOL, PARA-	707.09	169	000106-44-5
174	OXYCHLORDANE	706.99	170	027304-13-8
175	1,2-DICHLOROETHENE, TRANS-	703.86	167	000156-60-5
176	AMOSITE ASBESTOS	703.57	133	012172-73-5
177	CARBON DISULFIDE	703.21	174	000075-15-0
178	AMERICIUM	701.63	176	007440-35-9
178	HEPTACHLOROBIPHENYL	701.63	NEW	028655-71-2
178	PENTACHLOROBUTADIENE	701.63	NEW	055880-77-8
181	TETRACHLOROPHENOL	700.97	179	025167-83-3
182	1,2-DICHLOROBENZENE	700.89	178	000095-50-1
183	INDENO(1,2,3-CD)PYRENE	700.86	180	000193-39-5
184	HEXACHLORODIBENZOFURAN	699.32	172	055684-94-1
185	PALLADIUM	699.31	173	007440-05-3
186	PHENOL	698.68	162	000108-95-2
187	ACETONE	694.90	181	000067-64-1
188	CHLOROETHANE	693.46	182	000075-00-3
189	DIBENZOFURAN	691.84	177	000132-64-9
190	P-XYLENE	688.75	183	000106-42-3
191	2,4-DIMETHYLPHENOL	688.14	184	000105-67-9
192	AROCLOR 1268	684.90	185	011100-14-4
193	CARBON MONOXIDE	684.55	198	000630-08-0
194	ALUMINUM	684.18	186	007429-90-5
195	PENTACHLORODIBENZOFURAN	672.51	188	030402-15-4
196	CHLOROMETHANE	670.70	190	000074-87-3
197	HYDROGEN SULFIDE	669.09	187	007783-06-4
198	BIS(2-METHOXYETHYL) PHTHALATE	664.55	191	034006-76-3
199	CRESOL, ORTHO-	659.90	194	000095-48-7
200	BUTYL BENZYL PHTHALATE	654.16	192	000085-68-7
201	2,3,5,6-TETRACHLOROPHENOL	653.47	NEW	000935-95-5
202	HEXACHLOROETHANE	652.52	196	000067-72-1
203	VANADIUM	649.17	197	007440-62-2
204	1,3-BUTADIENE	646.15	195	000106-99-0
205	TETRACHLOROETHANE	645.45	189	025322-20-7
206	1,2,4-TRICHLOROBENZENE	645.08	193	000120-82-1
207	BROMOFORM	644.88	208	000075-25-2
208	TETRACHLORODIBENZO-P-DIOXIN	635.17	199	041903-57-5
209	1,3-DICHLOROBENZENE	629.76	200	000541-73-1
210	2,4-DICHLOROPHENOL	627.78	206	000120-83-2
211	N-NITROSODIPHENYLAMINE	625.10	205	000086-30-6
212	PENTACHLORODIBENZO-P-DIOXIN	624.58	201	036088-22-9
213	1,2-DICHLOROETHYLENE	624.12	202	000540-59-0
214	2-BUTANONE	622.63	204	000078-93-3
215	DIBENZOTHIOPHENE	621.60	NEW	000132-65-0

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2003 RANK	SUBSTANCE NAME	TOTAL POINTS	2001 RANK	CAS #
216	2,3,7,8-TETRACHLORODIBENZOFURAN	621.18	203	051207-31-9
217	CESIUM-137	611.86	209	010045-97-3
218	SILVER	611.75	207	007440-22-4
219	2-CHLOROPHENOL	611.10	247	000095-57-8
220	NITRITE	611.03	212	014797-65-0
221	CHROMIUM TRIOXIDE	610.93	211	007738-94-5
222	NITRATE	608.36	216	014797-55-8
223	DINITROTOLUENE	607.75	213	025321-14-6
224	POTASSIUM-40	607.52	214	013966-00-2
225	THORIUM-227	605.50	217	015623-47-9
226	COAL TAR PITCH	605.35	218	065996-93-2
227	ARSENIC ACID	604.46	223	007778-39-4
228	2,4,5-TRICHLOROPHENOL	604.39	210	000095-95-4
229	ARSENIC TRIOXIDE	604.38	220	001327-53-3
230	ANTIMONY	603.25	222	007440-36-0
231	PHORATE	603.14	224	000298-02-2
231	DICHLOROPROP	603.14	NEW	000120-36-5
233	DIMETHOATE	602.66	225	000060-51-5
234	STROBANE	602.58	226	008001-50-1
234	ACTINIUM-227	602.58	226	014952-40-0
236	PYRETHRUM	602.52	228	008003-34-7
236	BENZOPYRENE	602.52	228	073467-76-2
236	4-AMINOBIPHENYL	602.52	228	000092-67-1
239	ARSINE	602.43	231	007784-42-1
240	NALED	602.39	232	000300-76-5
241	ETHOPROP	602.17	233	013194-48-4
241	DIBENZOFURANS, CHLORINATED	602.17	233	042934-53-2
243	ALPHA-CHLORDENE	601.95	240	056534-02-2
243	CARBOPHENOTHION	601.95	236	000786-19-6
245	DICHLORVOS	601.68	237	000062-73-7
246	MERCURIC CHLORIDE	601.46	240	007487-94-7
246	URANIUM-233	601.46	240	013968-55-3
246	CALCIUM ARSENATE	601.46	240	007778-44-1
249	PHENANTHRENE	601.21	219	000085-01-8
250	CRESOLS	597.09	244	001319-77-3
251	FORMALDEHYDE	593.74	245	000050-00-0
252	2,4-D ACID	590.62	246	000094-75-7
253	HYDROGEN FLUORIDE	586.62	248	007664-39-3
254	2-CHLOROANILINE	579.79	NEW	000095-51-2
255	CHLORODIBROMOMETHANE	578.89	250	000124-48-1
256	1,2,3-TRICHLOROPROPANE	577.92	NEW	000096-18-4
257	BUTYLATE	576.87	252	002008-41-5
258	DIMETHYL FORMAMIDE	576.44	255	000068-12-2

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2003 RANK	SUBSTANCE NAME	TOTAL POINTS	2001 RANK	CAS #
259	PYRENE	575.91	249	000129-00-0
260	DICHLOROBENZENE	575.01	251	025321-22-6
261	ETHYL ETHER	571.53	254	000060-29-7
262	DICHLOROETHANE	570.15	253	001300-21-6
263	4-NITROPHENOL	568.88	256	000100-02-7
264	1,3-DICHLOROPROPENE, CIS-	562.26	257	010061-01-5
265	PHOSPHINE	557.97	260	007803-51-2
266	TRICHLOROBENZENE	555.37	258	012002-48-1
267	2,6-DINITROTOLUENE	554.09	263	000606-20-2
268	1,3-DICHLOROPROPENE, TRANS-	551.34	259	010061-02-6
269	FLUORIDE ION	549.11	261	016984-48-8
270	1,2,3,4,6,7,8-HEPTACHLORODIBENZO-P-DIOXIN	545.71	271	035822-46-9
271	METHYL PARATHION	544.47	262	000298-00-0
272	CARBAZOLE	539.38	266	000086-74-8
273	BIS(2-ETHYLHEXYL)ADIPATE	538.73	NEW	000103-23-1
274	METHYL ISOBUTYL KETONE	533.15	264	000108-10-1
275	STYRENE	530.25	265	000100-42-5

Substances were assigned the same rank when two (or more) substances received equivalent total scores.

CAS # = Chemical Abstracts Service Registry Number

2
BACKGROUND

2. BACKGROUND

The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund), as amended by the Superfund Amendments and Reauthorization Act (SARA), establishes certain requirements for the Agency for Toxic Substances and Disease Registry (ATSDR) and the Environmental Protection Agency (EPA) with regard to hazardous substances that are most commonly found at facilities on the CERCLA National Priorities List (NPL). Section 104(i)(2) of CERCLA, as amended (42 U.S.C. 9604[i][2]), required that the two agencies prepare a list, in order of priority, of at least 100 hazardous substances that are most commonly found at facilities on the NPL and which, in their sole discretion, are determined to pose the most significant potential threat to human health due to their known or suspected toxicity to humans and the potential for human exposure to such substances (see 52 FR 12866, April 17, 1987).

CERCLA also required the agencies to revise the priority list to include 100 or more additional hazardous substances (see 53 FR 41280, October 20, 1988), and to include at least 25 additional hazardous substances in each of the three successive years following the 1988 revision (see 54 FR 43619, October 26, 1989; 55 FR 42067, October 17, 1990; 56 FR 52166, October 17, 1991). CERCLA also requires that ATSDR and EPA thereafter revise the list at least once a year to include additional hazardous substances that are determined to pose the most significant potential threat to human health. However, in 1995, the two agencies decided to alter the publication schedule of the priority list by moving to a 2-year publication schedule, reflecting the stability of this listing activity (see 60 FR 16478, March 30, 1995). As a result, the priority list is now on a 2-year publication schedule, with a yearly informal review and revision. Each substance on the CERCLA Priority List of Hazardous Substances is a candidate to become the subject of a toxicological profile prepared by ATSDR and subsequently a candidate for the identification of priority data needs.

The first priority list of 100 substances was published in the *Federal Register* on April 17, 1987 (52 FR 12866), that included a summary of the procedure used by ATSDR and EPA to compile the list. In that notice, the agencies solicited public comments on the approach adopted to evaluate and rank hazardous substances found at NPL sites. The agencies announced the intention to refine the listing process in response to these comments, and to continue to improve the listing process.

A second priority list of 100 additional substances was published on October 20, 1988 (53 FR 41280), and the revised procedure used to prepare the second priority list was summarized. For the most part, the same procedure was used to generate the third and fourth lists of 25 substances each (54 FR 43619, October 26, 1989; and 55 FR 42067, October 17, 1990).

The initial (1987-1990) priority lists of hazardous substances were based on the most comprehensive and relevant information available when the lists were developed. More comprehensive sources of information on the frequency of occurrence and the potential for human exposure to substances at NPL sites became available with the development of ATSDR's Hazardous Substance Release/Health Effects Database (HazDat). This database became available for agency use in early 1991 and contains information from public health assessments, site files, health consultations, toxicological profiles, and health studies, as well as other information. ATSDR developed this scientific and administrative database as a repository for information on hazardous substances found at NPL and non-NPL waste sites or emergency events and on the potential health effects of hazardous substances on human populations. Utilizing this database, ATSDR and EPA developed a revised approach and algorithm for ranking substances, and a notice announcing their intention to revise and rerank the Priority List of Hazardous Substances was published on June 27, 1991 (56 FR 29485). Subsequently, the 1991 priority list and the approach used to generate it were published in the *Federal Register* on October 17, 1991 (56 FR 52166).

Using the same approach and the same algorithm from the 1991 listing activity, subsequent priority lists of hazardous substances were developed and notices were published on October 28, 1992 (57 FR 48801), February 28, 1994 (59 FR 9486), April 29, 1996 (61 FR 18744), November 17, 1997 (62 FR 61332), October 21, 1999 (64 FR 56792), and October 25, 2001 (66FR54014). This year's 2003 Priority List of Hazardous Substances used additional information entered into ATSDR's HazDat database since development of the 2001 priority list. The site-specific information from HazDat that is used in the listing activity has been collected from ATSDR public health assessments and health consultations, and from site file data packages used to develop public health assessments. The new information includes more recent NPL frequency of occurrence data, additional concentration data, and more information on exposure to substances present at NPL sites. A total of 863 candidate substances have been evaluated this year to create the 20003 priority list of 275 substances.

2.1 Listing Activity Workgroup

During the initial development of the current algorithm, a listing activity workgroup was created. For the 1991 and 1992 listing activities, the workgroup consisted of members of the divisions and offices of ATSDR, as well as representatives from the EPA (Office of Water, Office of Pollution Prevention and Toxic Substances, and Office of Emergency and Remedial Response) and the Centers for Disease Control and Prevention (National Center for Environmental Health [NCEH]).

In the summer of 1991, workgroup members met and discussed potential sources of information for the revised priority list and identified practical sources of information for the 1991 listing activity. The workgroup formulated the strategies for development of preliminary reports to assess the extent of data available in various databases, developed the scoring scheme for the subcomponents of the algorithm, and determined the weight assigned to subcomponents in calculating the total score in the ranking algorithm.

The workgroup also reviewed the toxicity/environmental scores (TESs) developed for substances lacking reportable quantities (RQs). After the 1991 list was developed, the workgroup members reviewed the list before releasing it to the public in October 1991. In the spring of 1992, the workgroup reconvened and discussed public comments received on the 1991 priority list. The workgroup decided, on the basis of favorable public comment, that the algorithm used for the 1991 list would again be used to develop the 1992 Priority List of Hazardous Substances.

Workgroup members met again in the summer of 1992 to discuss the toxicity scores assigned to new substances identified as candidates for the 1992 list. At that time, the workgroup discussed new HazDat data entered into the system since the 1991 priority list and were briefed on the efforts under way in the ATSDR Division of Toxicology to use this new information in the 1992 activity. There was no formal workgroup meeting for the 1993 listing activity because all formulations and strategies developed in 1991 and reviewed in 1992 were used to generate the 1993 Priority List of Hazardous Substances.

In the summer of 1994, the listing activity workgroup met once again to review the performance of the current algorithm used to develop the priority list and determine if any enhancements could be made to enrich the listing process. Many analyses of the listing parameters were performed and presented to the workgroup. As a result, a modification was made to the point assignment calculations for the source contribution component (see Section 3.4.1.5). The workgroup also discussed issues pertaining to the development of an algorithm to be used to generate a priority list of hazardous substances at U.S. Department of Energy NPL sites. This workgroup consisted of participants from the four divisions within ATSDR, NCEH and EPA.

It was stated in previous issues of this Support Document that refinements will be made to this listing process where possible, and that ATSDR intended to develop a strategy to better assess the toxicity of radionuclides for listing purposes. In 2001, a revised strategy was implemented to better assess the toxicity of radionuclides to provide more comparative values and consistency in this activity. Refer to Section 3.3.3.5 of this document for details on this revision.

2.2 Sources of Information Used in the Development of the Priority List

The priority lists of hazardous substances developed before 1991 were based on the most comprehensive and relevant information available when the lists were developed. Sources of information used in listing activities before 1991 are described in Table 1.

Table 1. Sources of Information for Previous Listing Activities (pre-1991)

Type of Information	Source	Limitations
Frequency of Occurrence at NPL Sites	Contract Laboratory Program (CLP) Statistical Database	Limited to target analytes. Frequency of occurrence tends to vary significantly only for the most frequently detected substances.
	Hazard Ranking System (HRS) Database	Only 15 substances of concern per site are listed.
	Special Analytical Services (SAS) Database	Only those substances with 5 or more requests are included.
Toxicity	EPA Reportable Quantity (RQ) Methodology	Not established for all substances.
Potential for Human Exposure	Contract Laboratory Program (CLP) Statistical Database	Limited concentration data.
	National Priorities List (NPL) Technical Database	Indirect information; frequency used as correlate of exposure potential.
	National Human Adipose Tissue Survey (NHATS)	Indirect information; applies to general population.
	U.S. Dept. of Transportation, Hazardous Materials Information System (DOT/HMIS)	Indirect information on releases on U.S. highways.
	Acute Hazardous Events (AHE) Database	Indirect information; industrial spill/accident information for U.S.
	National Response Center (NRC) Database	Indirect information; contains non-NPL information on releases greater than RQ.
	Removal Tracking System (RTS)	Indirect information; only includes substances that triggered clean-up activities.
	NEXIS Newswire Reports	Indirect information; applies to general population.

After reviewing and considering a number of information sources, the 1991 listing workgroup chose the sources shown in Table 2 for use in developing the priority list. The sources of information described in Table 2 were regarded by the workgroup as those representing the most comprehensive, reliable, and readily accessible data for developing the 1991 Priority List of Hazardous Substances. These information sources were retained for use in developing all subsequent priority lists of hazardous substances.

Table 2. Sources of Information Used in Development of the 2003 Priority List of Hazardous Substances

Type of Information	Source	Advantages
Frequency of Occurrence at NPL Sites	HazDat site file and public health assessment information	Substances not limited to CLP target analytes.
Toxicity	Reportable Quantity (RQ)	Well-established method for toxicity scoring.
	Toxicity/ Environmental Score (TES)	Provides consistency by basing toxicity scores for substances lacking RQs on the RQ methodology.
Potential for Human Exposure	HazDat concentration data	Data not limited to CLP target analytes. Ability to specify media to be included.
	HazDat data on exposure status of populations	Provides evidence of human exposure based on information in ATSDR public health assessments and health consultations.

3
METHODOLOGY USED IN THE GENERATION OF THE 2003 PRIORITY LIST OF HAZARDOUS SUBSTANCES

3. METHODOLOGY USED IN THE GENERATION OF THE PRIORITY LIST

3.1 OVERVIEW

The ranking of hazardous substances on the priority list is based on three criteria, which are combined to result in the total score. The three criteria are:

- FREQUENCY OF OCCURRENCE AT NPL SITES - ATSDR's HazDat database is the source of data for the frequency of occurrence of substances at NPL hazardous waste sites or facilities. Presence in at least one environmental medium per NPL site constitutes one occurrence (see Section 3.2).

- TOXICITY - If available, final Reportable Quantities (RQs) are used to assess the toxicity of candidate substances during the listing activity. If a final RQ is not available, the RQ methodology is applied to candidate substances to establish a Toxicity/Environmental Score (TES). This process is only used in scoring the substances with respect to their toxicity, and does not represent regulatory amounts (see Section 3.3).

- POTENTIAL FOR HUMAN EXPOSURE - The exposure component is based on two parts: the concentration of the substances in environmental media and the exposure status of populations. HazDat serves as the source of this information. HazDat contains concentration data and exposure information obtained from ATSDR public health assessments and health consultations (see Section 3.4).

Using these three criteria, the hazard potential of each candidate substance was ranked according to the following algorithm:

TOTAL SCORE	=	*NPL FREQUENCY*	+	*TOXICITY*	+	*POTENTIAL FOR HUMAN EXPOSURE*
(1,800 *max. points*)		(600 *points*)		(600 *points*)		(300 *conc. pts.*) + (300 *exposure pts.*)

Substances were ordinally ranked on the basis of their total score. Appendix A provides a summary report of the 2003 priority list in rank order. Appendices E and F, respectively, provide alphabetical and Chemical Abstracts Service (CAS) number sorts of the 2003 Priority List.

3.1.1 Criteria for Inclusion on the Priority List

Substances considered for the 2003 priority list of hazardous substances came from the universe of substances present at NPL sites, as indicated in HazDat from either health assessment or site file information. Currently, approximately 3,800 substances with unique CAS numbers are in HazDat. Only those substances found at three or more NPL sites were considered for the priority list; 863 substances were found at three or more sites.

The list of candidate substances was reviewed to identify petroleum-related substances. Substances of petroleum origin are regulated by legislation other than CERCLA [see CERCLA Section 101(14)]; and therefore, are excluded from becoming potential toxicological profile candidates under CERCLA. These substances were assigned TES values of zero and total point scores of -1 to place them at the bottom of the list of candidate substances. Appendix J lists these substances.

3.2 DETERMINATION OF THE FREQUENCY OF OCCURRENCE CRITERION

3.2.1 Overview

ATSDR's HazDat database was selected as the source of data for the frequency of occurrence of substances at NPL hazardous waste sites or facilities. The sources of HazDat site-specific information include ATSDR public health assessments and health consultations, and other site-specific documents submitted to ATSDR by EPA, state agencies, and other parties. HazDat has information on approximately 1,636 sites that have been proposed for, listed on, or delisted from the NPL.

HazDat contains information on substances found in various environmental media. The number of NPL sites at which a substance was identified in any environmental medium in health assessment or site-file documents was used to indicate the frequency of occurrence. Contaminants included in HazDat are substances identified in the ATSDR site files as having been positively identified at the site as a result of chemical analyses (i.e., at concentrations above the limits of detection), inventories, or other documentation collected during the ATSDR health assessment process. Substances identified in documents as "Tentatively Identified Compounds" (TICs) are not included in ATSDR's HazDat system and, therefore, were not considered in the determination of frequency-of-occurrence for the priority list. Presence of a substance in at least one environmental medium per NPL site constitutes one occurrence.

3.2.2 Frequency of Occurrence Scoring

The frequency-of-occurrence component of the algorithm was assigned a maximum score of 600 points. These points were distributed between the maximum and minimum frequencies, with the maximum frequency receiving 600 points. Lead had the highest frequency of 1,233 and therefore received 600 frequency points. The assignment of points for the remainder of substances was calculated using the following formula:

$$\frac{\textit{Current substance's frequency}}{\textit{Maximum frequency}} \times 600$$

For example, if a substance's NPL frequency = 841; then its frequency points = (841/1,233) x 600 = 409.

This method of point assignment was used in an effort to scale the measured frequency values into the allotted point range of 1-600, while maintaining their proportional relationship. As mentioned in Section 3.1.1, only those substances found at three or more NPL sites were considered for the priority list.

3.3 DETERMINATION OF THE TOXICITY COMPONENT

3.3.1 Overview

The Reportable Quantity (RQ) approach has continued to be used as the toxicity hazard scoring system for several reasons. This approach provides the most complete characterization of toxicity of all hazard scoring systems reviewed; other schemes were more limited in either the consideration of different types of toxic effects, severity of effects, or potency. In addition, toxicity data used in the RQ approach are derived from primary peer-reviewed literature, and RQs have already been established for the majority of substances that are frequently detected at hazardous waste sites. Moreover, the determination of RQ health effect values uses weight-of-evidence considerations in evaluating data.

The reportable quantity ranking scheme was developed by EPA to set RQs for hazardous substances as required by CERCLA. Section 103(a) of CERCLA, requires any person in charge of a vessel or an offshore or onshore facility from which a hazardous substance has been released in a quantity that equals or exceeds its RQ must immediately notify the National Response Center and state and local response authorities of the release. RQs are developed for individual chemicals and for waste streams that have already been designated as hazardous substances under CERCLA, Section 101(14).

Each CERCLA hazardous substance is assigned to one of five tiered RQ categories (1, 10, 100, 1,000, and 5,000 pounds) on the basis of acute toxicity, chronic toxicity, carcinogenicity, aquatic toxicity, and ignitability and reactivity. RQs are determined separately for each criterion; the lowest of these is selected as the RQ for the substance, subject to adjustment for potential hydrolysis, photolysis, or biodegradation in the environment. The RQ scoring scheme is described in the following four *Federal Register* notices: 50 FR 13456, April 4, 1985; 51 FR 34534, September 29, 1986; 52 FR 8140, March 16, 1987; 54 FR 35988, August 30, 1989.

The RQ methodology was applied for those candidate substances without final CERCLA RQs in order to establish a Toxicity/Environmental Score (TES). These scores were developed for use only in the ranking methodology and *do not* represent regulatory amounts. TESs have been assigned to more than 450 candidate substances. Substances that received a TES greater than 5,000 (using the RQ methodology) were dropped to the bottom of the candidate list because of their lack of known toxicity and received a rank of #698 and a total score of zero points. A breakdown of the TESs developed for candidate substances is provided in Appendix B. An overview of the toxicity scoring methodology is provided in Appendix C.

3.3.2 Sources of Information Used To Determine the Toxicity/Environmental Score (TES)

Several sources of information on toxicity, reactivity/ignitability, and environmental fate have been used to determine the TESs for substances lacking RQs. In the past and currently, the National Library of Medicine (NLM) online databases are one of the main sources of information. These databases include the Hazardous Substances Data Bank (HSDB), the Registry of Toxic Effects of Chemical Substances (RTECS), Chemical Carcinogenesis Research Information System (CCRIS), Integrated Risk Information System (IRIS), and TOXicology Information OnLINE (Toxline). In addition, EPA's AQUatic toxicity Information REtrieval database (AQUIRE) is also currently used. In the past, DIALOG online database files were used, as well as the following reference texts:

Sax I. 1984. *Dangerous properties of industrial materials.* 6th ed. New York: Van Nostrand Reinhold Company.

Sittig M. 1985. *Handbook of toxic and hazardous chemicals and carcinogens.* 2nd ed. Park Ridge, NJ: Noyes Publications.

Windholz M, editor. 1983. *The Merck Index.* 10th ed. Rahway, NJ: Merck and Company, Incorporated.

In 1996, the TESs and RQs for the candidate substances was reviewed. For this effort, NLM databases containing toxicity information for the candidate substances were reviewed, along with the AQUIRE database. The purpose of this review was to determine if any new toxicity information had become available since the substances were first evaluated (most in 1991). As a result, a number of substances had their toxicity values (RQs or TESs) revised to reflect any new information.

3.3.3 Assumptions Used in Determining the Toxicity/Environmental Score

3.3.3.1 Ignitability/Reactivity. Where no specific values were found to express potential for ignitability/reactivity, professional judgement was applied. For example, if a substance was classified as extremely flammable, but no flash point was given, a score of 10 was assigned for the ignitability/reactivity component. Similarly, if no information was found to indicate the substance was ignitable or reactive, the substance was assigned a score of >5,000 for this component of the TES.

3.3.3.2 Aquatic Toxicity. Specific aquatic toxicity data were lacking for many substances. In some of these cases, Sax (1984) was used to assess aquatic toxicity. The standard method of reporting aquatic toxicity in this text provides a range of toxicity without identifying the test species. Seventy-five percent of the maximum value was used for the aquatic toxicity component (for example, if the range was 100-1,000, the LC_{50} value used was 750) for substances that lacked any other source of aquatic toxicity information.

3.3.3.3 Chronic Toxicity. Some substances lacked chronic toxicity data in the NLM online databases, but were mentioned in HSDB or Sax as having developmental or reproductive effects at a specified dose. For these substances, the developmental or reproductive effects were used to assess the chronic toxicity component because these effects are given the highest effect ranking (R_e in the RQ methodology) and potentially occur, regardless of duration of exposure.

3.3.3.4 Carcinogenicity. Substances classified by EPA or the International Agency for Research on Cancer (IARC) in cancer classification groups A, B, or C were assigned TES scores of 1, 10, or 100, respectively. Substances with limited evidence of carcinogenicity in animals, but not classified by IARC or EPA for carcinogenicity, were assigned a TES score of 100. Substances with evidence of carcinogenicity in animals, but noted in the data source as "lacking sufficient evidence for carcinogenicity" by EPA or IARC were not evaluated for carcinogenicity (group D - insufficient evidence). Substances for which no information on carcinogenicity could be located were not evaluated for carcinogenicity.

3.3.3.5 Radionuclides. The RQs for radionuclides are expressed in curies (seven tiered categories), whereas other RQs are expressed in pounds. Before 2001, all radionuclides were assigned a TES of 1 and received the highest number of toxicity points, based on the potential carcinogenicity associated with exposure to various types of radiation. However, in 2001, a reassessment and revision was made to the toxicity scores for radionuclides for purposes of developing this priority list. To provide comparative values and consistency in this activity, the 7 tiered categories of radionuclide RQs (in curies) are now distributed into the toxicity point scale (see Section 3.3.4) so that the most harmful radionuclides receive the highest number of toxicity points and the less harmful radionuclides receive a lower number of toxicity points. Radionuclides with an RQ equal to 0.001 curie, 0.01 curie, or 0.1 curie still receive a TES of 1 and receive the highest number of 600 points for the toxicity component. Radionuclides with an RQ equal to 1 curie receive a TES of 10 (400 toxicity points); 10 curies receive a TES of 100 (178 toxicity points); 100 curies receive a TES of 1,000 (53 toxicity points); and 1,000 curies receive a TES of 5,000 (10 toxicity points). This method of point assignment should allow the

list to distinguish between the more harmful radionuclides (such as plutonium-238) and less harmful radionuclides (such as krypton-85).

3.3.3.6 Naturally Occurring Elements. TESs for several of the naturally occurring elements were based on values for the ionized forms of the element rather than the "pure" element because the ionized forms are those most likely to be found in environmental media. Substances for which this approach was used are presented in Table 3.

The RQ for phosphorus was not adjusted because of concern in the workgroup that pure phosphorus might in fact be found at certain sites. ATSDR recognizes the uncertainty in assigning TESs to naturally occurring inorganic substances.

Table 3. Substances with TESs Based on Ionized Forms

CAS Number	Chemical Name	CAS Number	Chemical Name
7439-95-4	Magnesium	7440-09-7	Potassium
7440-23-5	*Sodium	7440-24-6	Strontium
7440-46-2	Cesium	7440-67-7	Zirconium
14808-79-8	Sulfate	16887-00-6	Chloride

*EPA RQ was adjusted to reflect the toxicity of the ionic form most likely found under environmental conditions.

3.3.3.7 Substances Lacking Data. For several substances, essentially no relevant information was located. In these cases, TESs were assigned based on the RQs for structurally related substances (see Appendix B; TES=RQ column).

3.3.4 Toxicity Component Scoring

Various methods to assign points to the TES/RQ values were discussed and evaluated. The assignment of a "log scale" scoring system resulted in overemphasis of those substances that received an RQ or TES of 1 or 10, which overshadowed the other two components of the algorithm (NPL frequency and potential for human exposure) and tended to rank substances solely by their RQ or TES value. A scoring system using a 2/3 cumulative exponential decay was selected as the scoring method for the toxicity component of the priority list. Using this scoring system, the toxicity points value is equal to 2/3 raised to the exponent of the cumulative ordinal rank, multiplied by 600 (the highest value for the toxicity points = 600). The point assignments are presented in Table 4.

Table 4. Toxicity Component Scoring

Reportable Quantity or Toxicity/Environmental Score	Ordinal Rank	Cumulative Ordinal Rank (COR)	2/3 Raised to Exponent of COR	Toxicity Points ($(2/3^{COR} \times 600)$)
1	0	0	1.0000	600
10	1	1	0.6667	400
100	2	3	0.2963	178
1,000	3	6	0.0878	53
5,000	4	10	0.0173	10

3.4 DETERMINATION OF THE POTENTIAL FOR HUMAN EXPOSURE COMPONENT

In the approach for the priority list of hazardous substances, the most useful and directly relevant data to assess the potential for human exposure to hazardous substances at NPL sites were identified. The exposure component of the algorithm is based on two factors: concentrations of the substances in environmental media and exposure status of populations as described in ATSDR health assessments or consultations. These two parts of the potential-for-human-exposure portion of the algorithm were assigned a maximum of 300 points each. If no concentration or exposure data were available for the substance, no points were assigned.

3.4.1 Concentrations of the Substances in Environmental Media

3.4.1.1 Overview. To provide a means of ranking substances based on concentration data, the following formula for calculating a relative source contribution (SC) was used.

$$SC = \frac{(\overline{C_a}A_a) + (\overline{C_w}A_w) + (\overline{C_s}A_s)}{RQ \text{ or } TES}$$

Where $\overline{C_x}$ = geometric mean of maximum concentrations of the substance in a particular environmental medium (a = air, w = water, s = soil); A_x = standard exposure assumption for the particular environmental medium to approximate a theoretical daily dose to humans (e.g., 1 liter of drinking water consumed per day - see Section 3.4.1.4); and RQ or TES = the Reportable Quantity or Toxicity/Environmental Score for the substance.

The calculation of the source contribution was included in the methodology to distinguish between those substances that occur at low concentrations but are highly toxic and those substances that occur at higher concentrations but are relatively less toxic.

Note: Because of the complexity and uncertainty associated with calculating a daily dose for radioactive substances and asbestos compounds, source contribution values were not calculated for these substances.

3.4.1.2 Source of Concentration Data. HazDat served as the source of concentration data for NPL site contaminants. HazDat contains concentration data for hazardous substances that are documented in ATSDR health assessments and health consultations for NPL (as well as non-NPL) hazardous waste sites. The concentration data in HazDat represent the maximum concentration found in a particular environmental medium at a specific site. Concentrations were converted to standard units for calculating the estimated daily dose. The media and submedia used as sources of concentration data are presented in Table 5.

Table 5. Types of Media Used as Sources of Concentration Data

Media Type	Submedia
Water	Groundwater, public
	Groundwater, private
	Groundwater, unspecified
	Surface water (lakes, streams, ponds, etc.)
	Surface water, unspecified
Soil	Top soil
	Subsurface soil
	Soil, unspecified
Air	Air, outdoor
	Air, indoor
	Air, unspecified
	Air, personal monitoring

3.4.1.3 Calculation of the Geometric Mean of Maximum Concentrations. Since the concentration data in HazDat represent the maximum concentration found per environmental medium, the geometric mean calculated in this process represents the geometric mean of the maximum concentrations found per medium. Substances were evaluated per environmental medium, and the geometric mean for these maximum concentrations was calculated for all water, soil, or air data across all sites.

The geometric mean was chosen over other methods to calculate mean concentration because the geometric mean provides a reliable estimate of average concentration and attenuates distortion of the average by extreme outlying values. Units for geometric mean concentration were converted to milligrams per kilogram (mg/kg) for soil concentrations, milligrams per liter (mg/L) for water concentrations, and milligrams per cubic meter (mg/m^3) for air concentrations. Particulates were converted from parts per million (ppm) using molecular weight of substance in the calculation. Conversion to standard units per medium allowed a comparison of all substances under consideration for the priority list.

3.4.1.4 Calculation of Theoretical Daily Dose. The exposure assumptions for children (1 liter of water consumed per day, 200 milligrams of soil ingested per day, and 15 cubic meters of air breathed per day) were used to assist in the determination of a theoretical daily dose. These exposure assumptions were multiplied by the geometric mean concentration for their respective media, and then

added together to determine the theoretical daily dose. The theoretical daily dose is equal to the numerator of the source contribution formula (see Section 3.4.1.1).

3.4.1.5 Source Contribution Scoring. This component received 300 maximum points. The source contributions (SC) were scored according to their natural logarithms. In order to achieve a better distribution of the source contribution data, a normal-distribution approach was used. In this approach, a two-standard deviation "cutoff" is imposed, so that values above or below this cut-off receive 300 or 0 points, respectively, for this component (see Table 6). This allows for better discrimination of the individual data points; the 95% of the data within two standard deviations of the mean is more widely distributed across the 300 points that are available. This approach also ensures that average values fall in the center of the distribution, and prevents a particularly low or high outlier from drawing the average away from the center. The points are assigned using the following formula:

$$\frac{(\ln \text{Min. SC Cutoff} - \ln \text{current substance's SC})}{(\ln \text{Min. SC Cutoff} - \ln \text{Max. SC cutoff})} \times 300$$

Logarithms were used in order to retain discriminatory ability across the wide range of source contributions.

Table 6. SC Average and Cutoffs

SC Average	Min. SC Cutoff	Max. SC Cutoff
3.6E-4	7.24E-8	1.81

3.4.2 Exposure Status of Populations

3.4.2.1 Overview. Information concerning documented exposure or potential exposure to a particular substance, or to environmental media in which a substance was found was also used in the exposure component. In this component, the number of reported occurrences of exposure to a substance, or exposure or potential exposure to any media containing a substance, were counted. HazDat provides information obtained from ATSDR health assessments and health consultations on exposure or potential exposure to specific substances and to media, such as drinking water, in which substances have been reported. Substances were scored differentially with respect to identification of exposure to a particular *substance,* or of exposure or potential exposure to an *environmental medium* containing the substance (see Table 7).

3.4.2.2 Exposure Status Scoring. Exposures were broken down into three categories; the assignment of points to each of these categories is presented in Table 7. Information on all the exposure categories was assessed. If there were positive occurrences in Category 1 (exposure to contaminant), then that category was considered the prevailing exposure and the substance was scored on the basis of that exposure status. If there were no occurrences in Category 1, then Category 2 (exposure to medium containing contaminant) was used to assign exposure points; if there were no occurrences in Category 1 or 2, then Category 3 was used.

A maximum of 300 points was possible for this part of the algorithm. Points within each category were distributed from the highest to the lowest exposure instances, with the maximum exposure receiving 300 points. Lead had the highest exposure in Category 1 of 447, and therefore received

300 exposure points. The assignment of points for the remainder of substances was calculated using the following formula:

$$\frac{\text{Current substance's exposure}}{\text{Maximum exposure}} \times (\text{Max. allowed points} - \text{Min. allowed points}) + \text{Min. allowed points}$$

The Max. and Min. allowed points correspond to the specific prevailing category for the substance (see Table 7). For example, if a substance's prevailing exposure (from Category 1) equals 140, then its exposure points = [(140/447) x 100] + 200 = 231.

Table 7. Exposure Status Scoring

Exposure Status	Point Range Assignment
(1) Exposure to Contaminant	300 - 200
(2) Exposure to Medium Containing Contaminant	200 - 100
(3) Potential Exposure to Medium Containing Contaminant	100 - 1

4
REVISIONS TO THE PRIORITY LIST

4. REVISIONS TO THE PRIORITY LIST

4.1 Substances No Longer on the Priority List of Hazardous Substances

A list of 11 substances that appeared on the 2001 priority list but not included on the 2003 priority list of 275 hazardous substances, is presented in Appendix K. These substances did not meet the criteria for inclusion on the priority list as a result of the use of the most recent information on the toxicity and presence of substances at NPL sites. ATSDR acknowledges that the listing of substances to develop toxicological profiles is not an absolute process. ATSDR's intention is to provide a list of substances of sufficient length to predict future directions in the profile development process, while ensuring that the list does not become too lengthy to manage and monitor. The substances in Appendix K will not be considered for development of toxicological profiles at this time, unless a profile is developed for related forms of the substance that are included on the priority list.

4.2 Future Revisions to the Priority List of Hazardous Substances

The next priority list will be published in 2005 and will include further refinements, where possible. In addition, new sources of information on NPL frequency, toxicity, and potential for human exposure will be evaluated as they become available and will be considered in the development of future priority lists of hazardous substances.

Since HazDat is a dynamic database, information on contaminants found at hazardous waste sites is continually being added to the system as new data become available. New site, health assessment, and consultation data will continue to be added as sites are identified and health assessments and consultations are completed. These data are reviewed and quality assurance procedures are performed before the data are incorporated into HazDat.

II. SUBSTANCES MOST FREQUENTLY FOUND IN COMPLETED EXPOSURE PATHWAYS AT HAZARDOUS WASTE SITES

II. SUBSTANCES MOST FREQUENTLY FOUND IN COMPLETED EXPOSURE PATHWAYS AT HAZARDOUS WASTE SITES

ATSDR's Division of Toxicology publishes the following Completed Exposure Pathway Site Count Report (CEP Site Count Report) along with the CERCLA Priority List of Hazardous Substances. A completed exposure pathway (CEP) is an exposure pathway that links a contaminant source to a receptor population. The CEP ranking presented here is based on a site frequency count, and thus lists the number of sites at which a substance has been found in a CEP. ATSDR's HazDat database contains this information, which is derived from ATSDR's public health assessments and consultations. Since this CEP report focuses on documented exposure, it provides an important prioritization based on substances to which people have been exposed.

This CEP ranking is very similar to a subcomponent in the CERCLA priority list algorithm called "Exposure to Contaminant". This subcomponent is part of the potential-for-human-exposure component of the listing algorithm, and is an incident count of substances in a completed exposure pathway. An incident count, rather than a site count, is more appropriate for the priority list because it adds more discrimination to the less frequent substances on the list. Another difference between the two exposure counts is that since the priority list is mandated by CERCLA, it only uses data from sites on the CERCLA National Priorities List (NPL), whereas this CEP ranking uses data from all sites in HazDat.

Substances on the CEP list are similar to the substances on the CERCLA Priority List of Hazardous Substances. However, some substances frequently found in CEPs have a very low toxicity (e.g., sodium). These low toxicity substances are not on the CERCLA priority list because it incorporates three different components – toxicity, frequency of occurrence, and potential for human exposure – to determine its priority substances. Thus, because of their low toxicity, these substances are not on the CERCLA priority list and consequently are not the subject of toxicological profiles.

Note:
Unlike the CERCLA priority list, the CEP report also includes substance groups, process wastes, and other environmental hazards that have been identified at hazardous waste sites, but that do not have a Chemical Abstracts Service Registry Number (CAS number). Substances without CAS numbers have been excluded from the CERCLA priority list in order to focus the development of toxicological profiles on well-identified substances. Substances without CAS numbers appear on this report with a "pseudo-CAS number" assigned by ATSDR that begins with "HZ" and serves as a unique identifier for the particular substance.

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

2003 COMPLETED EXPOSURE PATHWAY SITE COUNT REPORT

Order	Substance Name	All Sites	NPL Sites	CAS Number
1	LEAD	386	251	007439-92-1
2	TRICHLOROETHYLENE	338	280	000079-01-6
3	ARSENIC	299	192	007440-38-2
4	TETRACHLOROETHYLENE	251	198	000127-18-4
5	VOLATILE ORGANIC COMPOUNDS, UNSPECIFIED	187	129	HZ1900-01-T
6	BENZENE	184	130	000071-43-2
7	CADMIUM	183	126	007440-43-9
8	CHROMIUM	178	121	007440-47-3
9	POLYCHLORINATED BIPHENYLS	168	111	001336-36-3
10	MERCURY	144	86	007439-97-6
10	MANGANESE	144	84	007439-96-5
12	ZINC	143	88	007440-66-6
13	1,1,1-TRICHLOROETHANE	128	108	000071-55-6
14	COPPER	125	73	007440-50-8
15	CHLOROFORM	116	90	000067-66-3
16	1,1-DICHLOROETHENE	109	93	000075-35-4
17	POLYCYCLIC AROMATIC HYDROCARBONS	108	75	130498-29-2
18	BENZO(A)PYRENE	105	55	000050-32-8
19	METHYLENE CHLORIDE	104	72	000075-09-2
20	NICKEL	102	65	007440-02-0
21	TOLUENE	101	66	000108-88-3
22	VINYL CHLORIDE	100	81	000075-01-4
23	BARIUM	95	54	007440-39-3
24	ANTIMONY	92	58	007440-36-0
25	1,2-DICHLOROETHANE	89	73	000107-06-2
26	1,1-DICHLOROETHANE	88	76	000075-34-3
26	DI(2-ETHYLHEXYL)PHTHALATE	88	58	000117-81-7
28	METALS N.O.S.	87	56	HZ0900-01-T
29	BENZO(A)ANTHRACENE	78	41	000056-55-3
29	CHRYSENE	78	38	000218-01-9
31	VANADIUM	76	41	007440-62-2
32	CARBON TETRACHLORIDE	75	54	000056-23-5
32	BERYLLIUM	75	35	007440-41-7
34	IRON	74	45	007439-89-6
35	PHENANTHRENE	73	32	000085-01-8
36	NAPHTHALENE	70	37	000091-20-3
37	BENZO(B)FLUORANTHENE	68	29	000205-99-2
38	BENZO(K)FLUORANTHENE	65	30	000207-08-9
39	ETHYLBENZENE	62	38	000100-41-4
39	XYLENES, TOTAL	62	38	001330-20-7
41	INDENO(1,2,3-CD)PYRENE	61	27	000193-39-5
42	PENTACHLOROPHENOL	60	40	000087-86-5
43	COBALT	57	25	007440-48-4
44	DDT, P,P'-	54	33	000050-29-3
44	DIELDRIN	54	28	000060-57-1
44	THALLIUM	54	25	007440-28-0
47	DIBENZO(A,H)ANTHRACENE	53	26	000053-70-3
48	BENZO(GHI)PERYLENE	52	21	000191-24-2
49	ALUMINUM	51	32	007429-90-5
50	1,2-DICHLOROETHENE, TRANS-	50	47	000156-60-5
50	SODIUM	50	33	007440-23-5
52	DDE, P,P'-	49	29	000072-55-9
52	SELENIUM	49	22	007782-49-2
54	1,2-DICHLOROETHYLENE	47	40	000540-59-0
54	2-METHYLNAPHTHALENE	47	21	000091-57-6
56	CHLOROBENZENE	45	33	000108-90-7

AGENCY FOR TOXIC SUBSTANCES AND DISEASE REGISTRY

2003 COMPLETED EXPOSURE PATHWAY SITE COUNT REPORT

Order	Substance Name	All Sites	NPL Sites	CAS Number
56	CYANIDE	45	24	000057-12-5
58	DDD, P,P'-	44	25	000072-54-8
59	FLUORANTHENE	43	17	000206-44-0
60	PYRENE	42	17	000129-00-0
61	HEPTACHLOR EPOXIDE	41	19	001024-57-3
62	PESTICIDES, UNSPECIFIED	39	23	HZ1200-01-T
63	SILVER	38	18	007440-22-4
63	DIBENZOFURAN	38	17	000132-64-9
65	1,2-DICHLOROETHENE, CIS-	37	28	000156-59-2
65	CHLORDANE	37	26	000057-74-9
67	MAGNESIUM	34	21	007439-95-4
68	2,3,7,8-TETRACHLORODIBENZO-P-DIOXIN	32	23	001746-01-6
68	ACETONE	32	20	000067-64-1
70	BROMODICHLOROMETHANE	30	23	000075-27-4
70	NITRATE	30	22	014797-55-8
70	AROCLOR 1254	30	20	011097-69-1
70	ASBESTOS	30	14	001332-21-4
70	FLUORENE	30	12	000086-73-7
70	CARBAZOLE	30	9	000086-74-8
76	DI-N-BUTYL PHTHALATE	29	15	000084-74-2
77	2-BUTANONE	28	21	000078-93-3
77	AROCLOR 1260	28	17	011096-82-5
77	ACENAPHTHYLENE	28	12	000208-96-8
77	ANTHRACENE	28	10	000120-12-7
81	ACENAPHTHENE	27	9	000083-32-9
82	CALCIUM	26	22	007440-70-2
82	DIOXINS N.O.S.	26	17	HZ0400-05-T
82	PHENOL	26	16	000108-95-2
82	ALDRIN	26	7	000309-00-2
82	BUTYL BENZYL PHTHALATE	26	7	000085-68-7
87	1,2-DICHLOROPROPANE	25	19	000078-87-5
87	1,1,2,2-TETRACHLOROETHANE	25	18	000079-34-5
89	1,1,2-TRICHLOROETHANE	24	19	000079-00-5
89	STYRENE	24	12	000100-42-5
91	DI-N-OCTYL PHTHALATE	23	13	000117-84-0
91	HEXACHLOROCYCLOHEXANE, GAMMA-	23	13	000058-89-9
91	CRESOL, PARA-	23	9	000106-44-5
94	1,4-DICHLOROBENZENE	22	9	000106-46-7
94	HEPTACHLOR	22	6	000076-44-8
96	CHLOROMETHANE	21	12	000074-87-3
96	SEMIVOLATILE ORGANIC COMPOUNDS N.O.S.	21	12	HZ1900-02-T
98	POTASSIUM	20	16	007440-09-7
98	CHLORODIBROMOMETHANE	20	15	000124-48-1
98	1,2,4-TRIMETHYLBENZENE	20	2	000095-63-6

All Sites = all sites with ATSDR activities; NPL Sites = current and former sites on the National Priorities List; CAS = Chemical Abstracts Service; CEP = Completed Exposure Pathway.

Summary Statistics for this July 18, 2003, HazDat Analysis:

	All Sites	NPL Sites
Number of Sites/Events in HazDat	4,791	1,636
Number of Public Health Assessments (PHAs)	2,382	1,627
Number of Sites/Events with CEPs	1,161	730
Number of CEP records (incidents) in HazDat	15,292	9,721
Number of CEP records (incidents) from PHAs	10,374	7,330
Total number of substances in CEPs	641	489