APPENDIX D

INFILTRATION RATE DATA

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LIST OF TABLES

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Table D-1: Tier 2 HELP-derived Infiltration Rates for Landfills (m/yr)

ID	City	State	No Liner			Clay Liner
			SLT	SNL	SCL	
19	Albuquerque	NM	0.00E+00	0.00E+00	3.00E-04	0.00E+00
98	Annette	AK	1.68E+00	1.84E+00	1.46E+00	3.38E-02
82	Astoria	OR	1.08E+00	1.15E+00	9.65E-01	5.26E-02
95	Atlanta	GA	3.42E-01	3.99E-01	2.82E-01	4.77E-02
62	Augusta	ME	2.12E-01	2.70E-01	1.67E-01	4.45E-02
44	Bangor	ME	1.47E-01	2.05E-01	1.23E-01	4.32E-02
99	Bethel	AK	5.64E-02	7.21E-02	5.54E-02	2.95E-02
7	Bismarck	ND	2.39E-02	3.00E-02	1.96E-02	1.88E-02
2	Boise	ID	8.00E-04	9.40E-03	3.80E-03	4.61E-03
67	Boston	MA	2.33E-01	2.38E-01	1.54E-01	4.45E-02
75	Bridgeport	CT	1.95E-01	2.46E-01	1.62E-01	4.44E-02
35	Brownsville	TX	5.49E-02	1.05E-01	3.84E-02	2.41E-02
43	Burlington	VT	1.36E-01	1.78E-01	1.17E-01	4.32E-02
41	Caribou	ME	1.08E-01	1.49E-01	8.86E-02	4.32E-02
18	Cedar City	UT	0.00E+00	8.00E-04	0.00E+00	6.69E-05
86	Central Park	NY	3.36E-01	4.17E-01	2.74E-01	4.86E-02
93	Charleston	SC	2.61E-01	3.29E-01	2.12E-01	4.77E-02
10	Cheyenne	WY	5.00E-04	1.30E-03	8.60E-03	2.38E-05
42	Chicago	IL	7.98E-02	1.14E-01	6.20E-02	4.32E-02
74	Cincinnati	OH	1.55E-01	2.21E-01	1.54E-01	4.44E-02
52	Cleveland	OH	7.80E-02	1.21E-01	8.23E-02	4.09E-02
55	Columbia	MO	1.53E-01	1.99E-01	1.22E-01	4.09E-02
51	Columbus	OH	7.65E-02	1.16E-01	6.63E-02	4.09E-02
38	Concord	NH	1.59E-01	2.06E-01	1.37E-01	4.32E-02
36	Dallas	TX	5.99E-02	1.07E-01	5.31E-02	2.41E-02
3	Denver	CO	8.00E-04	8.00E-04	3.60E-03	1.83E-05
53	Des Moines	IA	1.14E-01	1.64E-01	1.16E-01	4.09E-02
29	Dodge City	KS	1.35E-02	3.45E-02	2.26E-02	9.44E-03
32	E. Lansing	MI	1.09E-01	1.45E-01	1.10E-01	3.74E-02
54	E. St. Louis	IL	1.44E-01	1.68E-01	7.04E-02	4.09E-02
88	Edison	NJ	3.12E-01	3.91E-01	2.49E-01	4.86E-02
23	El Paso	TX	7.60E-03	1.30E-02	8.10E-03	1.03E-04
16	Ely	NV	0.00E+00	0.00E+00	3.00E-04	3.54E-05
100	Fairbanks	AK	1.04E-02	2.34E-02	1.17E-02	9.40E-03
28	Flagstaff	AZ	2.39E-02	6.30E-02	2.26E-02	2.41E-02
1	Fresno	CA	3.07E-02	3.68E-02	3.81E-02	4.61E-03
6	Glasgow	MT	9.90E-03	7.40E-03	9.90E-03	6.69E-05
27	Grand Island	NE	4.42E-02	6.27E-02	3.23E-02	1.96E-02
4	Grand Junction	CO	0.00E+00	0.00E+00	3.00E-04	2.70E-05
25	Great Falls	MT	3.60E-03	6.90E-03	7.40E-03	1.02E-04
77	Greensboro	NC	3.26E-01	3.90E-01	2.71E-01	3.62E-02
59	Hartford	CT	1.71E-01	2.23E-01	1.41E-01	4.45E-02
101	Honolulu	HI	5.23E-02	9.45E-02	3.66E-02	4.83E-03
73	Indianapolis	IN	1.30E-01	1.86E-01	1.06E-01	4.44E-02
66	Ithaca	NY	1.68E-01	2.14E-01	1.39E-01	4.45E-02
78	Jacksonville	FL	1.51E-01	2.11E-01	1.10E-01	3.62E-02
85	Knoxville	TN	4.11E-01	4.46E-01	3.54E-01	4.86E-02
96	Lake Charles	LA	3.65E-01	4.64E-01	2.82E-01	4.92E-02
11	Lander	WY	3.30E-03	5.30E-03	9.40E-03	1.28E-04
20	Las Vegas	NV	0.00E+00	0.00E+00	1.80E-03	6.89E-05
87	Lexington	KY	3.29E-01	3.97E-01	2.70E-01	4.86E-02
90	Little Rock	AK	3.53E-01	4.34E-01	2.82E-01	4.77E-02
12	Los Angeles	CA	7.87E-02	9.50E-02	6.99E-02	1.26E-03
69	Lynchburg	VA	3.08E-01	3.61E-01	2.57E-01	4.44E-02
50	Madison	WI	9.12E-02	1.40E-01	6.86E-02	4.09E-02
24	Medford	OR	2.07E-01	2.31E-01	2.10E-01	4.32E-02

Table D-1: Tier 2 HELP-derived Infiltration Rates for Landfills (m/yr)

ID	City	State	No Liner			Clay Liner
			SLT	SNL	SCL	
97	Miami	FL	1.45E-01	2.20E-01	1.02E-01	4.92E-02
30	Midland	TX	1.80E-02	2.54E-02	1.35E-02	9.44E-03
47	Montpelier	VT	1.06E-01	1.48E-01	8.79E-02	4.32E-02
65	Nashua	NH	2.27E-01	2.81E-01	1.94E-01	4.45E-02
89	Nashville	TN	4.67E-01	5.40E-01	3.77E-01	4.86E-02
83	New Haven	CT	3.52E-01	4.63E-01	2.86E-01	5.26E-02
92	New Orleans	LA	5.89E-01	7.45E-01	4.50E-01	4.77E-02
70	New York City	NY	2.44E-01	2.94E-01	1.97E-01	4.44E-02
80	Norfolk	VA	3.12E-01	0.00E+00	2.69E-01	3.62E-02
33	North Omaha	NE	6.71E-02	7.95E-02	5.36E-02	2.91E-02
37	Oklahoma City	OK	6.12E-02	9.42E-02	3.89E-02	2.46E-02
76	Orlando	FL	1.02E-01	1.70E-01	8.05E-02	3.62E-02
71	Philadelphia	PA	2.01E-01	2.61E-01	1.64E-01	4.44E-02
21	Phoenix	AZ	0.00E+00	3.00E-04	3.00E-04	1.69E-05
39	Pittsburg	PA	8.94E-02	1.31E-01	7.92E-02	4.32E-02
84	Plainfield	MA	1.90E-01	2.54E-01	1.52E-01	5.26E-02
5	Pocatello	ID	0.00E+00	0.00E+00	0.00E+00	5.50E-04
40	Portland	OR	4.17E-01	4.39E-01	3.93E-01	4.32E-02
64	Portland	ME	2.29E-01	2.84E-01	1.87E-01	4.45E-02
63	Providence	RI	2.13E-01	2.86E-01	1.75E-01	4.45E-02
8	Pullman	WA	6.90E-03	1.32E-02	8.40E-03	2.27E-04
49	Put-in-Bay	OH	5.08E-02	1.00E-01	4.95E-02	4.09E-02
17	Rapid City	SD	5.00E-04	7.10E-03	3.30E-03	6.40E-05
45	Rutland	VT	1.21E-01	1.60E-01	1.01E-01	4.32E-02
13	Sacramento	CA	1.02E-01	8.76E-02	9.45E-02	1.26E-03
26	Salt Lake City	UT	1.30E-02	2.69E-02	1.85E-02	5.10E-04
58	San Antonio	TX	1.10E-01	1.65E-01	8.20E-02	2.53E-02
14	San Diego	CA	2.21E-02	3.40E-02	2.41E-02	1.26E-03
102	San Juan	PR	1.27E-01	1.92E-01	9.45E-02	1.93E-02
15	Santa Maria	CA	9.47E-02	1.15E-01	8.41E-02	1.26E-03
48	Sault St. Marie	MI	1.65E-01	2.10E-01	1.44E-01	4.32E-02
68	Schenectady	NY	1.47E-01	1.93E-01	1.22E-01	4.45E-02
72	Seabrook	NJ	1.81E-01	2.43E-01	1.43E-01	4.44E-02
46	Seattle	WA	4.38E-01	4.58E-01	4.08E-01	4.32E-02
81	Shreveport	LA	2.30E-01	2.94E-01	1.84E-01	3.62E-02
31	St. Cloud	MN	6.02E-02	8.31E-02	5.54E-02	3.42E-02
60	Syracuse	NY	2.55E-01	3.25E-01	2.12E-01	4.45E-02
91	Tallahassee	FL	5.91E-01	7.31E-01	4.56E-01	4.77E-02
57	Tampa	FL	6.58E-02	1.03E-01	4.75E-02	2.53E-02
56	Topeka	KS	1.05E-01	1.48E-01	7.62E-02	3.50E-02
22	Tucson	AZ	0.00E+00	3.00E-04	5.00E-04	2.23E-05
34	Tulsa	OK	6.86E-02	1.01E-01	4.65E-02	2.41E-02
94	W. Palm Beach	FL	2.61E-01	3.49E-01	1.78E-01	4.77E-02
79	Watkinsville	GA	2.89E-01	3.56E-01	2.33E-01	3.62E-02
61	Worchester	MA	2.02E-01	2.59E-01	1.70E-01	4.45E-02
9	Yakima	WA	0.00E+00	2.30E-03	3.00E-04	1.15E-04

Notes:
SLT = Silt Loam cover
SNL = Sandy Loam cover
SCL = Silty Clay Loam cover

Table D-2: Tier 2 HELP-derived Infiltration Rates for Waste Piles (m/yr)

ID	City	State	No Liner			Clay Liner		
			Low Permeability Waste	Medium Permeability Waste	High Permeability Waste	Low Permeability Waste	Medium Permeability Waste	High Permeability Waste
19	Albuquerque	NM	2.54E-04	2.54E-04	2.54E-04	1.60E-03	1.51E-02	7.43E-03
98	Annette	AK	1.54E+00	1.81E+00	1.88E+00	1.35E-01	1.36E-01	1.35E-01
82	Astoria	OR	1.21E+00	1.21E+00	1.21E+00	1.32E-01	1.35E-01	1.35E-01
95	Atlanta	GA	5.16E-01	5.16E-01	5.16E-01	1.18E-01	1.35E-01	1.35E-01
62	Augusta	ME	3.14E-01	3.14E-01	3.14E-01	1.19E-01	1.29E-01	1.28E-01
44	Bangor	ME	2.57E-01	2.57E-01	2.57E-01	1.13E-01	1.27E-01	1.27E-01
99	Bethel	AK	5.02E-02	7.25E-02	1.23E-01	3.52E-02	3.64E-02	6.60E-02
7	Bismarck	ND	2.59E-02	2.59E-02	2.59E-02	1.24E-02	6.89E-02	9.50E-02
2	Boise	ID	2.54E-04	2.54E-04	2.54E-04	1.36E-02	4.34E-02	6.06E-02
67	Boston	MA	3.22E-01	3.22E-01	3.22E-01	1.19E-01	1.29E-01	1.28E-01
75	Bridgeport	CT	3.69E-01	3.69E-01	3.69E-01	1.06E-01	1.34E-01	1.33E-01
35	Brownsville	TX	2.27E-01	2.27E-01	2.27E-01	4.97E-03	1.33E-01	1.32E-01
43	Burlington	VT	2.13E-01	2.13E-01	2.13E-01	1.13E-01	1.27E-01	1.27E-01
41	Caribou	ME	1.88E-01	1.88E-01	1.88E-01	1.13E-01	1.27E-01	1.27E-01
18	Cedar City	UT	2.54E-04	2.54E-04	2.54E-04	4.82E-03	8.26E-04	5.32E-03
86	Central Park	NY	5.23E-01	5.23E-01	5.23E-01	1.26E-01	1.35E-01	1.35E-01
93	Charleston	SC	4.83E-01	4.83E-01	4.83E-01	1.18E-01	1.35E-01	1.35E-01
10	Cheyenne	WY	4.32E-03	4.32E-03	4.32E-03	1.37E-03	2.92E-04	7.07E-03
42	Chicago	IL	1.68E-01	1.68E-01	1.68E-01	1.13E-01	1.27E-01	1.27E-01
74	Cincinnati	OH	3.10E-01	3.10E-01	3.10E-01	1.06E-01	1.34E-01	1.33E-01
52	Cleveland	OH	1.82E-01	1.82E-01	1.82E-01	6.88E-02	1.32E-01	1.32E-01
55	Columbia	MO	3.10E-01	3.10E-01	3.10E-01	6.88E-02	1.32E-01	1.32E-01
51	Columbus	OH	1.72E-01	1.72E-01	1.72E-01	6.88E-02	1.32E-01	1.32E-01
38	Concord	NH	2.35E-01	2.35E-01	2.35E-01	1.13E-01	1.27E-01	1.27E-01
36	Dallas	TX	2.58E-01	2.58E-01	2.58E-01	4.97E-03	1.33E-01	1.32E-01
3	Denver	CO	7.62E-04	7.62E-04	7.62E-04	1.97E-03	1.28E-03	3.66E-03
53	Des Moines	IA	2.51E-01	2.51E-01	2.51E-01	6.88E-02	1.32E-01	1.32E-01
29	Dodge City	KS	1.01E-01	1.01E-01	1.01E-01	3.26E-03	1.06E-01	1.19E-01
32	E. Lansing	MI	1.36E-01	1.36E-01	1.36E-01	4.81E-02	1.15E-01	1.11E-01
54	E. St. Louis	IL	2.63E-01	2.63E-01	2.63E-01	6.88E-02	1.32E-01	1.32E-01
88	Edison	NJ	4.90E-01	4.90E-01	4.90E-01	1.26E-01	1.35E-01	1.35E-01
23	El Paso	TX	2.31E-02	2.31E-02	2.31E-02	5.81E-03	2.63E-03	6.74E-03
16	Ely	NV	2.54E-04	2.54E-04	2.54E-04	5.89E-03	1.12E-03	3.61E-03
100	Fairbanks	AK	7.67E-03	1.67E-02	7.77E-02	9.80E-03	1.18E-02	4.07E-02
28	Flagstaff	AZ	4.04E-02	4.04E-02	4.04E-02	1.05E-02	1.23E-01	1.23E-01
1	Fresno	CA	4.22E-02	4.22E-02	4.22E-02	1.36E-02	4.34E-02	6.06E-02
6	Glasgow	MT	3.66E-02	3.66E-02	3.66E-02	5.35E-04	2.25E-04	2.34E-02
27	Grand Island	NE	9.63E-02	9.63E-02	9.63E-02	4.22E-02	1.35E-01	1.34E-01
4	Grand Junction	CO	2.54E-04	2.54E-04	2.54E-04	4.59E-03	1.66E-03	1.98E-03
25	Great Falls	MT	2.59E-02	2.59E-02	2.59E-02	1.94E-03	4.66E-03	3.34E-02
77	Greensboro	NC	4.84E-01	4.84E-01	4.84E-01	8.04E-02	1.27E-01	1.27E-01
59	Hartford	CT	2.79E-01	2.79E-01	2.79E-01	1.19E-01	1.29E-01	1.28E-01
101	Honolulu	HI	5.01E-02	1.08E-01	1.98E-01	3.23E-02	4.94E-02	8.71E-02
73	Indianapolis	IN	2.69E-01	2.69E-01	2.69E-01	1.06E-01	1.34E-01	1.33E-01
66	Ithaca	NY	2.61E-01	2.61E-01	2.61E-01	1.19E-01	1.29E-01	1.28E-01
78	Jacksonville	FL	4.09E-01	4.09E-01	4.09E-01	8.04E-02	1.27E-01	1.27E-01
85	Knoxville	TN	5.42E-01	5.42E-01	5.42E-01	1.26E-01	1.35E-01	1.35E-01
96	Lake Charles	LA	6.07E-01	6.07E-01	6.07E-01	4.89E-02	5.58E-02	9.27E-02
11	Lander	WY	2.03E-03	2.03E-03	2.03E-03	4.19E-03	1.25E-03	2.00E-02
20	Las Vegas	NV	2.54E-04	2.54E-04	2.54E-04	5.15E-03	1.79E-03	7.97E-03
87	Lexington	KY	4.52E-01	4.52E-01	4.52E-01	1.26E-01	1.35E-01	1.35E-01
90	Little Rock	AK	5.38E-01	5.38E-01	5.38E-01	1.18E-01	1.35E-01	1.35E-01
12	Los Angeles	CA	1.33E-01	1.33E-01	1.33E-01	0.00E+00	5.56E-02	7.18E-02
69	Lynchburg	VA	2.69E-01	2.69E-01	2.69E-01	1.06E-01	1.34E-01	1.33E-01
50	Madison	WI	2.02E-01	2.02E-01	2.02E-01	6.88E-02	1.32E-01	1.32E-01

Table D-2: Tier 2 HELP-derived Infiltration Rates for Waste Piles (m/yr)

ID	City	State	No Liner			Clay Liner		
			Low Permeability Waste	Medium Permeability Waste	High Permeability Waste	Low Permeability Waste	Medium Permeability Waste	High Permeability Waste
24	Medford	OR	2.50E-01	2.50E-01	2.50E-01	1.26E-01	1.33E-01	1.31E-01
97	Miami	FL	4.23E-01	4.23E-01	4.23E-01	4.89E-02	5.58E-02	9.27E-02
30	Midland	TX	7.57E-02	7.57E-02	7.57E-02	3.26E-03	1.06E-01	1.19E-01
47	Montpelier	VT	1.76E-01	1.76E-01	1.76E-01	1.13E-01	1.27E-01	1.27E-01
65	Nashua	NH	3.34E-01	3.34E-01	3.34E-01	1.19E-01	1.29E-01	1.28E-01
89	Nashville	TN	6.14E-01	6.14E-01	6.14E-01	1.26E-01	1.35E-01	1.35E-01
83	New Haven	CT	5.42E-01	5.42E-01	5.42E-01	1.32E-01	1.35E-01	1.35E-01
92	New Orleans	LA	8.49E-01	8.49E-01	8.49E-01	1.18E-01	1.35E-01	1.35E-01
70	New York City	NY	3.99E-01	3.99E-01	3.99E-01	1.06E-01	1.34E-01	1.33E-01
80	Norfolk	VA	4.54E-01	4.54E-01	4.54E-01	8.04E-02	1.27E-01	1.27E-01
33	North Omaha	NE	1.62E-01	1.62E-01	1.62E-01	2.02E-02	1.26E-01	1.27E-01
37	Oklahoma City	OK	2.42E-01	2.42E-01	2.42E-01	7.47E-03	1.31E-01	1.30E-01
76	Orlando	FL	3.84E-01	3.84E-01	3.84E-01	8.04E-02	1.27E-01	1.27E-01
71	Philadelphia	PA	3.53E-01	3.53E-01	3.53E-01	1.06E-01	1.34E-01	1.33E-01
21	Phoenix	AZ	2.54E-04	2.54E-04	2.54E-04	4.73E-03	2.01E-03	7.62E-04
39	Pittsburg	PA	1.72E-01	1.72E-01	1.72E-01	1.13E-01	1.27E-01	1.27E-01
84	Plainfield	MA	3.03E-01	3.03E-01	3.03E-01	1.32E-01	1.35E-01	1.35E-01
5	Pocatello	ID	2.54E-04	2.54E-04	2.54E-04	5.86E-03	1.50E-03	3.19E-02
40	Portland	OR	5.06E-01	5.06E-01	5.06E-01	1.13E-01	1.27E-01	1.27E-01
64	Portland	ME	3.25E-01	3.25E-01	3.25E-01	1.19E-01	1.29E-01	1.28E-01
63	Providence	RI	3.48E-01	3.48E-01	3.48E-01	1.19E-01	1.29E-01	1.28E-01
8	Pullman	WA	2.54E-04	2.54E-04	2.54E-04	9.27E-03	1.43E-02	3.44E-02
49	Put-in-Bay	OH	1.48E-01	1.48E-01	1.48E-01	6.88E-02	1.32E-01	1.32E-01
17	Rapid City	SD	1.35E-02	1.35E-02	1.35E-02	9.92E-04	1.14E-03	1.92E-02
45	Rutland	VT	2.13E-01	2.13E-01	2.13E-01	1.13E-01	1.27E-01	1.27E-01
13	Sacramento	CA	1.23E-01	1.23E-01	1.23E-01	0.00E+00	5.56E-02	7.18E-02
26	Salt Lake City	UT	1.93E-02	1.93E-02	1.93E-02	9.11E-03	1.05E-02	3.68E-02
58	San Antonio	TX	2.95E-01	2.95E-01	2.95E-01	2.00E-02	1.34E-01	1.33E-01
14	San Diego	CA	6.58E-02	6.58E-02	6.58E-02	0.00E+00	5.56E-02	7.18E-02
102	San Juan	PR	1.50E-01	2.88E-01	4.44E-01	6.37E-02	7.93E-02	1.11E-01
15	Santa Maria	CA	1.51E-01	1.51E-01	1.51E-01	0.00E+00	5.56E-02	7.18E-02
48	Sault St. Marie	MI	2.37E-01	2.37E-01	2.37E-01	1.13E-01	1.27E-01	1.27E-01
68	Schenectady	NY	2.75E-01	2.75E-01	2.75E-01	1.19E-01	1.29E-01	1.28E-01
72	Seabrook	NJ	3.41E-01	3.41E-01	3.41E-01	1.06E-01	1.34E-01	1.33E-01
46	Seattle	WA	5.31E-01	5.31E-01	5.31E-01	1.13E-01	1.27E-01	1.27E-01
81	Shreveport	LA	4.46E-01	4.46E-01	4.46E-01	8.04E-02	1.27E-01	1.27E-01
31	St. Cloud	MN	1.52E-01	1.52E-01	1.52E-01	2.64E-02	1.26E-01	1.26E-01
60	Syracuse	NY	4.10E-01	4.10E-01	4.10E-01	1.19E-01	1.29E-01	1.28E-01
91	Tallahassee	FL	8.22E-01	8.22E-01	8.22E-01	1.18E-01	1.35E-01	1.35E-01
57	Tampa	FL	2.72E-01	2.72E-01	2.72E-01	2.00E-02	1.34E-01	1.33E-01
56	Topeka	KS	2.47E-01	2.47E-01	2.47E-01	1.74E-02	1.31E-01	1.30E-01
22	Tucson	AZ	2.54E-04	2.54E-04	2.54E-04	6.41E-03	7.53E-03	1.69E-03
34	Tulsa	OK	2.49E-01	2.49E-01	2.49E-01	4.97E-03	1.33E-01	1.32E-01
94	W. Palm Beach	FL	5.64E-01	5.64E-01	5.64E-01	1.18E-01	1.35E-01	1.35E-01
79	Watkinsville	GA	4.67E-01	4.67E-01	4.67E-01	8.04E-02	1.27E-01	1.27E-01
61	Worchester	MA	3.31E-01	3.31E-01	3.31E-01	1.19E-01	1.29E-01	1.28E-01
9	Yakima	WA	2.54E-04	2.54E-04	2.54E-04	4.86E-03	4.74E-03	2.84E-02

Notes:

Low, Medium, and High denote representative waste types with different hydraulic conductivities:

Low = Fine-grained waste (e.g., fly ash), Hydraulic conductivity is $5x10^{5}$ cm/sec

Medium = Medium-grained waste (e.g., bottom ash), Hydraulic conductivity is 0.0041 cm/sec

High = Coarse-grained waste (e.g., slag), Hydraulic conductivity is 0.041 cm/sec

Table D-3: Tier 2 HELP-derived Infiltration Rates for Land Application Units (m/yr)

ID	City	State	No Liner		
			SLT	SNL	SCL
19	Albuquerque	NM	0.00E+00	0.00E+00	3.00E-04
98	Annette	AK	1.80E+00	1.98E+00	1.52E+00
82	Astoria	OR	1.08E+00	1.15E+00	9.65E-01
95	Atlanta	GA	3.42E-01	3.99E-01	2.82E-01
62	Augusta	ME	2.12E-01	2.70E-01	1.67E-01
44	Bangor	ME	1.47E-01	2.05E-01	1.23E-01
99	Bethel	AK	1.85E-01	1.98E-01	1.78E-01
7	Bismarck	ND	2.39E-02	3.00E-02	1.96E-02
2	Boise	ID	8.00E-04	9.40E-03	3.80E-03
67	Boston	MA	2.33E-01	2.38E-01	1.54E-01
75	Bridgeport	CT	1.95E-01	2.46E-01	1.62E-01
35	Brownsville	TX	5.49E-02	1.05E-01	3.84E-02
43	Burlington	VT	1.36E-01	1.78E-01	1.17E-01
41	Caribou	ME	1.08E-01	1.49E-01	8.86E-02
18	Cedar City	UT	0.00E+00	8.00E-04	0.00E+00
86	Central Park	NY	3.36E-01	4.17E-01	2.74E-01
93	Charleston	SC	2.61E-01	3.29E-01	2.12E-01
10	Cheyenne	WY	5.00E-04	1.30E-03	8.60E-03
42	Chicago	IL	7.98E-02	1.14E-01	6.20E-02
74	Cincinnati	OH	1.55E-01	2.21E-01	1.54E-01
52	Cleveland	OH	7.80E-02	1.21E-01	8.23E-02
55	Columbia	MO	1.53E-01	1.99E-01	1.22E-01
51	Columbus	OH	7.65E-02	1.16E-01	6.63E-02
38	Concord	NH	1.59E-01	2.06E-01	1.37E-01
36	Dallas	TX	5.99E-02	1.07E-01	5.31E-02
3	Denver	CO	8.00E-04	8.00E-04	3.60E-03
53	Des Moines	IA	1.14E-01	1.64E-01	1.16E-01
29	Dodge City	KS	1.35E-02	3.45E-02	2.26E-02
32	E. Lansing	MI	1.09E-01	1.45E-01	1.10E-01
54	E. St. Louis	IL	1.44E-01	1.68E-01	7.04E-02
88	Edison	NJ	3.12E-01	3.91E-01	2.49E-01
23	El Paso	TX	7.60E-03	1.30E-02	8.10E-03
16	Ely	NV	0.00E+00	0.00E+00	3.00E-04
100	Fairbanks	AK	1.46E-01	1.48E-01	1.45E-01
28	Flagstaff	AZ	2.39E-02	6.30E-02	2.26E-02
1	Fresno	CA	3.07E-02	3.68E-02	3.81E-02
6	Glasgow	MT	9.90E-03	7.40E-03	9.90E-03
27	Grand Island	NE	4.42E-02	6.27E-02	3.23E-02
4	Grand Junction	CO	0.00E+00	0.00E+00	3.00E-04
25	Great Falls	MT	3.60E-03	6.90E-03	7.40E-03
77	Greensboro	NC	3.26E-01	3.90E-01	2.71E-01
59	Hartford	CT	1.71E-01	2.23E-01	1.41E-01
101	Honolulu	HI	5.41E-02	9.83E-02	3.63E-02
73	Indianapolis	IN	1.30E-01	1.86E-01	1.06E-01
66	Ithaca	NY	1.68E-01	2.14E-01	1.39E-01
78	Jacksonville	FL	1.51E-01	2.11E-01	1.10E-01
85	Knoxville	TN	4.11E-01	4.46E-01	3.54E-01
96	Lake Charles	LA	3.65E-01	4.64E-01	2.82E-01
11	Lander	WY	3.30E-03	5.30E-03	9.40E-03
20	Las Vegas	NV	0.00E+00	0.00E+00	1.80E-03
87	Lexington	KY	3.29E-01	3.97E-01	2.70E-01
90	Little Rock	AK	3.53E-01	4.34E-01	2.82E-01
12	Los Angeles	CA	7.87E-02	9.50E-02	6.99E-02
69	Lynchburg	VA	3.08E-01	3.61E-01	2.57E-01
50	Madison	WI	9.12E-02	1.40E-01	6.86E-02
24	Medford	OR	2.07E-01	2.31E-01	2.10E-01

Table D-3: Tier 2 HELP-derived Infiltration Rates for Land Application Units (m/yr)

ID	City	State	No Liner		
			SLT	SNL	SCL
97	Miami	FL	1.45E-01	2.20E-01	1.02E-01
30	Midland	TX	1.80E-02	2.54E-02	1.35E-02
47	Montpelier	VT	1.06E-01	1.48E-01	8.79E-02
65	Nashua	NH	2.27E-01	2.81E-01	1.94E-01
89	Nashville	TN	4.67E-01	5.40E-01	3.77E-01
83	New Haven	CT	3.52E-01	4.63E-01	2.86E-01
92	New Orleans	LA	5.89E-01	7.45E-01	4.50E-01
70	New York City	NY	2.44E-01	2.94E-01	1.97E-01
80	Norfolk	VA	3.12E-01	0.00E+00	2.69E-01
33	North Omaha	NE	6.71E-02	7.95E-02	5.36E-02
37	Oklahoma City	OK	6.12E-02	9.42E-02	3.89E-02
76	Orlando	FL	1.02E-01	1.70E-01	8.05E-02
71	Philadelphia	PA	2.01E-01	2.61E-01	1.64E-01
21	Phoenix	AZ	0.00E+00	3.00E-04	3.00E-04
39	Pittsburg	PA	8.94E-02	1.31E-01	7.92E-02
84	Plainfield	MA	1.90E-01	2.54E-01	1.52E-01
5	Pocatello	ID	0.00E+00	0.00E+00	0.00E+00
40	Portland	OR	4.17E-01	4.39E-01	3.93E-01
64	Portland	ME	2.29E-01	2.84E-01	1.87E-01
63	Providence	RI	2.13E-01	2.86E-01	1.75E-01
8	Pullman	WA	6.90E-03	1.32E-02	8.40E-03
49	Put-in-Bay	OH	5.08E-02	1.00E-01	4.95E-02
17	Rapid City	SD	5.00E-04	7.10E-03	3.30E-03
45	Rutland	VT	1.21E-01	1.60E-01	1.01E-01
13	Sacramento	CA	1.02E-01	8.76E-02	9.45E-02
26	Salt Lake City	UT	1.30E-02	2.69E-02	1.85E-02
58	San Antonio	TX	1.10E-01	1.65E-01	8.20E-02
14	San Diego	CA	2.21E-02	3.40E-02	2.41E-02
102	San Juan	PR	1.49E-01	2.16E-01	1.05E-01
15	Santa Maria	CA	9.47E-02	1.15E-01	8.41E-02
48	Sault St. Marie	MI	1.65E-01	2.10E-01	1.44E-01
68	Schenectady	NY	1.47E-01	1.93E-01	1.22E-01
72	Seabrook	NJ	1.81E-01	2.43E-01	1.43E-01
46	Seattle	WA	4.38E-01	4.58E-01	4.08E-01
81	Shreveport	LA	2.30E-01	2.94E-01	1.84E-01
31	St. Cloud	MN	6.02E-02	8.31E-02	5.54E-02
60	Syracuse	NY	2.55E-01	3.25E-01	2.12E-01
91	Tallahassee	FL	5.91E-01	7.31E-01	4.56E-01
57	Tampa	FL	6.58E-02	1.03E-01	4.75E-02
56	Topeka	KS	1.05E-01	1.48E-01	7.62E-02
22	Tucson	AZ	0.00E+00	3.00E-04	5.00E-04
34	Tulsa	OK	6.86E-02	1.01E-01	4.65E-02
94	W. Palm Beach	FL	2.61E-01	3.49E-01	1.78E-01
79	Watkinsville	GA	2.89E-01	3.56E-01	2.33E-01
61	Worchester	MA	2.02E-01	2.59E-01	1.70E-01
9	Yakima	WA	0.00E+00	2.30E-03	3.00E-04

Notes:
SLT = Silt Loam soil
SNL = Sandy Loam soil
SCL = Silty Clay Loam soil

Table D-4: Tier 1 HELP-derived Infiltration Rates for Clay Liner Scenarios (m/yr)

City	State	Tier 1 Clay Lined Landfill Infiltration Rate (m/yr)	Tier 1 Clay Lined Waste Pile Infiltration Rate (m/yr)		
			Low Permeability Waste	Medium Permeability Waste	High Permeability Waste
Boise [1)]	**ID**	4.61E-03	1.36E-02	4.34E-02	6.06E-02
Fresno	CA	4.61E-03	1.36E-02	4.34E-02	6.06E-02
Bismarck	**ND**	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Denver	CO	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Grand Junction	CO	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Pocatello	ID	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Glasgow	MT	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Pullman	WA	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Yakima	WA	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Cheyenne	WY	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Lander	WY	1.88E-02	1.24E-02	6.89E-02	9.50E-02
Rapid City	**SD**	1.26E-03	0.00E+00	5.56E-02	7.18E-02
Los Angeles	CA	1.26E-03	0.00E+00	5.56E-02	7.18E-02
Sacramento	CA	1.26E-03	0.00E+00	5.56E-02	7.18E-02
San Diego	CA	1.26E-03	0.00E+00	5.56E-02	7.18E-02
Santa Maria	CA	1.26E-03	0.00E+00	5.56E-02	7.18E-02
Ely	NV	1.26E-03	0.00E+00	5.56E-02	7.18E-02
Cedar City	UT	1.26E-03	0.00E+00	5.56E-02	7.18E-02
Albuquerque	**NM**	0.00E+00	1.60E-03	1.51E-02	7.43E-03
Las Vegas	**NV**	0.00E+00	9.68E-02	1.35E-01	1.34E-01
Phoenix	AZ	0.00E+00	9.68E-02	1.35E-01	1.34E-01
Tucson	AZ	0.00E+00	9.68E-02	1.35E-01	1.34E-01
El Paso	TX	0.00E+00	9.68E-02	1.35E-01	1.34E-01
Medford	**OR**	4.32E-02	1.26E-01	1.33E-01	1.31E-01
Great Falls	MT	4.32E-02	1.26E-01	1.33E-01	1.31E-01
Salt Lake City	UT	4.32E-02	1.26E-01	1.33E-01	1.31E-01
Grand Island	**NE**	1.96E-02	4.22E-02	1.35E-01	1.34E-01
Flagstaff	**AZ**	2.41E-02	1.05E-02	1.23E-01	1.23E-01
Dodge City	**KS**	9.44E-03	3.26E-03	1.06E-01	1.19E-01
Midland	TX	9.44E-03	3.26E-03	1.06E-01	1.19E-01
St. Cloud	**MN**	3.42E-02	2.64E-02	1.26E-01	1.26E-01
E. Lansing	**MI**	3.74E-02	4.81E-02	1.15E-01	1.11E-01
North Omaha	**NE**	2.91E-02	2.02E-02	1.26E-01	1.27E-01
Dallas	**TX**	2.41E-02	4.97E-03	1.33E-01	1.32E-01
Tulsa	OK	2.41E-02	4.97E-03	1.33E-01	1.32E-01
Brownsville	TX	2.41E-02	4.97E-03	1.33E-01	1.32E-01
Oklahoma City	**OK**	2.46E-02	7.47E-03	1.31E-01	1.30E-01
Bangor	**ME**	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Concord	NH	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Pittsburg	PA	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Portland	OR	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Caribou	ME	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Chicago	IL	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Burlington	VT	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Rutland	VT	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Seattle	WA	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Montpelier	VT	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Sault St. Marie	MI	4.32E-02	1.13E-01	1.27E-01	1.27E-01
Columbia	**MO**	4.09E-02	6.88E-02	1.32E-01	1.32E-01
Put-in-Bay	OH	4.09E-02	6.88E-02	1.32E-01	1.32E-01
Madison	WI	4.09E-02	6.88E-02	1.32E-01	1.32E-01
Columbus	OH	4.09E-02	6.88E-02	1.32E-01	1.32E-01

Table D-4: Tier 1 HELP-derived Infiltration Rates for Clay Liner Scenarios (m/yr)

City	State	Tier 1 Clay Lined Landfill Infiltration Rate (m/yr)	Tier 1 Clay Lined Waste Pile Infiltration Rate (m/yr)		
			Low Permeability Waste	Medium Permeability Waste	High Permeability Waste
Cleveland	OH	4.09E-02	6.88E-02	1.32E-01	1.32E-01
Des Moines	IA	4.09E-02	6.88E-02	1.32E-01	1.32E-01
E. St. Louis	IL	4.09E-02	6.88E-02	1.32E-01	1.32E-01
Topeka	**KS**	3.50E-02	1.74E-02	1.31E-01	1.30E-01
Tampa	**FL**	2.53E-02	2.00E-02	1.34E-01	1.33E-01
San Antonio	TX	2.53E-02	2.00E-02	1.34E-01	1.33E-01
Portland	**ME**	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Hartford	CT	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Syracuse	NY	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Worchester	MA	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Augusta	ME	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Providence	RI	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Nashua	NH	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Ithaca	NY	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Boston	MA	4.45E-02	1.19E-01	1.29E-01	1.28E-01
Schenectady	NY	4.45E-02	1.19E-01	1.29E-01	1.28E-01
New York City	**NY**	4.44E-02	1.06E-01	1.34E-01	1.33E-01
Lynchburg	VA	4.44E-02	1.06E-01	1.34E-01	1.33E-01
Philadelphia	PA	4.44E-02	1.06E-01	1.34E-01	1.33E-01
Seabrook	NJ	4.44E-02	1.06E-01	1.34E-01	1.33E-01
Indianapolis	IN	4.44E-02	1.06E-01	1.34E-01	1.33E-01
Cincinnati	OH	4.44E-02	1.06E-01	1.34E-01	1.33E-01
Bridgeport	CT	4.44E-02	1.06E-01	1.34E-01	1.33E-01
Jacksonville	**FL**	3.62E-02	8.04E-02	1.27E-01	1.27E-01
Orlando	FL	3.62E-02	8.04E-02	1.27E-01	1.27E-01
Greensboro	NC	3.62E-02	8.04E-02	1.27E-01	1.27E-01
Watkinsville	GA	3.62E-02	8.04E-02	1.27E-01	1.27E-01
Norfolk	VA	3.62E-02	8.04E-02	1.27E-01	1.27E-01
Shreveport	LA	3.62E-02	8.04E-02	1.27E-01	1.27E-01
Astoria	**OR**	5.26E-02	1.32E-01	1.35E-01	1.35E-01
New Haven	CT	5.26E-02	1.32E-01	1.35E-01	1.35E-01
Plainfield	MA	5.26E-02	1.32E-01	1.35E-01	1.35E-01
Nashville	**TN**	4.86E-02	1.26E-01	1.35E-01	1.35E-01
Knoxville	TN	4.86E-02	1.26E-01	1.35E-01	1.35E-01
Central Park	NY	4.86E-02	1.26E-01	1.35E-01	1.35E-01
Lexington	KY	4.86E-02	1.26E-01	1.35E-01	1.35E-01
Edison	NJ	4.86E-02	1.26E-01	1.35E-01	1.35E-01
Atlanta	**GA**	4.77E-02	1.18E-01	1.35E-01	1.35E-01
Little Rock	AK	4.77E-02	1.18E-01	1.35E-01	1.35E-01
Tallahassee	FL	4.77E-02	1.18E-01	1.35E-01	1.35E-01
New Orleans	LA	4.77E-02	1.18E-01	1.35E-01	1.35E-01
Charleston	SC	4.77E-02	1.18E-01	1.35E-01	1.35E-01
W. Palm Beach	FL	4.77E-02	1.18E-01	1.35E-01	1.35E-01
Lake Charles	**LA**	4.92E-02	3.84E-03	2.36E-02	2.97E-02
Miami	FL	4.92E-02	3.84E-03	2.36E-02	2.97E-02
Annette	**AK**	3.38E-02	1.35E-01	1.36E-01	1.35E-01
Bethel	**AK**	2.95E-02	3.52E-02	3.64E-02	6.60E-02
Fairbanks	**AK**	9.40E-03	9.80E-03	1.18E-02	4.07E-02
Honolulu	**HI**	4.83E-03	3.23E-02	4.94E-02	8.71E-02
San Juan	**PR**	1.93E-02	6.37E-02	7.93E-02	1.11E-01

[1)] City names in **bold face** are climate stations selected as representative of that region

Table D-5: Flow rate data used to develop landfill and waste pile composite liner infiltration rates (from TetraTech, 2001)

						Site Parameters			Landfill Cell Construction/Operation Information								
Landfill Cell ID[1]	Cell Type	Average Monthly LDS Flow Rate (L/ha/d)	(m/y)	Liner Type[2]	Type of Waste[3]	Location	Average Annual Rainfall (mm)	Subsurface Soil Type	Cell Area (ha)	GM Liner Material[4]	GM Liner Thickness (mm)	GCL or CCL Thickness (mm)	Maximum Height of Waste (m)	End Construction Date	Waste Placement Start Date	Final Closure Date	Source of Data
G228	Open	5.85	2.14E-04	GM/GCL	MSW	Mid-Atlantic	NA	NA	51	HDPE	1.5	NA	NA	1988	1989	NA	Eith & Koerner (1997)
G232	Open	11	4.02E-04	GM/GCL	MSW	Northeast	990	Silty Clay	4.7	HDPE	1.5	6	NA	May-92	May-92	Jul-94	EPA (1998)
G233	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	2	HDPE	1.5	6	24	Jun-88	Jul-88	Feb-91	EPA (1998)
G234	Open	2	7.30E-05	GM/GCL	MSW	Northeast	1040	Sand & Gravel	2	HDPE	1.5	6	24	Jun-88	Jul-88	Feb-91	EPA (1998)
G235	Open	4	1.46E-04	GM/GCL	MSW	Northeast	1040	Sand & Gravel	1.7	HDPE	1.5	6	24	Aug-88	Sep-88	Apr-93	EPA (1998)
G236	Open	1	3.65E-05	GM/GCL	MSW	Northeast	1040	Sand & Gravel	1.7	HDPE	1.5	6	24	Aug-88	Sep-88	Apr-93	EPA (1998)
G237	Open	2	7.30E-05	GM/GCL	MSW	Northeast	1040	Sand & Gravel	2.8	HDPE	1.5	6	24	Sep-88	Oct-88	-	EPA (1998)
G238	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	3.9	HDPE	1.5	6	24	Dec-88	Dec-88	-	EPA (1998)
G239	Open	2	7.30E-05	GM/GCL	MSW	Northeast	1040	Sand & Gravel	2.6	HDPE	1.5	6	24	Jan-89	Feb-89	-	EPA (1998)
G240	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	3.8	HDPE	1.5	6	24	Jul-89	Jul-89	-	EPA (1998)
G241	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	3.3	HDPE	1.5	6	24	Dec-89	Dec-89	-	EPA (1998)
G242	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	3.9	HDPE	1.5	6	24	Feb-90	Jul-90	-	EPA (1998)
G243	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	3	HDPE	1.5	6	24	Feb-90	Feb-90	-	EPA (1998)
G244	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	4	HDPE	1.5	6	24	Oct-90	Oct-90	-	EPA (1998)
G245	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	3	HDPE	1.5	6	24	Jan-91	Jan-91	-	EPA (1998)
G246	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	2.8	HDPE	1.5	6	24	Apr-92	Apr-92	-	EPA (1998)
G247	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	2.8	HDPE	1.5	6	24	May-92	May-92	-	EPA (1998)
G248	Open	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	4.5	HDPE	1.5	6	24	Jan-93	Jan-93	-	EPA (1998)
G249	Open	2	7.30E-05	GM/GCL	MSW	Northeast	760	Sand	3.8	HDPE	1.5	250	41	Sep-92	Dec-92	-	EPA (1998)
G250	Open	6	2.19E-04	GM/GCL	MSW	Southeast	1090	NA	4	HDPE	1.5	6	28	Dec-90	Feb-91	-	EPA (1998)
G251	Open	0	0.00E+00	GM/GCL	MSW	Southeast	1090	NA	2.4	HDPE	1.5	6	30	Jan-93	Jan-93	-	EPA (1998)
G252	Open	0	0.00E+00	GM/GCL	MSW	Southeast	1090	NA	2.8	HDPE	1.5	6	30	Jan-93	Jan-93	-	EPA (1998)
G232	closed	2	7.30E-05	GM/GCL	MSW	Northeast	990	Silty Clay	4.7	HDPE	1	6	NA	May-92	May-92	Jul-94	EPA (1998)
G233	closed	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	2	HDPE	1	6	24	Jun-88	Jul-88	Feb-91	EPA (1998)
G234	closed	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	2	HDPE	1	6	24	Jun-88	Jul-88	Feb-91	EPA (1998)
G235	closed	1	3.65E-05	GM/GCL	MSW	Northeast	1040	Sand & Gravel	1.7	HDPE	1	6	24	Aug-88	Sep-88	Apr-93	EPA (1998)
G236	closed	0	0.00E+00	GM/GCL	MSW	Northeast	1040	Sand & Gravel	1.7	HDPE	1	6	24	Aug-88	Sep-88	Apr-93	EPA (1998)

Notes:

1. Cell ID as reported by Tetra Tech (2001)
2. GM = geomembrane; GCL = geosynthetic clay liner
3. MSW = municipal solid waste
4. HDPE = high density polyethylene

NA = not available

- = not applicable

Data Sources:

Eith, A. W., and G.R. Koerner, 1997. Assessment of HDPE geomembrane performance in municipal waste landfill double liner system after eight years of service. Geotextiles and geomembranes, Vol. 15, pp. 277 - 287.

EPA, 1998. Assessment and Recommendations for Optimal Performance of Waste Containment Systems. Office of Research and Development, Cincinatti, Ohio.

Table D-6: Leak Density Data Used to Develop Surface Impound composite liner infiltration rates (from TetraTech, 2001)

Site ID[1]	Date	Area (m^2)	Location	Waste Type	WMU type	Type of GM Liner[2]	Thickness of GM (mm)	Quality of Material Beneath GM	Holes	Knife Cuts/Tears	Seam or Weld Defects	Total Leaks	Range of Hole Size (mm)	Leak Density (leaks/ha)	Source
L1	1995	18500	France	domestic	landfill	HDPE	2	high	0	0	5	5	NA	2.7	Rollin et al. (1999)
L2	1996	14926	France	domestic	landfill	HDPE	2	high	4	0	2	6	NA	4.02	Rollin et al. (1999)
L3	1994	13480	France	HW	landfill	HDPE	2	high	1	1	1	3	NA	2.23	Rollin et al. (1999)
L4	1995	11652	France	HW	landfill	HDPE	2	high	1	2	2	5	NA	4.29	Rollin et al. (1999)
L5	1997	8200	France	HW	landfill	HDPE	2	high	0	0	0	0	NA	0	Rollin et al. (1999)
L6	1998	9284	France	HW	landfill	HDPE	2	high	0	1	0	1	NA	1.08	Rollin et al. (1999)
L7	1995	67100	Canada	waste water treatment	pond	PBGM	3	high	3	0	2	5	NA	0.75	Rollin et al. (1999)
L8	1995	66150	Canada	waste water treatment	pond	PBGM	3	high	1	1	7	9	NA	1.36	Rollin et al. (1999)
L9	1997	11460	Canada	black liqueur	pond	PP	1.14	high	2	2	2	6	NA	5.24	Rollin et al. (1999)
L10	1998	18135	France	domestic	landfill	HDPE	2	high	0	3	3	6	NA	3.31	Rollin et al. (1999)
L86	Apr-96	9416	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L103	Oct-96	4980	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L110	Jan-97	11720	United Kingdom	NA	NA	HDPE	NA	NA	0	2	1	3	-	2.6	McQuade and Needham (1999)
L114	Jan-97	7000	United Kingdom	NA	NA	HDPE	NA	NA	0	3	1	4	-	5.7	McQuade and Needham (1999)
L136	Oct-97	13526	United Kingdom	NA	NA	HDPE	NA	NA	0	1	0	1	30x50	0.7	McQuade and Needham (1999)
L144	May-98	5608	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L152	Aug-98	3742	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L159	NA	15000	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L160	NA	10000	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L176	May-98	13500	United Kingdom	NA	NA	HDPE	NA	NA	1	0	0	1	NA	0.7	McQuade and Needham (1999)
L177	Sep-96	15000	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L178	Apr-97	7500	United Kingdom	NA	NA	HDPE	NA	NA	0	1	0	1	-	1.3	McQuade and Needham (1999)
L179	Sep-98	5000	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L180	Sep-98	13200	United Kingdom	NA	NA	HDPE	NA	NA	0	0	0	0	-	0	McQuade and Needham (1999)
L181	NA	48600	NA	waste water containment	pond	HDPE	1.5	NA	NA	NA	NA	21	NA	4.3	Laine (1991)
L182	NA	8000	NA	HW	landfill	HDPE/CCL	2	NA	NA	NA	NA	10	NA	12.5	Laine (1991)

Notes:

1. Cell ID as reported by Tetra Tech (2001)

2. HDPE = high density polyethylene; PBGM = pre-fabricated bituminous geomembrane; PP = polypropylene; CCL = compacted clay liner

NA = not available; - = not applicable

Data Sources:

Rollin, A.L., M. Marcotte, T. Jacqulein, and L. Chaput. 1999. Leak location in exposed geomembrane liners using an electrical leak detection technique. Geosynthetics '99, Vol. 2, pp. 615-626

McQuade, S.J., and A.D. Needham, 1999. Geomembrane liner defects - causes, frequency and avoidance. Geotechnical Engineering, Vol., 137. No. 4, pp. 203-213

Laine, D.L., 1991. Analysis of pinhole seam leaks located in geomembrane liners using the electrical leak location method. Proceedings, Geosynthetics '91, pp.239-253

Table D-7: Comparison of composite liner infiltration rates Calculated using Bonaparte Equation and Infiltration Rates for composite-lined landfill cells

Percentile	Calculated Infiltration (m/yr)	Observed Infiltration (m/yr)
0	0.00E+00	0.00E+00
10	0.00E+00	0.00E+00
20	0.00E+00	0.00E+00
30	0.00E+00	0.00E+00
40	1.05E-05	0.00E+00
50	1.37E-05	0.00E+00
60	2.03E-05	2.19E-05
70	3.96E-05	7.30E-05
80	6.01E-05	7.30E-05
90	7.13E-05	1.73E-04
100	1.87E-04	4.02E-04

Figure D-1: Infiltration Rate Comparison (Head =0.3m, Hole Area = 6mm^2)