

TABLE 1
Groundwater Quality Sample Locations, Frequency, and Schedule
Groundwater Quality Evaluation, 2007
St. Johns Landfill

Locations	Analytes*	Frequency	Schedule
Overbank Silt wells: Upper: D-1a, D-2a, D-3a, D-4a, D-6a, G-4a, G-5a, K-1, K-2, K-3, K-4, K-6a, Middle: D-1b, D-3b, F-1, G-2, Lower: D-1c, D-6b, G-1, G-3, G-3R, G-8a, D-4b.	Group 1a Group 1b Group 2a Group 2b Group 3	Semiannual	Spring and Fall
Columbia River Sand wells: K-6b, G-4b, G-7.	Group 1a Group 1b Group 2a Group 2b Group 3	Semiannual	Spring and Fall
Pleistocene Gravel wells: D-6c, G-5b, G-6, G-8b, G-8c.	Group 1a Group 1b Group 2a Group 2b Group 3	Semiannual	Spring and Fall
Piezometers: Transducer equipped: P-1a/b/c/d/e, P-2a/b/c/d, P-3a/b/c, P-4a/b/c, P-5a/b/c, P-6a/b/c, P- 7a/b/c/d, P-8a/b/c, P-9a/b/c/d, D-6c, G-4b, G-5b, G-6, G-8b, and G-8c.	Water levels	Continuous basis: P-1, P-4, P-6, P-7, P-8, P-9, D- 6c, G-4b, G-5b, G-6, G-8b, and G-8c. Monthly basis: P-2, P-3, P- 5, H-1, H-2, H-3, H-4, and H-5. Semiannually: all monitoring wells	
Leachate wells: H-1, H-2, H-3, H-4, H-5, K-5.	Group 1a Group 1b Group 2a Group 2b Group 3	Semiannual	Spring and Fall
	Priority Pollutants	Annual	Fall

NOTE: * - See Table 2 for Group definitions. Priority pollutants include parameters shown in Table 2. During the Fall event, a priority pollutant analysis is to be completed on nine selected groundwater monitoring wells. Semiannual compliance monitoring periods are Spring (April 1 through May 31) and Fall (October 1 through November 30). The screened locations from the Environmental Monitoring Plan are incorrect for wells D-4B and K-6B. They have been updated in this table.

TABLE 2
Groundwater Monitoring Parameters
2007 Groundwater Evaluation
St. Johns Landfill

Standard Landfill Groundwater Monitoring Parameters			St. Johns Landfill Priority Pollutant Groundwater Monitoring Parameters ¹				
Group 1a	Group 2a	Group 3	Semivolatile Organics	Semivolatile Organics	Pesticides	Herbicides	PCBs
Field Indicators	Anions and Cations	EPA 8260 (VOC)	EPA 8270c	EPA 8270c	EPA 8081a	EPA 8151a	EPA 8082
pH	Carbonate	1,1,1-trichloroethane *	1,2,4-trichlorobenzene	Benzo(k)fluoranthene	Alpha BHC	2,4-D	Aroclor 1016
Temperature	Bicarbonate	1,1,2,2-tetrachloroethane	1,2-dichlorobenzene	Benzo(a)anthracene	Lindane *	2,4-DB	Aroclor 1221
Specific Conductance	Ammonia	1,1,2-trichloroethane	1,3-dichlorobenzene	Benzoic acid	Heptachlor	2,4,5-T	Aroclor 1232
Dissolved Oxygen	Calcium	1,1,2-trichloroethylene *	1,4-dichlorobenzene *	Benzyl alcohol	Aldrin	2,4,5-TP	Aroclor 1242
Eh	Chloride	1,1-dichloroethane *	2-chlorophenol	Chrysene	Beta-BHC	Dalapon	Aroclor 1248
Water Elevation	Iron	1,1-dichloroethylene *	2,4,5-trichlorophenol	Di-n-butylphthalate	Delta-BHC	Dicamba	Aroclor 1254
	Magnesium	1,2-dichloroethane	2,4,6-trichlorophenol	Di-n-octyl phthalate	Heptachlor epoxide	Tricamba	Aroclor 1260
	Manganese	1,2-dichloroethylene *	2,4-dichlorophenol	Dibenzo(a,h)anthracene	Endosulfan I	Dichloroprop	
	Potassium	1,2-dichloropropane	2,4-dimethylphenol	Dibenzofuran	Endosulfan II	Dinoseb	
Group 1b	Sodium	2-butanone (MEK)	2,4-dinitrophenol	Diethylphthalate	Endosulfan sulfate	MCPA	
Laboratory Indicators	Silica	2-hexanone	2,4-dinitrotoluene	Dimethylphthalate	pp-DDE	MCPP	
Total Alkalinity	Sulfate	4-Bromofluorobenzene	2,6-dinitrotoluene	Fluoranthene	pp-DDD		
Total Hardness	Nitrate	4-methyl-2-pentanone (MIBK)	2-chloronaphthalene	Fluorene	pp-DDT		
Specific Conductance	Phosphorus	Acetone *	2-methylnaphthalene	Hexachlorobenzene	Endrin		
Chemical Oxygen Demand		Bromodichloromethane	2-methylphenol	Hexachlorobutadiene	Endrin aldehyde		
Total Suspended Solids		Benzene *	2-nitroaniline	Hexachloroethane	Methoxychlor		
Total Dissolved Solids	Group 2b	Bromoform	2-nitrophenol	Hexachlorocyclopentadiene	Toxaphene		
Total Organic Carbon	Trace Metals	Bromomethane	3,3-dichlorobenzidine	Indeno(1,2,3-cd)pyrene	Chlordane		
		Chlorodibromomethane	3-nitroaniline	Isophorone	Dieldrin		
	Silver	Carbon disulfide *	4,6-dinitro-2-methylphenol	N-nitrosodimethylamine			
	Arsenic *	Carbon tetrachloride *	4-bromophenyl-phenylether	N-nitrosodiphenylamine			
	Barium *	Chlorobenzene *	4-chloro-3-methylphenol	N-nitroso-di-n-propylamine			
	Beryllium	Chloroethane *	4-chlorophenyl-phenylether	Naphthalene			
	Cadmium	Chloroform	4-chloroaniline	Nitrobenzene			
	Chromium *	Chloromethane	4-methylphenol	Pentachlorophenol			
	Cobalt	Ethyl benzene *	4-nitroaniline	Phenanthrene			
	Copper	Methylene chloride *	4-nitrophenol	Phenol			
	Nickel	Styrene	Acenaphthene	Pyrene			
	Lead *	Tetrachloroethylene *	Acenaphthylene	bis-(2-ethylhexyl)phthalate			
	Antimony	Toluene *	Aniline	bis-(2-chloroethyl)ether			
	Selenium	Trichlorofluoromethane	Anthracene	bis-(2-chloroethoxy)methane			
	Thallium	Vinyl acetate	Azobenzene	bis-(2-chloroisopropyl)ether			
	Vanadium	Vinyl chloride *	Butylbenzylphthalate				
	Zinc	Xylenes (total) *	Benzo(a)anthracene				
		cis-1,3-dichloropropene	Benzo(a)pyrene	Cyanide			
		p-dichlorobenzene	Benzo(b)fluoranthene	Mercury *			
		trans-1,3-dichloropropene	Benzo(g,h,i)perylene	Nitrite			

* Confirmed Release List substance

Standard Surface Water Monitoring Parameters ²		
Group 5		
Total Kjeldahl Nitrogen	Total Coliform Bacteria	Biological Oxygen Demand
Total Phosphorus	Fecal Coliform Bacteria	Total Halogenated Organics
Orthophosphate	E. Coli	

¹ Analysis of SJLF Priority Pollutant monitoring parameters includes analysis of standard landfill groundwater monitoring parameters.

² Surface water monitoring is not required by permit.

TABLE 3
 Maximum Detected Results for Leachate from 2004 Through 2005
 Groundwater Quality Evaluation
 St. Johns Landfill, 2007

Parameter Name	Unit	Solid Waste ¹			
		H-2	H-4	H-5	K-5
General Chemistry:					
Alkalinity (bicarbonate)	mg/L	3,340	11,600	8,830	852
Alkalinity (dissolved)	mg/L	3,340	11,600	8,830	852
Alkalinity (total)	mg/L	3,640	10,200	9,490	1,000
Ammonia nitrogen	mg/L	581	2,160	1,890	33.8
Chemical oxygen demand	mg/L	1,230	52,700	118,000	107
Chloride	mg/L	1,460	2,920	4,500	0.523
Cyanide (total)	mg/L	0.0102	0.0296	0.05 U	0.0062
Hardness (total as CaCO ₃)	mg/L	411	380	423	1,150
Nitrate	mg/L	1 U	1 U	1 U	0.26
Nitrite	mg/L	1 U	10 U	10 U	1 U
ortho-phosphate as phosphorus	mg/L	5.31	18.1	17	0.01 U
Silica (SiO ₂)	mg/L	58	87.3	56.8	68.5
Specific Conductiv. (umhos/cm ³)	umhos/cm	10,100	24,200	27,000	2,850
Sulfate	mg/L	25.5	11.2	10 U	13
Total dissolved solids	mg/L	4,490	10,900	17,600	1,730
Total organic carbon	mg/L	0.371	1,830	3,250	27.1
Total suspended solids	mg/L	316	60	950	0.307
Herbicides:					
2,4-D	mg/L	0.005 U	0.015 U	0.015 U	0.003 U
Metals and Metalloids, Dissolved:					
Antimony	mg/L	0.00151		0.081	0.00095
Arsenic	mg/L	0.0702		0.232	0.0144
Barium	mg/L	0.586		0.459	0.986
Beryllium	mg/L	0.00024		0.002 U	0.0001 U
Cadmium	mg/L	0.0121		0.0128	0.00041
Chromium	mg/L	2.46		0.527	0.00378
Cobalt	mg/L	0.0837		0.233	0.00628
Copper	mg/L	0.0701		0.111	0.0346
Lead	mg/L	0.0428		0.095	0.0294
Nickel	mg/L	0.878		1.06	0.0218
Selenium	mg/L	0.149		0.146	0.0195
Thallium	mg/L	0.00024		0.002 U	0.0001 U
Vanadium	mg/L	0.0134		0.151	0.00651
Zinc	mg/L	0.0403		0.636	0.096
Metals, Total:					
Antimony	mg/L	0.00214	0.021	0.146	0.00072
Arsenic	mg/L	0.0609	0.128	0.316	0.0112
Barium	mg/L	0.672	0.685	0.713	1.05
Beryllium	mg/L	0.002 U	0.002 U	0.0036	0.0001 U
Cadmium	mg/L	0.0157	0.004	0.0915	0.0007
Calcium	mg/L	42.4	46	53.1	301
Chromium	mg/L	1.91	0.16	1.5	0.00432
Cobalt	mg/L	0.0958	0.14	0.254	0.00884
Copper	mg/L	0.101	0.00211	0.304	0.022
Iron	mg/L	3.41	1.43	33.8	135
Lead	mg/L	0.0552	0.0102	0.512	0.023
Magnesium	mg/L	74.4	66.2	71.5	97.9
Manganese	mg/L	0.169	0.246	0.154	9.62
Mercury	mg/L	0.0002 U	0.0002 U	0.0002 U	0.0002 U
Nickel	mg/L	0.667	0.382	1.67	0.0353
Potassium	mg/L	0.379	1,040	1,310	43.8
Selenium	mg/L	0.0354	0.0418	0.03	0.023
Sodium	mg/L	1,290	2,710	3,820	84.8
Thallium	mg/L	0.002 U	0.002 U	0.0032	0.00013
Vanadium	mg/L	0.1 U	0.039	0.154	0.005 U
Zinc	mg/L	0.0496	0.043	7.81	0.0784
Polychlorinated Biphenyls:					
PCB Arochlor-1242	mg/L	0.00279	0.00157	0.000556 U	0.0005 U
PCB Arochlor-1254	mg/L	0.000521 U	0.000539	0.00106	0.0005 U
Semi-volatile Organic Compounds:					
4-methylphenol ¹	mg/L	0.0312 U	0.222 U	0.588 U	0.0488
bis-(2-ethylhexyl)phthalate	mg/L	0.0728	0.527	1.21	0.01 U
N-nitrosodiphenylamine	mg/L	0.0312 U	0.222 U	0.588 U	0.005 U
Volatile Organic Compounds:					
1,1,1-trichloroethane	mg/L	0.02 U	0.02 U	0.1 U	0.01 U
1,1-dichloroethane	mg/L	0.01 U	0.01 U	0.05 U	0.005 U
1,1-dichloroethene	mg/L	0.01 U	0.01 U	0.05 U	0.005 U
1,2,4-trimethylbenzene	mg/L	0.02 U	0.0212	0.0798	0.01 U
1,2-Dichlorobenzene	mg/L	0.00093	0.00104	0.05 U	0.005 U
1,3,5-trimethylbenzene	mg/L	0.01 U	0.0077	0.028	0.005 U
1,3-Dichlorobenzene	mg/L	0.01 U	0.01 U	0.05 U	0.005 U
1,4-Dichlorobenzene	mg/L	0.0058	0.0114	0.0399	0.005 U
2-butanone (MEK)	mg/L	0.2 U	0.0131	1 U	0.1 U
Acetone	mg/L	0.5 U	0.0333	2.5 U	0.25 U
Benzene	mg/L	0.0341	0.0026	0.05 U	0.005 U
Chlorobenzene	mg/L	0.006	0.00068	0.05 U	0.005 U
cis-1,2-dichloroethene	mg/L	0.01 U	0.0108	0.355	0.005 U
Ethyl benzene	mg/L	0.01 U	0.0256	0.0648	0.005 U
Isopropylbenzene	mg/L	0.00249	0.00277	0.2 U	0.02 U
m,p-Xylene	mg/L	0.00124	0.0384	0.194	0.01 U
Naphthalene	mg/L	0.00889	0.0227	0.075	0.02 U
n-propylbenzene	mg/L	0.00305	0.0039	0.013	0.005 U
o-Xylene	mg/L	0.00139	0.0208	0.077	0.005 U
para-isopropyltoluene	mg/L	0.04 U	0.149	0.723	0.02 U
Secondary-butylbenzene	mg/L	0.00167	0.01 U	0.05 U	0.005 U
Styrene	mg/L	0.01 U	0.00275	0.0039	0.005 U
Tetrachloroethene	mg/L	0.01 U	0.01 U	0.05 U	0.005 U
Toluene	mg/L	0.01 U	0.0615	0.192	0.005 U
trans-1,2-dichloroethene	mg/L	0.01 U	0.01 U	0.0036	0.005 U
Trichloroethene	mg/L	0.01 U	0.01 U	0.05 U	0.005 U
Notes:					
Maximum Detected Results from Metro St. Johns EMIS Database					
U = Not detected above detection limit.					
1) H1 and H3 could not be sampled in 2004 and 2005.					

TABLE 5

Most Frequently Detected VOCs in St. Johns Landfill Leachate

*Groundwater Quality Evaluation**St. Johns Landfill, 2007*

Organic Compound	Median Concentration Detected in Groundwater (mg/L)	Minimum Concentration Detected in Groundwater (mg/L)	Maximum Concentration Detected in Groundwater (mg/L)	Detected in Groundwater	Lowest Sedimentary Horizon Detected
Aromatic					
1,2,4-trimethylbenzene	0.042	0.002	0.111	N	NA
1,3,5-trimethylbenzene	0.013	0.001	0.035	Y	Upper OBS (K-2)
1,4-Dichlorobenzene	0.011	0.005	0.040	Y	Lower OBS
Benzene	0.026	0.003	0.051	Y	Lower OBS
Chlorobenzene	0.006	0.001	0.008	Y	CRS
Ethyl benzene	0.036	0.002	0.213	Y	Lower OBS
m,p-Xylene	0.053	0.001	0.321	Y	Lower OBS
o-Xylene	0.025	0.001	0.106	Y	Upper OBS
Naphthalene	0.035	0.009	0.522	N	NA
n-propylbenzene	0.008	0.003	0.023	Y	Upper OBS
para-isopropyltoluene	0.156	0.010	0.723	N	NA
Toluene	0.064	0.005	0.251	Y	Lower OBS
Aliphatic					
cis-1,2,-dichloroethene	0.012	0.001	0.355	Y	PG
Notes:					
1) Includes Leachate H-series wells and monitoring well K-5.					
2) Frequently detected VOCs are defined as VOC constituents with 8 or more detections in leachate wells from Spring 2001 through Spring 2006.					
3) Median, maximum, and minimum values are based on detected values only.					

TABLE 6

Distribution of Frequent VOC Detections in Monitoring Well Network (2004 - 2005)

*Groundwater Quality Evaluation**St. Johns Landfill, 2007*

Organic Compound	Median Concentration Detected in Groundwater (mg/L)	Minimum Concentration Detected in Groundwater (mg/L)	Maximum Concentration Detected in Groundwater (mg/L)	Detections in Upper OBS	Detections in Middle OBS	Detections in Lower OBS	Detections in CRS/PG
Aromatic							
1,4-Dichlorobenzene	0.0017	0.0012	0.0032	11	0	0	0
Chlorobenzene	0.0042	0.0006	0.0306	15	0	3	0
Aliphatic							
1,1,1-trichloroethane	0.0046	0.0029	0.0088	0	0	0	8
1,1-dichloroethane	0.0025	0.0006	0.0343	0	0	0	19
1,1-dichloroethene	0.0038	0.0010	0.0064	0	0	0	7
cis-1,2,-dichloroethene	0.0064	0.0006	0.1270	0	0	0	18
Tetrachloroethene	0.0031	0.0005	0.0125	0	0	0	16
trans-1,2-dichloroethene	0.0014	0.0005	0.0054	0	0	0	6
Notes							
1) Frequent VOC detections are defined as VOC constituents with more than 8 detections from 2004 through 2005.							

TABLE 7
 Summary of Median Values for Leachate Indicator Constituents
Groundwater Quality Evaluation
St. Johns Landfill, 2007

	Total Dissolved Solids (mg/L)	Chloride (mg/L)	Ammonia as Nitrogen (mg/L)	Alkalinity (mg/L)	Chemical Oxygen Demand (mg/L)
EPA Primary and Secondary Drinking Water Standard	500	250			
Background Concentration	321	6.985	5.23	282	22.7
Leachate Wells					
H-2	500	1340	548	3150	1090
H-3	4380	3580	1645	8390	5495
H-4	12050	2820	1910	9560	6010
H-5	10800	4500	1580	8665	11950
K-5 ^a	18000	512	33.4	766	108.5
Upper OBS Wells					
D-1A	1060	188	7.945	692	63.8
D-2A	546	44.5	59.5	580	104
D-3A	1090	200.5	29.65	800	102
D-4A	915	171	34.3	676	77.8
D-6A	640	15.65	4.31	612	40.2
G-4A	310	6.37	1.34	262	10
G-5A	321	6.985	5.23	282	22.7
K-1	2000	633.5	52.15	890	238
K-2	630	62.35	43.65	616	91.8
K-3	1310	310	76.75	238	104.35
K-4	648	26.2	0.79	606	35.15
K-6A	1580	234	69.65	1090	133.5
Middle OBS Wells					
D-1B	541	13.35	16.75	536	24.05
D-3B	1200	309.5	4.495	502	49.25
F-1	207	5.19	1.67	151.5	10
G-2	431	3.98	12.8	423	17.9
Lower OBS Wells					
D-1C	415	15.85	14.4	380	43.6
D-4B	391	3.405	16	384.5	17.85
D-6B	278	3.19	5.95	230	12.55
G-1	557	3.125	24.95	594	28.2
G-3 ^b	315	3.1	5.7	300	15
G-3R	305	3.13	7.44	280	11
G-8A	406	3.635	0.05	236	5
CRS/PG Wells					
G-4B	230	9.155	0.05	140	8.225
G-5B	230	6.395	0.0605	130	7.37
G-7	1670	519	13.9	669	132.5
K-6B	600	23.3	11.1	540	29.65
D-6C	251	6.675	0.05	124	5
G-6	350	13	0.56	207.5	9.77
G-8B	175	3.605	0.05	68.4	5
G-8C	250	7.36	0.05	118	5

Notes:
 a = K-5 is considered a leachate monitoring well because it is screened across buried refuse.
 b = G-3 was abandoned in 2005 and replaced with G-3R.
 Median values were calculated using 1/2 detection limit for nondetected values.
 G-4A and G-5A were used as background wells.

	1.5 x Background
	2 x Background
	10 x Background