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December 2, 1993

Ms. Kathleen McCue
Project Manager
Bureau of Eastern Remedial Action
Division. of Hazardous Waste Remediation
NYSDEC
50 Wolf Road
Albany, NY 12233

DEC 6 1993

RE: RAMAPO LANDFILL REMEDIAL DESIGN
RESULTS OF THIRD QUARTER MONITORING

Dear Ms. McCue:

Attached are the results of the third quarter monitoring event which was conducted as part of the Remedial Design phase of the Ramapo Landfill Remediation Project. This document provides the validated analytical data for the third of four quarterly sampling events, which are included in the project. It further includes historical analytical data tables for the four targets compounds agreed to by the agencies, i.e., benzene, chromium, iron and manganese. Locations sampled during the third quarter are shown in Figure 1. The third quarter monitoring event was conducted the week of September 20, 1993.

The third round samples were analyzed for routine parameters, site parameters and pesticides (alpha, gamma and delta-BHC). Only 4OS, 4I, 4R, 5I, 5R, 7OS, 7R, 9OS, 9I, and 9R were analyzed for pesticides following NYSDEC direction in your August 27, 1993 letter to the Town of Ramapo.

The third quarter samples were collected during a period of low water conditions in the groundwater aquifer as well as in the Ramapo River. As a result of the low river water level, the four Spring Valley Water Co. wells scheduled for sampling were not in operation at this time. It was agreed with the Hackensack (Spring Valley) Water Co. personnel and NYSDEC that only one of the four well field wells would be sampled. The well closest to the landfill, SVW-C95 was operated to allow sampling. As a result of the low groundwater table, well 5OS could not be sampled.

The fourth quarter monitoring even is tentatively scheduled for the week of December 13, 1993. Please feel free to call if you have any questions or wish to discuss the results.

Sincerely,

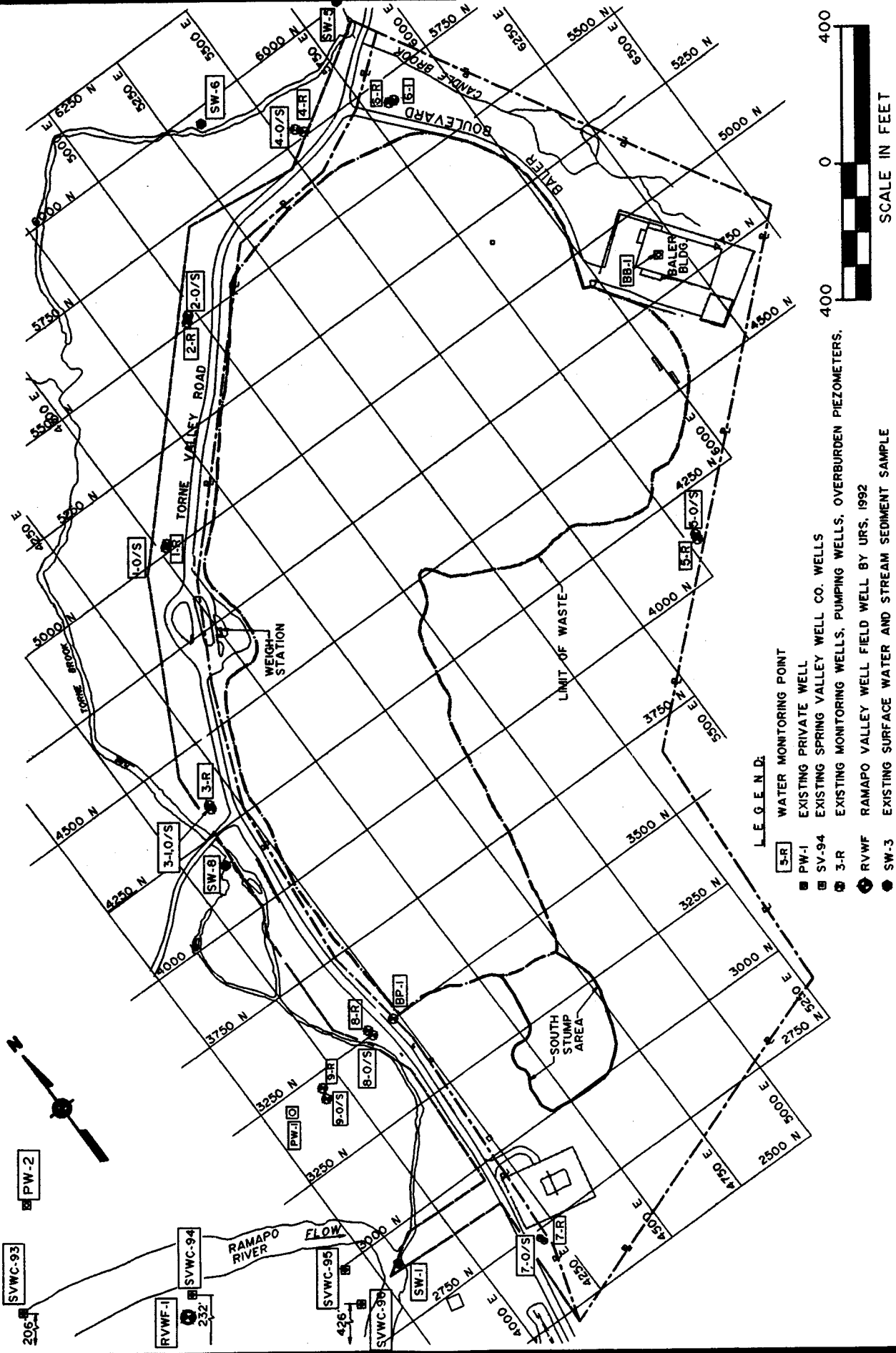


James Lanzo, P.E.
Project Manager

JL/hs

Enclosure

cc: Supervisor Reisman - Town of Ramapo
G. Ostertag - Town of Ramapo
R. Najjar - URS
File: 35314 (VI-C)



**RAMAPO LANDFILL
SAMPLE LOCATIONS**

FIGURE 1

TABLE 1
RAMAPO LANDFILL - SEPTEMBER 1993 SAMPLING

ANALYTE	CONCENTRATION (µg/L)									
	1-OS	1-R	2-OS	2-R	3-OS/I	3-R	4-I	4-OS	4-R	5-I
1,1-Dichloroethane	--	--	--	--	--	--	--	--	2	--
Chlorobenzene	--	--	--	--	--	--	--	--	--	--
Benzene	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl)phthalate	R	R	R	R	R	R	--	R	R	--
Dibenzofuran	--	--	--	--	--	--	--	--	--	--
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	--
gamma BHC	--	--	--	--	--	--	--	--	--	--
delta-BHC	--	--	--	--	--	--	--	--	--	--
alpha-BHC	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	3.1 □	--	--
Arsenic	2.2 □	--	--	--	1.8 □	--	--	--	--	--
Cadmium	--	--	--	--	--	--	--	--	--	--
Calcium	92,800	99,900	84,900	53,600	90,800	76,400	--	29,200	47,400	--
Chromium	60	84.9	50.2	14.8	1,350	--	--	10.8	--	--
Copper	45.8	22.9 □	20.2 □	11.5 □	31.8	11.7 □	--	10.6 □	--	--
Iron	32,300	1,940	11,800	1,120	21,300	3,280	--	5,560	3,100	--
Lead	8.7	3.4	8.7	1.1 □	8.7	2.6 □	--	--	--	--
Magnesium	27,900	19,300	19,800	9,940	24,600	24,200	--	10,200	17,300	--
Manganese	4,010	143	4,850	126	9,590	11,000	--	2,080	1,160	--
Mercury	0.15 □	--	--	--	--	--	--	--	--	--
Nickel	49.0	61.0	48.3	--	1,070	34.2 □	--	--	--	--
Potassium	6,000	2,380 □	2,880 □	1,310	5,920	1,710	--	1,240	1,450	--
Sodium	55,000	19,800	12,900	6,720	77,400	49,100	--	22,900	12,900	--
Zinc	68.5	63.7	46.8	20.7	55.0	39.1	--	30.6	11.3 □	--

R - Compound rejected due to contamination in the associated blank
 □ - The reported value is less than CRDL but greater than the IDL.

TABLE 1 (Cont'd)
RAMAPO LANDFILL - SEPTEMBER 1993 SAMPLING

ANALYTE	CONCENTRATION (µg/L)										
	5-R	6-I	6-R	7-I	7-OS	7-R	8-OS	8-R	9-I	9-OS	9-R
1,1-Dichloroethane	--	--	--	--	--	--	--	--	--	--	--
Chlorobenzene	--	--	--	--	--	--	1	--	--	--	2
Benzene	--	--	--	--	--	--	--	--	--	--	--
Vinyl Chloride	--	--	--	--	--	--	--	--	--	--	--
Hexachlorobenzene	--	--	--	--	--	--	--	--	--	--	--
Bis(2-Ethylhexyl)phthalate	R	R	R	--	12 B	R	R	R	--	45 B	R
Dibenzofuran	--	--	--	--	--	--	--	--	--	--	--
Di-n-octylphthalate	--	--	--	--	--	--	--	--	--	1 J	--
gamma BHC	--	--	--	--	--	--	--	--	--	--	--
delta-BHC	--	--	--	--	--	--	--	--	--	--	--
alpha-BHC	--	--	--	--	--	--	--	--	--	--	--
Antimony	--	--	--	--	--	--	--	--	--	--	--
Arsenic	--	--	--	--	9.4 □	--	--	9.4 □	--	--	3.0 □
Cadmium	--	--	--	--	3.8 □	--	--	--	--	--	--
Calcium	13,100	21,500	24,600	--	124,000	66,200	34,600	66,700	--	7,150	39,800
Chromium	--	13.4	27.7	--	1,890	--	--	17.7	--	--	16.7
Copper	5.6 □	4.5 □	6.3 □	--	948	11.1 □	5.9 □	9.7 □	--	2.7 □	4.5 □
Iron	751	332	662	--	619,000	989	6,180	9,160	--	383	11,500
Lead	--	1.6 □	2.4 □	--	250 +	2.1 □W	--	2.4 □	--	6.3	1.6 □
Magnesium	4,570 □	5,480	5,800	--	101,000	17,200	10,600	15,500	--	1,770	12,800
Manganese	11.4 □	34.4	60.7	--	45,100	114	3,330	2,440	--	9.6 □	2,540
Mercury	--	--	--	--	20.0	--	0.29	0.47	--	--	0.12 □
Nickel	--	--	--	--	1,130	--	20.3 □	25.6	--	--	20.9 □
Potassium	836 □	1,120	1,210 □	--	62,000	2,250	17,100	20,100	--	569 □	18,400
Sodium	4,110 □	5,350	5,580	--	67,000	18,200	53,500	66,900	--	2,680 □	83,600
Zinc	35.3	23.1	16.3 □	--	1,190	39.4	24.3	25.4	--	14.7 □	30.0

J - Concentration is less than the contract required detection limit, but > 0

B - Compound detected in the associated method blank

R - Compound rejected due to contamination in the associated blank

[] - The reported value is less than CRDL but greater than the IDL.

+ - Correlation coefficient for the MSA is less than 0.995

W - Post digestion spike for GFAA is out of control limits (85-115%) while sample absorbance is < 50% of spike absorbance

TABLE 1 (Cont'd)
RAMAPO LANDFILL - SEPTEMBER 1993 SAMPLING

ANALYTE	CONCENTRATION (µg/L)						
	BB-1	PW-1	PW-2	RVWF-1	SVWC-95	ARARs @	
1,1-Dichloroethane	--	--	--	--	--	5	
Chlorobenzene	--	--	--	--	--	5 §	
Benzene	--	--	--	--	--	0.7 @	
Vinyl Chloride	--	--	--	--	--	2	
Hexachlorobenzene	--	--	--	--	--	0.35	
Bis(2-Ethylhexyl)phthalate	R	13 B	48 B	R	11 B	50	
Dibenzofuran	--	--	--	--	--	50 □	
Di-n-octylphthalate	--	--	--	--	--	50	
gamma BHC	--	--	--	--	--	ND	
delta-BHC	--	--	--	--	--	ND	
alpha-BHC	--	--	--	--	--	ND	
Antimony	--	--	--	--	--	3	
Arsenic	--	--	--	--	--	25	
Cadmium	--	--	--	--	--	10	
Calcium	17,200	8,740	49,300	29,200	31.2 □	--	
Chromium	--	--	--	13.2	--	50	
Copper	32.5	110	--	8.3 □	--	200	
Iron	247	1,260	--	202	--	300	
Lead	1.6 □	4.1	0.70 □	--	1.6 □	15 ¥	
Magnesium	3,690 □	2,620 □	5,720	8,060	--	35,000	
Manganese	11.1 □	--	6.3 □	1710	--	300	
Mercury	--	--	--	--	--	2	
Nickel	--	--	--	15.8 □	--	--	
Potassium	705 □	730 □	1,240 □	2,530 □	--	--	
Sodium	5,260	5,330	12,100	39,100	58.6 □	20,000	
Zinc	250	12.7 □	58.4	36.9	--	300	

@ - Values obtained from Water Quality Regulations for Surface Waters and Groundwaters 6 NYCRR Parts 700-705, September 1, 1991, unless otherwise indicated.

§ - Values obtained from Chapter I - New York State Sanitary Code, Subpart 5-1, Principle Organic Contaminants.

□ - Value obtained from Chapter I - New York State Sanitary Code, Subpart 5-1, Unspecified Organic Contaminants.

¥ - USEPA action level

R - Compound rejected due to contamination in the associated blank
B - Compound detected in the associated method blank
□ - The reported value is less than CRDL but greater than the IDL.

TABLE 1 (Cont'd)
RAMAPO LANDFILL - SEPTEMBER 1993 SAMPLING

ANALYTE	CONCENTRATION (µg/L)					
	SW-1	SW-5	SW-6	SW-8	ARARs æ	
1,1-Dichloroethane	--	--	--	--	0.07	
Chlorobenzene	--	--	--	--	20	
Benzene	--	--	--	--	0.7	
Vinyl Chloride	--	--	--	--	0.3	
Hexachlorobenzene	--	--	--	--	0.02	
Bis(2-Ethylhexyl)phthalate	21 B	R	R	R	0.6	
Dibenzofuran	--	--	--	--	50	
Di-n-octylphthalate	--	--	--	--	50	
gamma BHC	--	--	--	--	0.01	
delta-BHC	--	--	--	--	0.01	
alpha-BHC	--	--	--	--	0.01	
Antimony	--	--	--	--	3	
Arsenic	--	--	--	--	50	
Cadmium	--	--	--	--	10, c	
Calcium	31,100	9,500	10,500	10,900	--	
Chromium	--	--	--	--	50, c	
Copper	4.8 []	--	--	6.3 []	200, c	
Iron	170	168	76.7	--	300	
Lead	0.8 []	3.1 W	--	--	50, c	
Magnesium	8,100	2,260 []	2,500 []	2,600 []	35,000	
Manganese	50.4	70.8	14.4 []	8.6 []	300	
Mercury	--	--	--	--	0.012 £	
Nickel	--	--	--	--	1.30E-07 £	
Potassium	3,520	611	644	667 []	--	
Sodium	58,100	4,650 []	5,110	5,350	--	
Zinc	--	--	--	--	30	

æ - Values obtained from Water Quality Regulations for Surface Waters and Groundwaters 6 NYCRR Parts 700-705, September 1, 1991, unless otherwise indicated.

£ - Clean Water Act

c - ARAR value must be calculated; see next page.

B - Compound detected in the associated method blank

R - Compound rejected due to contamination in the associated blank

[] - The reported value is less than CRDL but greater than the IDL.

W - Post digestion spike for GFAA is out of control limits (85-115%) while sample absorbance is < 50% of spike absorbance

TABLE 2

RAMAPO LANDFILL

GROUNDWATER AND SURFACE WATER

MONITORING DATA

COMPOUND: Benzene

Sample ID	Date of Sampling Event				
	1/90	9/90	1/93	4/93	9/93
1 O/S	ND	ND	ND	ND	ND
1 R	ND	ND	ND	ND	ND
2 O/S	ND	ND	NA	ND	ND
2 R	ND	ND	NA	ND	ND
3 O/S	ND	ND	ND	ND	ND
3 R	ND	ND	ND	ND	ND
4 O/S	ND	0.3	ND	ND	ND
4 R	1.0	1.0	ND	0.7	ND
5 O/S	2.0	ND	ND	ND	NA
5 R	ND	ND	ND	ND	ND
6 I	NA	0.2	ND	ND	ND
6 R	NA	ND	ND	ND	ND
7 O/S	ND	ND	ND	ND	ND
7 R	ND	ND	ND	ND	ND
8 O/S	2.0	0.3	ND	ND	ND
8 R	3.0	0.4	ND	0.9	ND
9 O/S	NA	ND	ND	ND	ND
9 R	NA	0.9	ND	ND	ND
PW-1	NA	ND	ND	ND	ND
PW-2	NA	NA *	ND	ND	ND
BP-1	NA	NA	ND	NA	NA
BB-1	NA	NA	ND	ND	ND
RVWF-1	NA	NA	ND	ND	ND
SVWC-93	NA	NA	ND	ND	NA
SVWC-94	NA	NA	ND	ND	NA
SVWC-95	NA	NA	ND	ND	ND
SVWC-96	NA	NA	ND	ND	NA
Surface Water					
Sample ID	Date of Sampling Event				
	10/89	7/90	1/934	4/93	9/93
SW-1	ND	NA	ND	ND	ND
SW-5	ND	ND	ND	ND	ND
SW-6	NA	ND	ND	ND	ND
SW-8	NA	ND	ND	ND	ND

Notes: Concentration reported in $\mu\text{g/L}$ (ppb).

ND - Not detected

NA - Not applicable (e.g. well not installed by this date or if installed, not sampled)

* NYSDOH results from 3/92 sampling.

 - Exceeded ARAR value of 0.7 ppb for groundwater.

TABLE 3
RAMAPO LANDFILL
GROUNDWATER AND SURFACE WATER
MONITORING DATA
COMPOUND: Chromium

Sample ID	Date of Sampling Event				
	1/90	9/90	1/93	4/93	9/93
1 O/S	153	57.3	8	ND	60.0
1 R	39.7	17.5	ND	ND	84.9
2 O/S	180	141	NA	ND	50.2
2 R	16.1	5.5	NA	ND	14.8
3 O/S	587	1290	807	40.4	1350
3 R	28	11.4	ND	ND	ND
4 O/S	139	40.1	5.8	ND	10.8
4 R	35.5	13.1	ND	8.8	ND
5 O/S	90	35.6	48.8	ND	NA
5 R	27.4	29.3	6.8	ND	ND
6 I	NA	28.7	ND	ND	13.4
6 R	NA	31.1	24	34.8	27.7
7 O/S	33.5	40.1	24.2	13.0	1890
7 R	16.2	16.8	ND	ND	ND
8 O/S	34.8	16.7	ND	ND	ND
8 R	20	23.1	9.9	ND	17.7
9 O/S	NA	6.8	ND	ND	ND
9 R	NA	8.8	3.9	16.4	16.7
PW-1	NA	ND	ND	ND	ND
PW-2	NA	ND *	ND	ND	ND
BP-1	NA	NA	ND	NA	NA
BB-1	NA	NA	ND	ND	ND
RVWF-1	NA	NA	25.2	14.7	13.2
SVWC-93	NA	NA	ND	ND	NA
SVWC-94	NA	NA	ND	ND	NA
SVWC-95	NA	NA	ND	ND	ND
SVWC-96	NA	NA	ND	ND	NA
Surface Water					
	Date of Sampling Event				
Sample ID	10/89	7/90	1/93	4/93	9/93
SW-1	ND	NA	ND	ND	ND
SW-5	ND	ND	ND	ND	ND
SW-6	NA	ND	ND	ND	ND
SW-8	NA	ND	ND	ND	ND

Notes: Concentration reported in $\mu\text{g/L}$ (ppb).

ND - Not detected

NA - Not applicable (e.g. well not installed by this date or if installed, not sampled)

* NYSDOH results from 3/92 sampling.

	- Exceeded ARAR value of 50 ppb for groundwater.
	- Exceeded ARAR value of 50 ppb for surface water.

The ARAR for SW-1 (Class A water body) is 50 ppb.

TABLE 4

RAMAPO LANDFILL

GROUNDWATER AND SURFACE WATER

MONITORING DATA

COMPOUND: Iron

Sample ID	Date of Sampling Event				
	1/90	9/90	1/93	4/93	9/93
1 O/S	45000	17500	1870	884	32300
1 R	1180	2650	395	197	1940
2 O/S	912	41800	NA	186	11800
2R	409	602	NA	674	1120
3 O/S	6830	9750	5110	333	21300
3 R	1930	1370	11500	2940	3280
4 O/S	15600	12400	529	520	5560
4 R	8230	5290	3520	4920	3100
5 O/S	27000	11200	11100	4700	NA
5 R	658	368	620	2310	751
6 I	NA	486	953	17.3	332
6 R	NA	683	1220	715	662
7 O/S	981	24500	1250	521	619000
7 R	ND	1940	31.5	56.6	989
8 O/S	229000	43800	3230	2080	6180
8 R	1360	2940	11600	2590	9160
9 O/S	NA	249	50.7	1200	383
9 R	NA	20200	2680	8250	11500
PW-1	NA	64	186	130	1260
PW-2	NA	11 *	41.8	49.5	ND
BP-1	NA	NA	274	NA	NA
BB-1	NA	NA	NA	297	247
RVWF-1	NA	NA	362	207	202
SVWC-93	NA	NA	32.6	10.6	NA
SVWC-94	NA	NA	40.3	19.1	NA
SVWC-95	NA	NA	51.7	74.4	ND
SVWC-96	NA	NA	22.3	17.3	NA
Surface Water	Date of Sampling Event				
Sample ID	10/89	7/90	1/93	4/93	9/93
SW-1	2630	NA	141	1670	170
SW-5	93	163	194	204	168
SW-6	NA	177	82.5	245	76.7
SW-8	NA	1290	109	341	ND

Notes: Concentration reported in $\mu\text{g/L}$ (ppb).

ND - Not detected

NA - Not applicable (e.g. well not installed by this date or if installed, not sampled)

* NYSDOH results from 3/92 sampling.

	- Exceeded ARAR value of 300 ppb for groundwater.
	- Exceeded ARAR value of 300 ppb for surface water.

TABLE 5
RAMAPO LANDFILL
GROUNDWATER AND SURFACE WATER
MONITORING DATA
COMPOUND: Manganese

Sample ID	Date of Sampling Event				
	1/90	9/90	1/93	4/93	9/93
1 O/S	3,790.0	3,700.0	809.0	1410	4010
1 R	144.0	98.5	61.4	38.7	143
2 O/S	298.0	4770.0	NA	27.0	4850
2R	197.0	135.0	NA	118	126
3 O/S	8,700.0	18,100.0	3,450.0	1690	9590
3 R	7,230.0	12,400.0	10,700.0	12900	11000
4 O/S	4,210.0	5,020.0	547.0	506	2080
4 R	1,730.0	1,520.0	1,660.0	1890	1160
5 O/S	981.0	530.0	192.0	43.2	NA
5 R	22.3	9.3	9.6	21.9	11.4
6 I	NA	33.1	151.0	1.3	34.4
6 R	NA	14.3	100.0	57.5	60.7
7 O/S	1,240.0	3,260.0	48.3	46.1	45100
7 R	51.9	102.0	46.1	51.8	114
8 O/S	2,830.0	2,750.0	1,680.0	1640	3330
8 R	872.0	181.0	1,660.0	2600	2440
9 O/S	NA	14.6	ND	21.1	9.6
9 R	NA	3,270.0	2,320.0	2280	2540
PW-1	NA	ND	1.2	1.8	ND
PW-2	NA	ND *	4.7	7.5	6.3
BP-1	NA	NA	4,630.0	NA	NA
BB-1	NA	NA	7.9	11.7	11.1
RVWF-1	NA	NA	839.0	40.2	1710
SVWC-93	NA	NA	ND	1.7	NA
SVWC-94	NA	NA	7.3	ND	NA
SVWC-95	NA	NA	56.4	1.8	ND
SVWC-96	NA	NA	ND	ND	NA
Surface Water	Date of Sampling Event				
Sample ID	10/89	7/90	1/93	4/93	9/93
SW-1	1,120.0	NA	16.6	107	50.4
SW-5	19.5	44.5	19.3	27.9	70.8
SW-6	NA	31.9	14.5	23.9	14.4
SW-8	NA	153.0	10.9	28.5	8.6

Notes: Concentration reported in µg/L (ppb).

ND - Not detected

NA - Not applicable (e.g. well not installed by this date or if installed, not sampled)

* NYSDOH results from 3/92 sampling.

 - Exceeded ARAR value of 300 ppb for groundwater.