5.6.5 Soil

Over 650 soil samples were collected from different areas at the site and background locations. The results discussion is broken down into the following three sub sections: UPA/UNPA, WBA, and off-site.

5.6.5.1 Upland Area Soil

Over 100 soil samples were collected from the UPA and UNPA. There were analyzed for a variety of contaminants and summarized below.

VOCs

Ninety-eight soil samples were collected from the UPA and 10 soil samples from the UNPA. Sample depths ranged from the surface soil to ten ft bgs. Twenty-four VOCs were detected in the UPA, while only three VOCs were detected in the UNPA. **Table 54** summarizes VOCs detected, frequency of detection, concentration ranges and location of the maximum concentration.

Table 54: Upland Area Soil Data Summary - VOCs

Analyte	FOD%	minimum conc.	maximum conc.	maximum location	maximum location depth (feet)
VOCs via method SW8260. Concentration units are in µg/kg.					
1,1-dichloroethane	2%	0.95	2.4	SB-68V	5-10
1,2-dibromo-3-chloropropane	1%	0.89	0.89	SB-77	0-0.5
1,2-dichloroethene (total)	3%	52	52	SB-10	2-2.5
2-butanone	4%	5	600	SB-13	0-0.5
acetone	31%	4.9	28,000	SB-7	1-2
acetophenone	7%	120	220	HC-02	SS
benzene	2%	0.7	3.3	SB-1	2-3.5
bromodichloromethane	2%	6.5	360	SB-13	0-0.5
bromoform	2%	4.5	140	SB-13	0-0.5
bromomethane	1%	3.9	3.9	SB-8	0-0.5
carbon disulfide	27%	0.66	4,800	SB-7	1-2
carbon tetrachloride	3%	3.3	2,400	SB-13	0-0.5
chlorodibromomethane	1%	1.2	1.2	SB-13	2-4
chloroform	8%	1.4	20,000	SB-13	0-0.5
cis-1,2-dichloroethene	3%	0.82	1	SB-70V	1-5
ethylbenzene	3%	1.5	180	SB-13	0-0.5
isopropylbenzene (cumene)	1%	1.9	1.9	SB-310V	0-0.5
methyl isobutyl ketone	23%	4.7	48	SB-13	2-4
methylene chloride	1%	230	230	SB-13	0-0.5
styrene	1%	900	900	SB-13	0-0.5
tetrachloroethene (PCE)	7%	1.1	870	SB-13	0-0.5

Analyte	FOD%	minimum conc.	maximum conc.	maximum location	maximum location depth (feet)
toluene	10%	0.81	5	HC-03	SBA
trans-1,2-dichloroethene	2%	2.1	2.1	SB-68V	5-10
trichloroethene (TCE)	6%	0.72	84	SB-13	0-0.5
vinyl chloride	2%	3.4	8.1	SB-10	2-2.5
xylenes (total)	2%	3.3	300	SB-13	0-0.5

SVOCs

One hundred and two soil samples were collected from the UPA and 14 soil samples were collected from the UNPA and analyzed for SVOCs. Sample depths ranged from the surface soil to ten ft bgs. Forty-seven SVOCs were detected in the UPA, while only 21 SVOCs were detected in the UNPA. **Table 55** summarizes SVOCs detected, frequency of detection, concentration ranges and location of the maximum concentration.

Table 55: Upland Area Soil Data Summary - SVOCs

Analyte	FOD%	minimum conc.	maximum conc.	maximum location	maximum location depth (feet)
SVOCs via method SW8270. Concentration units are in mg/kg.					
1,1-biphenyl	2%	0.35	0.35	HC-05	SBB
1,2,4-trichlorobenzene	4%	0.03	0.11	SB-1	2-3.5
1,3-dichlorobenzene	3%	0.033	0.039	SB-3	2-5
1,4-dichlorobenzene	1%	0.039	0.039	SB-13	0-0.5
2,4,6-trichlorophenol	1%	2.6	2.6	SB-13	0-0.5
2,4-dichlorophenol	1%	0.12	0.12	SB-13	0-0.5
2,4-dimethylphenol	2%	0.11	0.12	SB-9	0-0.5
2,6-dinitrotoluene	2%	0.14	0.16	SB-8	0-0.5
2-methylnaphthalene	9%	0.021	2.3	SB-14	0-0.5
2-methylphenol	1%	0.075	0.075	SB-14	0-0.5
3,3-dichlorobenzidine	1%	0.18	0.18	SB-70	1-5
3+4-methylphenol	5%	0.062	0.3	HC-06	SBB
4-methylphenol	2%	0.066	0.066	SB-68	5-10
acenaphthene	10%	0.0027	9.3	SB-14	0-0.5
acenaphthylene	3%	0.0025	0.15	SB-14	0-0.5
anthracene	15%	0.0023	16	SB-14	0-0.5
benzaldehyde	4%	0.11	0.28	HB-05	SBB
benzo(a)anthracene	47%	0.0047	37	SB-14	0-0.5

Analyte	FOD%	minimum conc.	maximum conc.	maximum location	maximum location depth (feet)
benzo(a)pyrene	28%	0.0045	26	SB-14	0-0.5
benzo(b)fluoranthene	34%	0.02	30	SB-14	0-0.5
benzo(g,h,i)perylene	32%	0.0057	13	SB-14	0-0.5
benzo(k)fluoranthene	36%	0.014	24	SB-14	0-0.5
bis(2-ethylhexyl)phthalate	28%	0.039	15	SB-68	1-5
butyl benzyl phthalate	13%	0.019	2.4	SB-7	0-0.5
caprolactam	6%	0.043	0.064	HC-04	SBA
carbazole	10%	0.0023	7.1	SB-14	0-0.5
chrysene	53%	0.0065	38	SB-14	0-0.5
dibenzo(a,h)anthracene	14%	0.0033	7.8	SB-14	0-0.5
dibenzofuran	7%	0.025	3.7	SB-14	0-0.5
diethyl phthalate	2%	0.023	0.03	SB-4	0-0.5
dimethyl phthlate	19%	0.0035	7.4	SB-13	0-0.5
di-n-butyl phthalate	4%	0.025	1.4	SB-13	0-0.5
di-n-otyl phthalate	4%	0.058	0.27	SB-9	0-0.5
fluoranthene	56%	0.0034	67	SB-14	0-0.5
fluorene	11%	0.0016	7.4	SB-14	0-0.5
hexachlorobenzene	54%	0.006	39	SB-14	0-0.5
hexachlorobutadiene	4%	0.043	0	SB-1	2-3.5
hexachlorocyclopentadiene	1%	0.54	1	SB-13	0-0.5
hexachloroethane	29%	0.011	3.8	SB-1	2-3.5
ideno(1,2,3-cd)pyrene	33%	0.0033	13	SB-14	0-0.5
naphthalene	10%	0.02	2	SB-14	0-0.5
nitrobenzene	1%	0.12	0.12	HC-02	SS
n-nitrosodiphenylamine	1%	0.28	0.28	SB-9	0-0.5
pentachlorophenol	2%	0.67	7.1	SB-13	0-0.5
phenanthrene	46%	0.022	61	SB-14	0-0.5
phenol	2%	0.07	0.11	SB-14	0-0.5
pyrene	57%	0.0028	65	SB-14	0-0.5

Inorganics

One hundred and ten soil samples from the UPA and 16 soil samples from the UNPA were collected and analyzed for inorganics. Mercury was analyzed in 353 soil samples. Sample depths ranged from the surface soil to ten ft bgs. Twenty-three inorganics were detected in the UPA, while only 21 inorganicss were detected in the UNPA. **Table 56** summarizes inorganics detected, frequency of detection, concentration ranges and location of the maximum concentration

Table 56: Upland Area Soil Data Summary - Inorganics

Analyte	minimum conc.	maximum conc.	maximum location	maximum location depth (feet)
Inorganics via method SW6010/7471. Concentration units are in mg/kg.				
aluminum	280	25,200	SB-2	0-0.5
antimony	0.27	40	SB-9	0-0.5
arsenic	0.27	17.1	SB-14	0-0.5
barium	1.6	241	SB-12	0-0.5
beryllium	0.029	1	SB-68	0-0.5
cadmium	0.087	8.3	SB-9	0-0.5
calcium	180	306,000	W-5	0-0.5
chromium	0.99	120	HC-02	SS
cobalt	0.29	22.2	SB-13	0-0.5
copper	0.37	570	HC-01	SS
iron	220	197,000	SB-13	0-0.5
lead	0.79	222	SB-14	0-0.5
magnesium	28	8,140	SB-68	0-0.5
manganese	2	894	SB-13	0-0.5
mercury	0.00822	11,000	HC-05	SBB
nickel	0.52	870	HC-05	SBB
potassium	22	7,260	SB-74	0-0.5
selenium	0.27	1.5	HC-02	SS
silver	0.082	24.4	SB-9	0-0.5
sodium	52.2	5,200	HC-06	SBB
thallium	0.36	4.3	HC-02	SS
vanadium	0.7	93.1	SB-2	0-0.5
zinc	1.9	4,430	SB-14	0-0.5

Pesticides

Ninety-four soil samples from the UPA and 14 soil samples from the UNPA were collected and analyzed for pesticides. Sample depths ranged from the surface soil to ten feet bgs. Nineteen pesticides were detected in both the UPA and UNPA. **Table 57** summarizes pesticides detected, frequency of detection, concentration ranges and location of the maximum concentration

Table 57: Upland Area Soil Data Summary - Pesticides

Analyte	minimum conc.	maximum conc.	maximum location	maximum location depth (feet)
Pesticides via method SW8081. Concentration units are in mg/kg.				
4,4'-DDD	0.0002	0.243	SB-1	0-0.5
4,4'-DDE	0.000264	0.154	SB-1	0-0.5
4,4'-DDT	0.00077	1.31	SB-14	0-0.5
aldrin	0.00053	0.525	SB-1	2-3.5
alpha-BHC	0.00019	0.12	UNP-1-SO-1-050609	
alpha-chlordane	0.000368	0.286	SB-1	0-0.5
beta-BHC	0.00027	0.092	SB-70	0-0.5
delta-BHC	0.00022	0.014	SB-70	0-0.5
dieldrin	0.00031	0.865	SB-14	0-0.5
endosulfan I	0.00015	0.0729	SB-14	2-2.5
endosulfan II	0.00014	0.6	SB-4	0-0.5
endosulfan sulfate	0.00021	0.162	SB-14	0-0.5
endrin	0.00024	0.264	SB-4	0-0.5
endrin aldehyde	0.001	0.6	SB-70	1-5
endrin ketone	0.53	0.53	HC-02	SBA
gamma-BHC (lindane)	0.00016	0.15	SB-70	0-0.5
gamma-chlordane	0.00267	0.286	SB-13	0-0.5
heptachlor	0.000448	0.721	SB-1	2-3.5
heptachlor epoxide	0.0002	0.049	SB-9	1-5
methoxychlor	0.00026	0.48	HC-06	SBB

PCBs

Two hundred and thirty soil samples from the UPA and 14 soil samples from the UNPA were collected and analyzed. Sample depths ranged from the surface soil to 10 ft bgs. **Table 58** summarizes PCBs detected, frequency of detection, concentration ranges and location of the maximum concentration

Table 58: Upland Area Soil Data Summary - PCBs

Analyte	minimum conc.	maximum conc.	maximum location	maximum location depth (feet)
Aroclors via method SW8082. Concentration units are in mg/kg.				
Aroclor 1254	0.0074	5.1	SB-69	1-5
Aroclor 1268	0.0036	2,500	SB-63	1-3
PCB Congeners via method E1668. Concentration units are in ng/kg.				
PCB-77	3.6	2,970	SB-70	1-5
PCB-81	4.93	810	SB-70	1-5
PCB-105	10.9	23,100	SB-69	0.5-1
PCB-106/118	27.9	129,000	SB-69	0.5-1
PCB-114	3.2	1,030	SB-69	0.5-1
PCB-123	6.75	632	SB-70	1-5
PCB-126	7.18	697	SB-70	1-5
PCB-156	5.56	16,200	SB-69	0.5-1
PCB-157	4.56	2,750	SB-69	0.5-1
PCB-167	4.18	7,310	SB-69	0.5-1
PCB-169	3.48	991	SB-70	1-5
PCB-189	8.29	8,800	SB-70	1-5

Dioxins and Furans

Twenty-five soil samples from the UPA and five soil samples from the UNPA were collected and analyzed for dioxins and furans. Sample depths ranged from the surface soil to ten feet bgs.

Table 59 summarizes dioxin and furans detected, frequency of detection, concentration ranges and location of the maximum concentration.

Table 59: Upland Area Soil Data Summary - Dioxins/Furans

Analyte	minimum conc.	maximum conc.	maximum location	maximum location depth (feet)
Dioxins/Furans via method E1613. Concentration units are in ng/kg.				
1,2,3,4,6,7,8-HpCDD	0.997	518	SB-75	1-5
1,2,3,4,6,7,8-HpCDF	0.328	5,200	SB-69	0-0.5
1,2,3,4,7,8,9-HpCDF	0.155	352	SB-70	0-0.5
1,2,3,4,7,8-HxCDD	0.257	11.3	SB-68	5-10
1,2,3,4,7,8-HxCDF	0.485	1,130	SB-70	0-0.5
1,2,3,6,7,8-HxCDD	0.283	8.32	SB-75	1-5
1,2,3,6,7,8-HxCDF	0.197	205	SB-69	0-0.5
1,2,3,7,8,9-HxCDD	0.303	7.92	SB-68	5-10
1,2,3,7,8,9-HxCDF	0.334	30.5	SB-69	0-0.5
1,2,3,7,8-PeCDD	0.252	2.23	SB-68	5-10
1,2,3,7,8-PeCDF	0.499	150	SB-70	0-0.5
2,3,4,6,7,8-HxCDF	0.171	301	SB-70	1-5
2,3,4,7,8-PeCDF	0.258	132	SB-70	1-5
2,3,7,8-TCDD	0.252	0.728	SB-69	0-0.5
2,3,7,8-TCDF	0.827	60	SB-70	0-0.5
OCDD	68	7,450	SB-75	1-5
OCDF	0.371	4,520	SB-69	0-0.5
HpCDD	4.49	2,000	SB-75	1-5
HpCDF	0.328	7,520	SB-69	0-0.5
HxCDD	1.07	260	SB-68	5-10
HxCDF	0.11	4,100	SB-70	1-5
PeCDD	0.181	25.7	SB-68	5-10
PeCDF	0.258	1,200	SB-70	1-5
TCDD	0.199	8.37	SB-70	1-5
TCDF	0.348	399	SB-70	1-5
Total 2,3,7,8-TCDD TEQ (dioxin/furan & PCB) - Bird	1.52	668	SB-70	1-5
Total 2,3,7,8-TCDD TEQ (dioxin/furan & PCB) - Fish	0.48	265	SB-69	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan & PCB) - Mammal	0.92	334	SB-70	1-5
Total 2,3,7,8-TCDD TEQ (dioxin/furan) - Bird	0.53	366	SB-70	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan) - Fish	0.46	264	SB-69	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan) - Mammal	0.4	250	SB-69	0-0.5
Total 2,3,7,8-TCDD TEQ (PCB) - Bird	0.69	303	SB-70	1-5
Total 2,3,7,8-TCDD TEQ (PCB) - Fish	0.02	5	SB-70	1-5
Total 2,3,7,8-TCDD TEQ (PCB) - Mammal	0.36	102	SB-70	1-5

5.6.5.2 WBA Soil

The WBA consists of approximately nine acres of land with three drainage pathways that slope to the Cape Fear River. A broad range of constituents were detected in the WBA. Sample depths ranged from the surface soil to one foot bgs. **Table 60** lists the range for percent solids and total organic carbon for the WBA soils.

Table 60: Bottomland Area Soil Data Summary - Percent Solids and TOC

Analyte	minimum conc.	maximum conc.	maximum location	sample depth (feet)
E160.3				
Total Solids (%)	55.98%	93.97%	WB-2	
SM2540G				
Percent Solids	74.40%	91.80%	WB-2	
SW9060 mg/kg				
Total Organic Carbon	19,000	42,000	SB-98	0-0.5

VOCs

Thirty-one soil samples were collected from the WBA and were analyzed for VOCs. Six VOCs were detected. **Table 61** includes the concentration ranges for detected VOCs, the sample ID and depth for the maximum concentration.

Table 61: Bottomland Area Soil Data Summary - VOCs

Analyte	minimum conc.	maximum conc.	maximum location	sample depth (feet)
VOCs via method SW8260. Concentration units are in µg/kg.				
2-butanone	9.1	9.1	SB-79	0-0.5
carbon disulfide	1.1	1.1	SB-98	0-0.5
Chloroform	0.71	2	SB-95	0.5-1
isopropylbenzene (cumene)	1.5	24	SB-96	0-0.5
Toluene	1.1	2.3	SB-79	0-0.5
Trichlorofluoromethane	1.8	1.8	SB-96	0.5-1

SVOCs

Thirty-five soil samples were collected from the WBA and analyzed for SVOCs. Twenty-six SVOCs were detected. **Table 62** includes the concentration ranges for detected SVOCs, the sample ID and depth for the maximum concentration.

Table 62: Bottomland Area Soil Data Summary - SVOCs

Analyte	minimum conc.	maximum conc.	maximum location	sample depth (feet)
SVOCs via method SW8270. Concentration units are in mg/kg.				
3,3-dichlorobenzidine	0.12	0.27	SB-89	0.5-1
acenaphthene	0.0012	0.02	SB-99	0-0.5
acenaphthylene	0.0016	0.0016	TERA-3	0-1
anthracene	0.003	0.03	SB-89 & SB-99	0-1
benzo(a)anthracene	0.0068	0.46	SB-99	0-0.5
benzo(a)pyrene	0.0022	0.39	SB-99	0-0.5
benzo(b)fluoranthene	0.015	0.6	SB-99	0-0.5
benzo(g,h,i)perylene	0.0061	0.21	SB-99	0-0.5
benzo(k)fluoranthene	0.04	0.56	SB-99	0-0.5
bis(2-ethylhexyl)phthalate	0.11	0.24	SB-89	0.5-1
butyl benzyl phthalate	0.051	0.051	SB-90	0-0.5
caprolactam	0.0071	0.013	TERA-5	0-1
carbazole	0.0017	0.16	SB-99	0-0.5
chrysene	0.0096	0.91	SB-99	0-0.5
dibenzo(a,h)anthracene	0.11	0.11	SB-99	0-0.5
dibenzofuran	0.033	0.033	SB-99	0-0.5
dimethyl phthlate	0.038	0.042	TERA-5	0-1
di-n-butyl phthalate	0.054	0.054	SB-94	0-0.5
di-n-otyl phthalate	0.042	0.042	TERA-3	0-1
fluoranthene	0.0068	1.8	SB-99	0-0.5
fluorene	0.0018	0.025	SB-99	0-0.5
hexachlorobenzene	0.035	0.28	SB-91	0-0.5
hexachloroethane	0.026	0.12	SB-91	0-0.5
ideno(1,2,3-cd)pyrene	0.0016	0.21	SB-99	0-0.5
phenanthrene	0.16	1.2	SB-99	0-0.5
pyrene	0.0047	1.6	SB-99	0-0.5

Inorganics

Forty-two soil samples were collected from the WBA and analyzed for inorganics and 68 soil samples were collected and analyzed for mercury. Many inorganics naturally occur in soil. **Table 63** includes the concentration ranges for detected inorganics, the sample ID and depth for the maximum concentration.

Table 63: Bottomland Area Soil Data Summary - Inorganics

Analyte	minimum conc. (mg/kg)	maximum conc. (mg/kg)	maximum location	sample depth (feet)
Inorganics via method SW6010/7471.				
aluminum	1,200	25,900	SB-94	0.5-1
arsenic	0.3	6.7	SB-94	0-0.5
barium	7.9	166	SB-80 & SB-94	0-0.5
beryllium	0.17	1.3	SB-94 & SB-97	0-0.5
cadmium	0.06	2.7	SB-94	0-0.5
calcium	362	25,400	WB-3	0-1
chromium	2.2	52.1	SB-93	0-0.5
cobalt	0.38	18.5	SB-94	0.5-1
copper	1.1	65.8	SB-94	0-0.5
iron	1,590	30,600	SB-94	0.5-1
lead	2.1	122	SB-94	0-0.5
magnesium	148	2,690	SB-98	0-0.5
manganese	16.5	1,020	SB-93	0-0.5
nickel	1.5	59.6	SB-94	0-0.5
potassium	96.5	2,100	SB-91	0-0.5
selenium	0.65	1.7	SB-97	0-0.5
silver	0.21	3.9	SB-94	0-0.5
sodium	44.1	5,600	HC-14	SS
thallium	0.33	2	SB-97	0-0.5
vanadium	4.4	81.3	SB-93	0-0.5
zinc	3.7	781	SB-94	0-0.5
Methylmercury via method E1630.				
methylmercury	0.00064	0.0222	WB-5	0-1
Mercury fractions via method E1631.				
mercury	0.136	32.3	TERA-5	0-1
mercury fraction 1 Bloom ES&T	0.00768	1.6	TERA-5	0-1
mercury fraction 2 Bloom ES&T	0.00255	0.0239	TERA-5	0-1
mercury fraction 5 Bloom ES&T	0.00382	19.2	TERA-5	0-1
Mercury via method 7471.				
mercury	0.02	92	SB-94	0-0.5

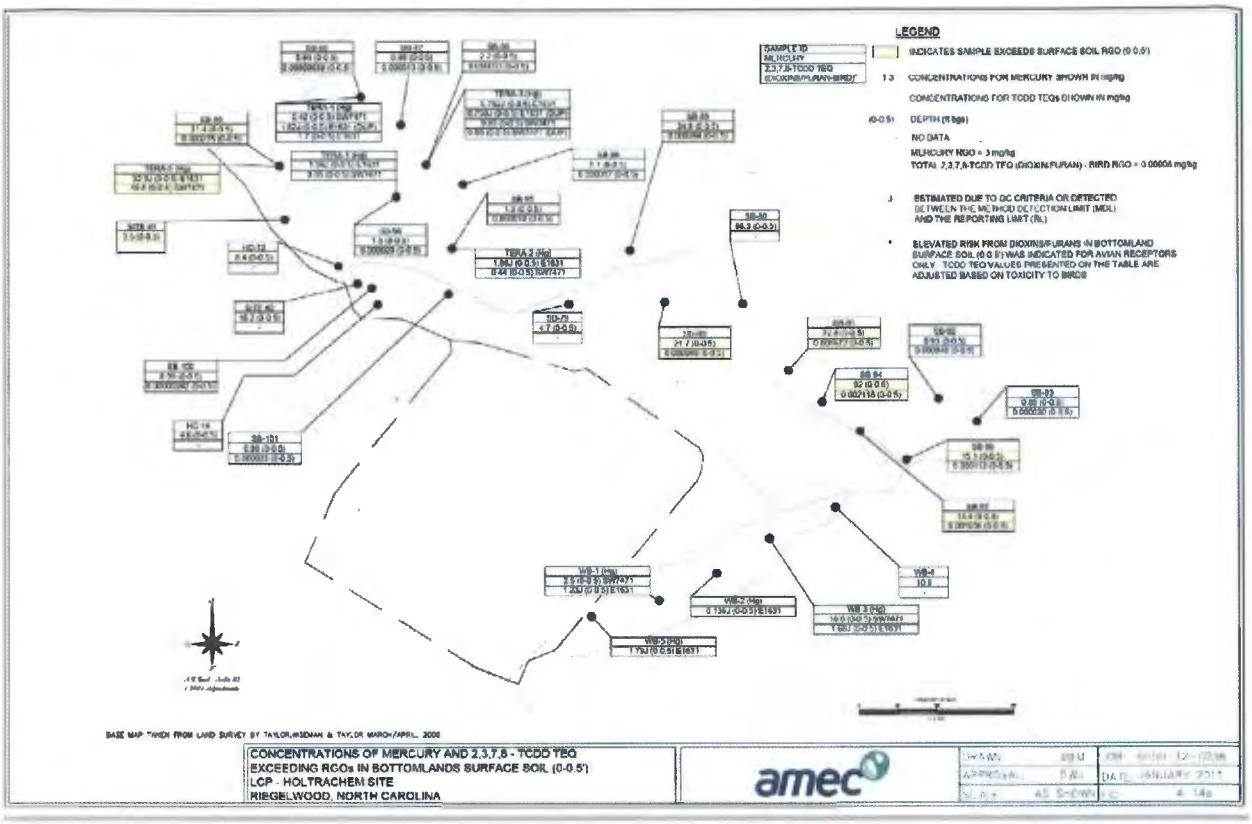
Table 64 lists the sample IDs and concentrations that exceeded the mercury PRG.

Table 64: Wooded Bottomland Surface Soil Sample Results that Exceed an Inorganic PRG

Location ID	Mercury (mg/kg)
Preliminary Remediation Goal (PRG):	**3**
HC-13	**8.4**
HC-14	**4.6**
SB-79	**4.7**
SB-80	**86.3**
SB-89	**34.8**
SB-90	**21.7**
SB-91	**72.8**
SB-94	**92**
SB-97	**14.4**
SB-98	**15.1**
SB-99	**21.4**
Site #1 Surface	**3.5**
Site #2 Surface	**16.2**
TERA-5 (E1631)	**32.3 J**
TERA-5 (SW7471)	**19.8**
WB-3 (SW7471)	**16.8**
WB-4 (E1631)	**10.8**
Notes:	
Only samples that had a concentration that exceeded the PRG are included in this table.	
J = estimated concentration	

Figure 22 illustrates the distribution of the mercury in WBA soil. The northeastern portion of this area was designated as wetlands and is influenced primarily by the central drainage pathway. As evidenced by the pattern of occurrence, the mercury likely originated from the Fill and Retort Areas runoff and was transported in surface water and sediment from the central drainage pathway to the wetland areas.

Figure 22: Concentrations exceeding PRGs in Bottomlands



Pesticides

Thirty-five soil samples were collected from the WBA and analyzed for pesticides. Seventeen pesticides were detected. **Table 65** includes the concentration ranges for detected pesticides, the sample ID and depth for the maximum concentration.

Table 65: Wooded Bottomland Soil Data Summary - Pesticides

Analyte	minimum conc. (mg/kg)	maximum conc. (mg/kg)	maximum location	sample depth (feet)
Pesticides via method SW8081				
4,4'-DDD	0.00026	0.17	TERA-5	0-1
4,4'-DDE	0.00032	1.4	SB-89	0.5-1
4,4'-DDT	0.00075	2.3	SB-89	0.5-1
aldrin	0.00075	0.062	SB-89	0.5-1
alpha-BHC	0.00098	0.028	SB-89	0.5-1
beta-BHC	0.00041	0.16	SB-90	0.5-1
delta-BHC	0.00021	0.016	SB-79	0-0.5
dieldrin	0.00034	0.16	SB-89	0.5-1
endosulfan I	0.000098	0.19	SB-89	0.5-1
endosulfan II	0.00014	0.51	SB-89	0.5-1
endosulfan sulfate	0.00021	0.021	SB-79	0-0.5
endrin	0.00053	0.76	SB-89	0.5-1
endrin aldehyde	0.0033	1.4	SB-89	0.5-1
gamma-BHC (lindane)	0.00018	0.021	SB-79	0-0.5
heptachlor	0.0092	0.14	SB-89 & SB-94	0-1
heptachlor epoxide	0.00028	0.24	SB-89	0.5-1
methoxychlor	0.0021	0.082	SB-89	0.5-1

Aroclors

Ninety-seven soil samples were collected from the WBA and analyzed for Aroclor 1268. Sixty-four soil samples were collected from the WBA and analyzed for Aroclor 1254. **Table 66** includes the concentration ranges for detected Aroclors, the sample ID and depth for the maximum concentration.

Table 66: Wooded Bottomland Soil Data Summary - PCBs

Analyte	minimum conc. (mg/kg)	maximum conc. (mg/kg)	maximum location	sample depth (feet)
PCBs via method SW8082				
Aroclor 1254	0.0045	67	SB-89	0.5-1
Aroclor 1268	0.0071	1,200	SB-89	0.5-1
PCBs via method SW8280				
PCB 1268	0.027	3,800	SITE#1	0-0.5

Table 67 lists the samples and concentrations that exceeded the PRGs.

Table 67: Wooded Bottomland Surface Soil Sample Results that Exceed a PCB PRG

Sample ID	Sample Depth (feet)	Aroclor 1254 (mg/kg)	Aroclor 1268 (mg/kg)
Preliminary Remediation Goal (PRG):		**21**	**21**
SB-80	0-0.5	< 9.8	**190** B
SB-89	0-0.5	0.31 J	**38**
SB-89	0.5-1	**67**	**1200**
SB-90	0-0.5	1.5 J	**130**
SB-90	0.5-1	< 2.4	**130**
SB-91	0-0.5	2.2 J	**400**
SB-94	0-0.5	<2.7	**460**
SB-94	0.5-1	< 0.48	**24**
SB-97	0-0.5	1.1 J	**150**
SB-98	0-0.5	< 0.58	**23**
SB-99	0-0.5	0.25 J	**31**
SB-177	0-1	NA	**32.2**
Site #1 Surface	0-0.5	**< 36**	**3800**
Site #2 Surface	0-0.5	**< 37**	**1500**
Site #2 B2	0-0.8	< 1.7	**46**
TERA-5	0-0.5	< 0.091	**21**

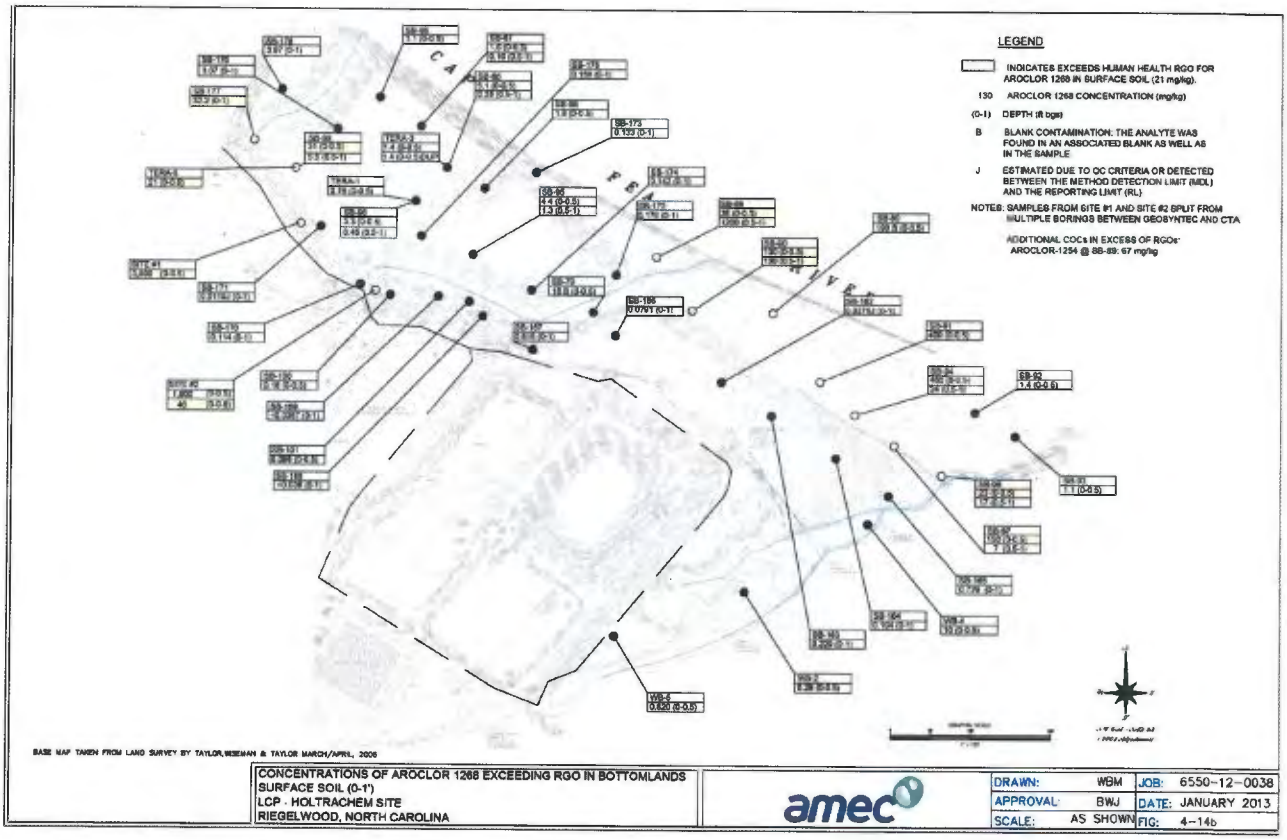
Notes:

Only samples that had a concentration that exceeded at least one PRG are included in this table.

Sample ID	Sample Depth (feet)	Aroclor 1254 (mg/kg)	Aroclor 1268 (mg/kg)
Preliminary Remediation Goal (PRG):		**21**	**21**
B = blank contamination. The analyte was found in an associated blank as well as in the sample			
J = estimated concentration			
NA = not analyzed			
< = less than the reporting limit. The reporting limit is included.			
< = less than the reporting limit. The reporting limit is included and exceeds the PRG.			
Bold value exceeds PRG			

Figure 23 illustrates the distribution of the PCBs in soil. The northeastern portion of this area was designated as wetlands and is influenced primarily by the central drainage pathway. Aroclor 1268 likely originated from historical Fill Area runoff and was transported in surface water and sediment from the central drainage pathway to the wetland areas.

Figure 23: Concentrations of Aroclor 1268 Exceeding PRG in Bottomlands



Dioxins/Furans and PCBs

Thirty-two soil samples were collected from the WBA and analyzed for dioxins/furans and dioxin/furan-like PCB congeners. **Table 68** and **Table 69** include the concentration ranges for detected PCB congeners and dioxins/furans respectively.

Table 68: Bottomland Area Soil Data Summary - PCB congeners

Analyte	minimum conc. (ng/kg)	maximum conc. (ng/kg)	maximum location	sample depth (feet)
PCB congeners via method E1668.				
PCB-77	2.51	11,700	SB-94	0-0.5
PCB-81	2.84	1,870	SB-91	0-0.5
PCB-105	21.8	50,000	SB-91	0-0.5
PCB-106/118	39.3	191,000	SB-91	0-0.5
PCB-114	2.04	2,490	SB-91	0-0.5
PCB-123	2.65	2,010	SB-91	0-0.5
PCB-126	1.66	1,870	SB-91	0-0.5
PCB-156	15.2	22,000	SB-91	0-0.5
PCB-157	3.13	5,760	SB-91	0-0.5
PCB-167	13.9	18,800	SB-91	0-0.5
PCB-169	2.24	3,260	SB-94	0-0.5
PCB-189	18.2	24,700	SB-91 & SB-94	0-0.5

Table 69: Bottomland Area Soil Data Summary - Dioxins/Furans

Analyte	minimum conc. (ng/kg)	maximum conc. (ng/kg)	maximum location	sample depth (feet)
Dioxins/furans via method E1613.				
1,2,3,4,6,7,8-HpCDD	2.44	2,990	SB-91	0-0.5
1,2,3,4,6,7,8-HpCDF	4.3	20,800	SB-94	0-0.5
1,2,3,4,7,8,9-HpCDF	0.84	988	SB-94	0-0.5
1,2,3,4,7,8-HxCDD	0.368	29.2	SB-90	0.5-1
1,2,3,4,7,8-HxCDF	2.08	5,550	SB-94	0-0.5
1,2,3,6,7,8-HxCDD	0.608	56.2	SB-97	0-0.5
1,2,3,6,7,8-HxCDF	0.499	1,090	SB-94	0-0.5
1,2,3,7,8,9-HxCDD	0.475	29.7	SB-94	0-0.5
1,2,3,7,8,9-HxCDF	0.412	217	SB-94	0-0.5
1,2,3,7,8-PeCDD	0.243	8.89	SB-94	0-0.5
1,2,3,7,8-PeCDF	0.311	531	SB-94	0-0.5
2,3,4,6,7,8-HxCDF	0.552	1,600	SB-94	0-0.5
2,3,4,7,8-PeCDF	0.396	679	SB-94	0-0.5
2,3,7,8-TCDD	0.163	7.14	SB-94	0-0.5
2,3,7,8-TCDF	0.514	293	SB-94	0-0.5
HpCDD	6.49	6,210	SB-91	0-0.5
HpCDF	6.15	31,600	SB-94	0-0.5
HxCDD	0.747	1,080	SB-97	0-0.5
HxCDF	6.33	22,400	SB-94	0-0.5
OCDD	53.1	40,700	SB-91	0-0.5
OCDF	1.53	21,700	SB-94	0-0.5
PeCDD	0.346	342	SB-97	0-0.5
PeCDF	1.77	9,390	SB-94	0-0.5
TCDD	0.274	77	SB-94	0-0.5
TCDF	0.846	4,630	SB-94	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan & PCB) - Bird	2.3	3,041	SB-94	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan & PCB) - Fish	1.3	1,495	SB-94	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan & PCB) - Mammal	1.48	1,660	SB-94	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan) - Bird	1.52	2,118	SB-94	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan) - Fish	1.27	1,484	SB-94	0-0.5
Total 2,3,7,8-TCDD TEQ (dioxin/furan) - Mammal	1.15	1,384	SB-94	0-0.5
Total 2,3,7,8-TCDD TEQ (PCB) - Bird	0.81	967	SB-91	0-0.5
Total 2,3,7,8-TCDD TEQ (PCB) - Fish	0.01	13	SB-91	0-0.5
Total 2,3,7,8-TCDD TEQ (PCB) - Mammal	0.32	282	SB-91	0-0.5

Table 70 lists sample locations with surface soil results that exceeded 2,3,7,8-TCDD TEQ PRGs.

Table 70: Wooded Bottomland Area Soil Sample locations that Exceed a Dioxin PRG

	Avian Ecological		Human Health
Location ID	Total 2,3,7,8-TCDD TEQ (dioxin/furan) (mg/kg)	Total 2,3,7,8-TCDD TEQ (PCB) (mg/kg)	Total 2,3,7,8-TCDD TEQ (dioxin/furan + PCB) (mg/kg)
Preliminary Remediation Goal (PRG):	**0.0000854**	**0.000196**	**0.000936**
SB-89	**0.000285**	0.000109	0.00024
SB-90	**0.000849**	**0.000262**	0.000651
SB-91	**0.00167**	**0.000967**	**0.00136**
SB-94	**0.00212**	**0.000923**	**0.00166**
SB-97	**0.00104**	**0.000264**	0.000743
SB-98	**0.000112**	0.0000321	0.0000613
SB-99	**0.000275**	0.000128	0.000189

Notes:

Only samples that had a concentration that exceeded the PRG are included in this table.

Bold value exceeds PRG

5.6.5.3 Off-site Soil

Eight soil samples were collected from background locations. The background soil data indicated that a broad range of constituents were present in surface and subsurface soils to a depth of 5 feet. **Table 71** through **Table 74** include summary statistics of the detected constituents in background soils. **Figure 24** illustrates the locations of the background samples.

Table 71: Background Soil Data Summary – Percent Solids, TOC, VOCs and SVOCs

Analyte	FOD%	minimum conc.	maximum conc.	maximum location	sample depth (feet)
E160.3					
Total Solids (%)	100%	91.46%	91.46%	SOREF-050709	
SM2540G					
Percent Solids	100%	92%	92%	SOREF-050709	
SW9060 mg/kg					
Total Organic Carbon	100%	1,700	15,000	SB-104	0-0.5
VOCs via method SW8260. Concentration units are in mg/kg.					
2-butanone	19%	0.0055	0.0066	SB-105	0-0.5
acetone	38%	0.013	0.14	SB-105	0-0.5
toluene	19%	0.00083	0.00094	SB-104	0-0.5
trichlorofluoromethane	60%	0.0016	0.0023	SB-104	0-0.5
SVOCs via method SW8270. Concentration units are in mg/kg.					
benzo(a)anthracene	7%	0.0029	0.0029	SOREF-050709	
benzo(a)pyrene	7%	0.0024	0.0024	SOREF-050709	
benzo(b)fluoranthene	7%	0.0066	0.0066	SOREF-050709	
benzo(g,h,i)perylene	7%	0.0061	0.0061	SOREF-050709	
bis(2-ethylhexyl)phthalate	7%	0.1	0.1	SB-28	2-5
chrysene	7%	0.0049	0.0049	SOREF-050709	
dibenzo(a,h)anthracene	7%	0.0053	0.0053	SOREF-050709	
fluoranthene	7%	0.0019	0.0019	SOREF-050709	
ideno(1,2,3-cd)pyrene	7%	0.0063	0.0063	SOREF-050709	

Table 72: Background Soil Data Summary – Inorganics

Analyte	FOD%	minimum conc.	maximum conc.	maximum location	sample depth (feet)
Inorganics via method SW6010/7471. Concentration units are in mg/kg.					
aluminum	100%	343	24,000	SB-28	2-5
antimony	6%	0.49	0.49	SB-28	2-5
arsenic	75%	0.26	3.5	SB-28	2-5
barium	100%	3.6	17.5	SB-28	2-5
beryllium	44%	0.041	0.25	SB-28	2-5
cadmium	19%	0.099	0.21	SB-105	1-5
calcium	100%	18.2	448	SB-26	0-0.5
chromium	94%	1.1	36	HC-23-SBB	
cobalt	31%	0.39	1.2	SB-28	2-5
copper	44%	0.54	3.2	SB-28	2-5
iron	100%	384	34,000	HC-23-SBB	
lead	100%	2.4	10	HC-23-SBB	
magnesium	100%	22.5	415	SB-28	2-5
manganese	100%	3.3	17.1	SB-26	0-0.5
mercury	56%	0.016	0.044	SB-104	0-0.5
nickel	94%	0.44	4.2	SB-28	2-5
potassium	50%	25.9	240	HC-23-SBB	
selenium	13%	0.35	1.8	HC-23-SBB	
sodium	19%	320	390	HC-23-SBB	
thallium	25%	0.33	2.8	HC-23-SBB	
vanadium	100%	3.7	49.1	SB-28	2-5
zinc	88%	1	8.8	HC-23-SBB	
E1630 (mg/kg)					
methylmercury	100%	0.00013	0.00013	SOREF-050709	
E1631 (mg/kg)					
mercury	100%	0.0268	0.0268	SOREF-050709	

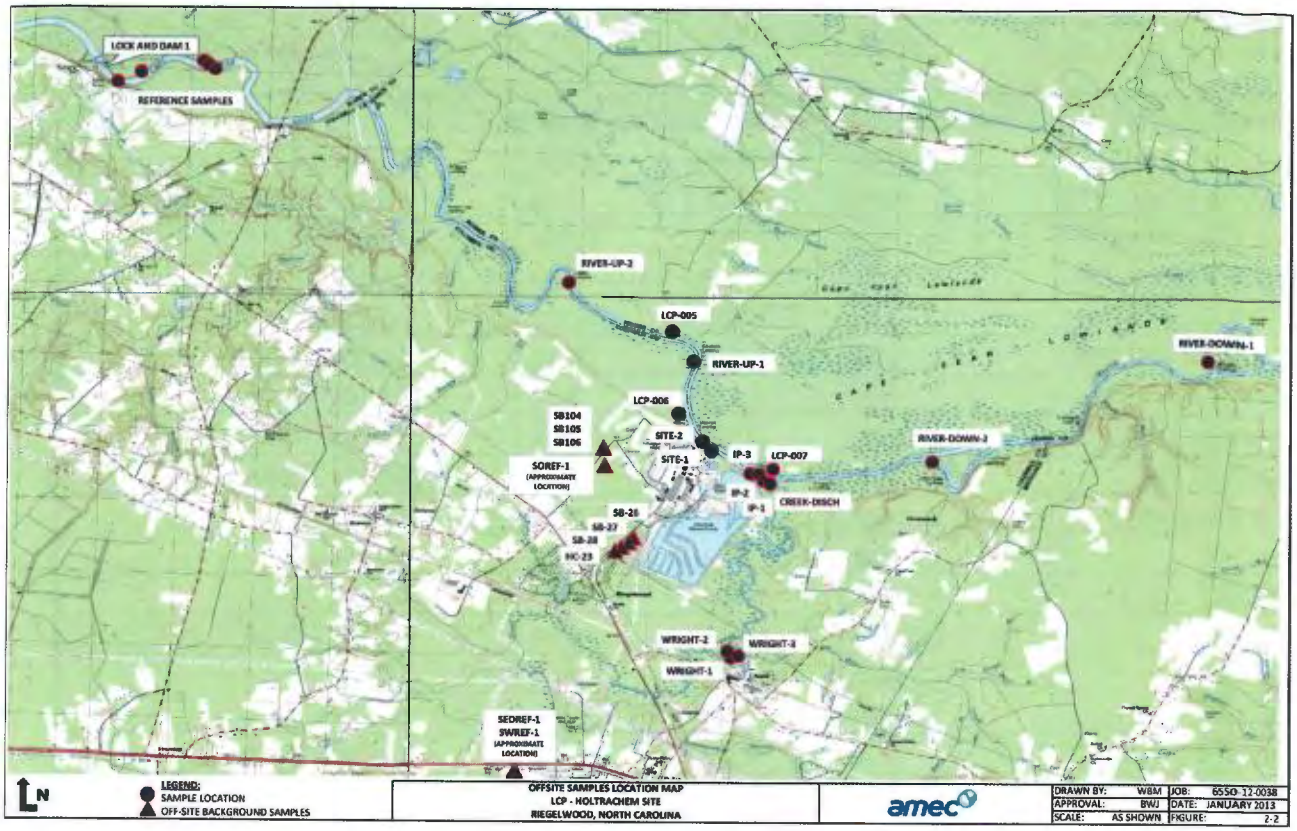
Table 73: Background Soil Data Summary – Pesticides and PCBs

Analyte	FOD%	minimum conc.	maximum conc.	maximum location	sample depth (feet)
Pesticides via method SW8081. Concentration units are in mg/kg.					
4,4'-DDD	19%	0.00027	0.00042	SB-104	0-0.5
4,4'-DDE	25%	0.00053	0.00137	SB-26	0-0.5
4,4'-DDT	13%	0.00069	0.00072	SB-104	0-0.5
alpha-chlordane	10%	0.000381	0.000381	SB-27	0-0.5
endosulfan I	19%	0.00021	0.000782	SB-27	0-0.5
endosulfan II	13%	0.00014	0.00015	SB-104	0-0.5
endosulfan sulfate	25%	0.00029	0.0014	SB-104	0-0.5
endrin	13%	0.00024	0.00071	SOREF-050709	
gamma-BHC (lindane)	10%	0.00028	0.00028	SB-104	0-0.5
gamma-chlordane	11%	0.000967	0.000967	SB-27	0-0.5
heptachlor epoxide	20%	0.00018	0.00033	SB-104	0-0.5
methoxychlor	30%	0.00042	0.00095	SB-104	0-0.5
PCBs via method SW8082. Concentration units are in mg/kg.					
Aroclor 1268	54%	0.0078	0.245	SB-26	0-0.5
PCB congeners via method E1668. Concentration units are in ng/kg.					
PCB-105	50%	8.79	45.2	SB-105	0-0.5
PCB-106/118	50%	22	117	SB-105	0-0.5
PCB-156	33%	15.5	19.2	SB-105	0-0.5
PCB-167	33%	9.79	9.8	SB-104	0-0.5
PCB-189	33%	5.35	7.67	SB-104	0-0.5

Table 74: Background Soil Data Summary – Dioxins/Furans

Analyte	FOD%	minimum conc.	maximum conc.	maximum location	sample depth (feet)
Dioxins/furans via method E1613. Concentration units are in ng/kg.					
1,2,3,4,6,7,8-HpCDD	100%	8.49	58.9	SB-104	1-5
1,2,3,4,6,7,8-HpCDF	67%	0.504	2.52	SB-104	0-0.5
1,2,3,4,7,8-HxCDF	67%	0.264	0.863	SB-104	0-0.5
1,2,3,6,7,8-HxCDD	17%	1.93	1.93	SB-105	0-0.5
1,2,3,6,7,8-HxCDF	33%	0.309	0.323	SB-105	0-0.5
1,2,3,7,8,9-HxCDD	17%	0.811	0.811	SB-104	0-0.5
1,2,3,7,8-PeCDD	50%	0.931	8.24	SB-105	0-0.5
2,3,4,6,7,8-HxCDF	50%	0.51	0.804	SB-105	0-0.5
2,3,7,8-TCDD	50%	3.12	5.38	SB-104	0-0.5
2,3,7,8-TCDF	33%	0.828	1.19	SB-105	0-0.5
HpCDD	100%	23.2	128	SB-104	1-5
HpCDF	67%	0.504	3.53	SB-104	0-0.5
HxCDD	100%	1.7	234	SB-105	0-0.5
HxCDF	80%	0.264	13.5	SB-105	0-0.5
OCDD	100%	288	8,890	SB-104	1-5
OCDF	33%	1.57	1.6	SB-104	0-0.5
PeCDD	67%	0.917	92	SB-105	0-0.5
PeCDF	50%	6.53	18.6	SB-105	0-0.5
TCDD	50%	4.69	6.6	SB-104	0-0.5
TCDF	50%	6.28	10.4	SB-105	0-0.5

Figure 24: Background Samples Location Map



5.6.6 Groundwater

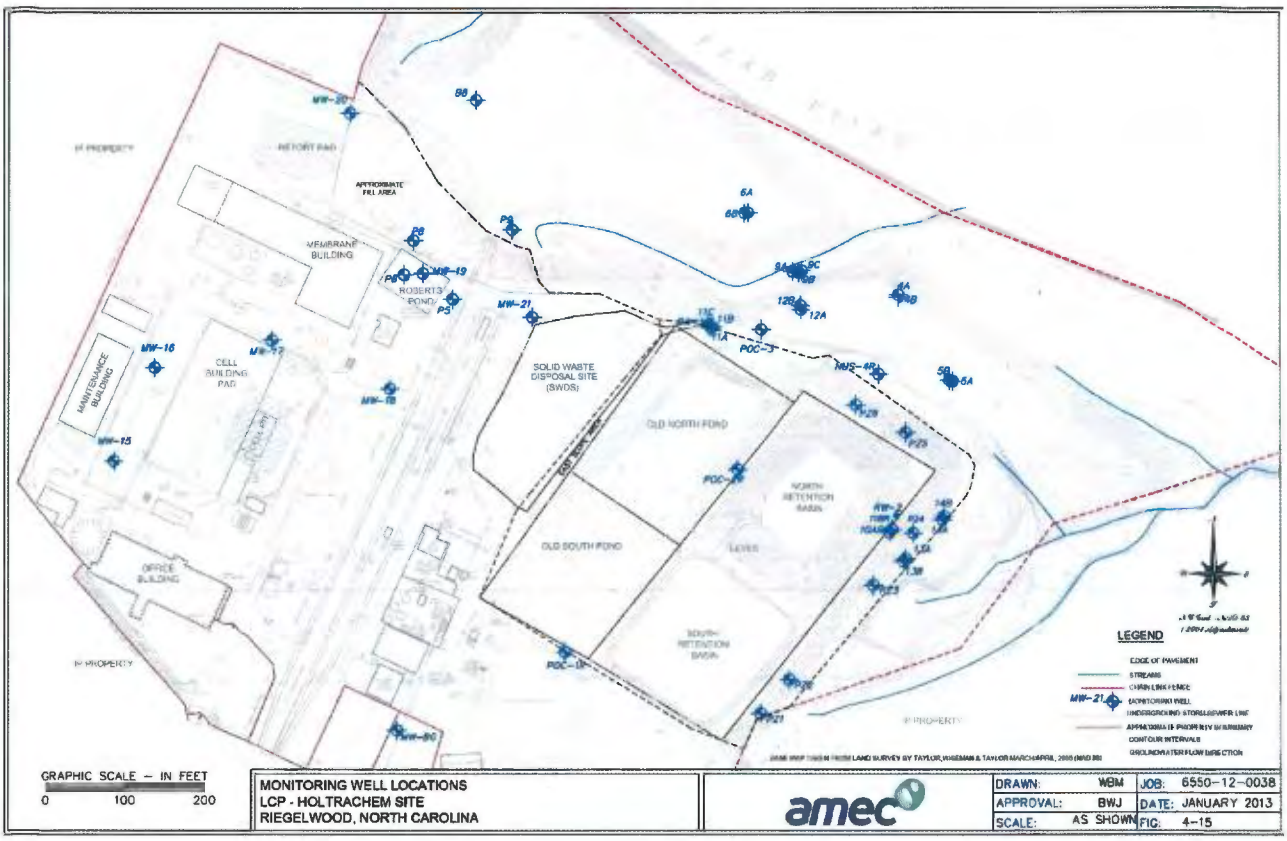
Groundwater monitoring at the site began in the early 1990s to comply with RCRA requirements. After RCRA transferred the site to the CERCLA program, contractors conducted additional groundwater monitoring to determine the nature and extent of groundwater contamination.

5.6.6.1 RCRA Groundwater Monitoring Data

Before 2000, RCRA regulated site activities. The RCRA groundwater monitoring included sampling 15 wells as part of post-closure monitoring in accordance with the hazardous waste permit. This included annual and quarterly groundwater sampling from about 1992 through 2003.

The monitoring wells were located in the upland non-process and bottomland areas. The wells included BG (background); POC-1, POC-1R, POC-2, POC-2R and POC-3; NUS-4R, 4A, 5A, 9A, 10A, 10AR, 10B, l0BR, 11A, 11B, 13A, and 14A. **Figure 25** shows well locations.

Figure 25: Monitoring Well Locations



Annual Sampling

Under RCRA, the facility performed annual monitoring for the three POC wells. **Table 75** through **Table 77** summarize the results of RCRA annual sampling events.

Table 75: Detected Analytes in POC-1/POC-1R during January 1993 - December 2000

Analyte	Standards		POC-1**						POC-1R	
	2L	MCL	Jan-93	Dec-93	Dec-94	Dec-95	Dec-96	Dec-98	Jan-00	Dec-00
VOCs (µg/L)										
1,1-dichloroethane	7	7	ND	ND	ND	ND	ND	ND	1	ND
trans-1,2-dichloroethene	100	100	ND	ND	ND	ND	ND	ND	1	ND
tetrachloroethene (PCE)	0.7	5	ND	ND	ND	ND	ND	ND	2	ND
trichloroethene (TCE)	2.8	5	ND	ND	ND	ND	ND	ND	19	5
vinyl chloride	0.015	2	ND	ND	ND	ND	ND	ND	1	ND
Inorganics (mg/L)										
arsenic	0.05	0.01	ND	0.014	ND	ND	ND	ND	ND	ND
barium	2	2	0.084	ND	0.056	0.035	0.059	ND	0.172	0.2
chromium	0.05	0.1	ND	0.052	ND	ND	0.005	ND	ND	ND
lead	0.015	0.015	ND	ND	0.011	ND	0.007	*	ND	ND
mercury	0.00105	0.002	0.0042	0.043	0.002	ND	0.0006	*	0.0019	ND
zinc	1.05	5	0.22	0.12	0.07	0.028	0.052	ND	ND	ND

Notes:
* no data readily available
**Well POC-1 was destroyed in September 1999 and replaced in December 1999. The new POC well was named POC-1R.
2L = Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Standards (I5A NCAC 2L Standard)
MCL = Safe Drinking Water Act's Maximum Contaminant Level
ND = not detected
mg/L = milligrams per liter
µg/L = micrograms per liter
concentration exceeds 2L value but is less than the MCL
concentration exceeds MCL

Table 76: Detected Analytes in POC-2/POC-2R during January 1993 - December 2003

Analyte	Standards		POC-2**						POC-2R				
	2L	MCL	Jan-93	Dec-93	Dec-94	Dec-95	Dec-96	Dec-98	Jan-00	Dec-00	Dec-01	Dec-02	Dec-03
Inorganics (mg/L)													
arsenic	0.05	0.01	ND	ND	ND	ND	ND	ND	ND	ND	0.0114	ND	ND
barium	2	2	0.067	ND	0.041	0.03	0.022	ND	0.398	0.35	0.327	0.234	ND
mercury	0.00105	0.002	ND	ND	ND	ND	0.0002	*	0.0012	ND	ND	ND	ND
selenium	0.05	0.05	ND	ND	ND	ND	0.007	*	ND	ND	ND	ND	ND
vanadium	NS	NS	ND	0.063	ND	ND	ND	ND	ND	ND	ND	ND	ND
zinc	1.05	5	0.1	0.058	0.062	0.029	0.013	ND	ND	0.0224	ND	0.0306	ND

Notes:
Only analytes with at least one detection are included in this table. No VOCs, SVOCs, pesticides, herbicides or dioxins were detected.
* no data readily available
**Well POC-2 was destroyed in September 1999 and replaced in January 2000. The new well was named POC-2R.
2L = Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Standards (I5A NCAC 2L Standard)
MCL = Safe Drinking Water Act's Maximum Contaminant Level
ND = not detected
NS = no standard has been established
mg/L = milligrams per liter
concentration exceeds 2L value but is less than the MCL
concentration exceeds MCL

Table 77: Detected Analytes in POC-3 during January 1993 - December 2003

Analyte	Standards		POC-3										
	2L	MCL	Jan-93	Dec-93	Dec-94	Dec-95	Dec-96	Dec-98	Jan-00	Dec-00	Dec-01	Dec-02	Dec-03
VOCs (µg/L)													
carbon disulfide	700	NS	ND	ND	ND	ND	ND	ND	1	1	17	ND	ND
Inorganics (mg/L)													
barium	2	2	0.17	ND	0.085	0.072	0.081	ND	ND	ND	ND	ND	ND
beryllium	NS	0.004	ND	ND	ND	ND	0.002	ND	ND	ND	ND	ND	ND
chromium	0.05	0.1	**0.14**	0.09	ND	ND	0.005	ND	ND	ND	ND	ND	ND
lead	0.015	0.015	ND	ND	0.01	ND	ND	*	ND	ND	ND	ND	ND
mercury	0.00105	0.002	ND	ND	ND	ND	ND	*	**0.0026**	ND	ND	ND	ND
zinc	1.05	5	0.24	0.13	0.061	0.041	0.055	ND	ND	ND	ND	0.0299	ND

Notes:
Only analytes with at least one detection are included in this table. No SVOCs, pesticides, herbicides or dioxins were detected.
* no data readily available
2L = Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Standards (I5A NCAC 2L Standard)
MCL = Safe Drinking Water Act's Maximum Contaminant Level
ND = not detected
NS = no standard has been established
mg/L = milligrams per liter
µg/L = micrograms per liter
concentration exceeds MCL

Analytical results did not detect SVOCs, dioxins, pesticides, or herbicides in any of the well samples. PCBs were not required to be analyzed under RCRA. Analytical results did not detect VOCs at concentrations above drinking water standards in wells POC-1, POC-2, POC-2R and POC-3.

In 1999, the damaged POC-1 well was replaced with POC-1R. In January 2000, three VOCs were detected in well POC-1R above drinking water standards. These included PCE, TCE and vinyl chloride. In December 2000, the concentrations of these three VOCs decreased to non-detect for PCE and vinyl chloride, and from 19 to 5 µg/L for TCE.

Analytical results indicated concentrations of arsenic, chromium and mercury were in excess of drinking water standards sporadically in POC wells.

Quarterly sampling

Under RCRA, 15 wells were sampled quarterly from August 1992 through December 2003. Analysis was limited to mercury and select inorganic indicator parameters. **Table 78** summarizes the results of RCRA quarterly sampling events results for mercury.

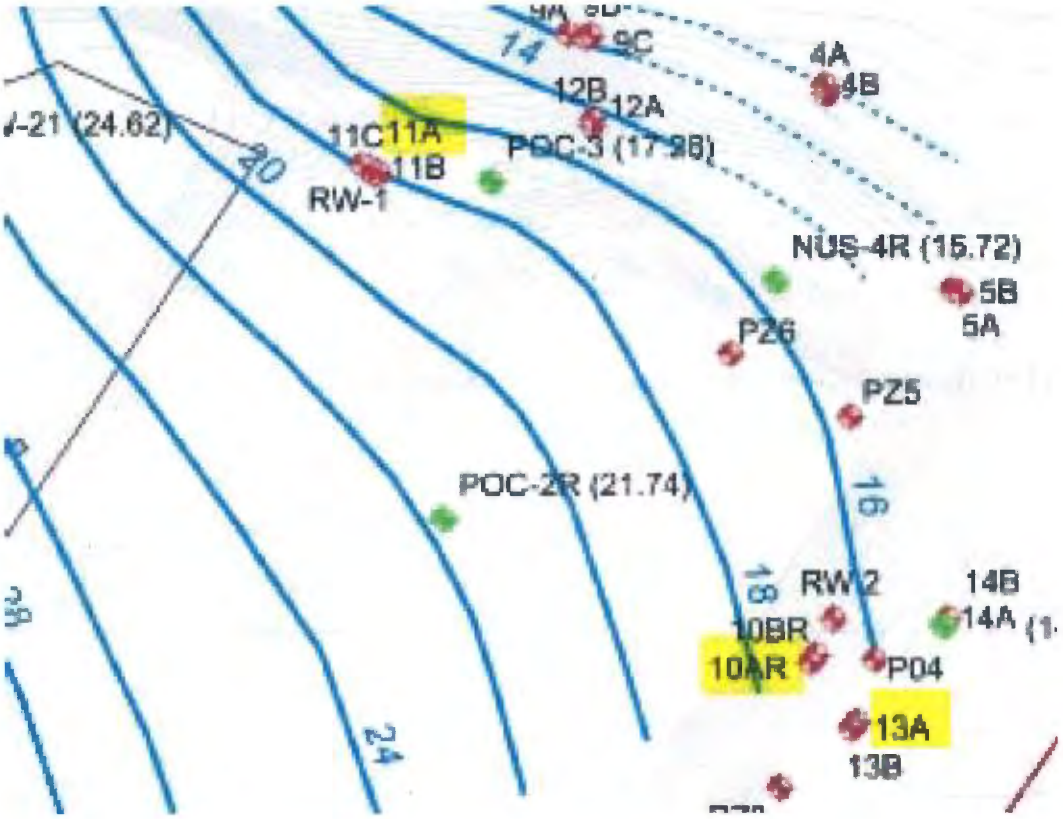
Table 78: Summary of mercury in groundwater during August 1992 – December 2003

Date	BG	POC-2R	POC-3	NUS-4R	4A	5A	9A	10AR	10BR	11A	11B	13A	14A
Aug-92	--	0.001	0.001	--	**0.002**	--	--	**0.114**	--	**0.048**	--	**0.002**	--
Dec-92	0.0002	0.0004	--	--	0.0008	--	**0.0011**	**0.0152**	--	**0.0474**	--	**0.0022**	--
Mar-93	--	0.0004	--	--	0.0003	--	0.0009	**0.02**	--	**0.045**	--	**0.002**	--
Jun-93	--	0.006	--	--	--	--	0.0003	**0.003**	--	**0.044**	--	**0.0042**	--
Sep-93	--	--	--	--	--	--	--	NS	--	**0.1**	--	--	--
Dec-93	--	--	--	--	NS	--	--	**0.017**	--	**0.064**	--	--	--
Mar-94	--	--	--	--	--	--	--	**0.079**	--	**0.018**	--	**0.003**	--
Jun-94	--	--	--	--	--	--	**0.0045**	NA	--	**0.0508**	--	**0.0045**	--
Sep-94	--	--	--	--	NA	--	--	**0.06**	--	**0.048**	--	**0.004**	--
Dec-94	--	--	--	--	--	--	--	**0.041**	--	**0.045**	--		--
Apr-95	--	--	--	--	--	--	--	**0.076**	--	**0.033**	--	**0.002**	--
Jun-95	--	--	--	--	--	--	--	**0.1315**	--	**0.0369**	--	**0.0043**	--
Sep-95	--	--	--	--	--	--	--	**0.038**	--	**0.034**	--	**0.003**	--
Dec-95	--	--	--	--	--	--	--	**0.0108**	--	**0.0377**	--	**0.0039**	--
Mar-96	--	--	--	--	--	--	--	**0.0438**	--	**0.0342**	--	**0.0032**	--
Jun-96	--	--	--	--	--	--	--	**0.0093**	--	**0.036**	--	--	--
Sep-96	--	--	--	--	--	--	**0.0014**	**0.076**	--	**0.031**	--	--	--
Dec-96	--	--	--	--	--	--	--	**0.057**	--	--	--	--	--
Mar-97	--	--	--	--	--	--	--	**0.0164**	--	**0.0197**	--	--	--
Jun-97	--	--	--	--	--	--	--	**0.032**	--	**0.013**	--	--	--
Sep-97	--	--	--	--	--	--	--	NS	--	**0.0038**	--	--	--
Dec-97	--	--	--	--	NS	--	--	NS	--	**0.0036**	--	0.0003	--
Mar-98	--	--	--	--	--	--	--	**0.004**	--	**0.003**	--	--	--
Jun-98	--	--	--	--	--	--	--	**0.152**	--	**0.012**	--	--	--
Sep-98	--	--	--	--	--	--	--	**0.045**	NS	**0.005**	--	--	--
Dec-98	--	**0.0045**	--	--	--	--	--	NS	NS	**0.0087**	--	0.0006	--
Mar-99	--	0.00054	--	--	--	--	--	**0.00127**	NS	**0.00531**	--	0.0006	--
Jun-99	--	0.00035	--	--	--	--	--	**0.00525**	--	**0.00706**	--	**0.00185**	--
Sep-99	--	NS	--	--	--	--	--	NS	NS	**0.015**	--	**0.0019**	--
Jan-00	**0.0017**	**0.0012**	**0.0026**	0.0007	**0.0012**	**0.0012**	**0.0045**	**0.0011**	**0.0009**	**0.0011**	**0.0007**	**0.0031**	**0.0022**
Mar-00	--	0.0008					0.0002			**0.0107**	--	**0.0019**	--
Jun-00	--	--	--	--	--	--	--	--	--	--	--	--	--
Sep-00	--	--	--	--	--	--	--	--	--	--	--	--	--
Dec-00	--	0.0007	--	--	NS	--	0.0006	0.0003	--	**0.0137**	--	**0.0023**	--
Mar-01	--	0.0002	--	--	NS	--	0.0003	0.0003	--	**0.0113**	--	**0.0021**	--
Jun-01	--	--	--	--	--	--	NS	0.0004	--	**0.0149**	--	**0.0017**	--
Sep-01	--	--	--	--	--	--	--	0.0004	--	**0.0152**	0.0004	**0.0018**	--
Dec-01	--	--	--	--	NS	--	--	--	--	**0.0039**	--	--	--
Mar-02	--	--	--	--	NS	--	--	--	--	**0.0051**	--	0.0006	--
Jun-02	--	--	--	--	NS	--	--	--	--	**0.0071**	--	--	--
Sep-02	--	--	--	--	NS	--	--	--	--	**0.0079**	--	0.0007	--
Dec-02	--	--	--	--	NS	--	--	--	--	--	--	--	--
Mar-03	--	--	--	--	NS	--	--	--	--	**0.0023**	--	0.0007	--
Jun-03	--	--	--	--	NS	--	--	--	--	**0.0056**	--	0.00071	--
Sep-03	--	--	--	--	NS	--	--	--	--	**0.026**	--	0.0005	--
Dec-03	--	--	--	--	NS	--	--	--	--	**0.0044**	--	0.0003	--
% Exceed 2L only	2.2%	2.2%	0.0%	0.0%	2.2%	2.2%	4.3%	4.3%	2.2%	2.2%	2.2%	8.7%	0.0%
% Exceed MCL	0.0%	2.2%	2.2%	0.0%	2.2%	0.0%	4.3%	47.8%	0.0%	89.1%	0.0%	32.6%	2.2%

Notes:
All concentrations are in milligrams per liter (mg/L)
Only wells with at least one detection of mercury are included in this table.
-- = not detected
NS = not sampled
2L = Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Standards (15A NCAC 2L Standard)
MCL = Safe Drinking Water Act's Maximum Contaminant Level
concentration exceeds 2L value for mercury (0.0011 mg/L) but is less than the MCL (0.002 mg/L)
concentration exceeds MCL for mercury (0.002 mg/L)

The wells with frequent detections of mercury at concentrations above drinking water standards were UNPA wells 10AR, 11A and 13A. **Figure 26** illustrates the locations of these wells. Wells 10AR and 13A are on the east side of the North Retention Basin and well 11A is located north of the former North Pond.

Figure 26: Locations of wells 10AR, 11A and 13A



Detected mercury concentrations in wells 10AR and 13A dropped below drinking water standards in March of 2000 and December 2001, respectively. Detected mercury concentrations in well 11A dropped from 0.1 mg/L in 1993 to only slightly above the MCL in 2002 through 2003. **Figure 27** illustrates the trend of mercury concentrations in groundwater over time for well 11A. The mercury concentration in 11A has decreased significantly over time, trending to non-detect.

Figure 27: Graph of mercury concentrations over time from well 11A

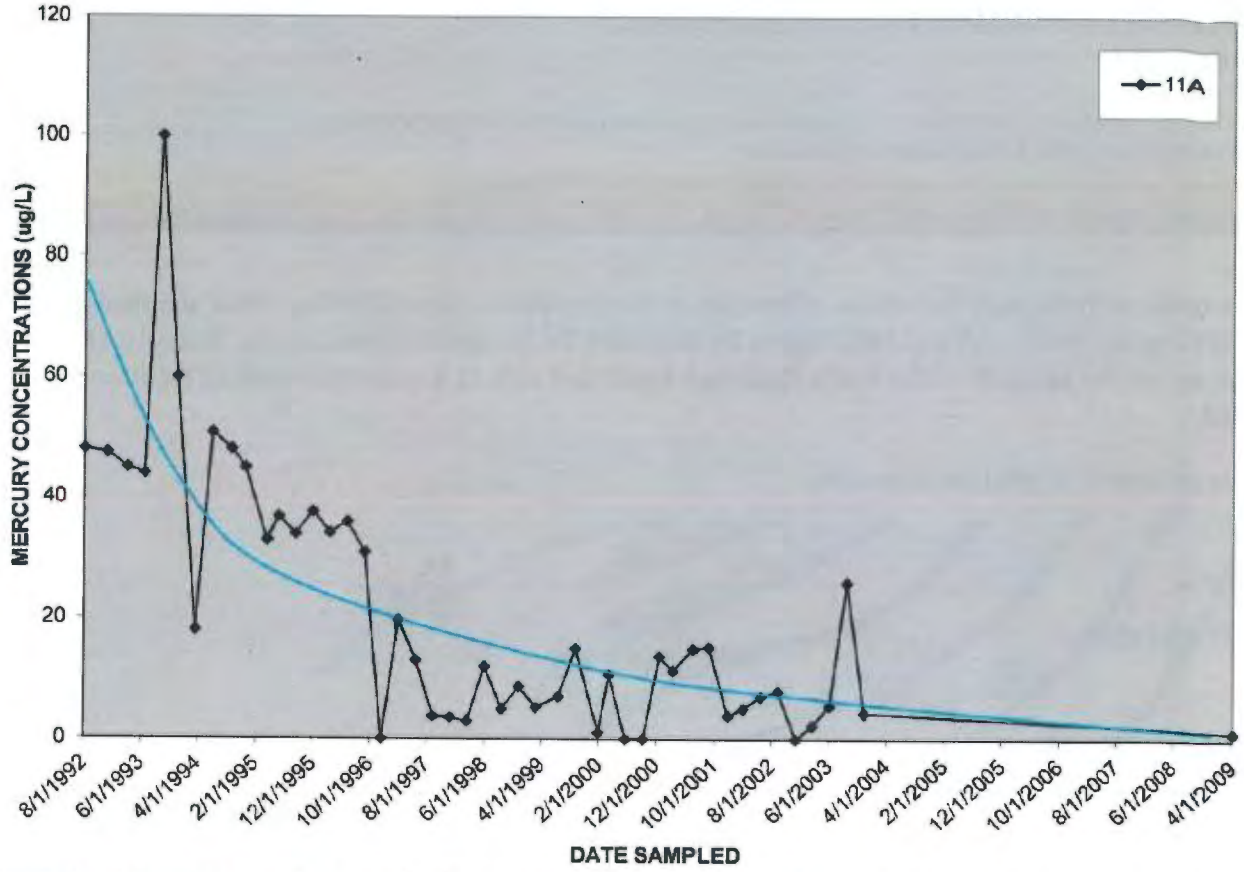


Illustration 4-2 – Graph of Hg concentrations in groundwater over time from well 11A

5.6.6.2 CERCLA Groundwater Monitoring Data

Under CERCLA authority, four groundwater sampling events have occurred and the results are discussed in the following three subsections.

5.6.6.2.1 April 2002 Sampling Event

Groundwater samples were collected during the iESI/RA from temporary wells in six locations in the UPA and two background locations. Unfiltered samples were analyzed for TAL metals; TCL VOCs; SVOCs, PCBs, pesticides, and inorganics.

Three VOCs and nine inorganics were detected at concentrations that exceeded drinking water standards. SVOCs were present at concentrations below drinking water standards. The laboratories did not detect PCBs or pesticides.[6] **Table 79** summarizes results that had a detectable concentration that exceeded a State or Federal drinking water standard. **Figure 28** illustrates the sample locations.

[6] Aroclor 1268 was not included in the list of PCBs analyzed.

Table 79: Constituents with Results Greater than Drinking Water Standards in April 2002 Sampling Event

Analyte	Standard		HC-01	HC-03	HC-04	HC-05	HC-07	HC-09	HC-23	HC-24
			On-Site						Background	
	2L	MCL	Retort Area				Fill Area	Robert's Pond	Off-site	Old Parking Area
VOCs (µg/L)										
1,1-dichloroethane	6	NE	25	13	18	5	--	NA	--	--
trichloroethene	3	5	3	1	2	--	--	NA	--	--
vinyl chloride	0.03	2	**8**	**9**	**13**	**4**	--	NA	--	--
INORGANICS (µg/L)										
aluminum	NE	50*	26,000	190	34,000	4,900	6,300	900	4,500	3,900
arsenic	10	10	**190**	**110**	**170**	**33**	--	**20**	--	**22**
beryllium	NE	4	--	--	--	--	--	**6.4**	--	--
cadmium	2	5	1.2	--	2.9	--	--	1.7	--	--
chromium	10	100	99	NA	78	9.6	16	8.6	3.6	11
iron	300	NE	3,000	410	3,200	3,100	6,400	4,400	5,700	31,000
mercury	1	2	**24**	0.67	**14**	0.96	**6.4**	**2.4**	--	--
manganese	50	NE	44	35	34	320	360	66	30	480
thallium	NE	2	--	NA	--	NA	NA	**6.4**	--	NA

Notes:

* Secondary MCL, not enforceable

2L = Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Standards (15A NCAC 2L Standard)

-- = not detected

MCL = Safe Drinking Water Act's Maximum Contaminant Level

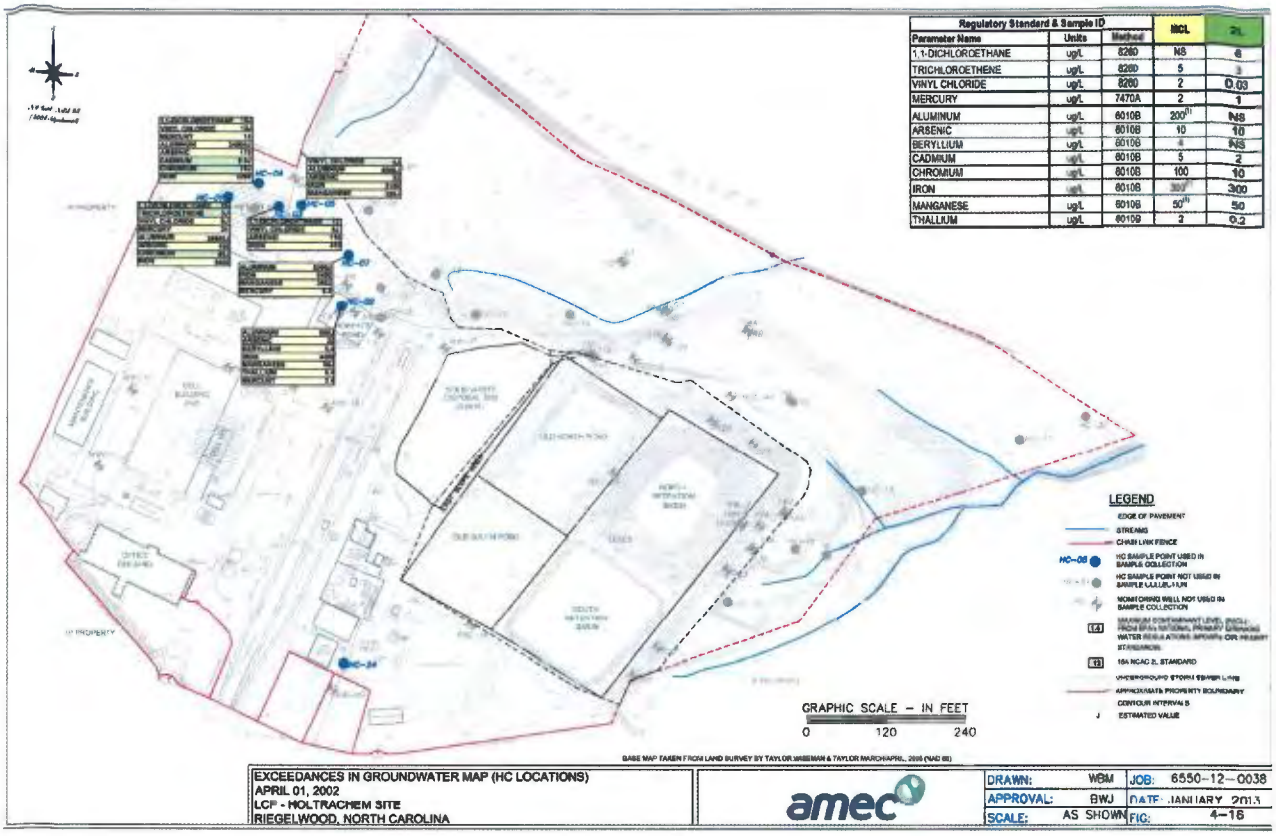
NA = not analyzed

NE = not established

concentration exceeds 2L value but is less than the MCL

concentration exceeds MCL value

Figure 28: Exceedances in groundwater from April 2002 sampling event



5.6.6.2.2 December 2004 and April 2009 Sampling Events

Site-wide groundwater sampling events occurred as part of the EE/CA-RI in 2004 and 2009. During each event, the groundwater samples were analyzed for TAL metals, TCL VOCs, SVOCs, PCBs + Aroclor 1268, pesticides, and inorganics.

A summary of the detected constituents and their 2L Standards, MCLs and SMCLs, where available, for the 2004 and 2009 sampling events are presented in **Table 80** and **Table 81** respectively.

Table 80: Summary of Detected Constituents - 2004 Groundwater

Table 4-17
Summary of Detected Constituents - 2004 Groundwater
RI Report
LCP-Holtrachem Site, Riegelwood, NC

			General Site Location		UPA								UNPA		Wooded Bottomland Area			
Regulatory Standard & Sample ID			2L	MCL	BG	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	POC-2R	14A	POC-3	NUS-4R	6A	B8
Parameter Name	Units	Method			2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004	2004
Field pH*	s.u.	150.1	6.5 - 8.5	6.5 - 8.5(1)	5.9	9.36	8.7	5.84	6.01	6.37	6.66	5.89	6.57	6.78	8.21	7.5	6.77	6.2
pH	s.u.	9040B	6.5 - 8.5	6.5 - 8.5(1)	7.5	10.2	9.2	6.5	7.2	7.5	6.9	8.3	6.9	7	6.7	7.3	7.4	6.5
CHLORIDE	mg/L	300.0A	250	250(1)	86.4	196	216	1060	7670	28800	3210	16000	2770	2520	2960	28.8	24.5	2470
NITROGEN, NITRATE (AS N)	mg/L	300.0A	10	10	0.5U	10U	5U	5U	5U	35.6	NA	3.8B	0.5U	0.5U	0.5U	0.5U	0.5U	0.5U
SULFATE	mg/L	300.0A	250	250(1)	26.9	953	282	3450	588	1280	48.2	376	169	129	755	240	592	168
ALPHA-CHLORDANE	ug/L	8081A	0.10	2	0.000335U	0.0064	0.383	0.00102U	0.00105U	0.192	0.00442	0.00232	0.000962U	0.00428	0.000962U	0.00111U	0.00115U	0.0154
BETA-CHLORDANE	ug/L	8081A	0.10	2	0.000456U	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
DIELDRIN	ug/L	8081A	0.002	NE	0.000287U	0.00202U	0.04U	0.00203U	0.000953	0.0583	0.000984J	0.00189U	0.00192U	0.00196U	0.00192U	0.00222U	0.0023U	0.00155J
HEPTACHLOR	ug/L	8081A	0.008	0.4	0.000718U	0.00101	0.117	0.00102U	0.00105U	0.0841	0.0274	0.0216	0.0229	0.0228	0.000962U	0.00111U	0.00115U	0.021
AROCHLOR-1268	ug/L	8082	NE	0.5	0.0138J	0.037B	0.757E	0.00371J	0.191	0.0227	0.0243	0.00455J	0.00957J	0.0197U	0.0195U	0.0199U	0.0075J	0.0137J
BENZO(B)FLUORANTHENE	ug/L	8270C	0.05	NE	2U	1J	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U
BIS(2-ETHYLHEXYL)PHTHALATE	ug/L	8270C	3	6	10U	3.7J	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U	10U
NAPHTHALENE	ug/L	8270C	6	NE	2U	2J	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U	2U
ALUMINUM	ug/L	6010B	NE	50-200(1)	124B	4220	46700	280	9630	480B	527	612	154B	282	152B	200U	1120	152B
ANTIMONY	ug/L	6010B	NE	6	60U	17.9B	15.2B	60U	60U	60U	60U	60U	60U	60U	60U	60U	60U	60U
ARSENIC	ug/L	6010B	10	10	10U	288	280	10U	5.5B	100U	4B	10U	4B	10U	10U	10U	10U	10U
BARIUM	ug/L	6010B	700	2000	13.2B	27.3B	75	30B	109	323B	470	613	381	198	79.8	24.2B	74	158
CHROMIUM	ug/L	6010B	10	100	10U	283	382	10U	13.7	100U	4.8B	10U	10U	10U	10U	10U	3.1B	10U
IRON	ug/L	6010B	300	300(1)	77.3B	17700	11300	31500	5760	1000U	15500	13000	24100	280	107	162	1210	906
MANGANESE	ug/L	6010B	50	50(1)	3.3B	301	153	1700	347	125B	723	4460	1180	51.7	255	1.9B	145	578
MERCURY	ug/L	7470A	1	2	0.2U	0.43	0.84	0.18B	66.2	3.1	1.4	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U	0.2U
NICKEL	ug/L	6010B	100	NE	40U	114	380	3.6B	12.3B	400U	9B	15B	40U	7.1B	6.4B	40U	2.9B	11.6B
SELENIUM	ug/L	6010B	20	50	5U	1.5B	6.2	5U	3.4B	21.8B	5U	2.2B	5U	5U	5U	5U	5U	5U
THALLIUM	ug/L	6010B	NE	2	3.3BJ	6.1BJ	7.3BJ	6.7BJ	4BJ	100U	3.9BJ	6.3BJ	4.3BJ	2.8BJ	3.9BJ	3.5BJ	10U	3.4BJ

Notes

ug/L = micrograms per liter / mg/L = milligrams per liter / s.u. = Standard Units / mS/cm = milli Siemens/centimeter
2L = Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Standards (15A NCAC 2L Standard)
MCL = Maximum Contaminant Level - from EPA's National Primary Drinking Water Regulations (NPDWRs or primary standards)
(1) - National Secondary Drinking Water Standard was used where no National Primary Standard was established.
(2) Interim 2L Standard
Shaded & bold values indicate concentrations that exceed either a 2L or MCL regulatory standard
UPA - Upland Process Area
UNPA - Upland Non Process Area
NE = Not Established
NA = Not Analyzed

Qualifiers
B - When associated with metals, value is between the contract required detection limit (CRDL) and instrument detection limit (IDL)
B - When associated with organics, analyte was also detected in the blank
D - Compound quantitated on a diluted sample
E - Concentration exceeds the calibration range of the instrument
J - Estimated value, the result falls between the method detection limit and the limit of quantitation
JN - Estimated maximum possible concentration (EMPC)
U - Not detected, value shown is detection limit
UG - Elevated reporting limit due to matrix interference
N = estimated (for metals)

Table 81: Summary of Detected Constituents - 2009 Groundwater

Table 4-18
Summary of Detected Constituents - 2009 Groundwater
RI Report
LCP-Holtrachem Site, Riegelwood, NC

			General Site Location		UPA								UNPA			Wooded Bottomland Area		
Regulatory Standard & Sample ID			2L	MCL	BG	MW-15	MW-16	MW-17	MW-18	MW-19	MW-20	MW-21	POC-2R	11A	14A	POC-3	NUB-4R	BG
Parameter Name	Units	Method			2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009	2009
Field pH*	s.u.	150.1	6.5 - 8.5	6.5 - 8.5(1)	6.72	9.23	8.92	6.72	7.42	7.84	6.93	6.46	7.14	8.96	6.73	6.41	7.01	6.52
pH	s.u.	9040B	6.5 - 8.5	6.5 - 8.5(1)	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
CHLORIDE	mg/L	300.0A	250	250(1)	64	223	198	866	1260	17800	1140	10100	1040	6610	2980	3720	41.8	1380
NITROGEN, NITRATE (AS N)	mg/L	300.0A	10	10	0.076	0.05U	0.05U	0.05U	1.8	2.5UG	0.05U	0.24J	0.05U	1.2U	0.48J	0.5U	0.008J	0.15
SULFATE	mg/L	300.0A	250	250(1)	14.5	1320	295	1900	63.7	734	10.7	165	27.3	216	130	960	217	61.2
NAPHTHALENE	ug/L	8270C	6	NE	0.19U	4.4	0.97U	0.2U	0.19U	0.2U	0.2U	0.2U	0.19U	0.25	0.15J	0.19U	0.19U	0.19U
ALUMINUM	ug/L	6010B	NE	50-200(1)	30U	2360	27300	255	46200	1140	319	150U	413	150U	30U	30U	30U	30U
ANTIMONY	ug/L	6010B	NE	6	2U	5.5	14.3	2U	6	1.5J	2U	10U	2U	2.1J	2U	2U	2U	2U
ARSENIC	ug/L	6010B	10	10	1U	78.4	133	0.6J	13.7	1U	3.2	5U	3.8	5U	1U	1U	1U	1U
BARIUM	ug/L	6010B	700	2000	8J	13.2	68.6	26.7	33.4	23.4	58	520	105	9.4J	200	66.2	19.6	66.4
CHROMIUM	ug/L	6010B	10	100	2U	121	228	2U	48.8	2U	2U	10U	2U	10U	2U	2U	2U	2U
IRON	ug/L	6010B	300	300(1)	131	3180	11700	2140	22800	900	1040	114J	4340	250U	476	179	50U	835
MANGANESE	ug/L	6010B	50	50(1)	22.4	88.8	69	380	138	19.8	158	353	210	2.5U	77.9	147	4.1	117
MERCURY	ug/L	7470A	1	2	0.2U	0.19J	0.79	0.44	87.8	0.56	0.51	0.2U	0.2U	1.2	0.2U	0.2U	0.2U	0.2U
NICKEL	ug/L	6010B	100	NE	1.2	33.1	211	1.3	22.9	1.8	10.4	2.7J	2.6	6.5	3.4	3.9	1U	4.4
SELENIUM	ug/L	6010B	20	50	5U	1.9J	11.7	5U	1.2J	0.48J	2.6J	25U	0.96J	25U	5U	5U	5U	1.4J

Notes
ug/L = micrograms per liter / mg/L = milligrams per liter / s.u. = Standard Units / mS/cm = milli Siemens/centimeter
2L = Title 15A North Carolina Administrative Code Subchapter 2L Groundwater Standards (15A NCAC 2L Standard)
MCL = Maximum Contaminant Level - from EPA's National Primary Drinking Water Regulations (NPDWRs or primary standards).
(1)- National Secondary Drinking Water Standard was used where no National Primary Standard was established.
(2) Interim 2L Standard
Shaded & bold values indicate concentrations that exceed either a 2L or MCL regulatory standard
NE = Not Established
NA = Not Analyzed

Qualifiers
B - When associated with metals, value is between the contract required detection limit (CRDL) and instrument detection limit (IDL)
B - When associated with organics, analyte was also detected in the blank
D - Compound quantitated on a diluted sample
E - Concentration exceeds the calibration range of the instrument
J - Estimated value, the result falls between the method detection limit and the limit of quantitation
JN - Estimated maximum possible concentration (EMPC)
U - Not detected, value shown is detection limit
UG - Elevated reporting limit due to matrix interference
N = estimated (for metals)

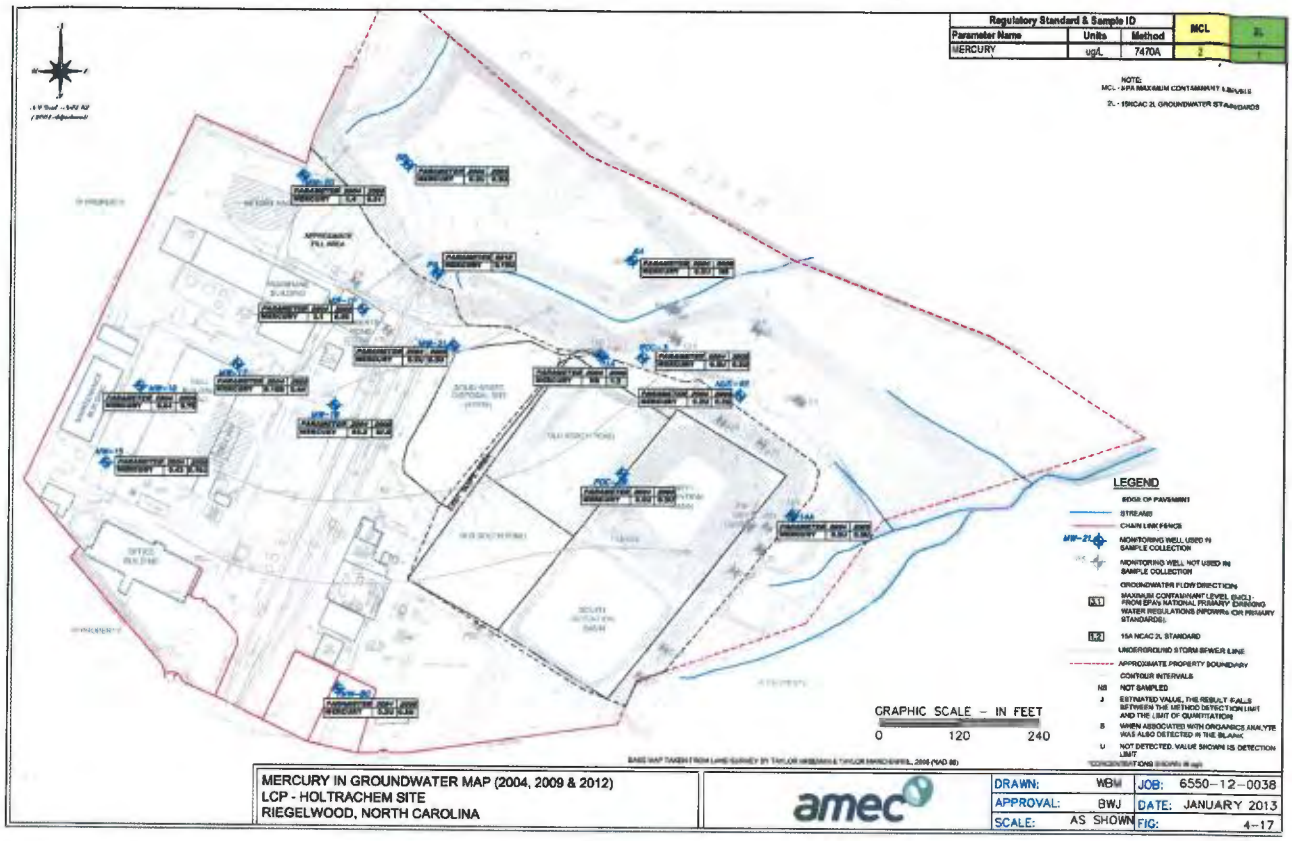
Several contaminants were present in groundwater at concentrations exceeding drinking water standards. The following paragraphs discuss these results.

Mercury

Figure 29 shows the distribution of mercury in groundwater for the 2004, 2009 and 2012 monitoring events. In 2004, mercury was present in the following three wells at concentrations exceeding drinking water standards: MW-18, MW-19, and MW-20. These wells are located in the UPA. No detectable concentrations of mercury were present in the UNPA or WBA during this event.

In 2009, mercury concentrations for MW-19 and MW-20 dropped to below the drinking water standards. Wells MW-11A and MW-18 were the only two wells with mercury concentrations in excess of a standard. The concentrations were 1.2 and 87.8 µg/L respectively. No detectable concentrations of mercury were present in the WBA during this event.

Figure 29: Mercury in Groundwater 2004, 2009 and 2012

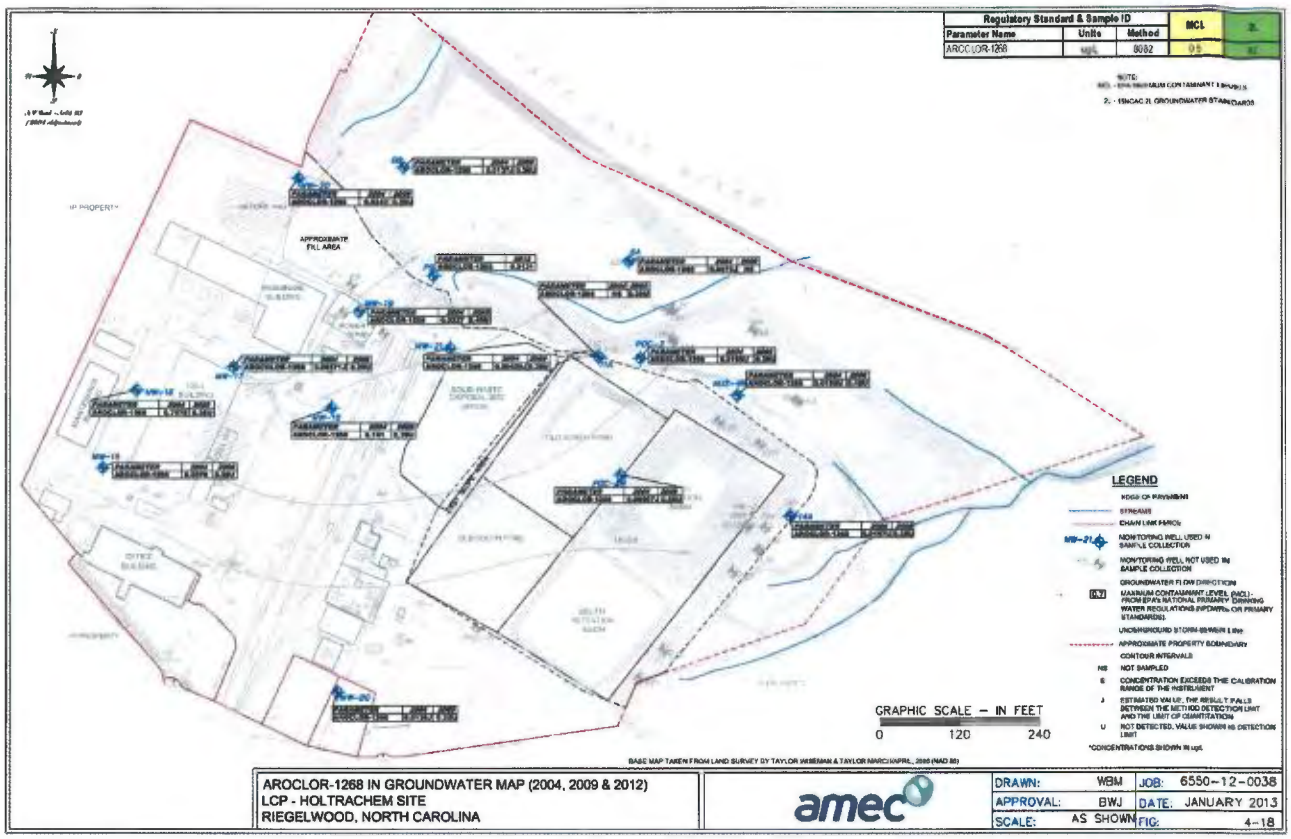


Aroclor 1268

Figure 30 shows the distribution of Aroclor 1268 in groundwater for the 2004, 2009 and 2012 monitoring events. In 2004, Aroclor 1268 was present in several wells, but only one well had a concentration above the MCL.[7] Well MW-16 had an estimated concentration of 0.757 µg/L. In 2009, no detectable concentrations of Aroclor 1268 were present in groundwater. The laboratory detection limit was below the MCL.

[7] The MCL value for Aroclor 1268 is 0.5 µg/L. There is no 2L standard for Aroclor 1268. https://www.epa.gov/ground-water-and-drinking-water/table-regulated-drinking-water-contaminants#Organic

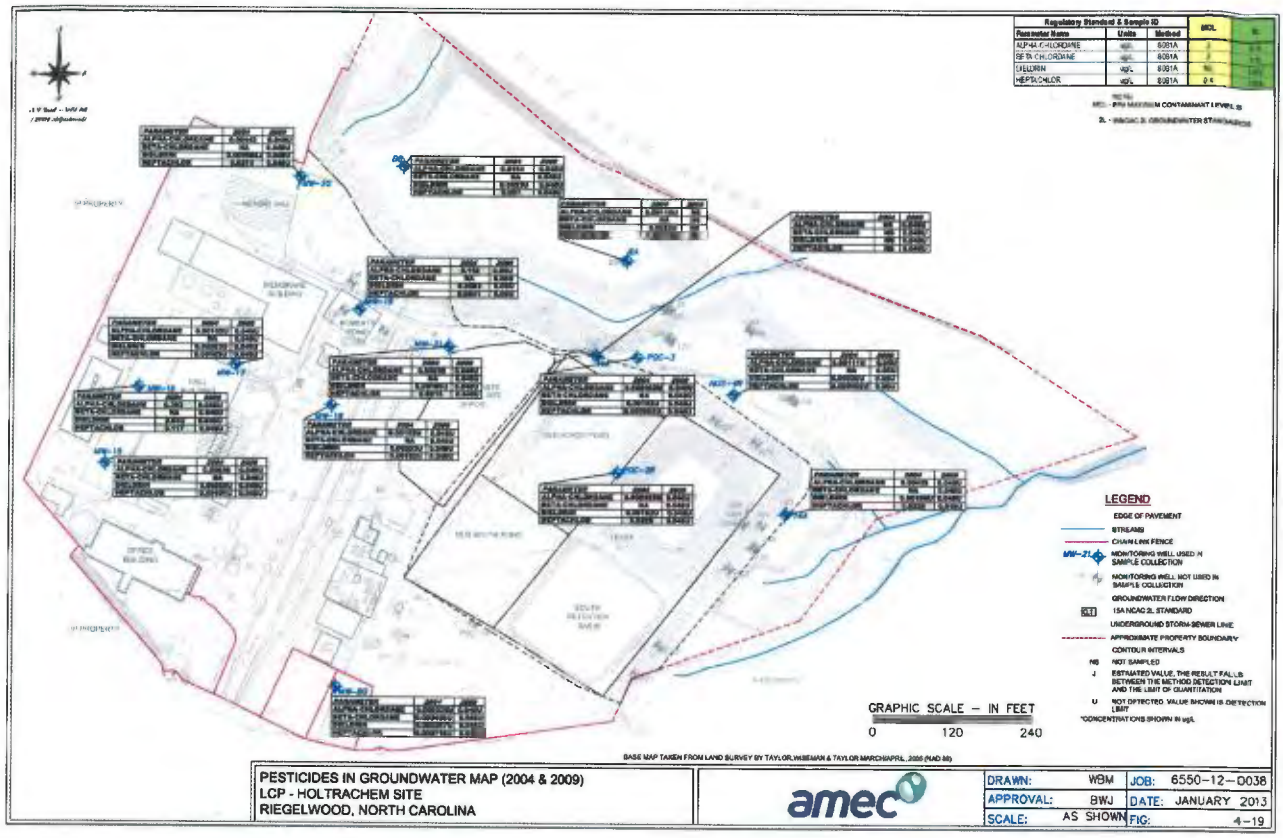
Figure 30: Aroclor 1268 in Groundwater 2004, 2009 and 2012



Pesticides

In 2004, pesticides were present at concentrations exceeding drinking water standards in wells in the UPA, UNPA and WBA. In 2009, there were no detectable concentrations of pesticides in any of the groundwater samples. As previously discussed, the annual RCRA sampling results from the three POC wells did not identify detectable concentrations of pesticides from 1992 to 2003. Previous investigations did not identify a source of pesticides at the site. **Figure 31** illustrates the concentrations of pesticides in groundwater in 2004 and 2009.

Figure 31: Pesticides in Groundwater 2004 & 2009



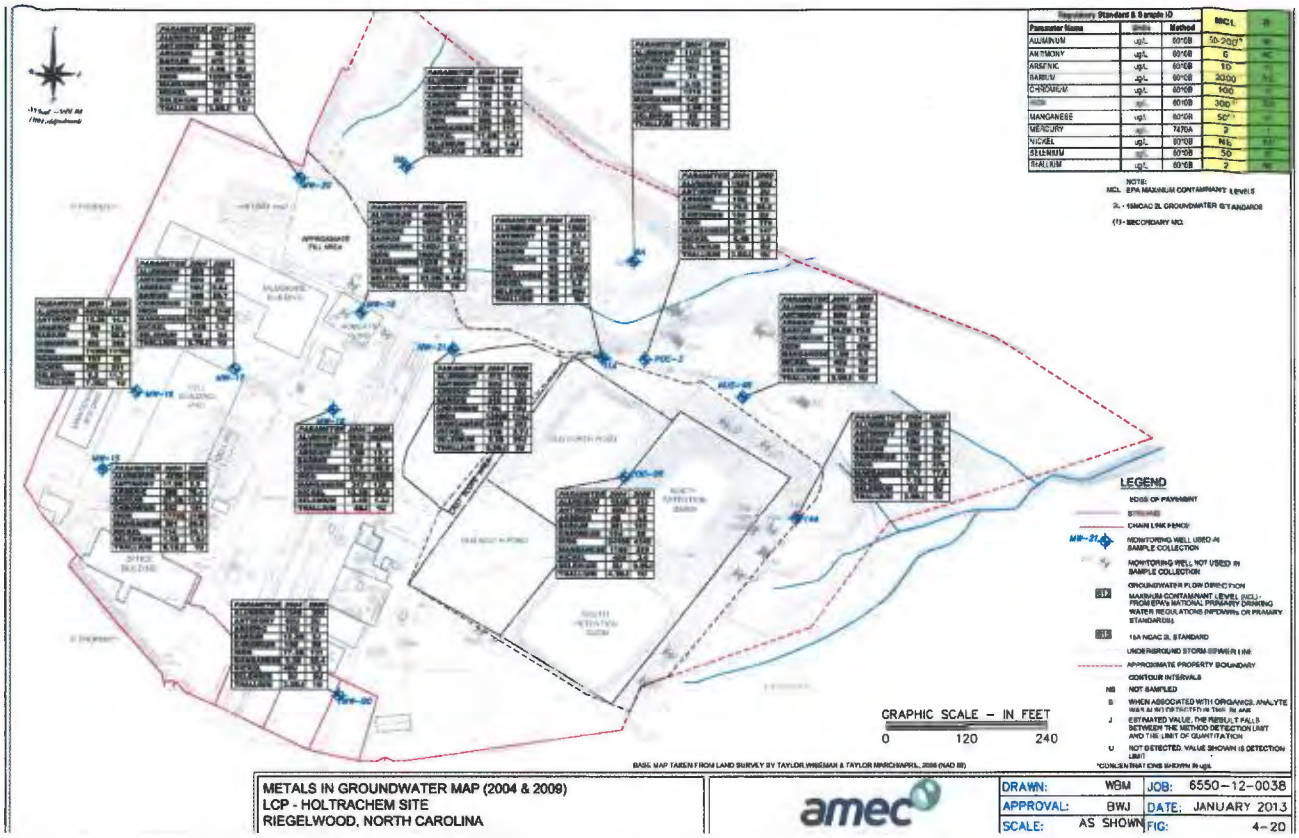
Metal Indicator Parameters

Figure 32 illustrates the concentrations of metals in groundwater in 2004 and 2009 that exceeded drinking water standards. The following inorganics were only present in the UPA groundwater at concentrations above a standard: antimony, arsenic, barium, chromium, nickel and selenium. Iron, manganese and thallium were present in groundwater above a standard across the site. The 2009 data indicated iron and manganese were the only metals detected in the WBA above a groundwater standard.

Antimony, arsenic, chromium and nickel were present in wells MW-15 and MW-16 in concentrations exceeding drinking water standards. These constituents do not appear to be migrating to down gradient wells as observed in the results from wells MW-17, MW-19 and MW-20.

Arsenic and chromium were present in well MW-18 in concentrations that exceeded drinking water standards. The 2009 data indicates these constituents are not migrating to the WBA as observed in the results from down gradient wells MW-19 and MW-21.

Figure 32: Metals in Groundwater 2004 & 2009



SVOCs

Figure 33 illustrates the concentrations of SVOCs in groundwater in 2004 and 2009 at concentrations that exceeded drinking water standards. In 2004, three SVOCs were present in well MW-15 at concentrations in excess of the 2L Standards. SVOCs were not detected in groundwater samples from the other wells. In 2009, the concentrations of SVOCs detected were less than 2L and MCL standards. The detected SVOCs do not appear to be migrating towards down gradient wells as observed from well MW-16. Previous investigations did not identify a source of SVOCs at the site.

Figure 33: SVOCs in Groundwater 2004 & 2009