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DRAFT RESOURCE CONSERVATION AND RECOVERY ACT FACILITY INVESTIGATION
REPORT VOLUME 3 OF 12 SECTIONS 10.3 TO 10.5 ZONE L CNC CHARLESTON SC
12/18/1998
ENSAFE INC.

**DRAFT ZONE L
RCRA FACILITY INVESTIGATION REPORT
CHARLESTON NAVAL COMPLEX**

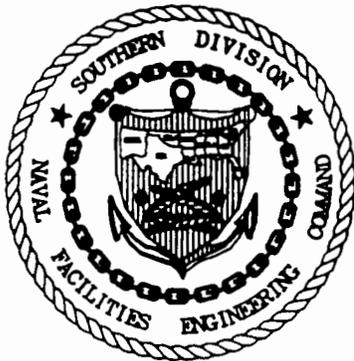


**VOLUME 3 OF 12
SECTIONS 10.3 TO 10.5**

**CTO-029
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Southern Division
Naval Facilities Engineering Command
North Charleston, South Carolina**



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December 18, 1998

10.3 Subzone C

The boundaries of Subzone C for the Zone L RFI are the existing areas investigated in the Zone C RFI. Data from the Zone C environmental samples have been compared to data from the Zone L investigation. Existing sample locations for Zone C are presented in Figures 10.3.1 and 10.3.2.

10.3.1 Subzone C, SWMU 37

Sampling in Subzone C, SWMU 37, consisted of 36 DPT soil samples and 40 DPT groundwater samples. The DPT samples were analyzed for VOCs, metals, and cyanide. Two upper level soil boring samples and two monitoring well groundwater samples were also collected and analyzed for VOCs, SVOCs, chlorinated pesticides, PCBs, metals, and cyanide.

Sample locations are presented in Figures 10.3.3 through 10.3.7.

10.3.1.1 Nature of Contamination in Subzone C, SWMU 37, DPT Soil

Organic compound analytical results for soil obtained by DPT collection are summarized in Table 10.3.1. Inorganic analytical results are summarized Table 10.3.2. Appendix C contains the complete data report for all samples collected in Zone L.

Volatile Organic Compounds Detected in DPT Soil

Three VOCs were detected in the DPT soil samples, but none exceeded RBC values.

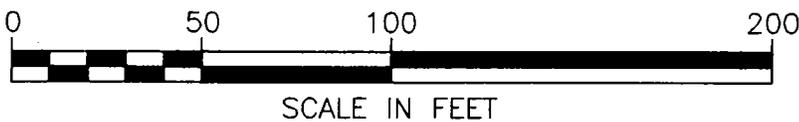


044001
044SB001

037SB002 ●
044SB008 ●
037SB001 ●
700SB003 ●
037C01 ▲
700SB005 ●
700SB001 ●
700SB004 ●
044008 ●
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037SP004 ◆
037SB002 ●
1228
HUNT
GDCSB007 ●
1635
ST.
037GP002 ◆

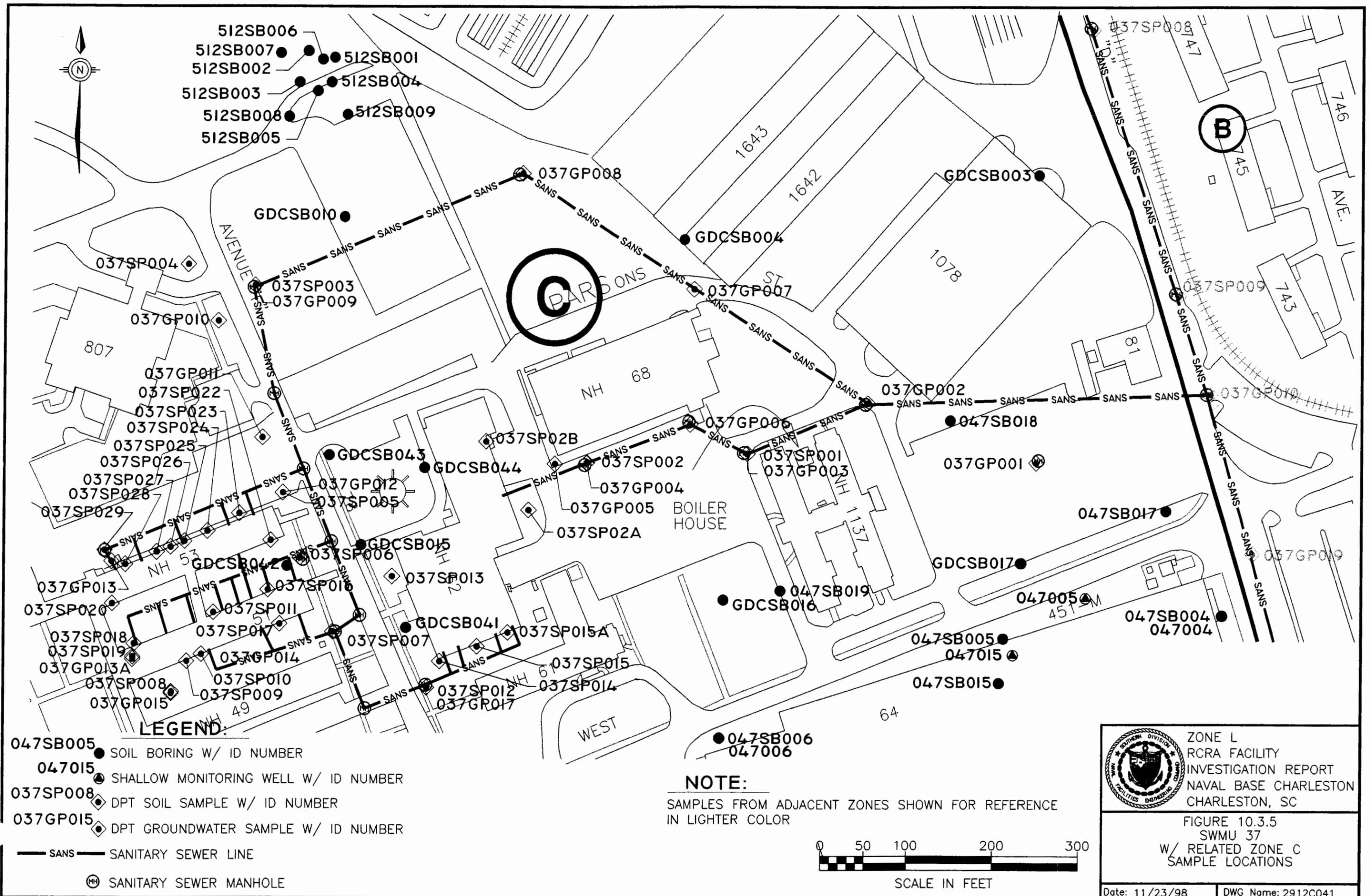
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- 037C02 ▲ SHALLOW MONITORING WELL W/ ID NUMBER
- 037SP004 ◆ DPT SOIL SAMPLE W/ ID NUMBER
- 037GP002 ◆ DPT SOIL SAMPLE W/ ID NUMBER
- SANS — SANITARY SEWER LINE
- (MH) SANITARY SEWER MANHOLE



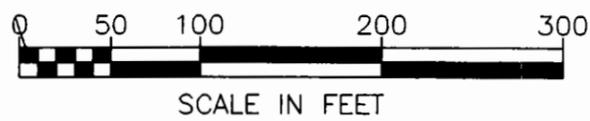
ZONE L
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.4
SWMU 37
W/ RELATED ZONE C
SAMPLE LOCATIONS

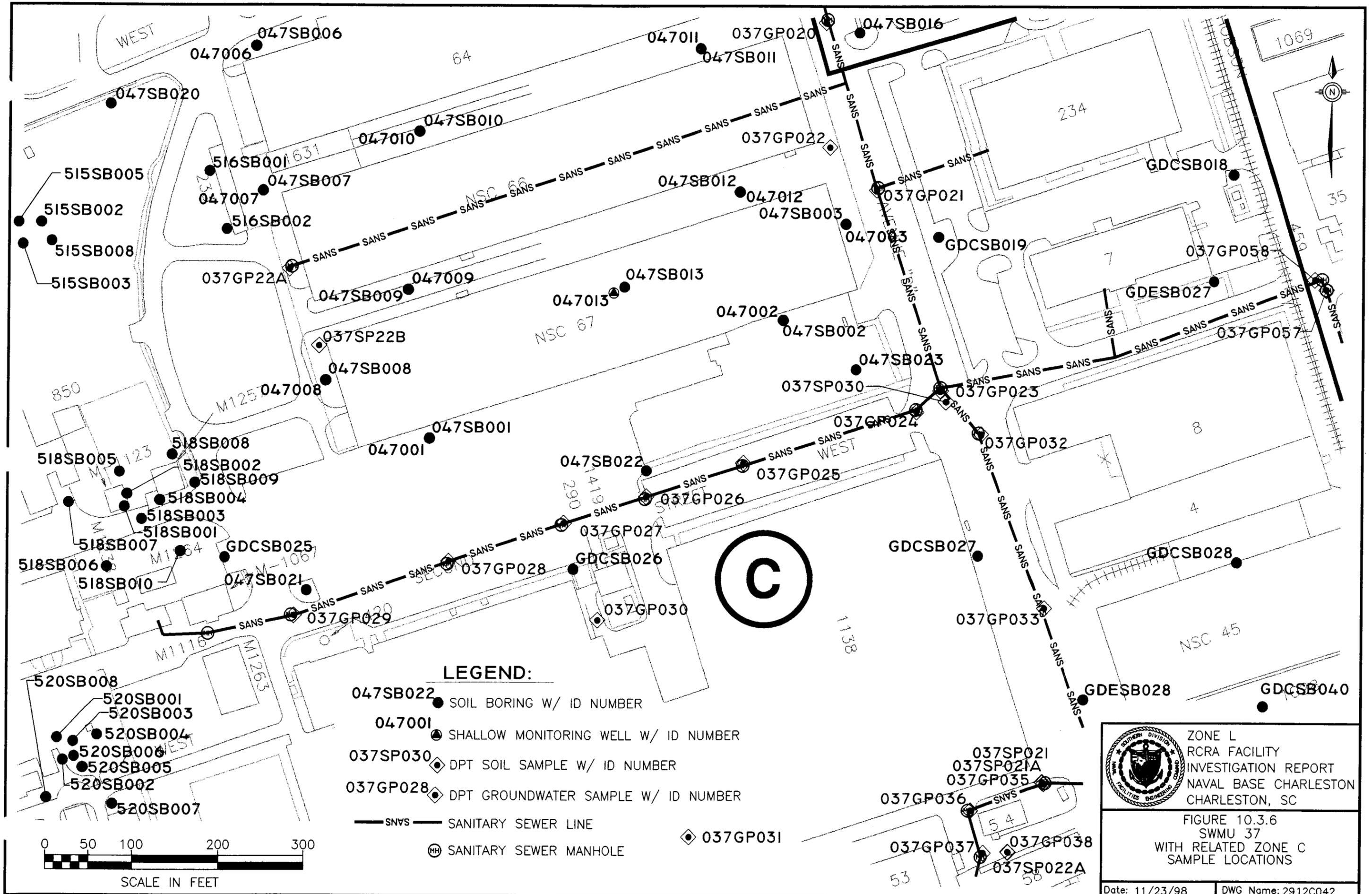


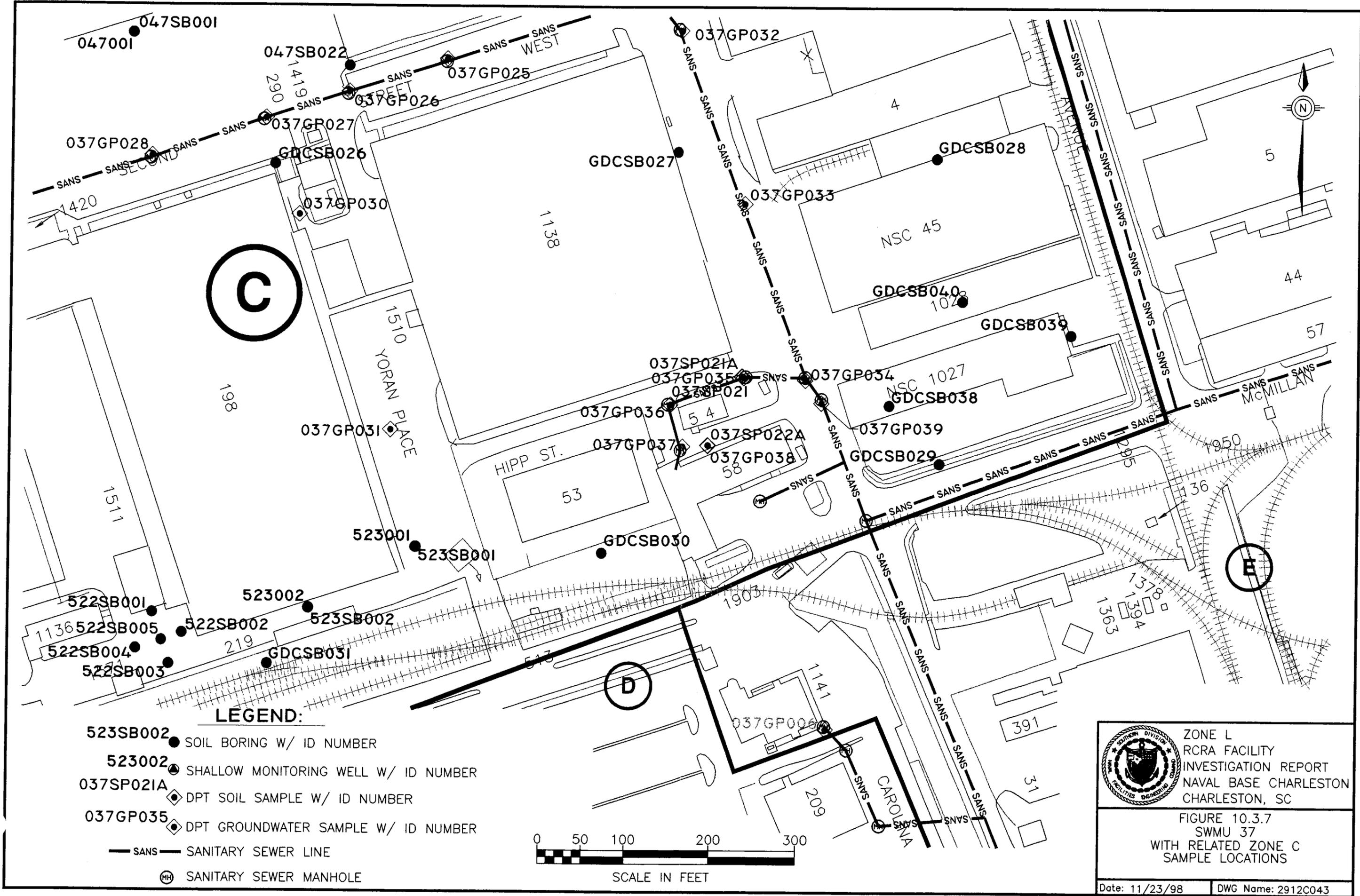
- LEGEND:**
- SOIL BORING W/ ID NUMBER
 - SHALLOW MONITORING WELL W/ ID NUMBER
 - ◇ DPT SOIL SAMPLE W/ ID NUMBER
 - ◇ DPT GROUNDWATER SAMPLE W/ ID NUMBER
 - SANS — SANITARY SEWER LINE
 - Ⓜ SANITARY SEWER MANHOLE

NOTE:
 SAMPLES FROM ADJACENT ZONES SHOWN FOR REFERENCE
 IN LIGHTER COLOR



	ZONE L RCRA FACILITY INVESTIGATION REPORT NAVAL BASE CHARLESTON CHARLESTON, SC
	FIGURE 10.3.5 SWMU 37 W/ RELATED ZONE C SAMPLE LOCATIONS
Date: 11/23/98	DWG Name: 2912C041





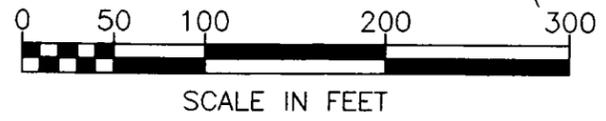
(C)

(E)

(D)

LEGEND:

- 523SB002 SOIL BORING W/ ID NUMBER
- 523002 SHALLOW MONITORING WELL W/ ID NUMBER
- ◆ 037SP021A DPT SOIL SAMPLE W/ ID NUMBER
- ◆ 037GP035 DPT GROUNDWATER SAMPLE W/ ID NUMBER
- SANS — SANITARY SEWER LINE
- ⊕ SANITARY SEWER MANHOLE



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CHARLESTON, SC

FIGURE 10.3.7
SWMU 37
WITH RELATED ZONE C
SAMPLE LOCATIONS

Table 10.3.1
SWMU 37, Zone L, Subzone C
Organic Compounds Detected in DPT Soil

Compound	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Volatile Organic Compounds ($\mu\text{g}/\text{kg}$)							
Acetone	15/36	9.10-2150	242.3	780000	0	16000	NO
Xylenes (Total)	2/36	8.00-8.34	8.17	16000000	0	140000 c	NO
cis-1,2-Dichloroethene	1/36	11.3	11.3	78000	0	400	NO

Notes:

- $\mu\text{g}/\text{kg}$ = Micrograms per kilogram
- RBC = Risk-based concentration
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 20, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone C RFI Report

Table 10.3.2
SWMU 37, Zone L, Subzone C
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)								
Aluminum (Al)	36/36	2270-16500	5190	7800	9990	1	1000000 c	NO
Arsenic (As)	27/36	1.06-13.2	3.06	0.430	14.2	27	29	NO
Barium (Ba)	36/36	5.68-62.3	19.2	550	77.2	0	1600	NO
Beryllium (Be)	8/36	0.230-0.920	0.353	16	ND	0	63	NO
Cadmium (Cd)	4/36	0.320-0.560	0.443	7.80	0.65	0	8	NO
Calcium (Ca)	36/36	214-179000	11128	NA	NA	NA	NA	NO
Chromium (Cr)	36/36	2.38-32.2	7.52	39.0	26.4	0	38	NO
Cobalt (Co)	14/36	0.560-3.79	1.27	470	3.22	0	2000 c	NO
Copper (Cu)	32/36	1.63-188	19.5	310	34.7	0	11200 c	NO
Iron (Fe)	36/36	285-16700	3144	2300	NA	23	NA	NO
Lead (Pb)	36/36	2.36-341	42.4	400	330	0	400	NO

Table 10.3.2
SWMU 37, Zone L, Subzone C
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Magnesium (Mg)	36/36	35.0-3030	492	NA	NA	NA	NA	NO
Manganese (Mn)	36/36	1.52-168	33.9	160	92.5	1	950 c	NO
Mercury (Hg)	17/36	0.0400-0.290	0.0871	NA	0.24	NA	2	NO
Nickel (Ni)	36/36	0.740-14.8	2.96	160	12.3	0	130	NO
Potassium (K)	36/36	43.0-953	175	NA	NA	NA	NA	NO
Selenium (Se)	4/36	0.540-1.46	0.790	39.0	1.44	0	5	NO
Sodium (Na)	36/36	119-501	172	NA	NA	NA	NA	NO
Tin (Sn)	6/36	3.93-6.53	5.57	4700	2.95	0	11000 c	NO
Vanadium (V)	36/36	1.84-40.5	6.99	55.0	23.4	0	6000	NO
Zinc (Zn)	35/36	2.68-273	38.9	2300	159	0	12000	NO

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 NA = Not applicable
 ND = Not detected
 c = Calculated SSL
 GW = Groundwater
 SSL = Soil screening level
 Soil to GW = Generic SSLs based on DAF = 20, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone C RFI Report

Metals/ Cyanide Detected in DPT Soil

As summarized in Table 10.3.2, aluminum (1/36), arsenic (27/36), iron (23/36), and manganese(1/36) were found at levels above RBC values. Locations of these exceedances are shown in Table 10.3.3.

10.3.1.2 Nature of Contamination in Subzone C, SWMU 37, DPT Groundwater

Forty DPT groundwater samples were collected for analysis of VOCs, metals, and cyanide. Results for detected compounds are presented in Tables 10.3.4 (VOCs) and 10.3.5 (metals and cyanide). As stated in Section 10.0, DPT groundwater has not been compared to RBCs or MCLs.

Table 10.3.3
Subzone C, SWMU 37, DPT Soil Sample Locations with
Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)			
Aluminum	037SP22B	16500.00	Y	N	7800.00	1,000,000			
Arsenic	037SP001	2.66	Y	N	0.43	29.00			
	037SP002	3.05	Y	N					
	037SP003	1.29	Y	N					
	037SP004	2.32	Y	N					
	037SP005	3.21	Y	N					
	037SP006	9.66	Y	N					
	037SP007	2.99	Y	N					
	037SP010	1.06	Y	N					
	037SP012	2.47	Y	N					
	037SP013	1.62	Y	N					
	037SP014	2.56	Y	N					
	037SP015	2.11	Y	N					
	037SP016	2.59	Y	N					
	Arsenic	037SP017	1.52	Y			N	0.43	29.00
		037SP019	1.29	Y			N		
		037SP022	2.42	Y			N		
037SP024		1.53	Y	N					
037SP025		1.63	Y	N					
037SP026		1.21	Y	N					
037SP028		1.25	Y	N					
037SP029		2.41	Y	N					
037SP02A		13.20	Y	N					
037SP02B		2.21	Y	N					
037SP030		2.89	Y	N					
037SP15A		1.70	Y	N					
037SP21A		2.16	Y	N					
037SP22B		9.65	Y	N					
Iron	037SP001	5800.00	Y	NA	2300.00	NA			
	037SP002	3270.00	Y	NA					
	037SP004	4720.00	Y	NA					
	037SP005	4030.00	Y	NA					
	037SP006	5170.00	Y	NA					
	037SP007	2740.00	Y	NA					
	037SP012	3260.00	Y	NA					
	037SP013	3080.00	Y	NA					
	037SP014	2650.00	Y	NA					
	037SP015	3030.00	Y	NA					
	037SP016	3460.00	Y	NA					

Table 10.3.3
 Subzone C, SWMU 37, DPT Soil Sample Locations with
 Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Iron	037SP017	3230.00	Y	NA		
	037SP022	3340.00	Y	NA		
	037SP023	2420.00	Y	NA		
	037SP024	2900.00	Y	NA		
	037SP025	2510.00	Y	NA		
	037SP026	2520.00	Y	NA		
	037SP02A	6680.00	Y	NA		
	037SP02B	4260.00	Y	NA		
	037SP030	3220.00	Y	NA		
	037SP15A	2820.00	Y	NA		
	037SP21A	3020.00	Y	NA		
	037SP22B	16700.00	Y	NA	2300.00	NA
	Manganese	037SP02A	168.00	Y	N	160.00

Table 10.3.4
 SWMU 37, Zone L, Subzone C
 Organic Compounds Detected in DPT Groundwater

Compound	Freq of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Volatile Compounds (µg/L)									
Acetone	7/40	14.7-683	187.1	370	NA	1	NA	YES	NO
Chloroform	2/40	10.9-38.5	24.7	0.15	100	2	815	YES	NO

Notes:

- µg/L = Micrograms per liter
- RBC = Risk-based concentration
- MCL = Maximum contaminant level
- NA = Not applicable

Table 10.3.5
SWMU 37, Zone L, Subzone C
Inorganic Detections for DPT Groundwater

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.
Inorganic Elements (µg/L)			
Cyanide (CN)	5/40	5.90-12.9	8.04
Aluminum (Al)	40/40	332-1140000	209937
Antimony (Sb)	12/40	8.20-26.2	13.9
Arsenic (As)	34/40	12.1-1220	170.5
Barium (Ba)	40/40	8.00-2530	608
Beryllium (Be)	28/40	2.00-63.4	9.67
Cadmium (Cd)	7/40	3.10-25.8	9.37
Calcium (Ca)	40/40	3580-3820000	311480
Chromium (Cr)	38/40	6.40-2840	386.9
Cobalt (Co)	32/40	6.40-196	35.6
Copper (Cu)	36/40	8.60-3930	217.5
Iron (Fe)	40/40	375-786000	136631
Lead (Pb)	38/40	3.30-2560	343.1
Magnesium (Mg)	39/40	585-123000	22509
Manganese (Mn)	40/40	7.20-2640	641.5
Mercury (Hg)	28/40	0.230-17.9	2.09
Nickel (Ni)	37/40	4.40-483	87.1
Potassium (K)	40/40	330-56900	12337
Selenium (Se)	27/40	5.50-46.5	17.9
Silver (Ag)	3/40	11.2-62.5	28.5
Sodium (Na)	40/40	1770-855000	74925
Thallium (Tl)	11/40	10.5-29.9	16.1
Tin (Sn)	1/40	87.4	87.4
Vanadium (V)	37/40	11.0-1770	338.7
Zinc (Zn)	37/40	23.1-2260	497.7

Notes:
 µg/L = Micrograms per liter

Volatile Organic Compounds Detected in DPT Groundwater

Of the 40 DPT groundwater samples collected, two VOC compounds were detected - acetone (1/40) and chloroform (2/40). Acetone exceeded the RBC of 370.0 $\mu\text{g/L}$ at 037GP032 and chloroform at 037GP012 and 037GP038 exceeded the RBC of 0.15 $\mu\text{g/L}$. No other organic compounds were detected.

Metals/Cyanide Detected in DPT Groundwater

Analytical results for inorganic compounds in DPT groundwater samples are shown in Table 10.3.5. As stated in Section 10.0, the metals and cyanide results from DPT groundwater samples were not compared to RBCs or MCLs.

10.3.1.3 Nature of Contamination in Subzone C, SWMU 37 Soil Borings

Two soil samples (upper interval) were collected using a hand auger and submitted for VOC, SVOC, metals, cyanide, chlorinated pesticides and PCBs analyses. Surface interval sample results were compared to RBCs. The results for detected compounds are summarized in Tables 10.3.6 (organics) and 10.3.7 (inorganics). No volatile organic compounds, chlorinated pesticides, or PCBs were detected above RBC or SSL values.

Semivolatile Organic Compounds Detected in Soil Borings

Dibenz(a,h)anthracene (1/2) at 037SB001 had a detection of 170 $\mu\text{g/kg}$ above the RBC of 88 $\mu\text{g/kg}$.

Metals/Cyanide Detected in Soil Borings

Analyses for inorganic compounds are shown in Table 10.3.7. As indicated, arsenic (2/2), chromium (1/2), iron (2/2), and thallium (2/2) were found at levels above the RBC values. The locations of these exceedances are shown in Table 10.3.8.

Table 10.3.6
SWMU 37, Zone L, Subzone C
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Semivolatile Compounds ($\mu\text{g}/\text{kg}$)								
2-Methylnaphthalene	Upper	2/2	180-290	235	310000	0	460000 c	NO
Acenaphthylene	Upper	1/2	130	130	31000	0	190000 c	NO
Anthracene	Upper	1/2	190	190	2300000	0	12000000	NO
B(a)P Equiv.	Upper	2/2	83.4-719	401	88	1	3200 c	NO
Benzo(a)anthracene	Upper	2/2	84.0-370	227	880	0	2000	NO
Benzo(a)pyrene	Upper	2/2	59.0-410	235	88	1	8000	NO
Benzo(b)fluoranthene	Upper	2/2	110-630	370	880	0	5000	NO
Benzo(g,h,i)perylene	Upper	2/2	56.0-400	228	310000	0	23000000 c	NO
Benzo(k)fluoranthene	Upper	2/2	75.0-500	288	8800	0	49000	NO
Chrysene	Upper	2/2	200-600	400	88000	0	160000	NO
Dibenz(a,h)anthracene	Upper	1/2	170	170	88	1	2000	NO
Dibenzofuran	Upper	2/2	47.0-120	84.0	31000	0	14000 c	NO
Fluoranthene	Upper	2/2	94.0-480	287	310000	0	4300000	NO
Indeno(1,2,3-cd)pyrene	Upper	2/2	40.0-330	185	880	0	14000	NO
Naphthalene	Upper	2/2	98.0-160	129	310000	0	84000	NO
Pentachlorophenol	Upper	1/2	50.0	50.0	5300	0	30	YES
Phenanthrene	Upper	2/2	350	350	310000	0	1300000 c	NO
Pyrene	Upper	2/2	100-530	315	230000	0	4200000	NO
bis(2-Ethylhexyl)phthalate (BEHP)	Upper	2/2	120-290	205	46000	0	3600000	NO
Chlorinated Pesticides ($\mu\text{g}/\text{kg}$)								
4,4'-DDD	Upper	1/2	14.0	14.0	2700	0	16000	NO
4,4'-DDE	Upper	2/2	36.0-110	73.0	1900	0	54000	NO
4,4'-DDT	Upper	2/2	74.0-140	107	1900	0	32000	NO
Endosulfan I	Upper	1/2	2.50	2.50	47000	0	18000	NO

Table 10.3.6
SWMU 37, Zone L, Subzone C
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Endrin aldehyde	Upper	2/2	12.0-44.0	28.0	2300	0	1000	NO
Heptachlor epoxide	Upper	1/2	5.50	5.50	70	0	700	NO
alpha-Chlordane	Upper	1/2	4.30	4.30	490	0	10000	NO
gamma-Chlordane	Upper	1/2	19.0	19.0	490	0	10000	NO

Notes:

- µg/kg = Micrograms per kilogram
- RBC = Risk-based concentration
- NA = Not applicable
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 20, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone C RFI Report

Table 10.3.7
SWMU 37, Zone L, Subzone C
Inorganic Detections for Soil

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)									
Aluminum (Al)	Upper	2/2	3510-4650	4080	7800	9990	0	1000000 c	NO
Arsenic (As)	Upper	2/2	38.9-76.3	57.6	0.430	14.2	2	29	YES
Barium (Ba)	Upper	2/2	35.6-53.2	44.4	550	77.2	0	1600	NO
Beryllium (Be)	Upper	2/2	0.590-0.630	0.610	16.0	ND	0	63	NO
Cadmium (Cd)	Upper	1/2	0.310	0.310	7.80	0.65	0	8	NO
Calcium (Ca)	Upper	2/2	746-46200	23473	NA	NA	NA	NA	NO
Chromium (Cr)	Upper	2/2	38.3-72.6	55.5	39	26.4	1	38	YES
Cobalt (Co)	Upper	2/2	2.20-3.10	2.70	470	3.22	0	2000 c	NO
Copper (Cu)	Upper	2/2	37.8-44.2	41.0	310	34.7	0	11200 c	NO
Iron (Fe)	Upper	2/2	8920-14900	11910	2300	NA	2	NA	NO

Table 10.3.7
SWMU 37, Zone L, Subzone C
Inorganic Detections for Soil

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Lead (Pb)	Upper	2/2	33.1-97.0	65.1	400	330	0	400	NO
Magnesium (Mg)	Upper	1/2	1620	1620	NA	NA	NA	NA	NO
Manganese (Mn)	Upper	2/2	38.1-69.2	53.7	160	92.5	0	950 c	NO
Mercury (Hg)	Upper	2/2	0.060	0.060	NA	0.24	NA	2	NO
Nickel (Ni)	Upper	2/2	7.90-14.5	11.2	160	12.3	0	130	NO
Potassium (K)	Upper	2/2	281-432	356.5	NA	NA	NA	NA	NO
Selenium (Se)	Upper	2/2	0.810-1.70	1.26	39.0	1.44	0	5	NO
Thallium (Tl)	Upper	2/2	0.630-1.70	1.17	0.55	ND	2	0.7	YES
Vanadium (V)	Upper	2/2	15.3-16.5	15.9	55	23.4	0	6000	NO
Zinc (Zn)	Upper	2/2	39.1-196	117.6	2300	159	0	12000	NO

Notes:

- mg/kg = Milligrams per kilogram
- RBC = Risk-based concentration
- NA = Not applicable
- ND = Not detected
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 20, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone C RFI Report

Table 10.3.8
Subzone C, SWMU 37, Soil Boring Sample Locations with
Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Arsenic	037SB001	38.90	Y	Y	0.43	29.00
	037SB002	76.30	Y	Y		
Chromium	037SB001	72.60	Y	Y	39.00	38.00
	037SB002	38.30	N	Y		

Table 10.3.8
Subzone C, SWMU 37, Soil Boring Sample Locations with
Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Iron	037SB001	8920.00	Y	NA	2300.00	NA
	037SB002	14900.00	Y	NA		
Thallium	037SB001	0.63	Y	N	0.55	0.70
	037SB002	1.70	Y	Y		

Appendix C contains the complete analytical results for each of the soil boring samples. 1

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10.3.1.4 Nature of Contamination in Subzone C, SWMU 37, Shallow Monitoring Well Groundwater 3

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Two shallow monitoring wells were installed to assess groundwater quality for Subzone C. 5
 Samples were collected and submitted for VOCs, SVOCs, chlorinated pesticides, PCBs, metals 6
 and cyanide analyses. The results for the detected compounds are summarized in Tables 10.3.9 7
 (organics) and 10.3.10 (inorganics). No VOCs or SVOCs were detected above RBC values. 8

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Metals/Cyanide Detected in Monitoring Well Groundwater 10

The analytical results for inorganic compounds in the shallow well groundwater samples are shown 11
 in Table 10.3.10. Of the inorganic compounds detected, only arsenic (2/2), iron (2/2) and 12
 manganese (2/2) exceeded the RBC values. The locations of these exceedances are shown in 13
 Table 10.3.11. 14

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Table 10.3.9
 SWMU 37, Zone L, Subzone C
 Organic Compounds Detected in First-Quarter Groundwater
 Shallow Monitoring Wells

Compound	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Groundwater Migration Concern	Surface Water Migration Concern
Volatile Compounds (µg/L)									
Toluene	1/2	1.00	1.00	75	1000	0	37	NO	NO
Semivolatile Compounds (µg/L)									
Benzoic acid	2/2	4.00-5.00	4.50	15000	NA	0	NA	NO	NO

Notes:
 µg/L = Micrograms per liter
 RBC = Risk-based concentration
 MCL = Maximum contaminant level
 NA = Not applicable

Table 10.3.10
 SWMU 37, Zone L, Subzone C
 Inorganic Detections for First Quarter Groundwater
 Shallow Monitoring Wells

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	Reference Conc.	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Groundwater Migration Concern	Surface Water Migration Concern
Inorganic Elements (µg/L)										
Cyanide (CN)	2/2	2.50-2.80	2.65	73	ND	200	0	1	NO	YES
Aluminum (Al)	2/2	28.1-62.8	45.5	3700	410	NA	0	NA	NO	NO
Arsenic (As)	2/2	2.30-49.2	25.8	0.045	6.07	50	2	36	YES	YES
Barium (Ba)	2/2	18.6-55.3	36.9	260	16.7	2000	0	NA	NO	NO
Calcium (Ca)	2/2	239000-298000	268500	NA	NA	NA	NA	NA	NO	NO
Chromium (Cr)	1/2	4.40	4.40	18	1.99	100	0	50	NO	NO
Iron (Fe)	2/2	16200-16800	16500	1100	NA	NA	2	NA	NO	NO
Magnesium (Mg)	2/2	24300-203000	113650	NA	NA	NA	NA	NA	NO	NO
Manganese (Mn)	2/2	473-793	633	73	608	NA	2	NA	YES	NO
Mercury (Hg)	1/2	0.150	0.150	NA	ND	2	NA	0.025	NO	YES
Nickel (Ni)	1/2	1.10	1.10	73	3.59	100	0	8.3	NO	NO

Table 10.3.10
SWMU 37, Zone L, Subzone C
Inorganic Detections for First Quarter Groundwater
Shallow Monitoring Wells

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	Reference Conc.	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Potassium (K)	2/2	9750-71400	40575	NA	NA	NA	NA	NA	NO	NO
Sodium (Na)	2/2	57100-1380000	718550	NA	NA	NA	NA	NA	NO	NO
Vanadium (V)	1/2	1.70	1.70	26	1.96	NA	0	NA	NO	NO
Zinc (Zn)	1/2	6.20	6.20	1100	13.2	NA	0	86	NO	NO

Notes:
 µg/L = Micrograms per liter
 RBC = Risk-based concentration
 MCL = Maximum contaminant level
 NA = Not applicable
 ND = Not detected

Table 10.3.11
SWMU 37, Zone L, Subzone C, Shallow Monitoring Well Locations with
Metal Detections Which Exceed RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (ug/L)	RBC Exceeded (Y/N)	MCL Exceeded (Y/N)	RBC (mg/kg)	MCL (mg/kg)
Arsenic	037GW001	49.20	Y	N	0.05	50.0
	037GW002	2.30	Y	N		
Iron	037GW001	16800.00	Y	NA	1100.00	NA
	037GW002	16200.00	Y	NA		
Manganese	037GW001	473.00	Y	NA	73.00	NA
	037GW002	793.00	Y	NA		

10.3.2 Subzone C, AOC 699

In accordance with the approved work plan, no samples were collected in Subzone C for AOC 699.

10.3.3 Subzone C, AOC 504

AOC 504 sampling in Subzone C consisted of 18 upper interval and six lower interval soil borings collected using a hand auger, and six soil samples collected using DPT methods. The samples

were all analyzed for VOCs, SVOCs, chlorinated pesticides, PCBs, metals, and cyanide. The DPT soil samples were analyzed for VOCs, metals, and cyanide. No DPT groundwater samples were collected. The locations of these samples are presented in Figures 10.3.8 through 10.3.10.

10.3.3.1 Nature of Contamination in Subzone C, AOC 504, DPT Soil

The six DPT soil samples were collected for analysis of VOCs, metals, and cyanide, the results of which are shown in Tables 10.3.12 and 10.3.13. A complete data report for all Zone L samples is shown in Appendix C.

Volatile Organic Compounds Detected in DPT Soil

Table 10.3.12 presents the organic compound analyses of the DPT samples from Subzone C, AOC 504. Acetone and 2-butanone (MEK) were detected in one of the six samples; however, neither compound exceeded its RBC value.

Metals/Cyanide Detected in DPT Soil

Aluminum (2/6), antimony (1/6), arsenic (6/6), chromium (1/6), iron (6/6), and manganese (1/6) showed concentrations in excess of their RBC values and concentrations of antimony (1/6), arsenic (1/6) and chromium (1/6) exceeding SSLs. These sample locations are summarized in Table 10.3.14. Analytical results for all DPT samples are shown in Appendix C.

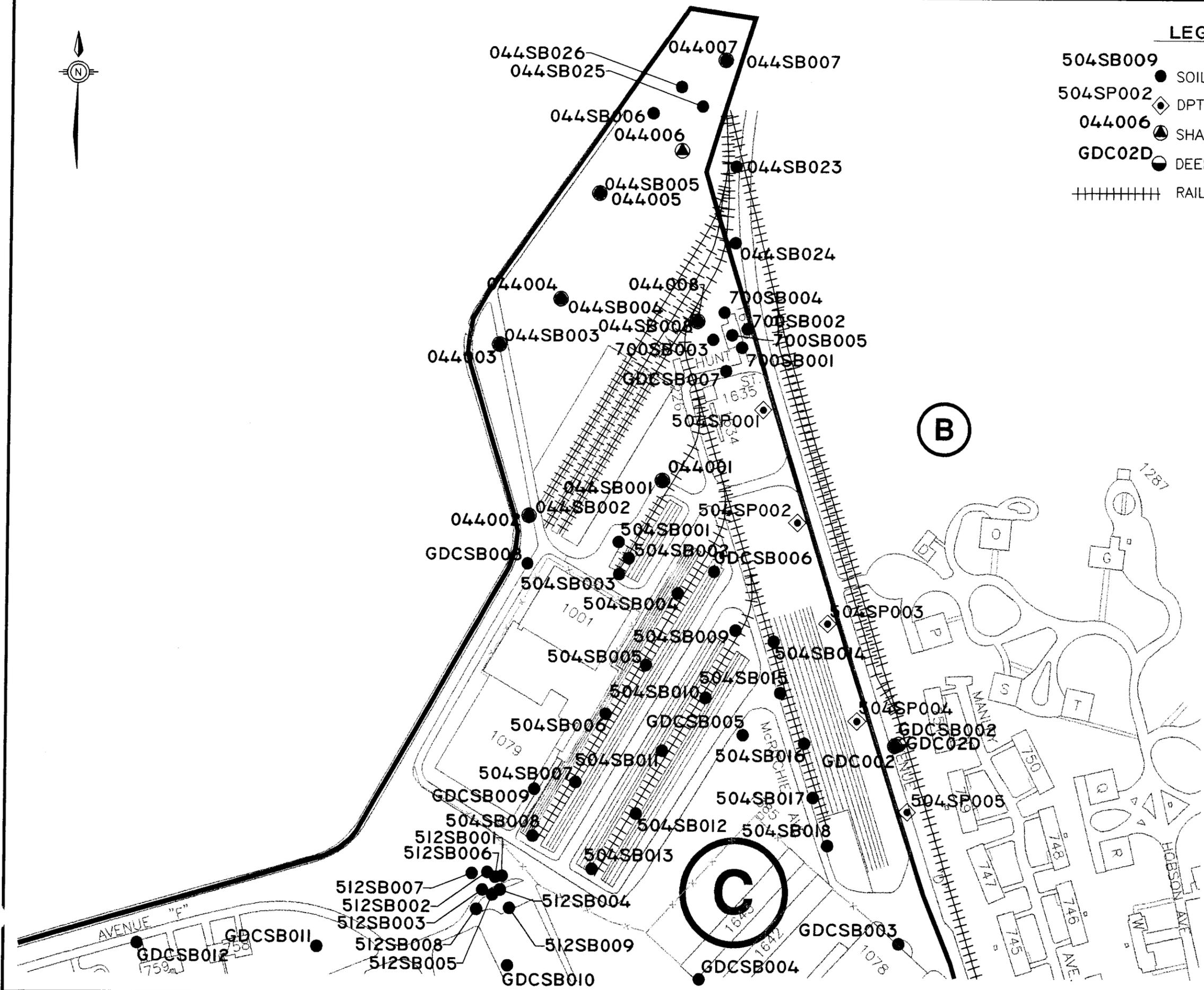
10.3.3.2 Nature of Contamination in Subzone C, AOC 504, Soil Borings

Eighteen upper interval and six lower interval soil boring samples were collected and analyzed for VOCs, SVOCs, chlorinated pesticides, PCBs, metals and cyanide. Analytical results are summarized in Tables 10.3.15 and 10.3.16.



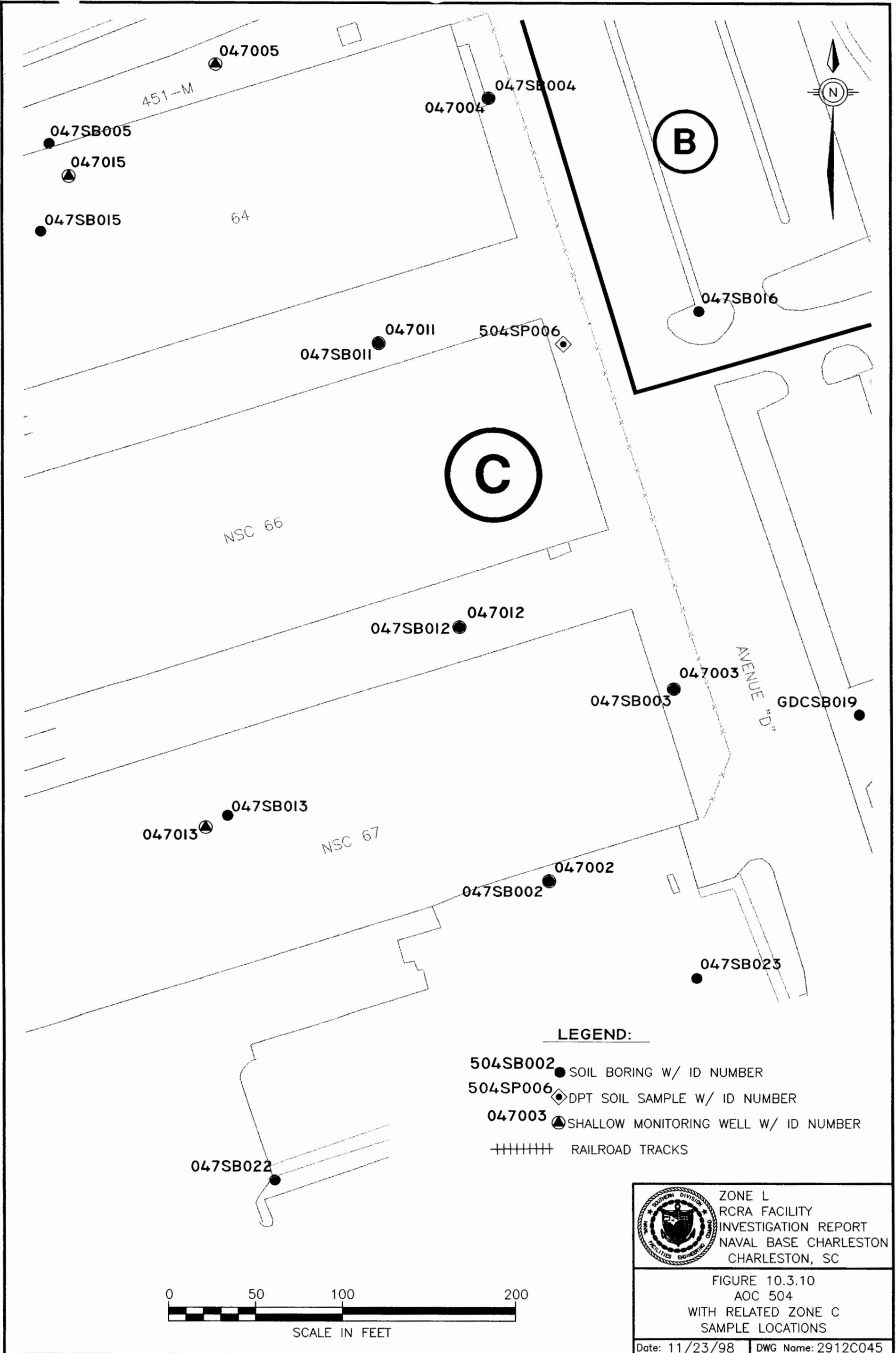
LEGEND:

- 504SB009 ● SOIL BORING W/ ID NUMBER
- 504SP002 ◊ DPT SOIL SAMPLE W/ ID NUMBER
- 044006 ▲ SHALLOW MONITORING WELL W/ ID NUMBER
- GDC02D ● DEEP MONITORING WELL W/ ID NUMBER
- +++++ RAILROAD TRACKS



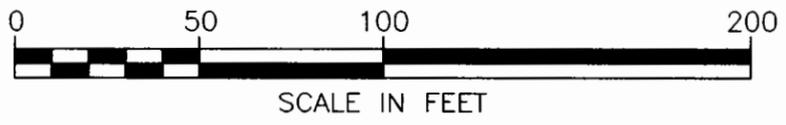
ZONE L
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.9
AOC 504
WITH RELATED ZONE C
SAMPLE LOCATIONS



LEGEND:

- SOIL BORING W/ ID NUMBER
- ◊ DPT SOIL SAMPLE W/ ID NUMBER
- ▲ SHALLOW MONITORING WELL W/ ID NUMBER
- +++++ RAILROAD TRACKS




 ZONE L
 RCRA FACILITY
 INVESTIGATION REPORT
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.10
 AOC 504
 WITH RELATED ZONE C
 SAMPLE LOCATIONS

Table 10.3.12
AOC 504, Zone L, Subzone C
Organic Compounds Detected in DPT Soil

Compound	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Volatile Organic Compounds ($\mu\text{g}/\text{kg}$)							
2-Butanone (MEK)	1/6	46.5	46.5	4700000	0	7800 c	NO
Acetone	1/6	239	239	780000	0	16000	NO

Notes:

- $\mu\text{g}/\text{kg}$ = Micrograms per kilogram
- RBC = Risk-based concentration
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 20, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone C RFI Report

Table 10.3.13
AOC 504 Zone L, Subzone C
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)								
Aluminum (Al)	6/6	1150-12800	6207	7800	9990	2	1000000 c	NO
Antimony (Sb)	1/6	27.0	27.0	3.10	0.55	1	5	YES
Arsenic (As)	6/6	4.53-42.7	15.8	0.430	14.2	6	29	YES
Barium (Ba)	6/6	23.4-66.0	35.8	550	77.2	0	1600	NO
Beryllium (Be)	6/6	0.250-0.660	0.483	16.0	ND	0	63	NO
Cadmium (Cd)	2/6	0.440-0.700	0.570	7.80	0.65	0	8	NO
Calcium (Ca)	6/6	7350-148000	72592	NA	NA	NA	NA	NO
Chromium (Cr)	6/6	4.17-39.7	24.6	39.0	26.4	1	38	YES
Cobalt (Co)	6/6	1.46-3.66	2.38	470	3.22	0	2000 c	NO
Copper (Cu)	6/6	8.34-28.6	16.4	310	34.7	0	11200 c	NO
Iron (Fe)	6/6	4100-15800	9815	2300	NA	6	NA	NO

Table 10.3.13
AOC 504 Zone L, Subzone C
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Lead (Pb)	6/6	7.84-180	63.5	400	330	0	400	NO
Magnesium (Mg)	6/6	164-5420	2307	NA	NA	NA	NA	NO
Manganese (Mn)	6/6	17.6-338	118	160	92.5	1	950 c	NO
Mercury (Hg)	3/6	0.050-0.130	0.087	NA	0.24	NA	2	NO
Nickel (Ni)	6/6	4.53-17.2	11.4	160	12.3	0	130	NO
Potassium (K)	6/6	96.9-1300	705.7	NA	NA	NA	NA	NO
Selenium (Se)	4/6	0.900-1.86	1.35	39.0	1.44	0	5	NO
Sodium (Na)	6/6	237-1080	532	NA	NA	NA	NA	NO
Tin (Sn)	2/6	3.81-28.6	16.2	4700	2.95	0	11000 c	NO
Vanadium (V)	6/6	4.53-36.9	18.9	55.0	23.4	0	6000	NO
Zinc (Zn)	6/6	56.0-209	101	2300	159	0	12000	NO

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 NA = Not applicable
 ND = Not detected
 GW = Groundwater
 SSL = Soil screening level
 c = Calculated SSL
 Soil to GW = Generic SSLs based on DAF = 20, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone C RFI Report

Table 10.3.14
AOC 504, Zone L, Subzone C, DPT Soil Sample Locations with
Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Aluminum	504SP004	12800	Y	N	7800.0	1,000,000
	504SP006	9330.0	Y	N		
Antimony	504SP001	27.0	Y	Y	3.10	5.00

Table 10.3.14
AOC 504, Zone L, Subzone C, DPT Soil Sample Locations with
Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Arsenic	504SP001	17.9	Y	N	0.43	29.0
	504SP002	42.70	Y	Y		
	504SP003	4.53	Y	N		
	504SP004	11.10	Y	N		
	504SP005	13.90	Y	N		
	504SP006	4.63	Y	N		
Chromium	504SP006	39.70	Y	Y	39.00	38.00
Iron	504SP001	8320.0	Y	NA	2300	NA
	504SP002	15800.00	Y	NA		
	504SP003	4100.00	Y	NA		
	504SP004	15200.00	Y	NA		
	504SP005	8940.00	Y	NA		
	504SP006	6530.00	Y	NA		
Manganese	504SP004	338.0	Y	N	160.0	950.0

Table 10.3.15
AOC 504, Zone L, Subzone C
Organic Compounds Detected in Soil Borings

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Volatile Organic Compounds (µg/kg)								
2-Butanone (MEK)	Upper	1/18	44.0	44.0	4700000	0	7800 c	NO
Acetone	Lower	1/6	16.0	16.0	NA	NA	16000	NO
Semivolatile Compounds (µg/kg)								
2-Methylnaphthalene	Upper	1/18	250	250	310000	0	460000 c	NO
Acenaphthylene	Upper	1/18	85.0	85.0	470000	0	190000 c	NO
B(a)P Equiv.	Upper	9/18	0.060-538	108	88	2	3200 c	NO
	Lower	2/6	0.590-62.9	31.7	NA	NA		
Benzo(a)anthracene	Upper	4/18	46.0-150	79.8	880	0	2000	NO

Table 10.3.15
AOC 504, Zone L, Subzone C
Organic Compounds Detected in Soil Borings

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Benzo(a)pyrene	Upper	6/18	39.0-340	113.7	88	2	8000	NO
	Lower	1/6	54.0	54.0	NA	NA		
Benzo(b)fluoranthene	Upper	8/18	39.0-530	137.5	880	0	5000	NO
	Lower	1/6	82.0	82.0	NA	NA		
Benzo(g,h,i)perylene	Upper	2/18	120-260	190	310000	0	23000000 c	NO
Benzo(k)fluoranthene	Upper	5/18	50.0-430	167.8	8800	0	49000	NO
	Lower	2/6	59.0-64.0	61.5	NA	NA		
Benzoic acid	Upper	2/18	41.0-48.0	44.5	31000000	0	400000	NO
Butylbenzylphthalate	Upper	4/18	50.0-160	79.3	1600000	0	930000	NO
	Lower	1/6	73.0	73.0	NA	NA		
Chrysene	Upper	9/18	47.0-280	96.7	88000	0	160000	NO
	Lower	1/6	67.0	67.0	NA	NA		
Dibenz(a,h)anthracene	Upper	1/18	100	100	88	0	2000	NO
Dibenzofuran	Upper	1/18	84.0	84.0	31000	0	14000 c	NO
Fluoranthene	Upper	7/18	46.0-210	93.0	310000	0	4300000	NO
	Lower	4/6	62.0-100	85.5	NA	NA		
Indeno(1,2,3-cd)pyrene	Upper	2/18	110-250	180	880	0	14000	NO
Naphthalene	Upper	1/18	130	130	310000	0	84000	NO
Phenanthrene	Upper	4/18	46.0-270	108.5	310000	0	1300000 c	NO
Pyrene	Upper	8/18	43.0-210	95.0	230000	0	4200000	NO
	Lower	3/6	100-150	123.3	NA	NA		
bis(2-Ethylhexyl)phthalate (BEHP)	Upper	2/18	14.0-21.0	17.5	46000	0	3600000	NO
Chlorinated Pesticides (µg/kg)								
4,4'-DDD	Upper	1/18	4.40	4.40	2700	0	16000	NO
4,4'-DDE	Upper	7/18	3.20-14.0	8.29	1900	0	54000	NO

Table 10.3.15
AOC 504, Zone L, Subzone C
Organic Compounds Detected in Soil Borings

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
4,4'-DDT	Upper	6/18	3.70-28.0	11.9	1900	0	32000	NO
Dieldrin	Upper	1/18	6.90	6.90	40	0	4	YES
Endrin	Upper	1/18	21.0	21.0	2300	0	1000	NO
Endrin aldehyde	Upper	7/18	3.30-7.05	4.51	2300	0	1000	NO
	Lower	3/6	3.40-6.00	5.13	NA	NA		
gamma-Chlordane	Upper	1/18	4.00	4.00	490	0	10000	NO
Polychlorinated biphenyls (µg/kg)								
Aroclor-1260	Upper	1/18	170	170	320	0	1000	NO

Notes:

- µg/kg = Micrograms per kilograms
- RBC = Risk-based concentration
- NA = Not applicable
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 20, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone C RFI Report

Table 10.3.16
AOC 504, Zone L, Subzone C
Inorganic Detections for Soil Borings

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)									
Cyanide (CN)	Upper	9/18	0.120-0.970	0.284	160	ND	0	40	NO
	Lower	2/6	0.200-0.390	0.295	NA	ND	NA		
Aluminum (Al)	Upper	18/18	420-29700	10021	7800	9990	9	1000000 ^c	NO
	Lower	6/6	848.5-31400	15209	NA	23700	NA		
Antimony (Sb)	Upper	3/18	0.320-0.660	0.490	3.10	0.55	0	5	NO
	Lower	1/6	0.530	0.530	NA	0.92	NA		

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**Table 10.3.16
AOC 504, Zone L, Subzone C
Inorganic Detections for Soil Borings**

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Arsenic (As)	Upper	18/18	1.40-47.9	10.3	0.430	14.2	18	29	YES
	Lower	6/6	1.20-27.2	12.9	NA	14.1	NA		
Barium (Ba)	Upper	18/18	3.10-61.6	24.7	550	77.2	0	1600	NO
	Lower	6/6	4.60-43.2	25.8	NA	68.5	NA		
Beryllium (Be)	Upper	16/18	0.110-1.50	0.592	16.0	ND	0	63	NO
	Lower	5/6	0.170-1.60	1.07	NA	0.98	NA		
Cadmium (Cd)	Upper	3/18	0.090-0.150	0.117	7.80	0.65	0	8	NO
Calcium (Ca)	Upper	18/18	155-81400	9584	NA	NA	NA	NA	NO
	Lower	6/6	3810-15900	10195	NA	NA	NA		
Chromium (Cr)	Upper	18/18	2.00-47.4	16.9	39	26.4	3	38	YES
	Lower	6/6	3.10-50.8	27.3	NA	12.5	NA		
Cobalt (Co)	Upper	14/18	0.270-8.70	3.31	470	3.22	0	2000 c	NO
	Lower	5/6	0.470-8.50	5.19	NA	7.1	NA		
Copper (Cu)	Upper	18/18	0.960-35.4	11.2	310	34.7	0	11200 c	NO
	Lower	6/6	1.30-37.4	18.4	NA	42.2	NA		
Iron (Fe)	Upper	18/18	1130-37000	14644	2300	NA	16	NA	NO
	Lower	6/6	1700-39800	19602	NA	NA	NA		
Lead (Pb)	Upper	18/18	2.10-72.9	20.6	400	330	0	400	NO
	Lower	6/6	3.60-54.6	28.1	NA	73.2	NA		
Magnesium (Mg)	Upper	18/18	76.0-4510	1337	NA	NA	NA	NA	NO
	Lower	6/6	247-5710	3055	NA	NA	NA		
Manganese (Mn)	Upper	18/18	6.60-550	132.6	160	92.5	5	950 c	NO
	Lower	6/6	18.2-510	289.1	NA	106	NA		
Mercury (Hg)	Upper	11/18	0.060-0.480	0.175	NA	0.24	NA	2	NO
	Lower	5/6	0.040-0.350	0.218	NA	0.30	NA		
Nickel (Ni)	Upper	17/18	0.610-20.3	6.28	160	12.3	0	130	NO
	Lower	6/6	1.00-15.7	8.61	NA	16.7	NA		
Potassium (K)	Upper	15/18	152-2460	892	NA	NA	NA	NA	NO
	Lower	6/6	155-3420	1678	NA	NA	NA		

Table 10.3.16
AOC 504, Zone L, Subzone C
Inorganic Detections for Soil Borings

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Residential RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Selenium (Se)	Upper	12/18	0.450-1.10	0.833	39	1.44	0	5	NO
	Lower	4/6	0.700-1.40	1.05	NA	2.90	NA		
Sodium (Na)	Upper	10/18	160-812	372	NA	NA	NA	NA	NO
	Lower	5/6	339-2940	1065	NA	NA	NA		
Thallium (Tl)	Upper	10/18	0.710-3.30	1.57	0.55	ND	10	0.7	YES
	Lower	3/6	0.860-2.10	1.39	NA	ND	NA		
Tin (Sn)	Upper	18/18	0.780-3.60	1.81	4700	2.95	0	11000 c	NO
	Lower	6/6	0.830-3.90	2.34	NA	2.37	NA		
Vanadium (V)	Upper	18/18	1.50-73.3	24.8	55	23.4	3	6000	NO
	Lower	6/6	2.55-96.4	44.0	NA	56.9	NA		
Zinc (Zn)	Upper	15/18	3.90-143.5	50.6	2300	159	0	12000	NO
	Lower	5/6	6.90-191	104.5	NA	243	NA		

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 NA = Not applicable
 ND = Not detected
 GW = Groundwater
 SSL = Soil screening level
 c = Calculated SSL
 Soil to GW = Generic SSLs based on DAF = 20, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone C RFI Report

1 Volatile Organic Compounds Detected in Soil Borings

2 Acetone and 2-butanone were detected in the soil boring samples, none of which exceeded RBC
 3 or SSL values.

4 Semivolatile Organic Compounds Detected in Soil Borings

5 Benzo(a)pyrene (2/18) exceeded its RBC value of 88 µg/kg in upper interval soil, at sample
 6 locations 504SB017 and 504SB018. As shown in Table 10.3.15, all other SVOCs detected did
 7 not exceed RBC or SSL values.
 8

Chlorinated Pesticides Detected in Soil Boring

None of the chlorinated pesticides detected exceeded RBCs or SSLs.

Polychlorinated Biphenyls Detected in Soil Boring

Aroclor-1260 was detected in one of the 18 upper interval soil samples, but not at a concentration above the RBC value. No other PCBs were detected.

Metals/Cyanide Detected in Soil Borings

Analytical results for the inorganic compounds in the 18 upper interval and six lower interval soil boring samples are shown in Table 10.3.16. Concentrations of aluminum (9/18), arsenic (18/18), chromium (3/18), iron (16/18), manganese (5/18), thallium (10/18) and vanadium (3/18) exceeded RBC values in upper interval soil. Upper interval locations where these exceedances occurred are shown in Table 10.3.17.

Table 10.3.17 also shows that for lower interval soil boring samples chromium (2/6) and thallium (3/6) exceeded their SSL values. These sample locations are also shown in the table.

Table 10.3.17
 Subzone C, AOC 504 Upper Interval Soil Boring Sample Locations with
 Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Aluminum	504SB002	8920.0	Y	N	7800.0	1,000,000
	504SB005	17900.0	Y	N		
	504SB006	16450.0	Y	N		
	504SB007	26100.0	Y	N		
	504SB008	27900.0	Y	N		
	504SB009	10700.0	Y	N		
	504SB010	7810.0	Y	N		
	504SB012	9770.0	Y	N		
	504SB013	29700.0	Y	N		

Table 10.3.17
 Subzone C, AOC 504 Upper Interval Soil Boring Sample Locations with
 Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)			
Arsenic	504SB001	2.50	Y	N	0.43	29			
	504SB002	12.90	Y	N					
	504SB003	2.10	Y	N					
	504SB004	1.40	Y	N					
	504SB005	12.30	Y	N					
	504SB006	11.35	Y	N					
	504SB007	23.30	Y	N					
	504SB008	47.90	Y	N					
	504SB009	7.70	Y	N					
	504SB010	3.10	Y	N					
	504SB011	3.80	Y	N					
	504SB012	6.20	Y	N					
	504SB013	24.00	Y	N					
	504SB014	6.80	Y	N					
	504SB015	3.60	Y	N					
	504SB016	1.50	Y	N					
	504SB017	11.60	Y	N					
	504SB018	2.60	Y	N					
Chromium	504SB001	46.50	N	Y	39.00	38.00			
	504SB004	50.80	N	Y					
	504SB007	47.30	Y	N					
	504SB008	47.30	Y	N					
	504SB013	47.40	Y	N					
Iron	504SB001	3740.00	Y	N	2300.00	32000.00			
	504SB002	11000.00	Y	N					
	504SB003	2790.00	Y	N					
	504SB005	25000.00	Y	N					
	504SB006	19450.00	Y	N					
	504SB007	33900.00	Y	N					
	504SB008	34500.00	Y	N					
	504SB009	22200.00	Y	N					
	504SB010	8260.00	Y	N					
	504SB011	6840.00	Y	N					
	504SB012	10300.00	Y	N					
	504SB013	30100.00	Y	N					
	504SB014	37000.00	Y	N					
	504SB015	6840.00	Y	N					
	504SB017	5830.00	Y	N					
	504SB018	3050.00	Y	N					
	Manganese	504SB005	271.00	Y			N	160.0	950.0
		504SB006	351.00	Y			N		
504SB007		471.00	Y	N					
504SB008		550.00	Y	N					
504SB013		284.00	Y	N					

Table 10.3.17
 Subzone C, AOC 504 Upper Interval Soil Boring Sample Locations with
 Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Thallium	504SB002	.86	N	Y	0.55	0.70
	504SB003	1.20	N	Y		
	504SB004	2.10	N	Y		
	504SB005	1.80	Y	N		
	504SB006	0.71	Y	N		
	504SB007	1.70	Y	N		
	504SB008	3.30	Y	N		
	504SB009	0.93	Y	N		
	504SB010	0.92	Y	N		
	504SB011	0.82	Y	N		
	504SB012	1.20	Y	N		
	504SB013	2.90	Y	N		
	504SB014	1.40	Y	N		
	Vanadium	504SB007	73.20	Y		
504SB008		72.20	Y	N		
504SB013		73.30	Y	N		

Sample locations with detected concentrations of analytes that exceed either RBC, SSL, or MCL values are shown in Figures 10.3.11 through 10.3.29.

10.3.4 Fate and Transport Assessment for SWMU 37 and AOCs 504, 699 in Subzone C

Section 10.3 contains short descriptions of the portions of SWMU 37 and AOC 504 within Subzone C. Environmental media sampled as part of the RFI for these sites include surface soil, subsurface soil (soil borings and DPT samples), and shallow groundwater (monitoring wells and DPT samples). Potential constituent migration pathways investigated for SWMU 37 and AOC 504 include soil to groundwater and groundwater to surface water. Soil to air and soil to sediment cross media fate and transport were determined not to be a concern.

The fate and transport screening comparison for SWMU 37 and AOC 504 soil and groundwater samples included referencing of previous Zone RFI Reports when applicable. Contaminants of potential concern were identified for each sample media and sampling method in Section 10.3.

The Zone C RFI Report was consulted to identify any sites within the subzone that are associated geographically with the Zone L sample points. Analytical results from samples with overlapping sites were compared to data generated during the Zone C RFI. If concentrations at Zone L sample points associated with overlapping sites were higher than those of the referenced Zone C RFI Report or if new fate and transport COPCs were identified, further evaluation will be deferred to the Zone C RFI and included as an addendum. If Zone L sample concentrations were less than or equal to those in the Zone C RFI Report, it was assumed that the Zone L fate and transport conclusions would be similar to those of the Zone C RFI and no further evaluation is needed. Zone L sampling locations that are not associated with any overlapping sites are summarized in the fate and transport COPC tables and fate and transport evaluations provided in the following sections.

10.3.4.1 Soil to Groundwater Cross-Media Transport
SWMU 37

In Section 10.3, Tables 10.3.1, 10.3.2, 10.3.6, and 10.3.7 compare maximum detected organic and inorganic constituent concentrations in soil boring and DPT soil samples from SWMU 37 to SSLs considered protective of groundwater. To provide a conservative screen, generic soil screening levels were used; leachate entering the aquifer was assumed to be diluted by a ratio of 20:1, with no attenuation of constituents in soil (DAF=20). Background reference values for inorganics were noted but did not enter into the screening process.

The screening comparisons in the four tables mentioned above identify the constituents with the potential to impact groundwater quality. Table 10.3.18 provides a summary of SWMU 37 soil samples reporting SSL exceedances, along with the names of any overlapping Zone C sites. As presented in Table 10.3.18, there are no SWMU 37 soil constituents exceeding soil to groundwater SSLs collected from locations not associated with Zone C sites.

Table 10.3.18
SMWU 37, Zone L, Subzone C
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
Soil Borings				
037SB001	SWMU 44; AOC 700	Arsenic Chromium Pentachlorophenol	Yes: No ^a No ^a ; Yes Yes; Yes	Table 10.1.13; Table 10.5.9* Table 10.1.13; Table 10.5.9* Table 10.1.13; Table 10.5.9*
037SB002	SWMU 44; AOC 700	Arsenic Chromium Thallium	Yes: No ^a No ^a ; Yes Yes: No ^a	Table 10.1.13; Table 10.5.9* Table 10.1.13; Table 10.5.9* Table 10.1.13; Table 10.5.9*
Groundwater				
037GW001	SWMU 44	Arsenic Cyanide Mercury	Yes Yes Yes	Table 10.1.13* Table 10.1.13* Table 10.1.13*
037GW002	SWMU 44	Cyanide Manganese	Yes No ^a	Table 10.1.13* Table 10.1.13*
DPT Groundwater				
037GP012	None	Chloroform	Yes	None
037GP032	SWMU 47	Acetone	Yes	Table 10.2.8*
037GP038	None	Chloroform	Yes	None

Notes:

*Zone C RFI Report (EnSafe, 1997)

^a Zone L concentrations are within the range of those in reference document.

AOC 504

In Section 10.3, Tables 10.3.12, 10.3.13, 10.3.15 and 10.3.16 compare maximum detected organic and inorganic constituent concentrations in soil borings and DPT soil samples from AOC 504 to SSLs considered protective of groundwater, using the conventions described above. The screening comparisons in these four tables identify the constituents with the potential to impact groundwater quality. Table 10.3.19 provides a summary of AOC 504 soil samples

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reporting SSL exceedances, along with the names of associated Zone C sites overlapping the areas where some of these soil samples were collected. For samples with no overlapping Zone C sites, fate and transport concerns are evaluated below. In these evaluations, shallow groundwater monitoring wells within 200 feet downgradient of Zone L sampling locations were used for comparing local groundwater quality to soil concentrations.

Table 10.3.19
AOC 504, Zone L, Subzone C
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
Soil Borings				
504SB001	None	Chromium Dieldrin	Yes Yes	None None
504SB002	None	Thallium	Yes	None
504SB003	None	Thallium	Yes	None
504SB004	None	Chromium Thallium	Yes Yes	None None
504SB005	None	Thallium	Yes	None
504SB006	None	Thallium	Yes	None
504SB007	None	Chromium Thallium	Yes Yes	None None
504SB008	None	Arsenic Chromium Thallium	Yes Yes Yes	None None None
504SB009	None	Thallium	Yes	None
540SB010	None	Thallium	Yes	None
504SB011	None	Thallium	Yes	None
504SB012	None	Thallium	Yes	None
504SB013	None	Chromium Thallium	Yes Yes	None None
504SB014	None	Thallium	Yes	None

Table 10.3.19
AOE 504, Zone L, Subzone C
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
DPT Soil				
504SP001	None	Antimony	Yes	None
504SP002	None	Arsenic	Yes	None
504SP006	None	Chromium	Yes	None

Antimony was detected in four of 24 soil boring samples and one of six DPT soil samples, and exceeded its soil to groundwater SSL of 5 mg/l at one DPT soil location, 504SP001 (27.0 mg/kg). The antimony detection also exceeds its Zone C background reference concentration of 0.92 mg/kg in subsurface soil. There are no monitoring wells within 200 feet downgradient of 504SP001 from which to evaluate the soil to groundwater pathway.

Arsenic was detected in all 24 soil boring samples and all six DPT soil samples, and exceeded its soil to groundwater SSL of 29 mg/kg at one DPT soil location, 504SP002 (42.7 mg/kg). The arsenic detection in soil at 504SP002 is also greater than its Zone C background reference concentration of 14.1 mg/kg in subsurface soil. There are no monitoring wells within 200 feet downgradient of 504SP002 from which to evaluate the soil to groundwater pathway.

Chromium was detected in all 24 soil boring samples and all six DPT soil samples, and exceeded its soil to groundwater SSL of 38 mg/kg at two soil boring locations – 504SB001 (upper-interval, 46.50 mg/kg) and 504SB004 (upper-interval, 50.80 mg/kg) – and one DPT soil location, 504SP006 (39.70 mg/kg). These three chromium concentrations also exceed its Zone C background reference concentration of 12.5 mg/kg in subsurface soil. Monitoring well 044001 is downgradient and within 200 feet of 504SB001 and 504SB004. Chromium detections at this

well decreased from at maximum estimated value of 1.6 $\mu\text{g}/\text{l}$ in the second sampling event to non-
detect in the third and fourth events and then increased to an estimated value of 5.5 $\mu\text{g}/\text{l}$ in the fifth
event, indicating a completed soil to groundwater pathway. However, the chromium in
groundwater does not exceed its RBC of 18 $\mu\text{g}/\text{l}$. There are no monitoring wells within 200 feet
downgradient of 504SP006 from which to evaluate the soil to groundwater pathway.

Thallium was detected in 10 of 18 upper-interval soil samples, three of six lower-interval soil
samples, and none of six DPT soil samples. All thirteen detections exceeded thallium's soil to
groundwater SSL of 0.7 mg/kg as follows: 504SB002 (lower-interval, 0.86 mg/kg), 504SB003
(lower-interval, 1.20 mg/kg), 504SB004 (lower-interval, 2.10 mg/kg), 504SB005 (upper-interval,
1.8 mg/kg), 504SB006 (upper-interval, 0.71 mg/kg), 504SB007 (upper-interval, 1.7 mg/kg),
504SB008 (upper-interval, 3.3 mg/kg), 504SB009 (upper-interval, 0.93 mg/kg), 504SB010 (upper-
interval, 0.92 mg/kg), 504SB011 (upper-interval, 0.82 mg/kg), 504SB012 (upper-interval,
1.2 mg/kg), 504SB013 (upper-interval, 2.9 mg/kg), and 504SB014 (upper-interval, 1.4 mg/kg).
These thirteen soil borings are within close proximity of one another in the area southeast of
Buildings 1001 and 1079. Monitoring well 044001 is downgradient and within 200 feet of only
two locations, 504SB002 and 504SB003. Thallium (RBC = 0.26 $\mu\text{g}/\text{l}$) was detected in 044001
in the last two of five sampling events at concentrations of 19.9 and 34.5 $\mu\text{g}/\text{l}$, indicating a
completed soil to groundwater pathway.

Dieldrin was detected in only one of 18 soil boring samples and in none of six DPT soil samples.
The 504SB001 detection of dieldrin (6.90 $\mu\text{g}/\text{kg}$) is greater than its soil to groundwater SSL
concentration of 4.0 $\mu\text{g}/\text{kg}$. Monitoring well 044001 is downgradient and within 200 feet of
504SB001. No dieldrin has been detected in groundwater samples collected from well 044001.

10.3.4.2 Groundwater to Surface Water Cross-Media Transport

SWMU 37

In Section 10.3, Tables 10.3.4, 10.3.5, 10.3.9 and 10.3.11 compare maximum detected organic and inorganic constituent concentrations in DPT and monitoring well groundwater samples from SWMU 37 to RBCs, and to chronic ambient saltwater quality criteria values for the protection of aquatic life (saltwater surface water chronic screening values). For inorganics, maximum concentrations in groundwater are compared to the greater of (a) RBCs, or (b) background reference concentrations for groundwater, as well as to the saltwater surface water chronic values. To provide a conservative screen, no attenuation or dilution of constituents in groundwater is assumed before comparison to the relevant standards.

The screening comparisons in the four tables mentioned above identify the constituents with the potential to impact downgrading groundwater quality and surface water quality. Table 10.3.18 provides a summary of SWMU 37 groundwater samples reporting exceedances of RBCs or surface water screening levels, along with the names of overlapping Zone C sites. Fate and transport concerns at Zone L groundwater sampling locations not associated with any overlapping Zone C sites are evaluated below. In these evaluations, shallow groundwater monitoring wells within 200 feet of the Zone L sampling location were used for comparison since the Zone L sampling point may be downgrading or cross-gradient from similar groundwater concentrations.

Chloroform was detected in two of 40 DPT groundwater samples. Both chloroform detections exceeded its RBC of 0.15 µg/l: 037GP012 (38.5 µg/l) and 037GP038 (10.9 µg/l). There are no wells within 200 feet of 037GP012; however, well GDE028 lies approximately 200 feet downgradient of 037GP038. Chloroform was detected in only the first-quarter sample from GDE028 at a concentration of 1.0 µg/l, which is 100 times below its MCL of 100 µg/l.

10.3.4.3 Fate and Transport Summary

Four inorganics – antimony, arsenic, chromium, and thallium – were reported at concentrations exceeding their soil to groundwater SSLs from Subzone C soil samples at locations not associated with existing Zone C sites. Since no downgradient shallow monitoring wells exist within 200 feet downgradient of the antimony and arsenic soil exceedance locations, the soil to groundwater pathways could not be evaluated.

Chromium and thallium exceedances coincided in soil boring samples southeast of Buildings 1001 and 1079. Both inorganics were detected in the nearest downgradient shallow groundwater monitoring well, 044001, indicating completed soil to groundwater pathways. Only thallium exceeded its RBC of 0.26 $\mu\text{g}/\text{l}$ in 044001. The chromium SSL is based on the conservative assumption that all detected chromium is hexavalent. Soil boring analytical data from Zone C indicates that hexavalent chromium has only been detected in three Zone C soil boring samples, ranging between 0.26 mg/kg to 1.19 mg/kg. None of these soil borings, however, are located in the same vicinity as the Zone L sample points.

Although one organic compound, dieldrin, was reported at concentrations exceeding its soil to groundwater SSL in one location, it was not detected in the nearest downgradient shallow groundwater monitoring well; thus, soil concentrations are protective of groundwater quality.

One organic compound, chloroform, was reported at concentrations exceeding its RBC concentration of 0.15 $\mu\text{g}/\text{l}$ in two SWMU 37 DPT groundwater samples. The only downgradient shallow groundwater monitoring well had a single detection (first-quarter) of chloroform at 1.0 $\mu\text{g}/\text{l}$.

Samples collected from locations with overlapping Zone C sites will be evaluated in an addendum to the Zone C RFI report.

10.3.5 Human Health Risk Assessment for SWMU 37 and AOC 504, Subzone C

10.3.5.1 Site Background and Investigative Approach

Section 10.3.1 provides a description for SWMU 37 and AOC 504 as well as a discussion of the sampling activities that took place during the Zone L RFI activities.

10.3.5.2 COPC Identification

SWMU 37 Soil

Based on the screening comparisons described in Section 7 of this RFI and presented in Tables 10.3.2, 10.3.6, and 10.3.7, aluminum, arsenic, BEQs, chromium, cyanide, manganese, and thallium were identified as COPCs for soil. Table 10.3.20 provides a summary of SWMU 37 soil samples that reported exceedances along with any associated sites that overlapped the area where these soil samples were taken. Except for soil sample 037SP02A, all of the soil samples that reported exceedances were collected in the vicinity of SWMU 44 and AOC 700. Manganese was the only COPC identified for sample 037SB02A. A risk assessment is provided to evaluate the significance of manganese soil concentrations. For the remainder of the COPCs identified for SWMU 37 subzone C, data generated during the Zone L RFI were compared to data generated during the SWMU 44 and AOC 700 RFIs and the results of these comparisons are provided on Table 10.3.20. A reference to the Zone C RFI report is also provided so that these comparisons can be easily verified. It was assumed that if the data generated during the Zone L RFI were less than or within the range of the data generated during either the SWMU 44 RFI or the AOC 700 RFI, then the conclusions for Zone L would be the similar and therefore no further evaluation would be necessary. Conversely, if for any reason the data generated during the Zone L RFI revealed something that was not evaluated during either the SWMU 44 RFI or the AOC 700 RFI (data reported higher than that presented in the SWMU 44 and/or AOC 700 RFIs, or new COPCs), then further evaluation should be deferred to the SWMU 44 and/or AOC 700 RFIs and included as an addendum. Recommendations are provided in Section 11.

Table 10.3.20
SMWU 37, Zone L, Subzone C
Risk Assessment COPCs

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
Soil				
037SB001	SWMU 44; AOC 700	Arsenic	Yes	Table 10.1.20; Table 10.9.7*
		BEQs	Yes	
		Chromium	Yes	
		Thallium	Yes	
037SB002	SWMU 44; AOC 700	Arsenic	Yes	Table 10.1.20; Table 10.9.7*
		Thallium	Yes	
DPT Soil				
037SP22B	SWMU 47	Aluminum	Yes	
037SP02A	None	Manganese	Yes	None
Groundwater				
037GW001	SWMU 44	Arsenic	Yes	Table 10.1.22*
		Cyanide	Yes	
037GW002	SWMU 44	Cyanide	Yes	Table 10.1.22*
		Manganese	Yes	
DPT Groundwater				
037GP032	SWMU 47	Acetone	Yes	Table 10.2.14*
037GP012	None	Chloroform	Yes	None
037GP038	None	Chloroform	Yes	None

Notes:

*Zone C RFI Report (EnSafe, 1997)

AOC 504 Soil

Based on the screening comparisons described in Section 7 of this RFI and presented in Tables 10.3.13, 10.3.15, and 10.3.16, aluminum, arsenic, BEQs, chromium, manganese, thallium, and vanadium were identified as COPCs for soil. Table 10.3.21 provides a summary of AOC 504 soil samples that reported exceedances along with any associated sites that overlapped

Table 10.3.21
AOC 504, Zone L, Subzone C
Risk Assessment COPCs

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
Soil				
504SB005	None	Aluminum Manganese Thallium	Yes Yes Yes	None None None
504SB006	None	Aluminum Arsenic Manganese Thallium	Yes Yes Yes Yes	None None None None
504SB007	None	Aluminum Arsenic Chromium Manganese Thallium Vanadium	Yes Yes Yes Yes Yes Yes	None None None None None None
504SB008	None	Aluminum Arsenic Chromium Manganese Thallium Vanadium	Yes Yes Yes Yes Yes Yes	None None None None None None
504SB009	None	Aluminum Thallium	Yes Yes	None None
504SB010	None	Thallium	Yes	None
504SB011	None	Thallium	Yes	None
504SB012	None	Thallium	Yes	None
504SB013	None	Aluminum Arsenic Chromium Manganese Thallium Vanadium	Yes Yes Yes Yes Yes Yes	None None None None None None
504SB014	None	Thallium	Yes	None
504SB017	None	BEQ's	Yes	None
504SB018	None	BEQ's	Yes	None
DPT Soil				

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
504SP001	None	Antimony Arsenic	Yes Yes	None None
504SP002	None	Arsenic	Yes	None
504SP004	None	Aluminum Manganese	Yes Yes	None None
504SP006	None	Chromium	Yes	None

the area where these soil samples were taken. As shown, none of the soil samples reporting exceedances were collected in the vicinity of any existing SWMU or AOC. Since there are no existing sites located in the area where these samples were taken, a risk assessment is provided to evaluate the significance of soil concentrations of these COPCs.

SWMU 37 Groundwater

Based on the screening comparisons described in Section 7 of this RFI and presented in Tables 10.3.4, and 10.3.10, acetone, arsenic, chloroform, and cyanide were identified as COPCs for groundwater. Table 10.3.20 provides a summary of SWMU 37 groundwater samples that reported exceedences along with any associated sites that overlapped the area where these samples were taken. As shown, DPT groundwater sample 037GP032 was collected in the vicinity of SWMU 47 and both monitoring wells are located in the vicinity of SWMU 44. DPT groundwater samples 037GP012 and 037GP038 were not collected near any existing sites. As a result, point risk/hazard estimates are provided to evaluate the significance of chloroform concentrations reported in groundwater at these two locations. Data generated during the Zone L RFI were compared to data generated during the SWMU 47 RFI and the results of these comparisons are provided on Table 10.3.20. A reference to the Zone C RFI report is also provided so that these comparisons can be easily verified. It was assumed that if the data generated during the Zone L RFI were less than or within the range of the data generated during the SWMU 47 RFI, then the

conclusions for Zone L would be the similar and therefore no further evaluation would be necessary. Conversely, if for any reason the data generated during the Zone L RFI revealed something that was not evaluated during the SWMU 47 RFI (data reported higher than that presented in the SWMU 47 RFI, or new COPCs), then further evaluation should be deferred to the SWMU 47 RFI and included as an addendum. Recommendations are provided in Section 11.

10.3.5.3 Exposure Assessment

Potentially Exposed Populations

Potentially exposed populations are current and future site workers and hypothetical future site residents. Future site resident and worker exposure scenarios were addressed in this risk assessment. The hypothetical future site worker scenario assumed continuous exposure to surface soil conditions and the use of shallow groundwater as a potable water source. Current site workers' exposure would be less than that assumed for the hypothetical future site worker scenario because of their limited soil contact and the fact that groundwater is not currently used onsite as a source of potable or process water. Therefore, future worker assessment is considered to be conservatively representative of current site use. The future site resident scenario was built on the premise that current buildings would be removed and replaced with dwellings. In addition, the future site residents were assumed to use the shallow aquifer onsite as a source of drinking water.

Exposure Pathways

Exposure pathways for the site workers are dermal contact, incidental ingestion of surface soils, and ingestion of shallow groundwater through potable use. Volatile organic compounds were reported in the groundwater; thus, inhalation of volatilized groundwater contaminants was also considered a viable exposure pathway. The exposure pathways for future residential land use are the same as those for the future site worker. In addition, the hypothetical future site worker scenario assumed continuous exposure to surface soil and groundwater conditions. Uniform

exposure was assumed for all sample locations. Table 10.3.22 presents the justification for exposure pathways assessed in this HHRA.

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Table 10.3.22
Exposure Pathways Summary – SWMU 37 and AOC 504
CNC – Subzone C
Charleston, South Carolina

Potentially Exposed Population	Medium and Exposure Pathway	Pathway Selected for Evaluation?	Reason for Selection or Exclusion
Current Land Uses			
Current Site Users/Maintenance	Air, Inhalation of gaseous contaminants emanating from soil	No	Based on the COPCs identified in this HHRA, this would not be a significant pathway.
	Air, Inhalation of chemicals entrained in fugitive dust	No	This pathway was considered to be insignificant relative to the other soil pathways that were evaluated.
	Shallow groundwater, Ingestion of contaminants during potable or general use	No (Qualified)	Future land use assessment is considered to be conservatively representative of current receptors.
	Shallow groundwater, Inhalation of volatilized shallow groundwater contaminants	No (Qualified)	Future land use assessment is considered to be conservatively representative of current receptors.
	Soil, Incidental ingestion	No (Qualified)	Future land use assessment is considered to be conservatively representative of current receptors.
	Soil, Dermal contact	No (Qualified)	Future land use assessment is considered to be conservatively representative of current receptors.
Future Land Uses			
Future Site Residents (Child and Adult) and Future Site Worker	Air, Inhalation of gaseous contaminants emanating from soil	No	Based on the COPCs identified in this HHRA, this would not be a significant pathway.
	Air, Inhalation of chemicals entrained in fugitive dust	No	This pathway was considered to be insignificant relative to the other soil pathways that were evaluated.

Table 10.3.22
Exposure Pathways Summary – SWMU 37 and AOC 504
CNC – Subzone C
Charleston, South Carolina

Potentially Exposed Population	Medium and Exposure Pathway	Pathway Selected for Evaluation?	Reason for Selection or Exclusion
	Shallow groundwater, Ingestion of contaminants during potable or general use	Yes	COPCs were identified subsequent to risk-based and background screening comparisons.
	Shallow groundwater, Inhalation of volatilized contaminants during domestic use	Yes	COPCs were identified subsequent to risk-based and background screening comparisons.
	Soil, Incidental ingestion	Yes	COPCs were identified subsequent to risk-based and background screening comparisons.
	Soil, Dermal contact	Yes	COPCs were identified subsequent to risk-based and background screening comparisons.
	Wild game or domestic animals, Ingestion of tissue impacted by media contamination	No	Hunting/taking of game and/or raising livestock is prohibited within the Charleston, South Carolina city limits.
	Fruits and vegetables, Ingestion of plant tissues grown in media	No	The potential for significant exposure via this pathway is low relative to that of other exposure pathways assessed.

Exposure Unit Area

With regard to soil pathways, the focus of the risk assessment for subzone C is the area located in the northern end of Zone C, just to the east of Buildings 1001 and 1079. All of the AOC 504 soil samples (18 samples) and all of the AOC 504 DPT soil samples (five samples) were used to characterize the soil pathways for subzone C. With respect to the groundwater pathways, DPT groundwater samples 037GP012 (located just to the northeast of Building NH 53) and 037GP038 (located just to the north of Building 58) represent isolated occurrences of chloroform reported at concentrations above its tap water RBC.

Exposure Point Concentrations

As discussed in Section 7 of this RFI, UCLs were calculated for datasets consisting of at least 10 samples. Table 10.3.23 presents a statistical summary of the soil data used in the risk assessment. As shown, the EPCs for all of the soil pathway COPCs were set equal to their respective 95% UCLs. The concentrations of chloroform reported in DPT groundwater samples 037GP012 and 037GP038 were used to calculate groundwater pathway point risk/hazard estimates for chloroform.

Quantification of Exposure

Soil

CDIs for ingestion and dermal contact with soils are shown in Tables 10.3.24 and 10.3.25, respectively.

10.3.5.4 Toxicity Assessment

Toxicity assessment terms and methods are discussed in Section 7 of this report. Table 10.3.26 presents toxicological information specific to each COPC evaluated in this risk assessment. This information was used in the quantification of risk/hazard associated with soil contaminants. Brief toxicological profiles for are provided in the following paragraphs.

Aluminum is one of the most abundant metals in the earth's crust (7% aluminum), and it is ubiquitous in air and water, as well as soil. This metal is water-soluble, silvery, and ductile, which suggests its usefulness in many processes. Ingesting aluminum can affect the absorption of other elements within the gastrointestinal tract and can alter intestinal function. Aluminum can potentially interfere with the absorption of essential nutrients and cholesterol. Another effect on the gastrointestinal system is the inhibition of acetylcholine-induced contractions, which are part

Table 10.3.23
 Statistical Analysis of COPCs
 AOC 504, Subzone C
 Surface Soil
 Charleston Naval Complex
 Charleston, South Carolina

COPC	Natural Log Transformed				UCL (mg/kg)	MAX (mg/kg)	EPC (mg/kg)
	n	mean	SD	H-stat			
Aluminum	24	8.575	1.116	2.682	18432	29700	18432 UCL Used
Antimony	24	-1.019	1.180	2.770	1.43	27	1.43 UCL Used
Arsenic	24	2.020	0.998	2.519	21.0	47.9	21.0 UCL Used
Benzo(a)pyrene equiv.	18	6.097	0.257	1.828	0.51	0.66	0.51 UCL Used
Chromium	24	2.478	0.931	2.435	29.5	47.4	29.5 UCL Used
Manganese	24	4.238	1.222	2.829	300	550	300 UCL Used
Thallium	24	-0.435	0.798	2.273	1.30	3.30	1.30 UCL Used
Vanadium	24	2.630	1.043	2.581	41.9	73.3	41.9 UCL Used

NOTES:

- mean arithmetic mean of the logtransformed data
- n number of samples analyzed
- SD standard deviation for a sample of data
- H-stat "H" statistic from Gilbert 1987; cuboidal interpolation was used to determine the val
 accordance with USEPA Supplemental Guidance to RAGS, Calculating the Conc
- NA not applicable
- EPC exposure point concentration
- UCL 95 percentile upper confidence level mean
- MAX maximum reported concentration

Table 10.3.24
 Chronic Daily Intakes (CDI)
 Incidental Ingestion of Surface Soil
 AOC 504, Subzone C
 Charleston Naval Complex
 Charleston, South Carolina

Chemical	Fraction Ingested from Contaminated Source *	Exposure Point Concentration (mg/kg)	Future Resident adult H-CDI (mg/kg-day)	Future Resident child H-CDI (mg/kg-day)	Future Resident lwa C-CDI (mg/kg-day)	Current Worker adult H-CDI (mg/kg-day)	Current Worker adult C-CDI (mg/kg-day)
Aluminum	1	18432	2.52E-02	2.36E-01	2.89E-02	9.02E-03	3.22E-03
Antimony	1	1.43	1.96E-06	1.83E-05	2.24E-06	7.00E-07	2.50E-07
Arsenic	1	21.0	2.87E-05	2.68E-04	3.28E-05	1.03E-05	3.66E-06
Benzo(a)pyrene equiv.	1	0.51	7.05E-07	6.58E-06	8.06E-07	2.52E-07	9.00E-08
Chromium	1	29.5	4.04E-05	3.77E-04	4.62E-05	1.44E-05	5.16E-06
Manganese	1	300	4.12E-04	3.84E-03	4.70E-04	1.47E-04	5.25E-05
Thallium	1	1.30	1.78E-06	1.66E-05	2.03E-06	6.35E-07	2.27E-07
Vanadium	1	41.9	5.74E-05	5.36E-04	6.56E-05	2.05E-05	7.32E-06

NOTES:

- lwa Lifetime weighted average; used to calculate carcinogenic CDI, RAGS Parts A and B
- CDI Chronic Daily Intake in mg/kg-day
- H-CDI CDI for hazard quotient
- C-CDI CDI for excess cancer risk
- * Reflects the estimated fraction of the site impacted by the corresponding COPC.

Table 10.3.25
 Chronic Daily Intakes (CDI)
 Dermal Contact with Surface Soil
 AOC 504, Subzone C
 Charleston Naval Complex
 Charleston, South Carolina

Chemical	Exposure Point Concentration (mg/kg)	Fraction Contacted from Contaminated Source *	Dermal Absorption Factor (unitless)	Future Resident adult H-CDI (mg/kg-day)	Future Resident child H-CDI (mg/kg-day)	Future Resident lwa C-CDI (mg/kg-day)	Current Worker adult H-CDI (mg/kg-day)	Current Worker adult C-CDI (mg/kg-day)
Aluminum	18432	1	0.001	1.04E-03	3.42E-03	6.48E-04	7.39E-04	2.64E-04
Antimony	1.43	1	0.001	8.04E-08	2.65E-07	5.03E-08	5.74E-08	2.05E-08
Arsenic	21.0	1	0.001	1.18E-06	3.88E-06	7.36E-07	8.41E-07	3.00E-07
Benzo(a)pyrene equiv.	0.51	1	0.01	2.89E-07	9.55E-07	1.81E-07	2.07E-07	7.38E-08
Chromium	29.5	1	0.001	1.66E-06	5.47E-06	1.04E-06	1.18E-06	4.23E-07
Manganese	300	1	0.001	1.69E-05	5.57E-05	1.06E-05	1.21E-05	4.31E-06
Thallium	1.30	1	0.001	7.29E-08	2.41E-07	4.57E-08	5.21E-08	1.86E-08
Vanadium	41.9	1	0.001	2.35E-06	7.77E-06	1.47E-06	1.68E-06	6.00E-07

NOTES:

- CDI Chronic Daily Intake in mg/kg-day
- H-CDI CDI for hazard quotient
- C-CDI CDI for excess cancer risk
- The dermal absorption factor was applied to the exposure point concentration to reflect the different trans-dermal migration of inorganic versus organic chemicals
- * Reflects the estimated fraction of the site impacted by the corresponding COPC.

Table 10.3.26
 Toxicological Database Information
 for Chemicals of Potential Concern
 AOC 504, Subzone C
 Charleston Naval Complex
 Charleston, South Carolina

Non-Carcinogenic Toxicity Data

Chemical	Oral	Confidence Level	Critical Effect	Uncertainty	Inhalation	Confidence Level	Critical Effect
	Reference Dose (mg/kg/day)			Factor Oral	Reference Dose (mg/kg/day)		
Inorganics							
Aluminum	1	d			ND		
Antimony	0.0004	a	L	1000	ND		
Arsenic	0.0003	a	M	3	ND		
Chromium (III)	1	a	L	100	ND		
Chromium (VI)	0.005	a	L	500	ND		
Manganese	0.047	a	M	1	1.43E-05	a	Increased incidence of pneumonia
Thallium	8E-05	a	L	3000	ND		
Vanadium	0.007	b		100	ND		
Carcinogenic PAHs							
Benzo(a)pyrene equivalents	ND				ND		

NOTES:

- a Integrated Risk Information System (IRIS)
- b Health Effects Assessment Summary Tables (HEAST)
- c HEAST alternative method
- d EPA Environmental Criteria and Assessment Office - Cincinnati (provisional)
- NA Not applicable or not available
- ND Not determined due to lack of information

Table 10.3.26 (continued)
 Toxicological Database Information
 for Chemicals of Potential Concern
 AOC 504, Subzone C
 Charleston Naval Complex
 Charleston, South Carolina

Carcinogenic Toxicity Data

Chemical	Oral Slope Factor [(mg/kg/day)] ⁻¹		Inhalation Slope Factor [(mg/kg/day)] ⁻¹		Weight of Evidence	Tumor Type
Aluminum	ND		ND			
Antimony	ND		ND			
Arsenic	1.5	a	15.1	a	A	various
Chromium (III)	ND		ND			
Chromium (VI)	ND		42	b	A	Lung cancer
Manganese	ND		ND		D	
Thallium	ND		ND			
Vanadium	ND		ND			
Carcinogenic PAHs/PCBs						
Benzo(a)pyrene equivalents	7.3	a	3.1	a	B2	Forestomach

NOTES:

- a Integrated Risk Information System (IRIS)
- b Health Effects Assessment Summary Tables (HEAST)
- c HEAST alternative method
- e EPA Environmental Criteria and Assessment Office - Cincinnati (provisional)
- NA Not applicable or not available
- ND Not determined due to lack of information

of the neuromuscular system controlling bowel muscles. The effect could explain why aluminum-containing antacids often produce constipation. Aluminum dust is moderately flammable and explosive in heat. Inhaling this dust can cause fibrosis (aluminosis) (Klaassen, et al., 1986) (Dreisbach, et al., 1987). No data are available on an applicable SF or the USEPA cancer group. The USEPA Region IV Office of Health Assessment suggested using the provisional oral RfD of 1.0 mg/kg-day. The aesthetic-based SMCL for drinking water is 50 to 200 $\mu\text{g}/\text{L}$ (USEPA, Office of Water).

Antimony belongs to the same periodic group as arsenic. This element is absorbed slowly through the gastrointestinal tract, which is the target of this element. Another target is the blood, where antimony concentrates. Due to frequent industrial use, the primary exposure route for antimony to the general population is food. Antimony is also a common air pollutant from industrial emissions. USEPA has not classified antimony as a carcinogen, and the oral RfD is 0.0004 mg/kg-day (Klaassen, et al, 1986).

Arsenic exposure via the ingestion route causes darkening and hardening of the skin in chronically exposed humans. Inhalation exposure to arsenic causes neurological deficits, anemia, and cardiovascular effects. Arsenic's effects on the nervous and cardiovascular systems are primarily associated with acute exposure to higher levels. Exposure to arsenic containing materials has been shown to cause cancer in humans. Inhalation of these materials can lead to increased lung cancer risk, and ingestion of these materials is associated with increased skin cancer rates. Human milk contains about 3 $\mu\text{g}/\text{L}$ arsenic (Klaassen, et al, 1986). USEPA set 0.0003 mg/kg-day as the oral RfD for arsenic based on a NOAEL of 0.0008 mg/kg-day and an uncertainty factor of 3. The uncertainty accounts for insufficiencies in the data base and sensitive human subpopulations. The overall confidence in the oral RfD is medium. Arsenic has been classified as a group A carcinogen with an oral slope factor of 1.5 (mg/kg-day)⁻¹. A inhalation slope factor of 15.1 (mg/kg-day)⁻¹ is calculated by converting the IRIS unit risk to dose units.

Benzo(a)pyrene equivalents include the following list of polynuclear aromatic hydrocarbons: 1

Benzo(a)anthracene	TEF	0.1	2
Benzo(a)pyrene	TEF	1.0	3
Benzo(b)fluoranthene	TEF	0.1	4
Benzo(k)fluoranthene	TEF	0.01	5
Chrysene	TEF	0.001	6
Dibenz(a,h)anthracene	TEF	1.0	7
Indeno(1,2,3-cd)pyrene	TEF	0.1	8

Some PAHs are toxic to the liver, kidney, and blood. However, the toxic effects of the PAHs 9
 above have not been well established. There are no RfDs for the PAHs above due to a lack of 10
 data. All PAHs listed above are classified by USEPA as B2 carcinogens, and their carcinogenicity 11
 is addressed relative to that of benzo(a)pyrene, having an oral SF of 7.3 (mg/kg-day)⁻¹. Toxicity 12
 Equivalency Factors, also set by USEPA, are multipliers that are applied to the detected 13
 concentrations, which are subsequently used to calculate excess cancer risk. These multipliers are 14
 discussed further in the exposure and toxicity assessment sections. Most carcinogenic PAHs have 15
 been classified as carcinogenic due to animal studies using large doses of purified PAHs. There 16
 is some doubt as to the validity of these listings, and the SFs listed in USEPA's RBC table are 17
 provisional. However, these PAHs are carcinogens when the exposure involves a mixture of other 18
 carcinogenic substances (e.g., coal tar, soot, cigarette smoke). As listed in IRIS, the basis for the 19
 benzo(a)pyrene B2 classification is that human data specifically linking benzo(a)pyrene to a 20
 carcinogenic effect are lacking. There are, however, multiple animal studies in many species 21
 demonstrating benzo(a)pyrene to be carcinogenic by numerous routes. 22

Benzo(a)pyrene has produced positive results in numerous genotoxicity assays. At the June 1992 CRAVE Work Group meeting, a revised risk estimate for benzo(a)pyrene was verified (see Additional Comments for Oral Exposure). This section provides information on two aspects of the carcinogenic risk assessment for the agent in question: the USEPA classification and quantitative estimates of exposure. The classification reflects a weight-of-evidence judgment of the likelihood that the agent is a human carcinogen. The quantitative risk estimates are presented in application of a low-dose extrapolation procedure and presented as the risk per (mg/kg)-day. The unit risk is the quantitative estimate in terms of either risk per $\mu\text{g}/\text{L}$ drinking water or risk per $\mu\text{g}/\text{m}^3$ air breathed. The third form in which risk is presented is drinking water or air concentration providing cancer risks of 1 in 10,000 or 1 in 1,000,000. The Carcinogenicity Background Document provides details on the carcinogenicity values found in IRIS. Users are referred to the Oral Reference Dose and Reference Concentration sections for information on long-term toxic effects other than carcinogenicity.

As listed in IRIS, the basis for the dibenz(a,h)anthracene and benzo(b)fluoranthene B2 classification is no human data and sufficient data from animal bioassays. Benzo(b)fluoranthene produced tumors in mice after lung implantation, intraperitoneal or subcutaneous injection, and skin painting. As listed in IRIS, the basis for the benzo(a)anthracene B2 classification is because of no human data exists and there is not sufficient data from animal bioassays. Benzo(a)anthracene produced tumors in mice exposed by gavage; intraperitoneal, subcutaneous or intramuscular injection; and topical application. Benzo(a)anthracene produced mutations in bacteria and in mammalian cells, and transformed mammalian cells in culture. As listed in IRIS the basis for the benzo(k)fluoranthene B2 classification is no human data and sufficient data from animal bioassays. Benzo(k)fluoranthene produced tumors after lung implantation in mice and when administered with a promoting agent in skin-painting studies. Equivocal results have been found in a lung adenoma assay in mice. Benzo(k)fluoranthene is mutagenic in bacteria. (Klaassen, et al., 1986).

Chromium exists in two stable, natural forms: trivalent (CrIII), and hexavalent (CrVI). Acute exposure to chromium can result in kidney damage following oral exposure or damage to the nasal mucosa and septum following inhalation exposure. Chronic inhalation exposure to hexavalent chromium has resulted in kidney and respiratory tract damage, as well as excess lung cancer in both animals and humans following occupational exposure. Only hexavalent chromium is believed to be carcinogenic by inhalation (Gradient, 1991). Oral RfD values for both forms of chromium are 1.0 and 5E-3 (mg/kg-day). For trivalent chromium, the RfD is based on liver toxicity in rats. For the hexavalent form, the RfD is based on unspecified pathological changes observed in rat studies. In addition, hexavalent chromium is considered a group A carcinogen for inhalation exposures, and an oral SF of 42 (mg/kg-day)⁻¹ has been established for the hexavalent form. Vitamin supplements contain approximately 0.025 mg of chromium. As listed in IRIS, no critical effects were observed for chromium (III). The uncertainty factor was determined to be 100 and the modifying factor was determined to be 10. As listed in IRIS, no critical effects were observed for chromium (VI). The uncertainty factor was determined to be 500 and the modifying factor was determined to be 1.

Manganese is an essential nutrient. Chronic exposure to manganese, 0.8 mg/kg-day, causes mental disturbances and various central nervous system effects. Studies have shown that manganese uptake from water is greater than manganese uptake from food, and the elderly appear to be more sensitive than children. The oral RfD is 0.14 mg/kg-day with uncertainty and modifying factors of 1. When assessing the potential for adverse health effects from nondietary intakes (ingestion of soil or drinking water) of manganese, a modifying factor of 3 is used which gives an oral RfD of 0.047 mg/kg-day. An additional consideration for increased uptake of manganese in infants and fasted individuals further reduces the oral RfD for water ingestion to 0.023 mg/kg-day. Inhalation of manganese dust causes neurological effects and increased incidence of pneumonia, and an inhalation RfD was set to 0.0000143 mg/kg-day. According to USEPA, manganese can not be classified as to its carcinogenicity. Therefore, the cancer class for

manganese is group D. The typical vitamin supplement dose of manganese is 2.5 mg/day (Klaassen, et al, 1986) (Dreisbach, et al, 1987).

Thallium is readily absorbed through the gut and skin. Primary effects are stomach and bowel disturbances, kidney and liver damage, and neurological disturbances. Thallium was used in the past as a rodenticide and ant killer, and its use for these purposes is now prohibited. This element remains in the body for a relatively long time, and could accumulate if the chronic dose is large. USEPA's oral RfD for thallium is 0.00008 mg/kg-day (Klaassen, et al, 1986) (Dreisbach, et al, 1987).

Vanadium is not readily absorbed through the skin or by oral ingestion and is ubiquitous. It is also a byproduct of petroleum refining. Vanadium is soluble in fats and oils (Klaassen, et al., 1986). Municipal water supplies contain 0.001 to 0.006 mg/L. The target organ is unclear, and the primary focus of toxicological information is inhalation of vanadium dust. Typical vitamin supplements contain approximately 0.010 mg in a daily dose. The oral RfD set by USEPA is 0.007 mg/kg-day.

10.3.5.5 Risk Characterization

Soil Pathways

Exposure to soil onsite was evaluated under both residential and site worker scenarios. For these scenarios, incidental ingestion and dermal contact exposure pathways were evaluated. For noncarcinogenic contaminants evaluated for future site residents, hazard was computed separately to address child and adult exposure. Tables 10.3.27 and 10.3.28 present the computed carcinogenic risks and/or HQs associated with incidental ingestion of and dermal contact with soils, respectively.

Table 10.10.3.27

Hazard Quotients and Incremental Lifetime Cancer Risks
 Incidental Surface Soil Ingestion
 AOC 504, Subzone C
 Charleston Naval Complex
 Charleston, South Carolina

Chemical	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day) ⁻¹	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident lwa ILCR	Current Worker adult Hazard Quotient	Current Worker adult ILCR
Aluminum	1	NA	0.025	0.24	ND	0.0090	ND
Antimony	0.0004	NA	0.0049	0.046	ND	0.0018	ND
Arsenic	0.0003	1.5	0.10	0.89	4.9E-05	0.034	5.5E-06
Benzo(a)pyrene equiv.	NA	7.3	ND	ND	5.9E-06	ND	6.6E-07
Chromium	0.005	NA	0.0081	0.075	ND	0.0029	ND
Manganese	0.047	NA	0.0088	0.082	ND	0.0031	ND
Thallium	7E-05	NA	0.025	0.24	ND	0.0091	ND
Vanadium	0.007	NA	0.0082	0.077	ND	0.0029	ND
SUM Hazard Index/ILCR			0.2	2	6E-05	0.06	6E-06

NOTES:

- NA Not available
- ND Not Determined due to lack of available information
- lwa Lifetime weighted average; used to calculate excess carcinogenic risk derived from RAGS Part A
- ILCR Incremental Lifetime Cancer Risk

Table 10.3.28
Hazard Quotients and Incremental Lifetime Cancer Risks
Dermal Contact With Surface Soil
AOC 504, Subzone C
Charleston Naval Complex
Charleston, South Carolina

Chemical	Dermal Adjustment	Oral RfD Used (mg/kg-day)	Oral SF Used (mg/kg-day) ⁻¹	Future Resident adult Hazard Quotient	Future Resident child Hazard Quotient	Future Resident lwa ILCR	Current Worker adult Hazard Quotient	Current Worker adult ILCR
Aluminum	0.2	0.2	NA	0.0052	0.017	ND	0.0037	ND
Antimony	0.2	8E-05	NA	0.0010	0.0033	ND	0.00072	ND
Arsenic	0.2	6E-05	7.5	0.020	0.065	5.5E-06	0.014	2.3E-06
Benzo(a)pyrene equiv.	0.5	NA	14.6	ND	ND	2.6E-06	ND	1.1E-06
Chromium	0.2	0.001	NA	0.0017	0.0055	ND	0.0012	ND
Manganese	0.2	0.0094	NA	0.0018	0.0059	ND	0.0013	ND
Thallium	0.2	1.4E-05	NA	0.0052	0.017	ND	0.0037	ND
Vanadium	0.2	0.0014	NA	0.0017	0.0055	ND	0.0012	ND
SUM Hazard Index/ILCR				0.04	0.1	8E-06	0.03	3E-06

NOTES:

- NA Not available
- ND Not Determined due to lack of available information
- lwa Lifetime weighted average; used to calculate excess carcinogenic risk derived from RAGS Part A
- ILCR Incremental Lifetime Cancer Risk
 - Dermal to absorbed dose adjustment factor is applied to adjust for Oral SF and RfD (i.e., the oral RfD is based on oral absorption efficiency which should not be applied to dermal exposure and dermal CDI)

Hypothetical Site Residents

The ingestion and dermal contact ILCR (based on the adult and child lifetime weighted average) for soils are 6E-05 and 8E-06, respectively. Arsenic and BEQs were the primary contributors to risk projections.

The computed hazard indices computed for soil based on the adult resident were 0.2 for the soil ingestion pathway and 0.04 for the dermal contact pathway. The computed hazard indices based on child resident were 2 for the soil ingestion pathway and 0.1 for the dermal contact pathway. Aluminum, arsenic, and thallium were the primary contributors to hazard index projections.

Hypothetical Site Workers

The site worker ILCRs for the ingestion and dermal contact pathways are 6E-06 and 3E-06, respectively. Arsenic and BEQs were the primary contributors for each pathway. Hazard indices for the ingestion and dermal pathways were 0.06 and 0.03, respectively.

Groundwater Pathways

Exposure to shallow groundwater was evaluated using point risk/hazard estimates under both residential and site worker scenarios. The groundwater pathways were evaluated assuming that site groundwater will be used for potable and/or domestic purposes and that an unfiltered well, drawing from the corresponding water-bearing zone, will be installed. For noncarcinogenic contaminants evaluated relative to future site residents, hazard was computed for a child resident. Table 10.3.29 presents the risk and hazard point estimates for the groundwater pathways.

Table 10.3.29
 Point Estimates of Risk and Hazard
 AOC 504, Subzone C, DPT Groundwater
 Charleston Naval Complex
 Charleston, South Carolina

Site	Location	Parameter	Concentration	Units	Residential		Site Worker	
					Hazard Index	Risk (E-06)	Hazard Index	Risk (E-06)
037	P012	Chloroform	38.5	ug/L	0.49	49.6	0.11	12.5
037	P038	Chloroform	10.9	ug/L	0.14	14.0	0.03	3.5

Hypothetical Site Residents

The chloroform concentration reported for DPT groundwater sample 037GP012 equates with a 5E-05 based on the site resident scenario. The concentration reported for DPT groundwater sample 037GP038 equates with a risk of 1E-05. The hazard indices for DPT samples 037GP012 and 037GP038 were calculated to be 0.5 and 0.1, respectively.

Hypothetical Site Workers

The chloroform concentration reported for DPT groundwater sample 037GP012 equates with a 1E-05 based on the site worker scenario. The concentration reported for DPT groundwater sample 037GP038 equates with a risk of 4E-06. The hazard indices for DPT samples 037GP012 and 037GP038 were calculated to be 0.1 and 0.03, respectively.

COCs Identified

Chemicals of concern were identified based on cumulative (all pathway) risk and hazard projected for this site. USEPA has established a generally acceptable risk range of 1E-4 to 1E-6, and a hazard index threshold of 1.0 (unity). In accordance with SCDHEC guidance, a COC was considered to be any chemical contributing to a cumulative risk level of 1E-6 or greater and/or a cumulative hazard index above 1.0, if its individual ILCR exceeded 1E-6 or hazard quotient exceeded 0.1. For carcinogens, this approach is relatively conservative, because a cumulative risk level of 1E-4 (and individual ILCR of 1E-6) is recommended by USEPA Region IV as the trigger for establishing COCs. The COC selection method presented was used to provide a more comprehensive evaluation of chemicals contributing to carcinogenic risk or noncarcinogenic hazard during the remedial goal options development process.

Soils

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Hypothetical Site Residents

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As shown in Table 10.3.30, aluminum, arsenic, BEQs, and thallium were identified as the soil pathway COCs based on their contribution to cumulative ILCR and/or hazard index projections.

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Hypothetical Site Workers

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Arsenic and BEQs were identified as the soil pathway COCs based on their contribution to cumulative ILCR and/or hazard index projections.

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Groundwater

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Due to its contribution to risk estimates above 1E-06, chloroform would be considered a groundwater COC for both the site resident and site worker scenarios based on the results of the point risk evaluation.

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10.3.5.6 Risk Uncertainty

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Characterization of Exposure Setting and Identification of Exposure Pathways

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The potential for high bias is introduced through the exposure setting and pathway selection due to the highly conservative assumptions (i.e., future residential use) recommended by USEPA Region IV when assessing potential future and current exposure. The exposure assumptions made in the site worker scenario are highly protective and would tend to overestimate exposure.

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Residential use of the site would not be expected, based on current site uses. If this area were to be used as a residential site, the buildings and other structures would be demolished, and the soil conditions would likely change — the soils would be covered with landscaping soil and/or a house. Consequently, exposure to current soil conditions would not be likely under a true future residential scenario. Current site worker's contact with impacted media is much less than is assumed in the exposure model that was used to assess this pathway. These factors indicate that

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Table 10.3.30
 Summary of Risk and Hazard-based COCs
 AOC 504, Subzone C
 Charleston Naval Complex
 Charleston, South Carolina

Medium	Exposure Pathway		Future	Future	Future	Site Worker		Identification of COCs			
			Resident Adult Hazard Quotient	Resident Child Hazard Quotient	Resident Iwa ILCR	Hazard Quotient	ILCR				
Surface Soil	Incidental Ingestion	Aluminum	0.025	0.24	ND	0.0090	ND	1			
		Antimony	0.0049	0.046	ND	0.0018	ND				
		Arsenic	0.10	0.89	4.9E-05	0.034	5.5E-06	1	2	4	
		Benzo(a)pyrene equiv.	ND	ND	5.9E-06	ND	6.6E-07		2		
		Chromium	0.0081	0.075	ND	0.0029	ND				
		Manganese	0.0088	0.082	ND	0.0031	ND				
		Thallium	0.025	0.24	ND	0.0091	ND	1			
		Vanadium	0.0082	0.077	ND	0.0029	ND				
		Dermal Contact	Aluminum	0.0052	0.017	ND	0.0037	ND			
			Antimony	0.0010	0.0033	ND	0.00072	ND			
	Arsenic		0.020	0.065	5.5E-06	0.014	2.3E-06	2		4	
	Benzo(a)pyrene equiv.		ND	ND	2.6E-06	ND	1.1E-06	2		4	
	Chromium		0.0017	0.0055	ND	0.0012	ND				
	Manganese		0.0018	0.0059	ND	0.0013	ND				
	Thallium		0.0052	0.017	ND	0.0037	ND				
	Vanadium		0.0017	0.0055	ND	0.0012	ND				
	Sum of All Pathways			0.2	2	6E-05	0.09	9E-06			

Notes:

ND Indicates not determined due to the lack of available risk information.

ILCR Indicates incremental excess lifetime cancer risk

HI Indicates hazard index

1- Chemical is a COC by virtue of projected child residence noncarcinogenic hazard.

2- Chemical is a COC by virtue of projected future resident lifetime ILCR.

3- Chemical is a COC by virtue of projected site worker noncarcinogenic hazard.

4- Chemical is a COC by virtue of projected site worker ILCR.

exposure pathways assessed in this HHRA would generally overestimate the risk and hazard posed to current site workers and future site residents.

A basewide system provides drinking and process water to buildings throughout Zone C. This system is slated to remain in operation under the current base reuse plan. As a result, groundwater would not be expected to be used under future site use scenarios. Therefore, the scenario established to project risk/hazard associated with groundwater exposure is highly conservative, and associated pathways are not expected to be completed in the future.

Determination of Exposure Point Concentrations

The exposure point concentrations were set equal to the 95% UCL concentrations for COPCs identified for this site. The EPCs used in the risk assessment provide a reasonable maximum estimate of chronic daily intakes. As a result, the EPCs would tend to overestimate risk and hazard.

Uncertainty in the Data

All of the DPT data were provided at DQO level II which adds to the uncertainty associated with some of the data used in this risk assessment. Usually QA/QC required for risk assessment is DQO level III or higher. The risk and hazard estimates provided in this risk assessment could be considered over- or underestimates due to the use of DQO level II data.

10.3.5.7 Risk Summary

Risk and hazard were assessed for the hypothetical site worker and the hypothetical future site resident under reasonable maximum exposure assumptions. In soils, the incidental ingestion and dermal contact pathways were assessed in this HHRA. The ingestion and inhalation pathways were evaluated for groundwater. To add perspective to the risk assessment point risk and hazard maps are presented below for soil. Point risk maps are based on the unlikely assumption that

conditions is more likely the result of uniform exposure to the soil conditions over the entire site rather than specific points. Risk maps are still useful because they allow the reader to visualize the contribution of risk or hazard index due to individual COCs.

Soil

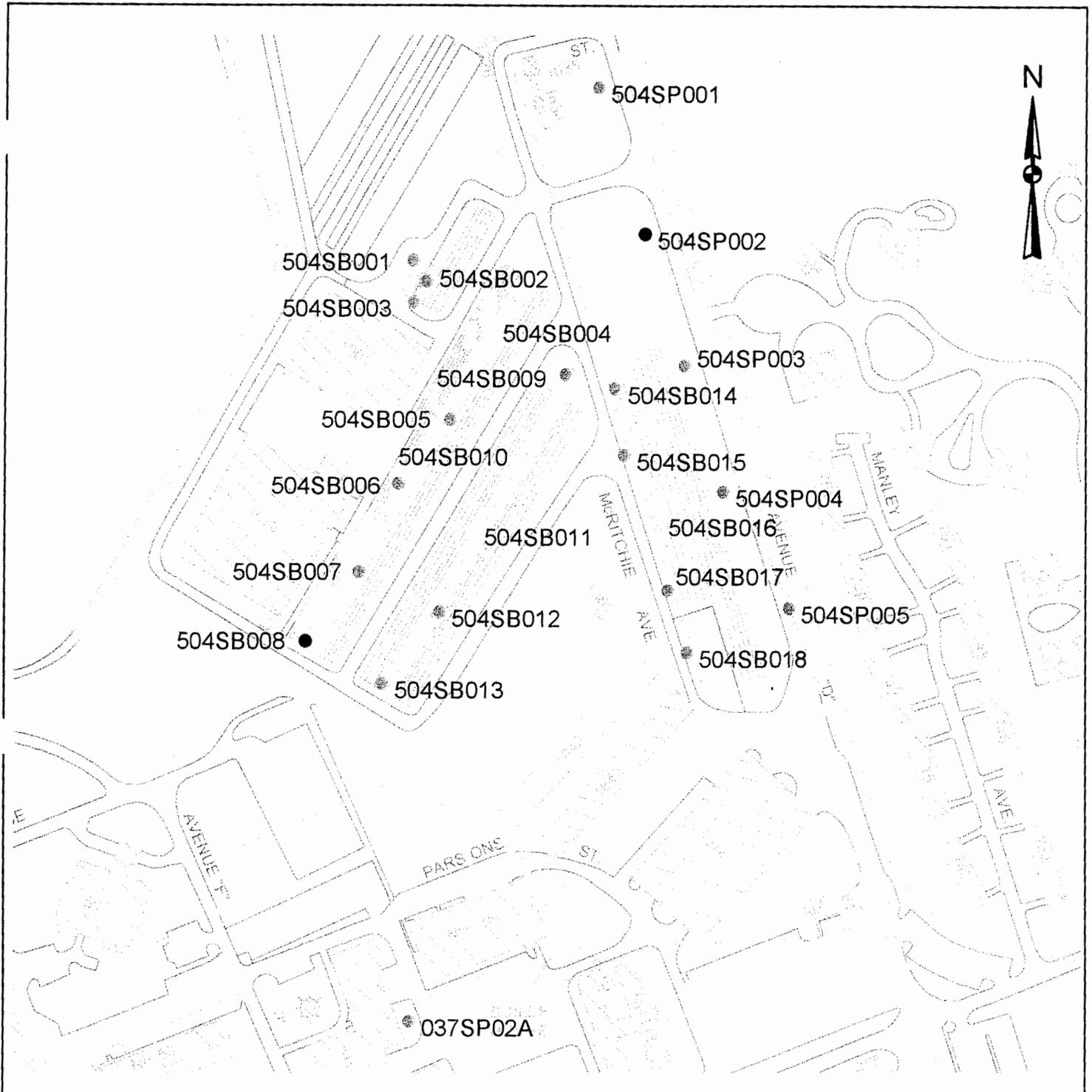
Figures 10.3.30 and 10.3.31 illustrate point risk and point hazard estimates for soil pathways under a residential scenario. Table 10.3.31 provides the contribution of individual COCs to cumulative risk and hazard at each sample location for both the residential and site worker scenarios. As shown, concentrations of arsenic and/or BEQs contribute to risk projections above $1E-06$ for each soil location. Risk estimates range from $4E-06$ (504SB004) to $1E-04$ (504SB008) with a mean risk of $3E-05$. As shown, point hazard index estimates exceeded one at only six locations (504SB005, 504SB007, 504SB008, 504SB013, 504SP001, and 504SP002). Arsenic was the primary contributor to hazard index estimates with secondary contributions from aluminum, chromium, manganese, thallium, and vanadium. Point hazard index estimates ranged from 0.1 (504SB004) to 4 (504SB008) with a mean hazard index of 1.

Figures 10.3.32 and 10.3.33 illustrate point risk and point hazard estimates for soil pathways under a site worker scenario. Table 10.3.31 provides the contribution of individual COCs to cumulative risk and hazard at each sample location for both the residential and site worker scenarios. As shown, concentrations of arsenic and/or BEQs contribute to risk projections above $1E-06$ for nine out of 24 soil locations. Risk estimate range from $4E-07$ (504SB004) to $2E-06$ (504SB008) with a mean risk of $9E-07$. As shown, point hazard index estimates did not exceed one at any location.

10.3.5.8 Remedial Goal Options

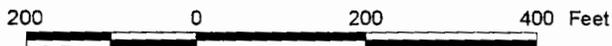
Soil

RGOs for carcinogens were based on the lifetime weighted average site resident or site workers as presented in Table 10.3.32 for soils.



LEGEND

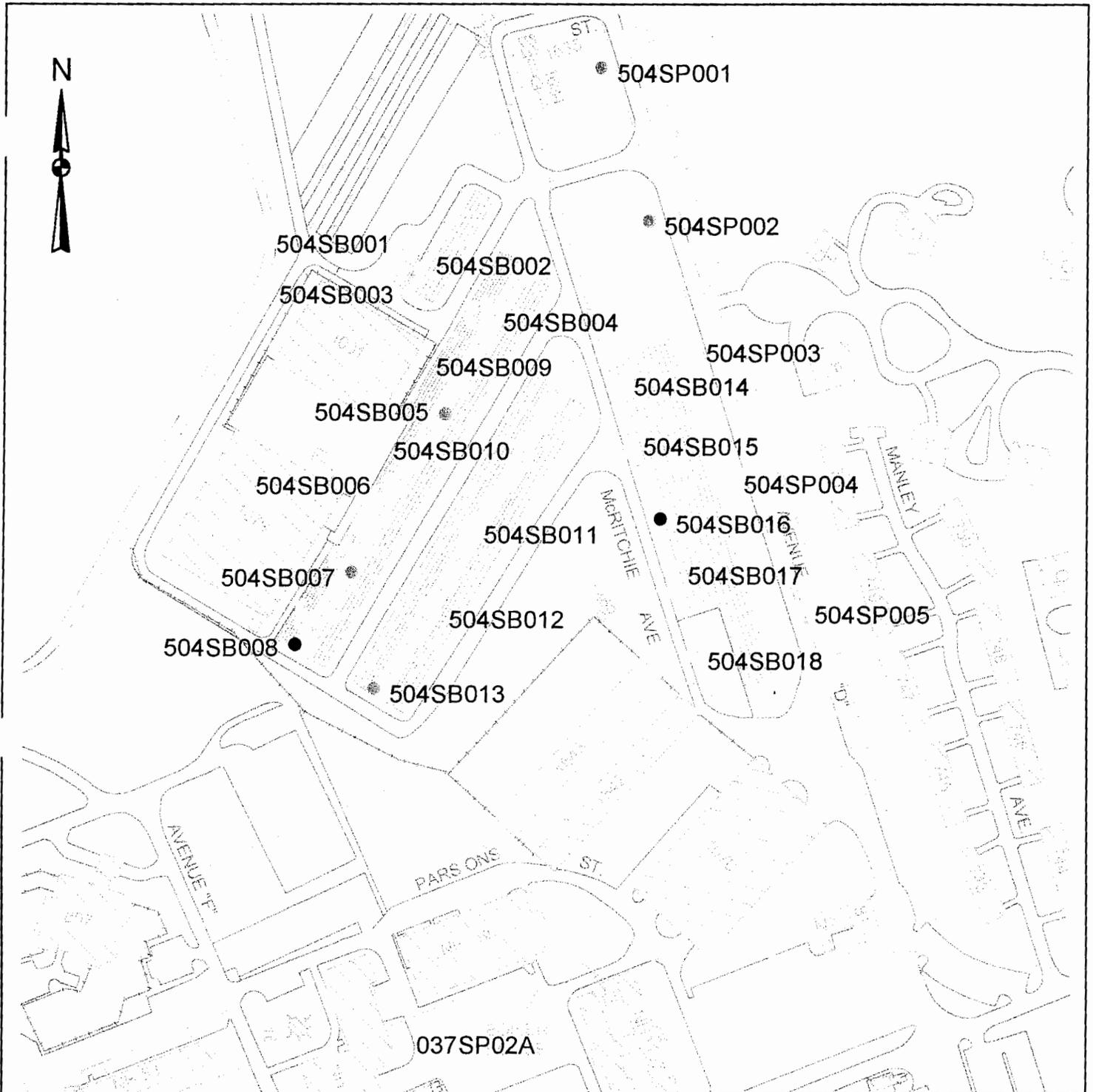
- NO COPCs DETECTED
- < 1E-6
- 1E-6 to 5E-6
- 5E-6 to 1E-5
- 1E-5 to 1E-4
- > 1E-4



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.30
 ZONE L - SUBZONE C
 SWMU 37, AOC 504

SOIL POINT RISK
 RESIDENTIAL SCENARIO



LEGEND

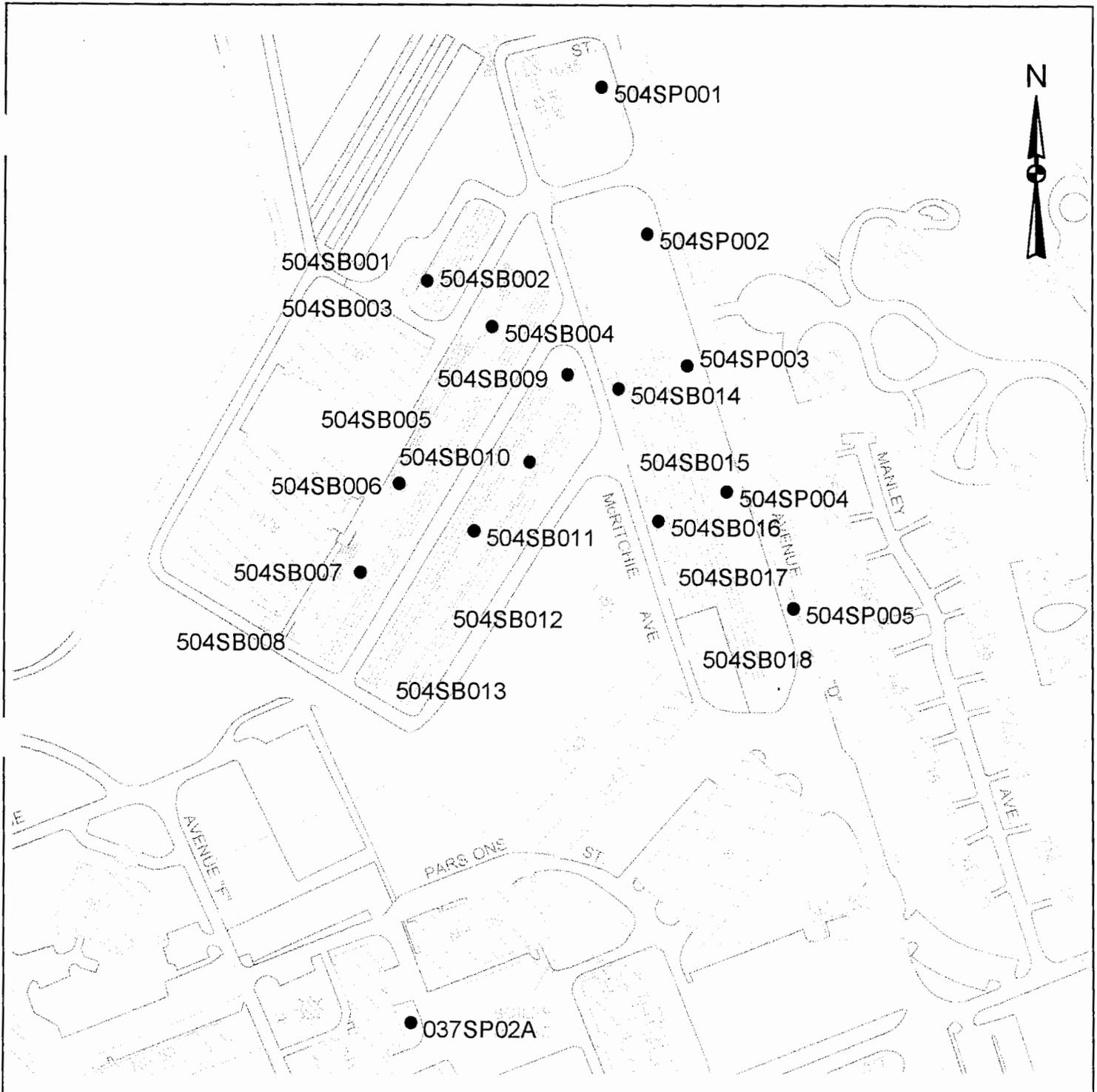
- NO COPCs DETECTED
- 0 to 0.1
- 0.1 to 0.5
- 0.5 to 1.0
- 1.0 to 3.0
- > 3.0



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.31
 ZONE L - SUBZONE C
 SWMU 37, AOC 504

SOIL HAZARD INDEX
 RESIDENTIAL SCENARIO



LEGEND

- NO COPCs DETECTED
- < 1E-6
- 1E-6 to 5E-6
- 5E-6 to 1E-5
- 1E-5 to 1E-4
- > 1E-4



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.32
 ZONE L - SUBZONE C
 SWMU 37, AOC 504

SOIL POINT RISK
 INDUSTRIAL SCENARIO



LEGEND

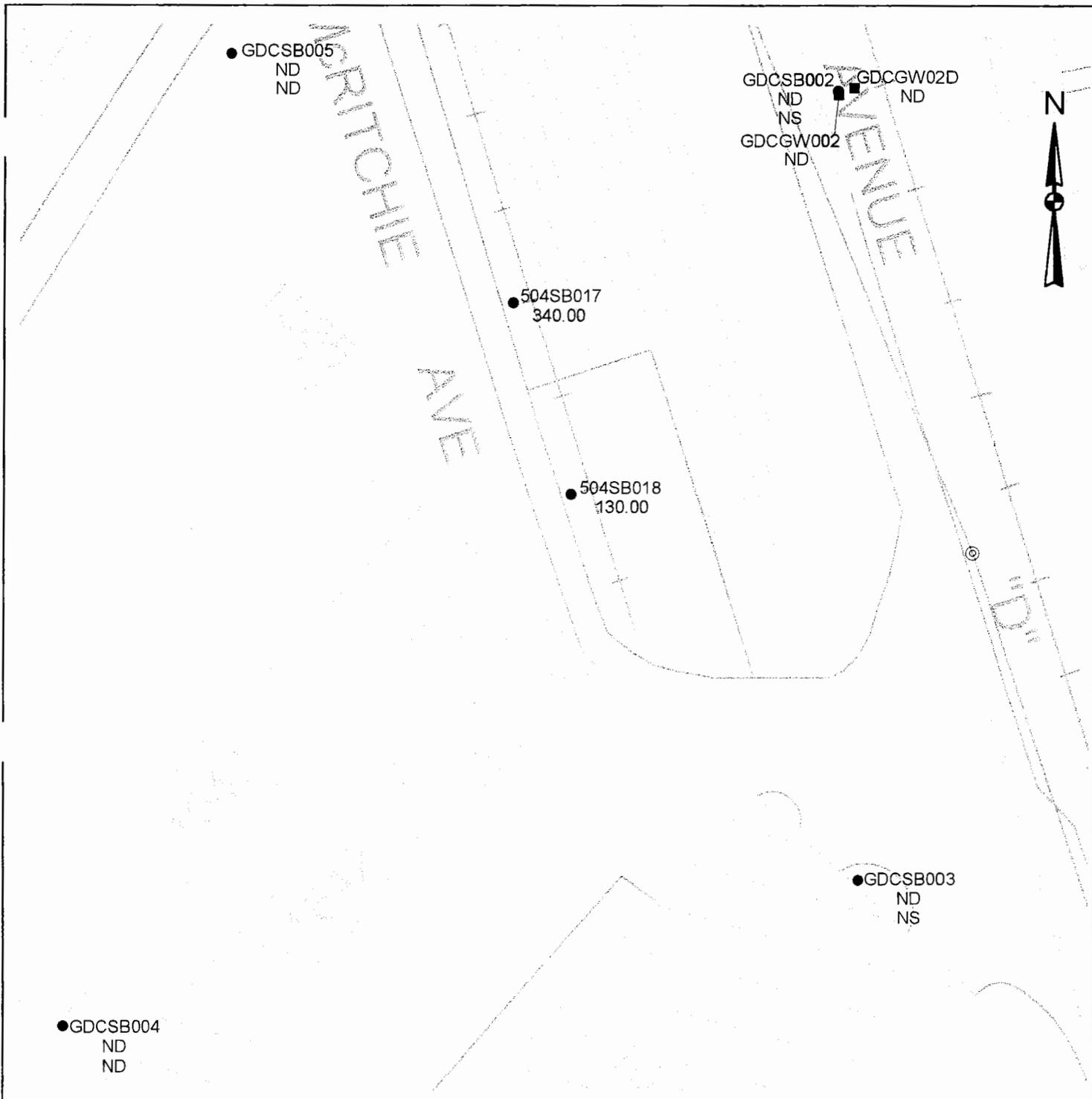
- NO COPCs DETECTED
- 0 to 0.1
- 0.1 to 0.5
- 0.5 to 1.0
- 1.0 to 3.0
- > 3.0



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.33
 ZONE L - SUBZONE C
 SWMU 37, AOC 504

SOIL HAZARD INDEX
 INDUSTRIAL SCENARIO



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

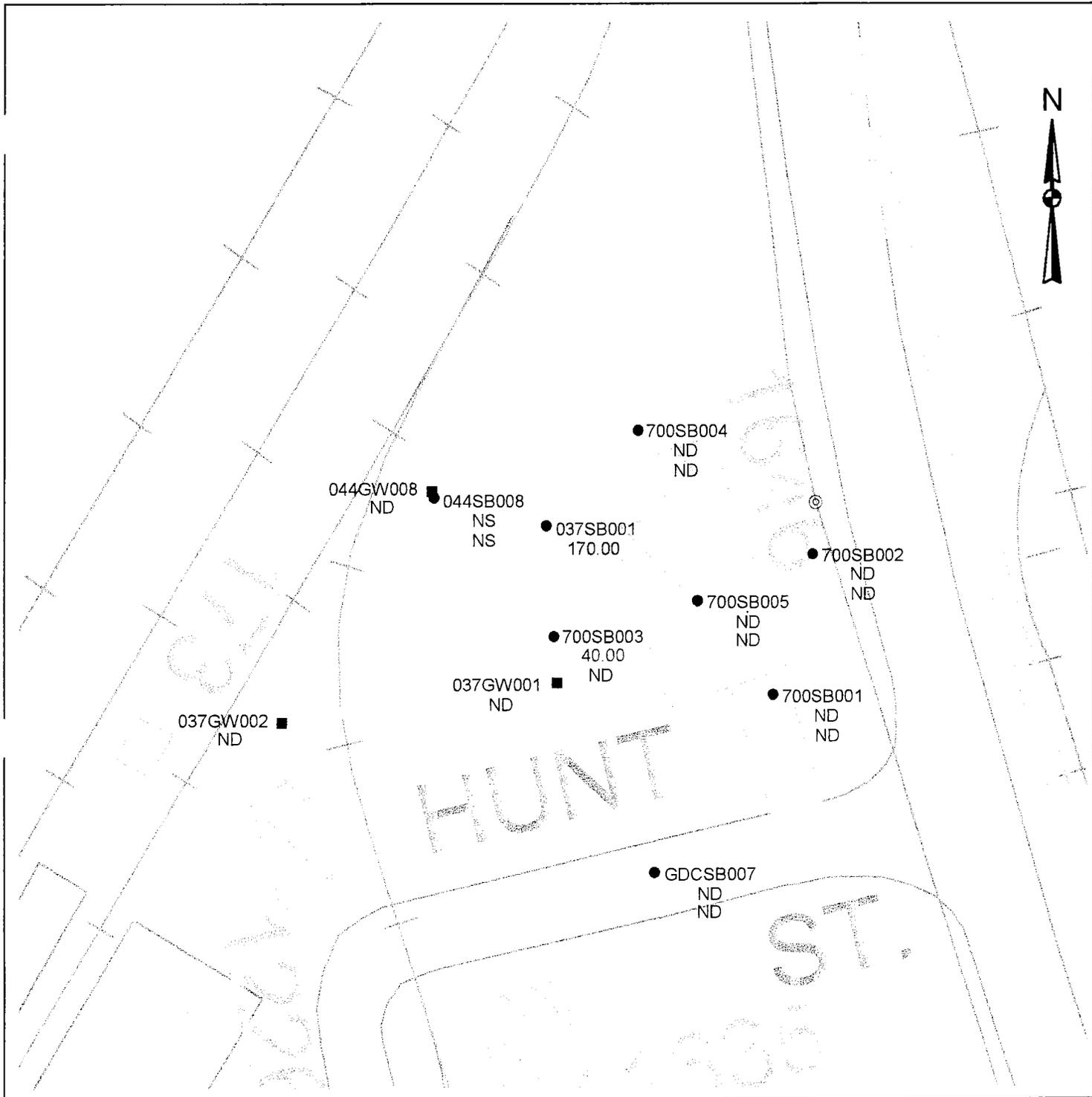


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.11
ZONE L - SUBZONE C
BENZO(A)PYRENE
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS



RBC = 88.0 ug/kg SSL = 8000 ug/kg MCL = 0.20 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

— SUBZONE BOUNDARY — RAILROAD © MANHOLE
 — SANITARY SEWER LINE — STORM SEWER LINE

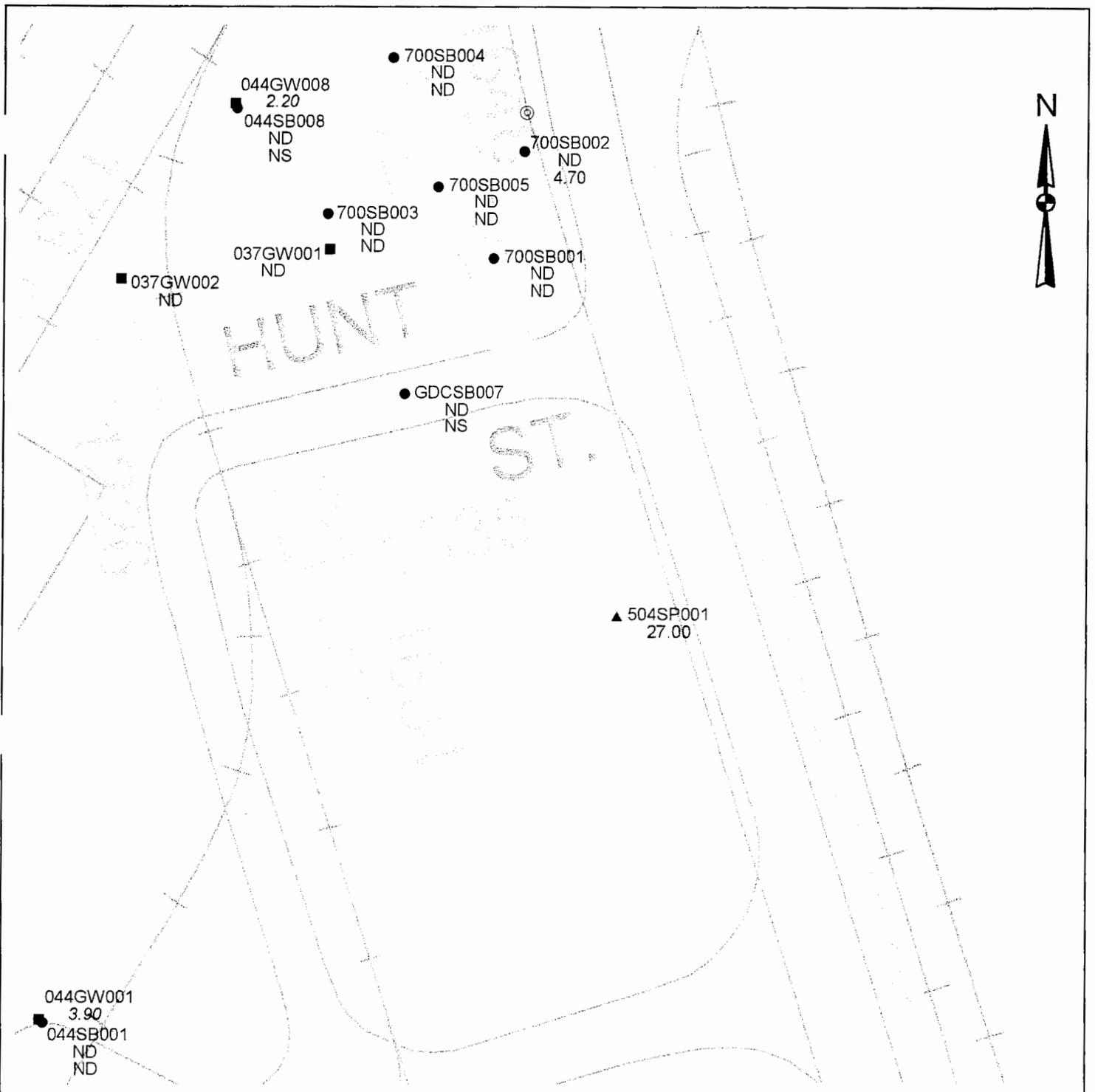
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.12
 ZONE L - SUBZONE C
 DIBENZ(A,H)ANTHRACENE
 ZONE L EXCEEDANCES WITH ZONE C
 SOIL AND GW CONCENTRATIONS

RBC = 88.0 ug/kg SSL = 2000 ug/kg MCL = NONE



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.13
ZONE L - SUBZONE C
ANTIMONY
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS



RBC = 3.10 mg/kg SSL = 5.00 mg/kg MCL = 6.00 ug/L



LEGEND

▲ ZONE L DPT SOIL LOCATION

● ZONE L SOIL BORING LOCATION

SUBZONE BOUNDARY / RAILROAD © MANHOLE
/ SANITARY SEWER LINE / STORM SEWER LINE

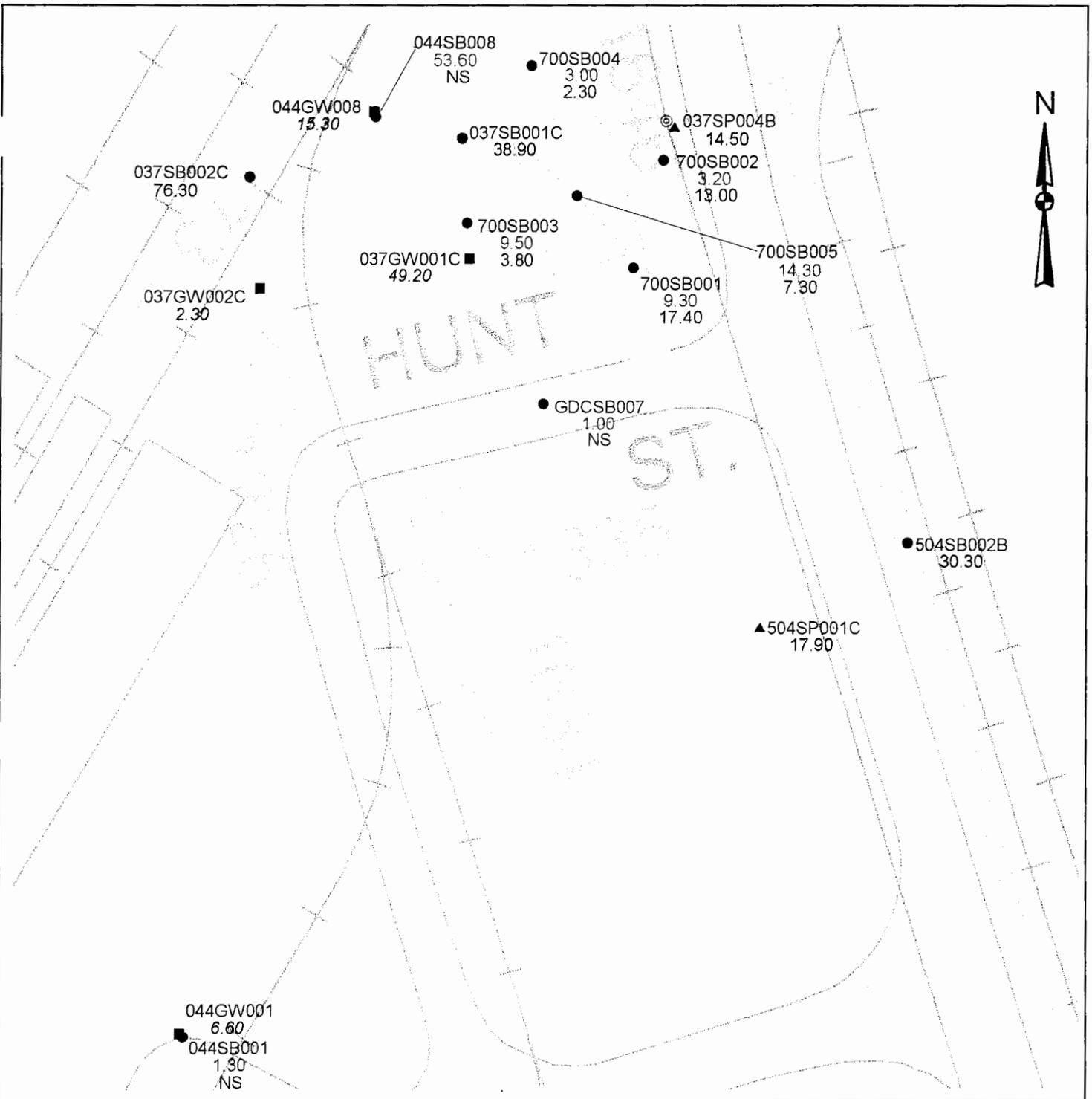
500 0 500 1000 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.14
ZONE L - SUBZONE C
ARSENIC
ZONE L EXCEEDANCES

RBC = 0.43 mg/kg SSL = 29.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

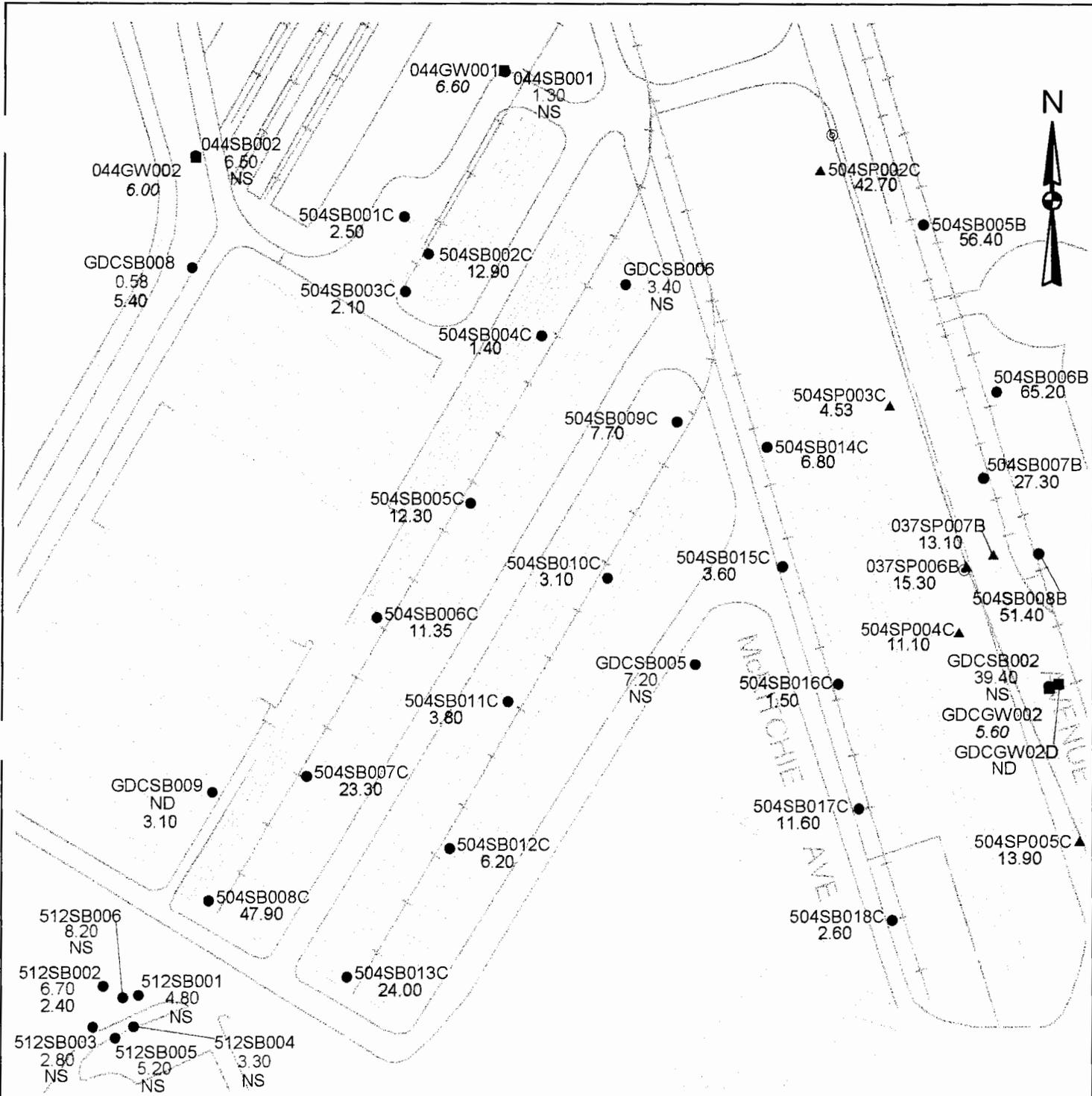


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.15
ZONE L - SUBZONE C
ARSENIC
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS



RBC = 0.43 mg/kg SSL = 29.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

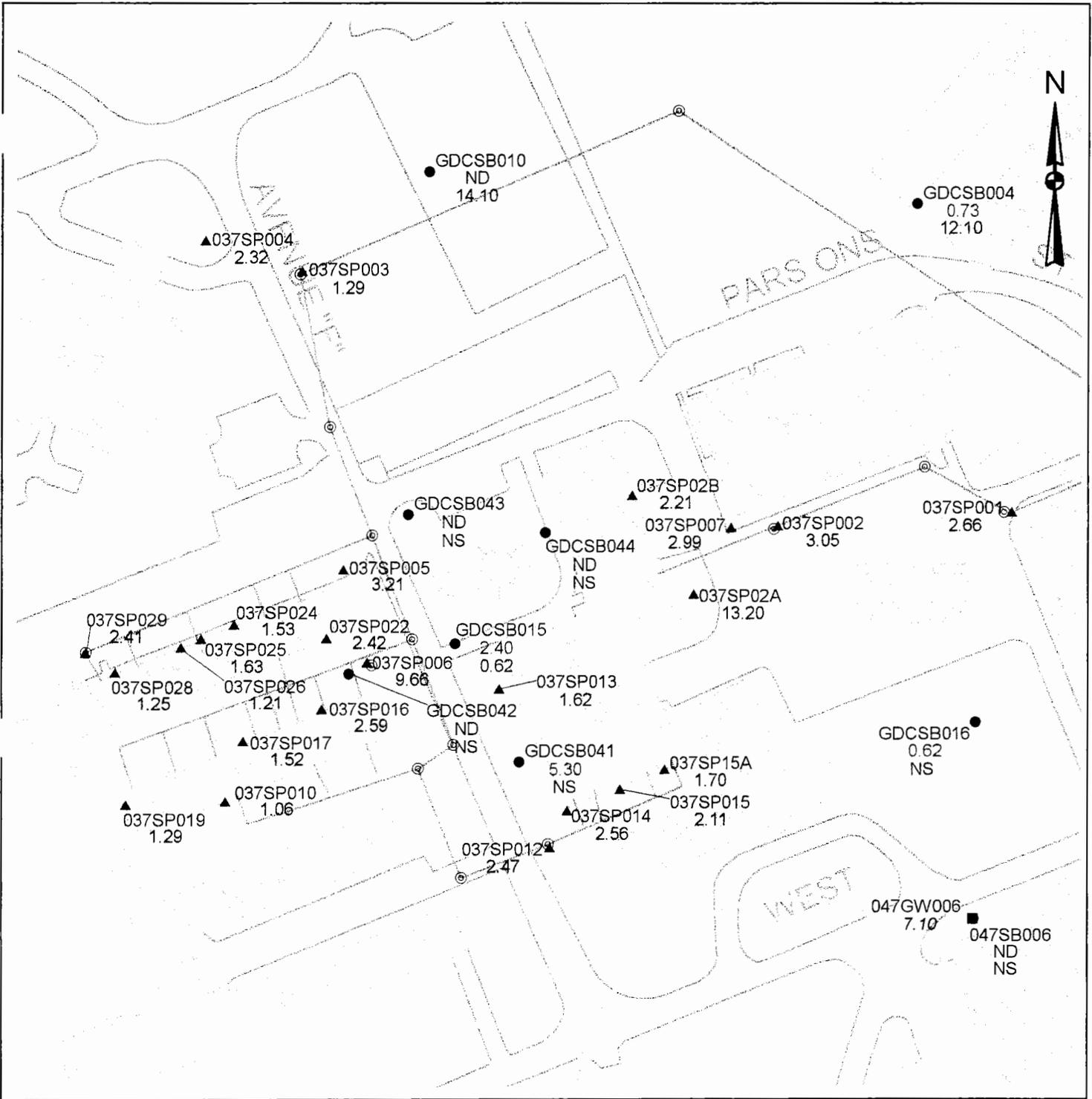
100 0 100 200 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.16
ZONE L - SUBZONE C
ARSENIC
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

RBC = 0.43 mg/kg SSL = 29.0 mg/kg MCL = 50.0 ug/L



LEGEND

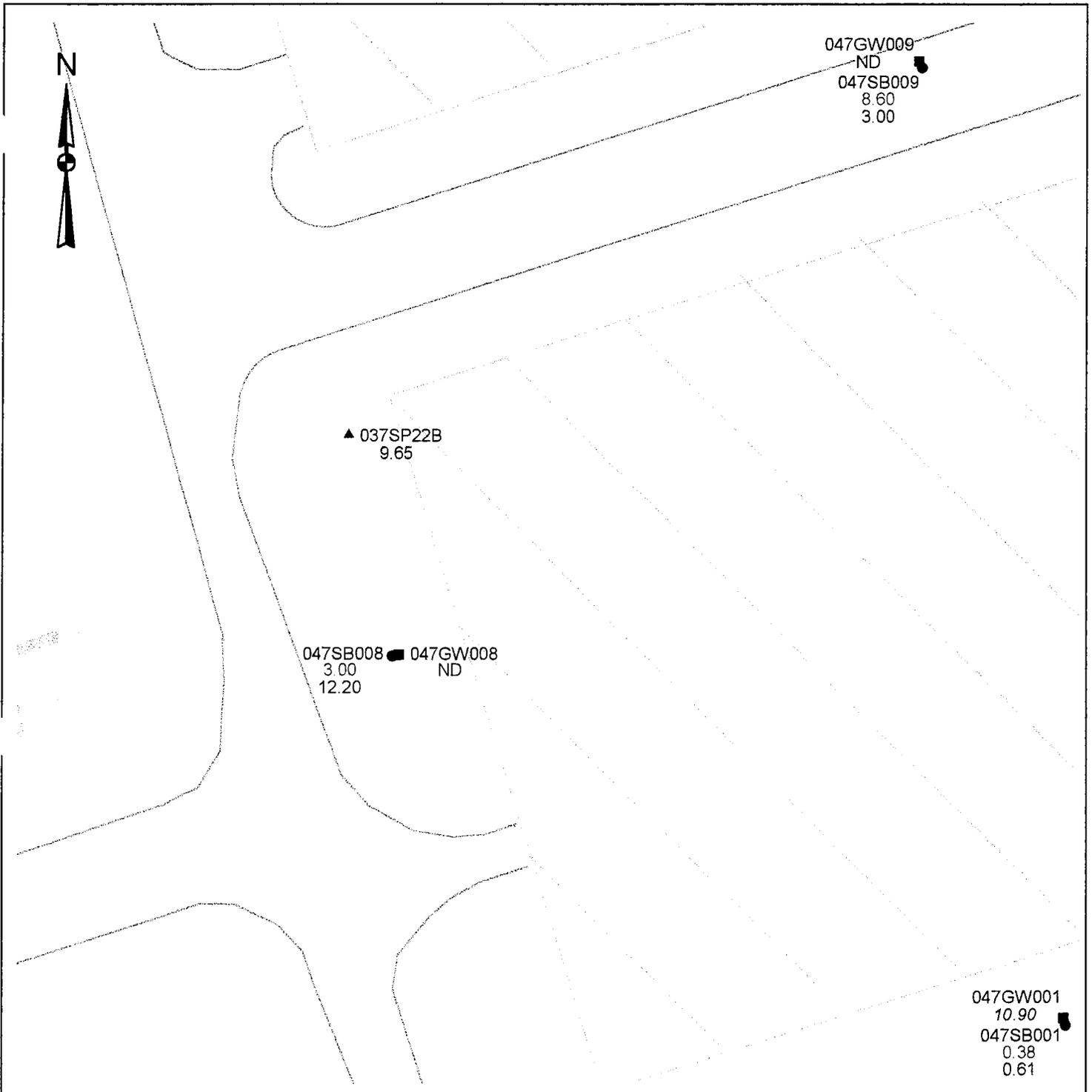
- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.17
 ZONE L - SUBZONE C
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE C
 SOIL AND GW CONCENTRATIONS

RBC = 0.43 mg/kg SSL = 29.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD © MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

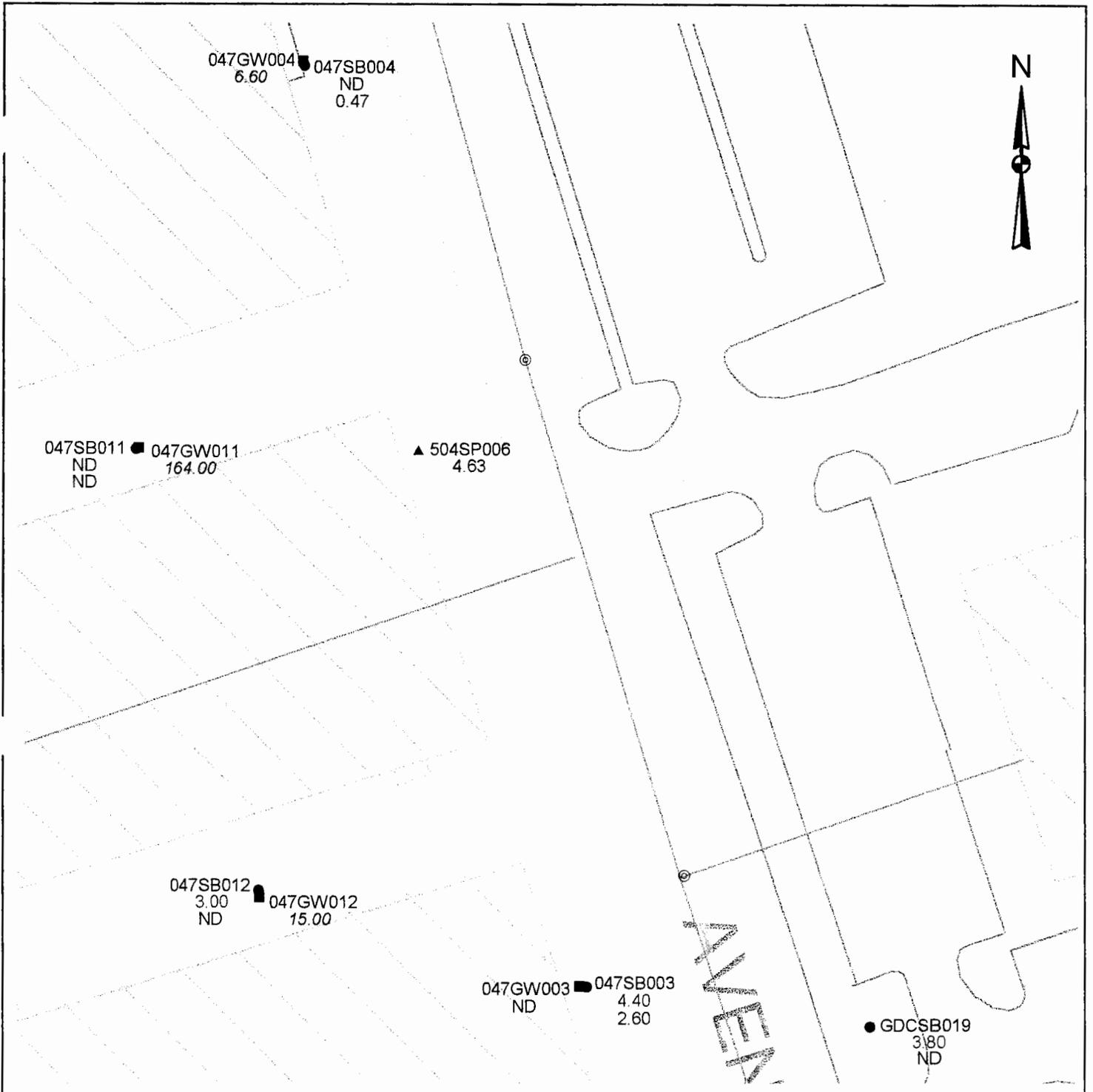
20 0 20 40 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.18
 ZONE L - SUBZONE C
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE C
 SOIL AND GW CONCENTRATIONS

RBC = 0.43 mg/kg SSL = 29.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD © MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

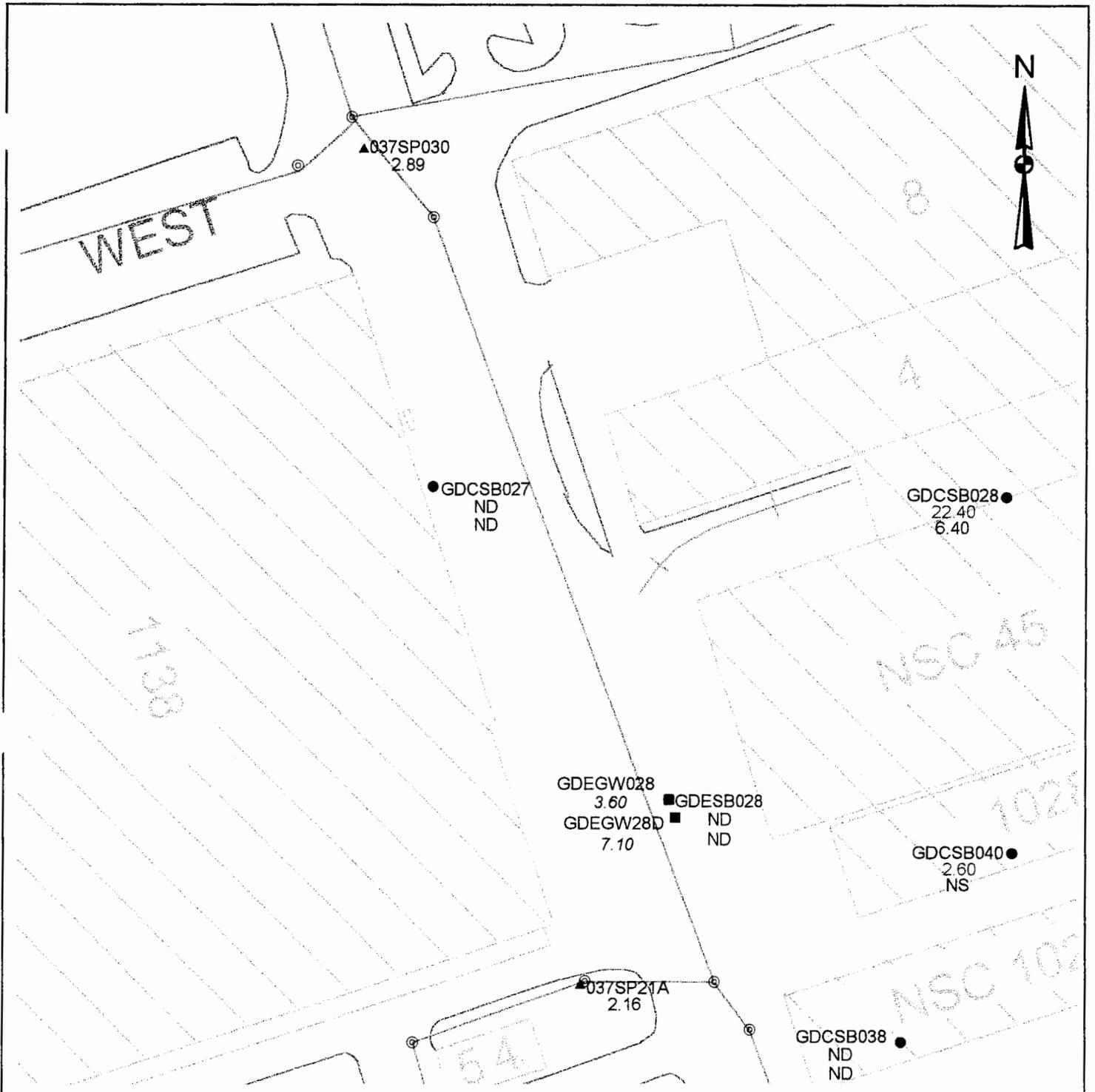
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.3.19
 ZONE L - SUBZONE C
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE C
 SOIL AND GW CONCENTRATIONS

RBC = 0.43 mg/kg SSL = 29.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

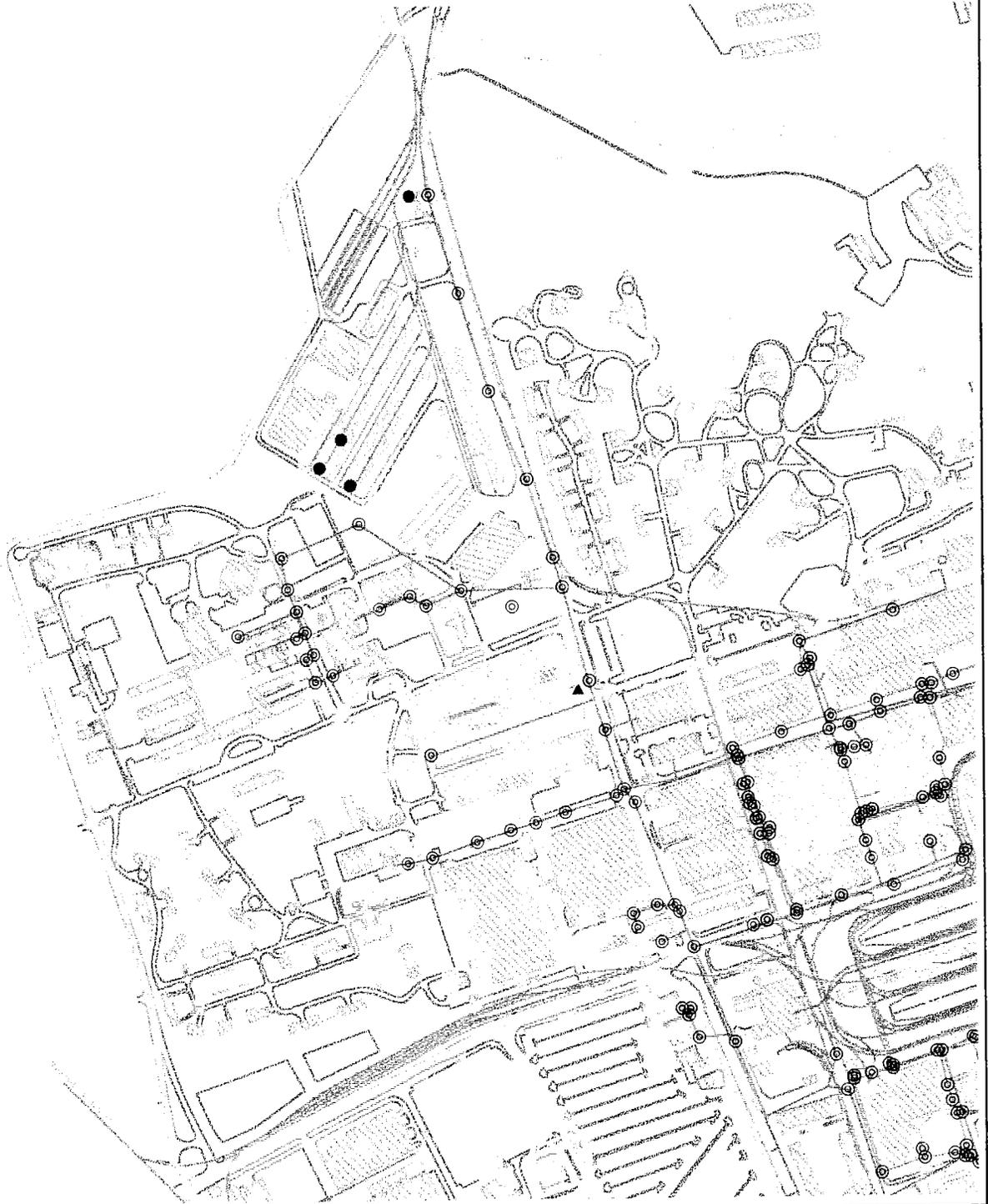
60 0 60 120 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.20
ZONE L - SUBZONE C
ARSENIC
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

RBC = 0.43 mg/kg SSL = 29.0 mg/kg MCL = 50.0 ug/L



LEGEND

▲ ZONE L DPT SOIL LOCATION

● ZONE L SOIL BORING LOCATION

--- SUBZONE BOUNDARY - - - RAILROAD ⊙ MANHOLE
- - - SANITARY SEWER LINE - - - STORM SEWER LINE

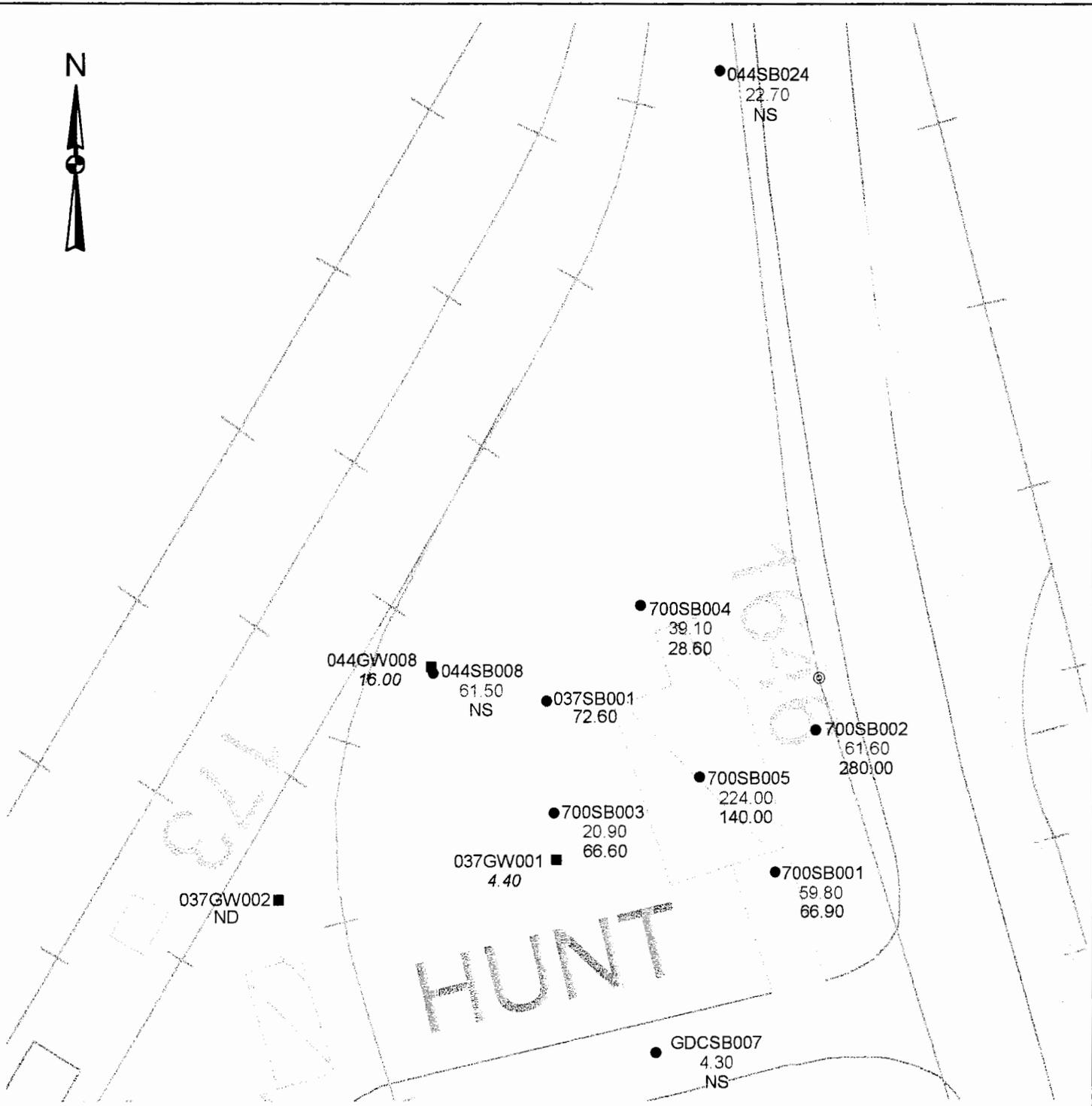
500 0 500 1000 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.21
ZONE L - SUBZONE C
CHROMIUM
ZONE L EXCEEDANCES

RBC = 39.0 mg/kg SSL = 38.0 mg/kg MCL = 100 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

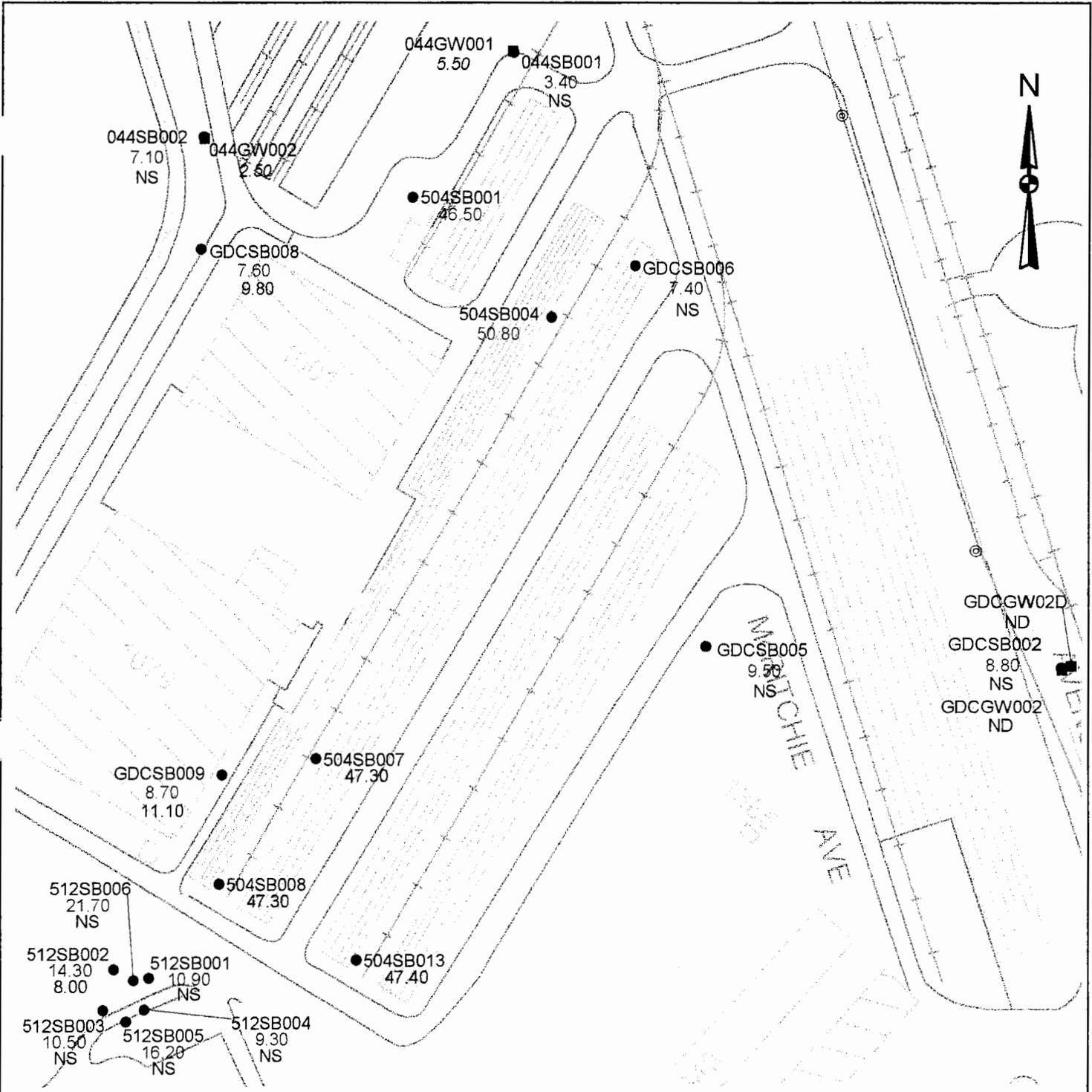


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.22
ZONE L - SUBZONE C
CHROMIUM
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

30 0 30 60 Feet

RBC = 39.0 mg/kg SSL = 38.0 mg/kg MCL = 100 ug/L



LEGEND

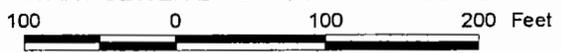
- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

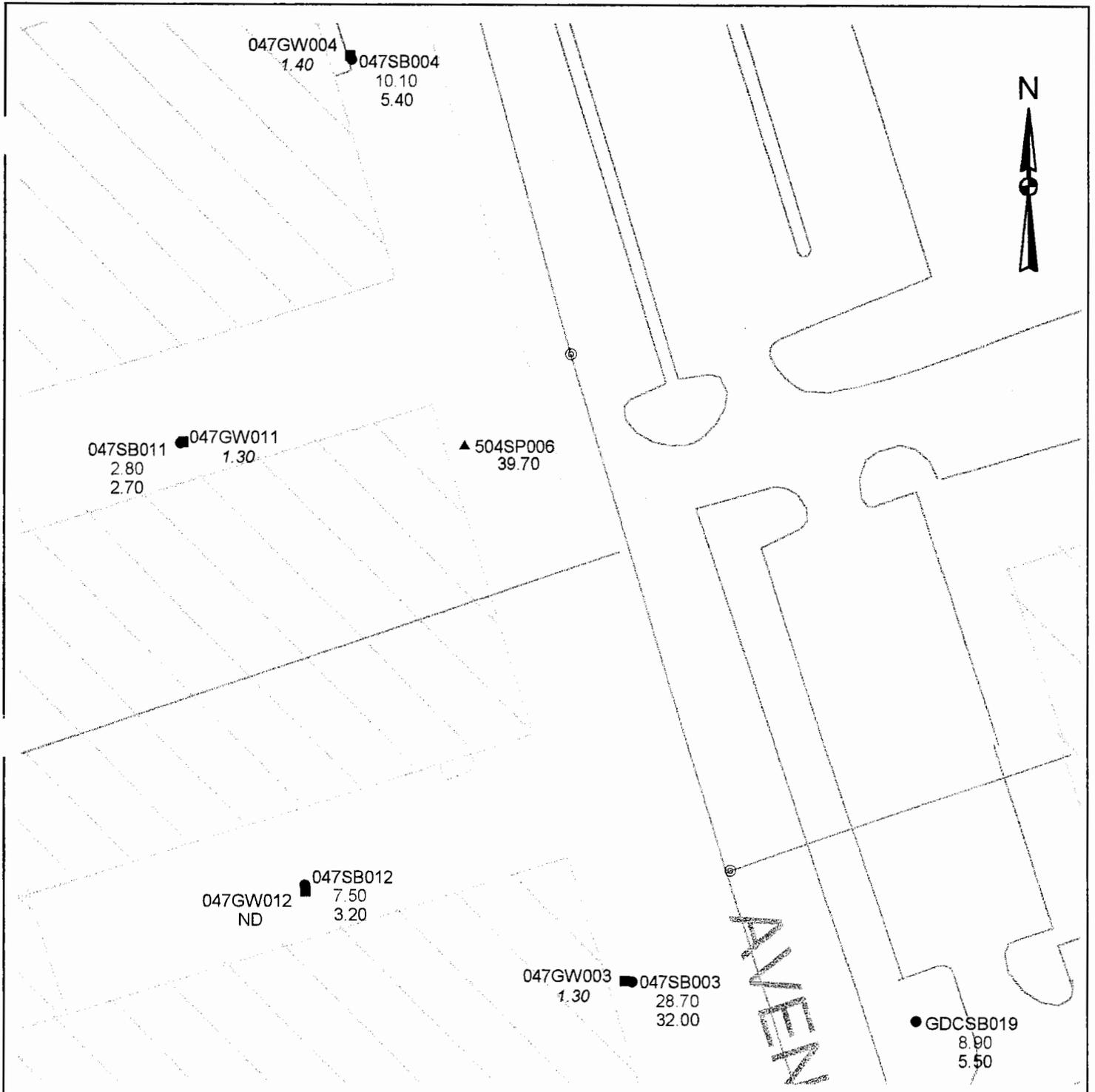


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.23
ZONE L - SUBZONE C
CHROMIUM
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

RBC = 39.0 mg/kg SSL = 38.0 mg/kg MCL = 100 ug/L





LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

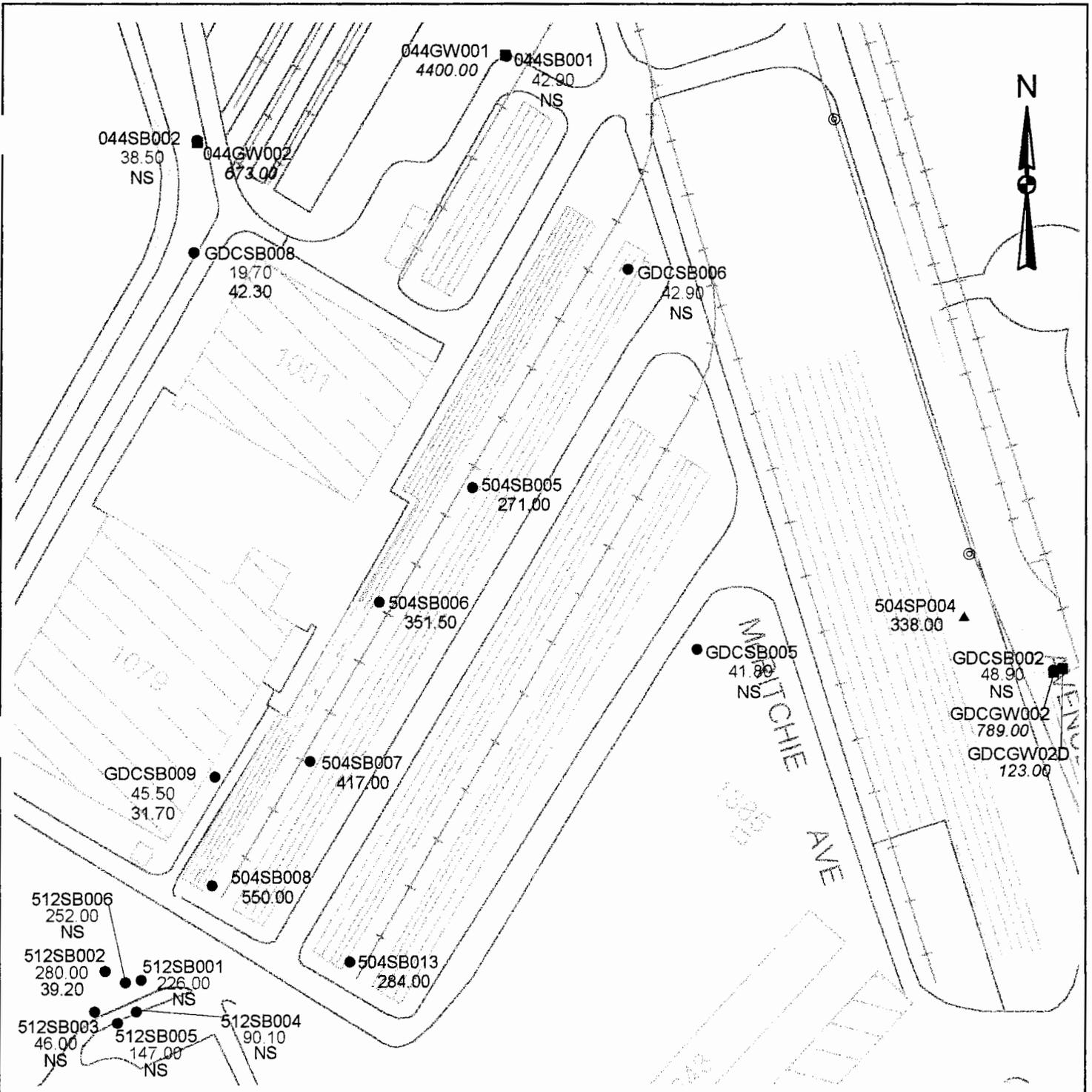


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.24
ZONE L - SUBZONE C
CHROMIUM
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

50 0 50 100 Feet

RBC = 39.0 mg/kg SSL = 38.0 mg/kg MCL = 100 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

100 0 100 200 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.25
ZONE L - SUBZONE C
MANGANESE
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

RBC = 160 mg/kg SSL = 950 mg/kg MCL = NONE



LEGEND

▲ ZONE L DPT SOIL LOCATION

● ZONE L SOIL BORING LOCATION

SUBZONE BOUNDARY /- RAILROAD © MANHOLE
/ SANITARY SEWER LINE /- STORM SEWER LINE

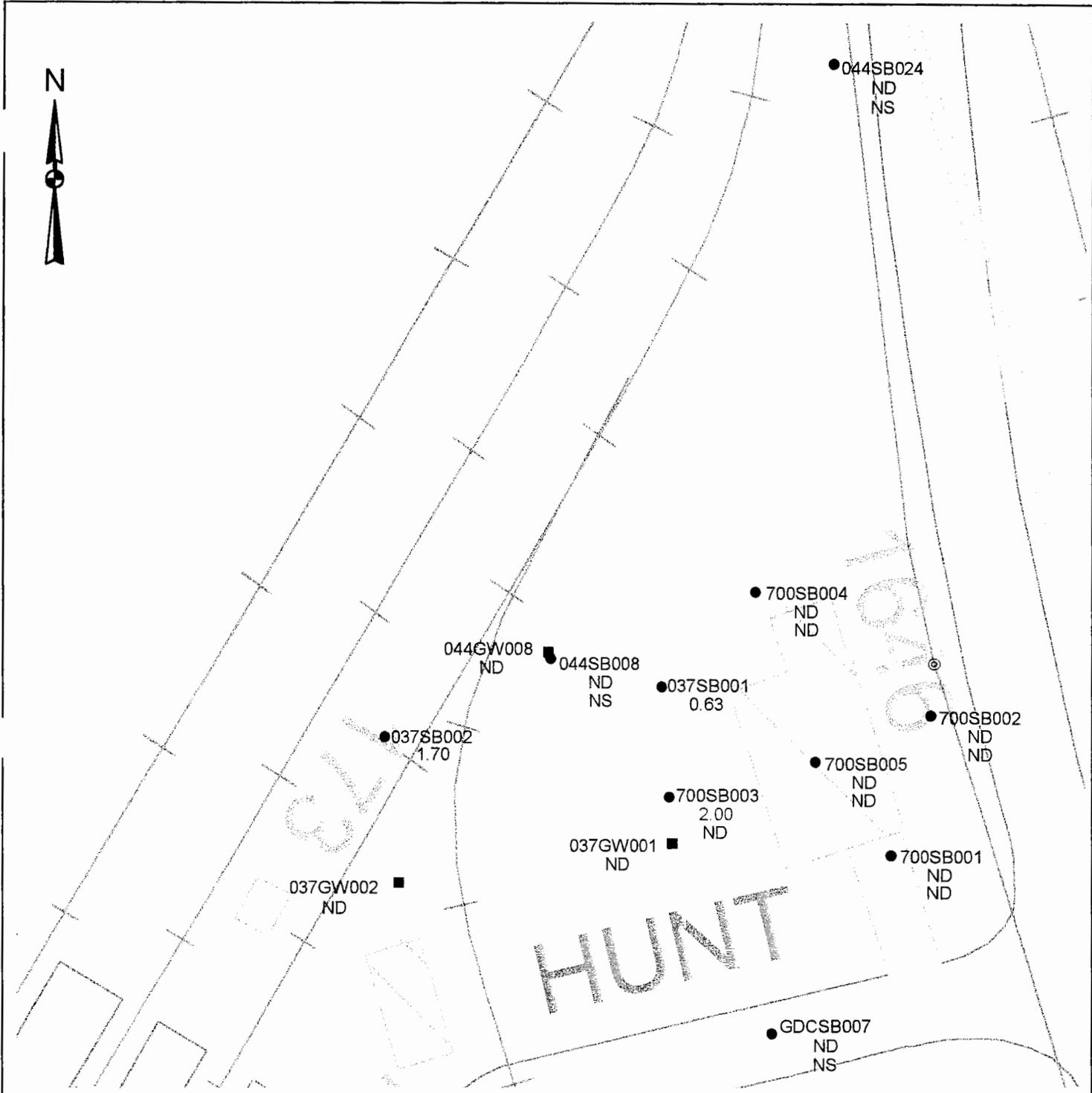
500 0 500 1000 Feet



ZONE L - RCRA
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CHARLESTON, SC

FIGURE 10.3.26
ZONE L - SUBZONE C
THALLIUM
ZONE L EXCEEDANCES

RBC = 0.55 mg/kg SSL = 0.70 mg/kg MCL = 2.00 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

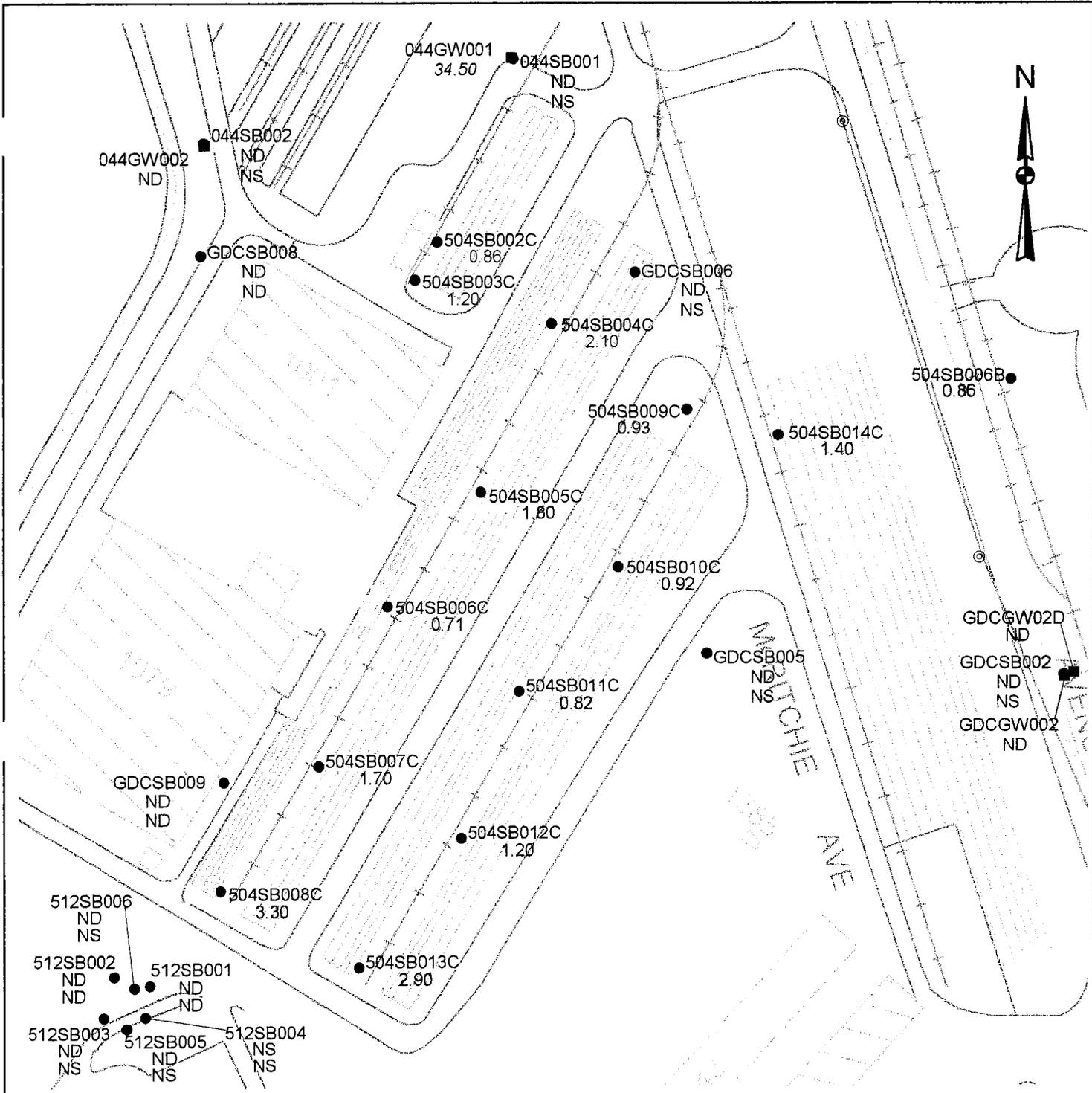


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FIGURE 10.3.27
ZONE L - SUBZONE C
THALLIUM
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

30 0 30 60 Feet

RBC = 0.55 mg/kg SSL = 0.70 mg/kg MCL = 2.00 ug/L



LEGEND

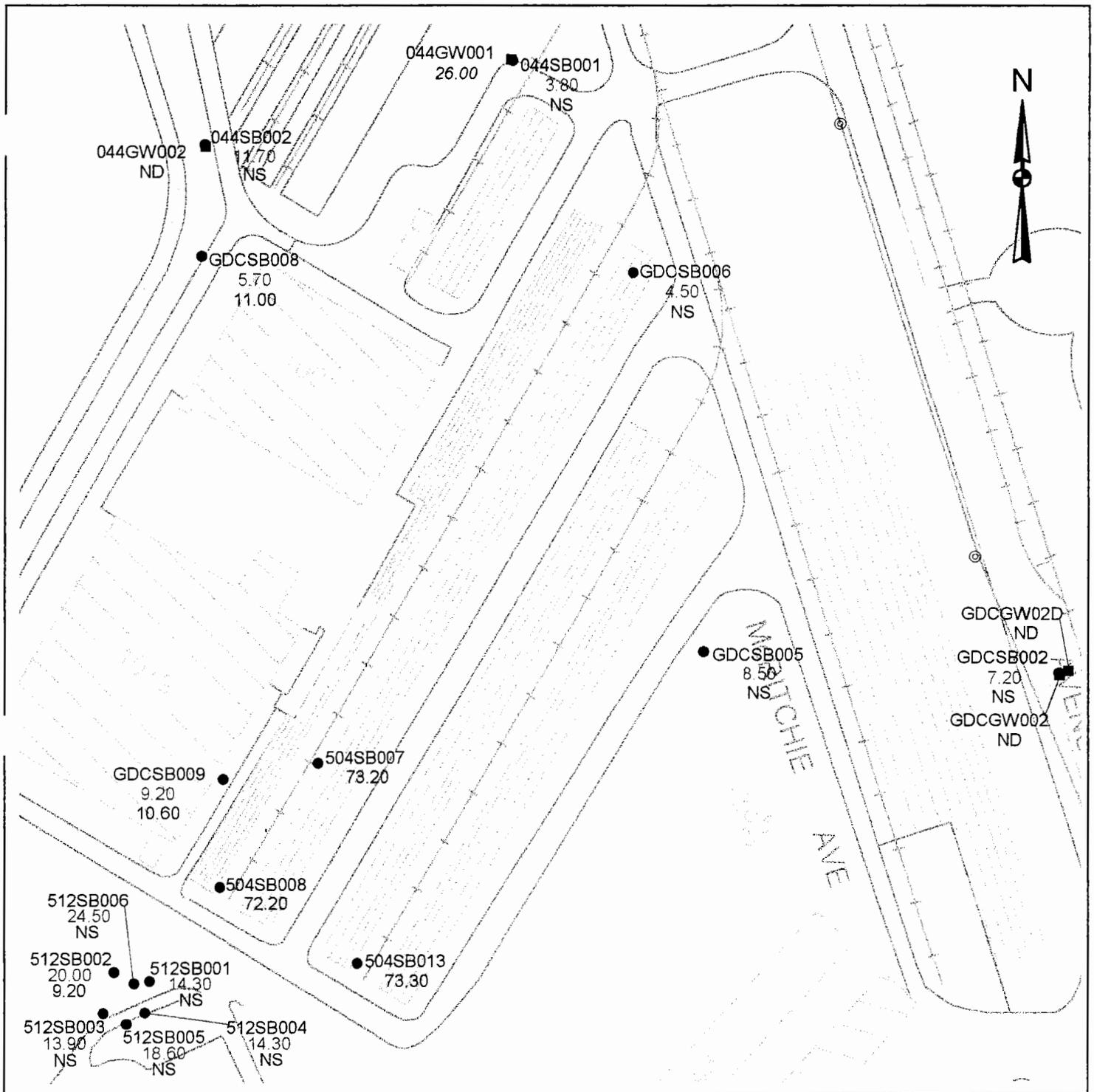
- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
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CHARLESTON, SC

FIGURE 10.3.28
ZONE L - SUBZONE C
THALLIUM
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

RBC = 0.55 mg/kg SSL = 0.70 mg/kg MCL = 2.00 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE C SOIL BORING LOCATION
- 12.30 ZONE C SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE C SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
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NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.3.29
ZONE L - SUBZONE C
VANADIUM
ZONE L EXCEEDANCES WITH ZONE C
SOIL AND GW CONCENTRATIONS

RBC = 55.0 mg/kg SSL = 6000 mg/kg MCL = NONE

10.4 Subzone D

1

In accordance with the approved work plan, no samples were collected in Subzone D for the
Zone L RFI investigation. Figure 10.4.1 shows the Zone D sample locations.

2

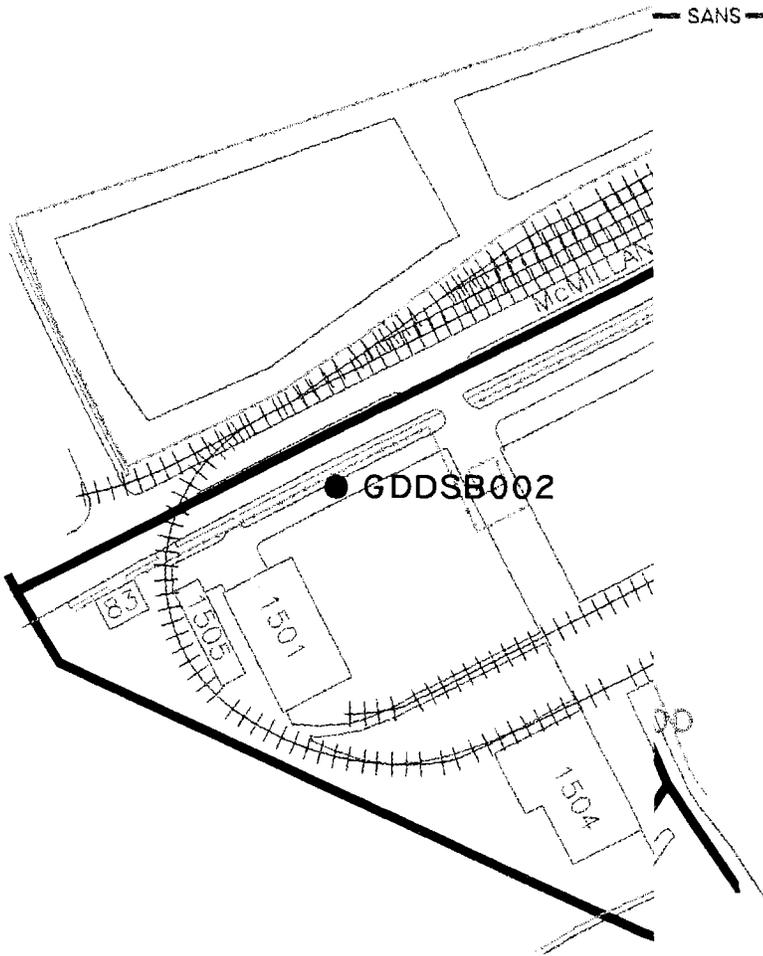
3

LEGEND:



- DD001 SHALLOW MONITORING WELL
W/ ID NUMBER
- DD01D DEEP MONITORING WELL
W/ ID NUMBER
- SB004 SOIL BORING W/ ID NUMBER
- SANITARY SEWER MANHOLE

SANS — SANITARY SEWER LINE



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FIGURE 10.4.1
ZONE D SAMPLING LOCATIONS

10.5 SUBZONE E

The boundaries of Subzone E for the Zone L RFI are the existing areas investigated in the Zone E RFI. Data from the Zone E environmental samples have been compared to data collected for the Zone L investigation. Existing Zone E sample locations are presented in Figures 10.5.1 and 10.5.2.

10.5.1 Subzone E, SWMU 37

Sampling in Subzone E, SWMU 37, consisted of two shallow monitoring wells, 12 upper- and four lower-interval soil boring samples collected using a hand auger, and 51 soil and 105 groundwater samples collected using DPT. The monitoring well groundwater and soil boring samples were analyzed for VOCs, SVOCs, chlorinated pesticides, PCBs, metals and cyanide. The DPT samples were analyzed for VOCs, metals, and cyanide. Sample locations are presented on Figures 10.5.3 through 10.5.11.

10.5.1.1 Nature of Contamination in Subzone E, SWMU 37, DPT Soil

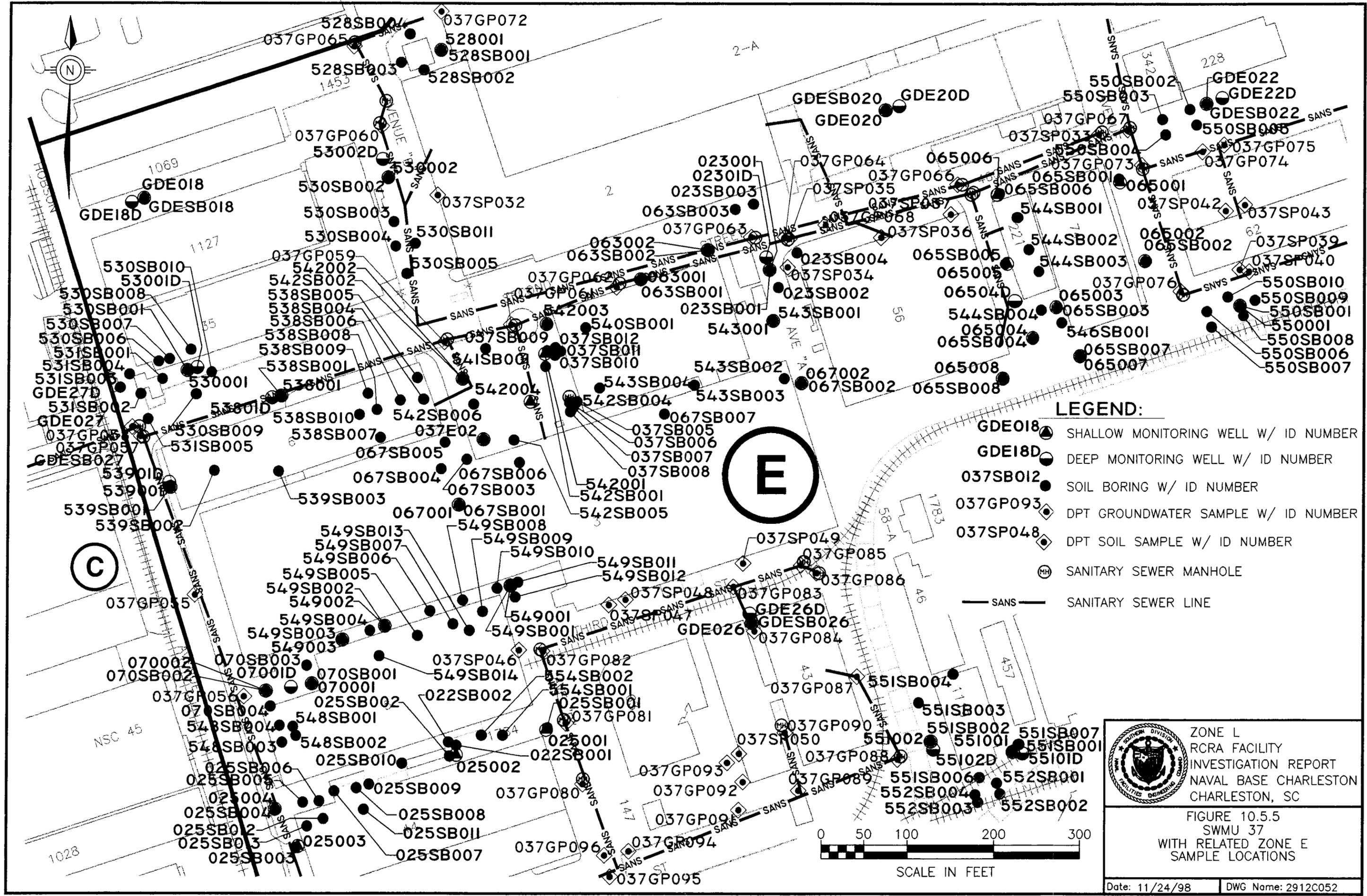
Organic compound analytical results for soil obtained by DPT collection are summarized in Table 10.5.1. Inorganic analytical results are summarized in Table 10.5.2. Appendix C contains the complete data report for all Zone L samples.

Volatile Organic Compounds Detected in DPT Soil

1,1-Dichlorethane, 2-butanone (MEK), acetone, carbon disulfide, tetrachloroethene, toluene, and xylenes (total) were detected, but none exceeded the industrial RBC or SSL values.

Metals/Cyanide Detected in DPT Soil

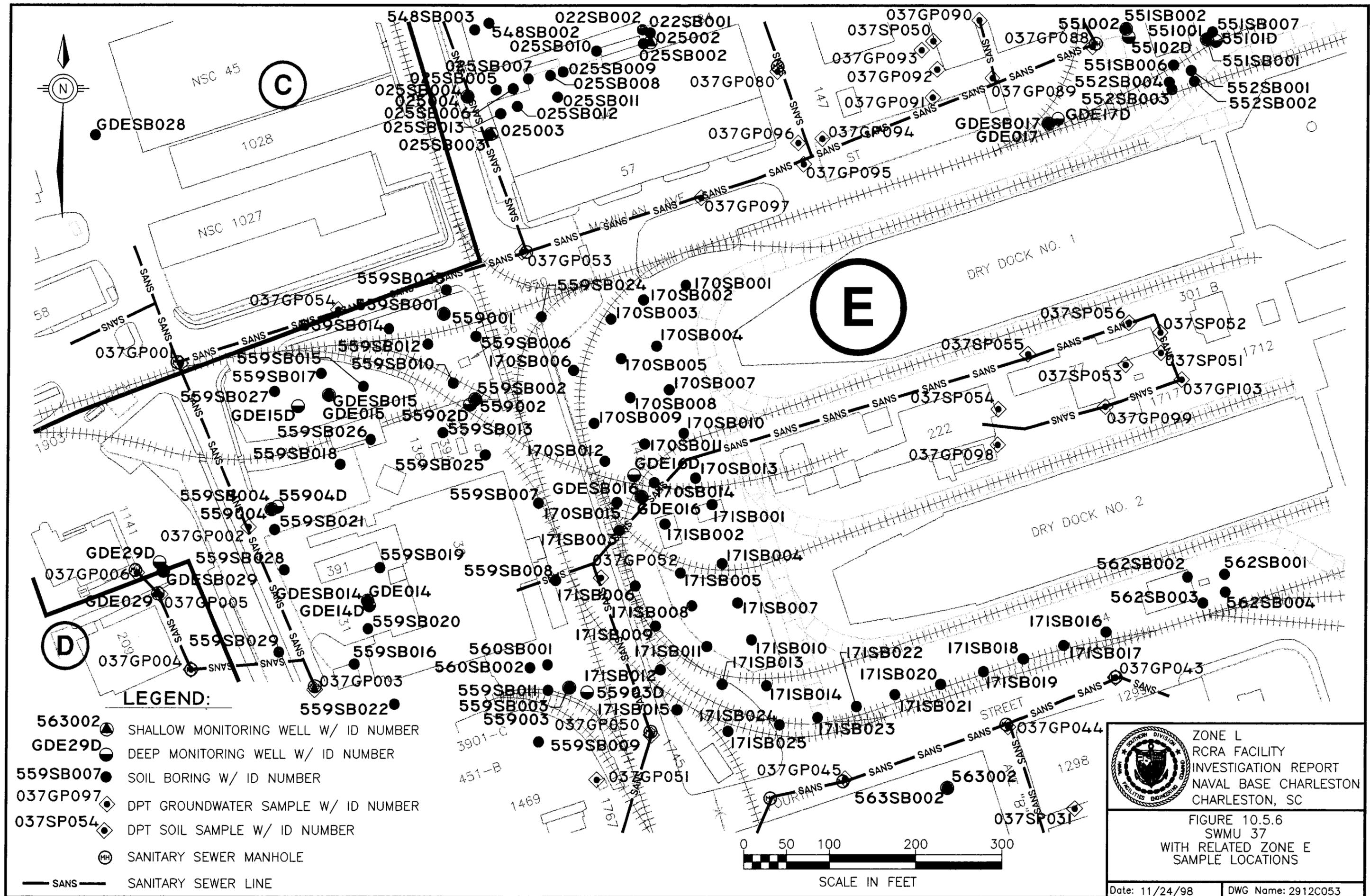
As summarized in Table 10.5.2, exceedances of industrial RBCs occurred for arsenic (31/51) and for lead (1/51). Locations of the metal detections exceeding RBCs are shown in Table 10.5.3.

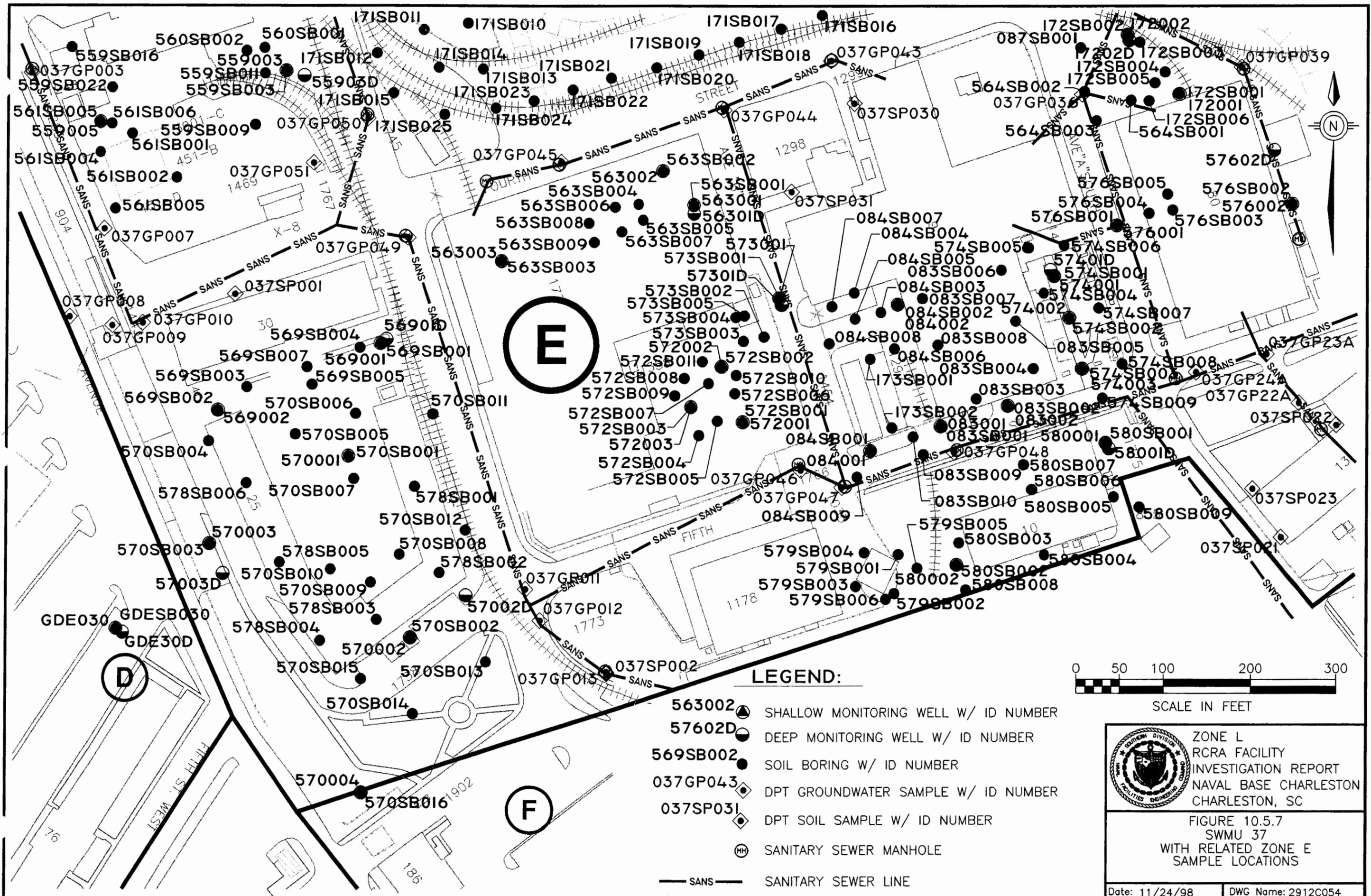


- LEGEND:**
- GDE018 ● SHALLOW MONITORING WELL W/ ID NUMBER
 - GDE18D ● DEEP MONITORING WELL W/ ID NUMBER
 - 037SB012 ● SOIL BORING W/ ID NUMBER
 - 037GP093 ◆ DPT GROUNDWATER SAMPLE W/ ID NUMBER
 - 037SP048 ◆ DPT SOIL SAMPLE W/ ID NUMBER
 - (MH) SANITARY SEWER MANHOLE
 - SANS — SANITARY SEWER LINE


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 FIGURE 10.5.5
 SWMU 37
 WITH RELATED ZONE E
 SAMPLE LOCATIONS

Date: 11/24/98 DWG Name: 2912C052





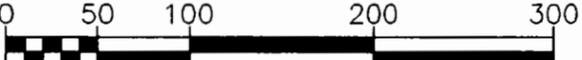
E

D

F

LEGEND:

- 563002 ● SHALLOW MONITORING WELL W/ ID NUMBER
- 57602D ● DEEP MONITORING WELL W/ ID NUMBER
- 569SB002 ● SOIL BORING W/ ID NUMBER
- 037GP043 ◆ DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 037SP031 ◆ DPT SOIL SAMPLE W/ ID NUMBER
- ⊕ SANITARY SEWER MANHOLE
- SANS — SANITARY SEWER LINE

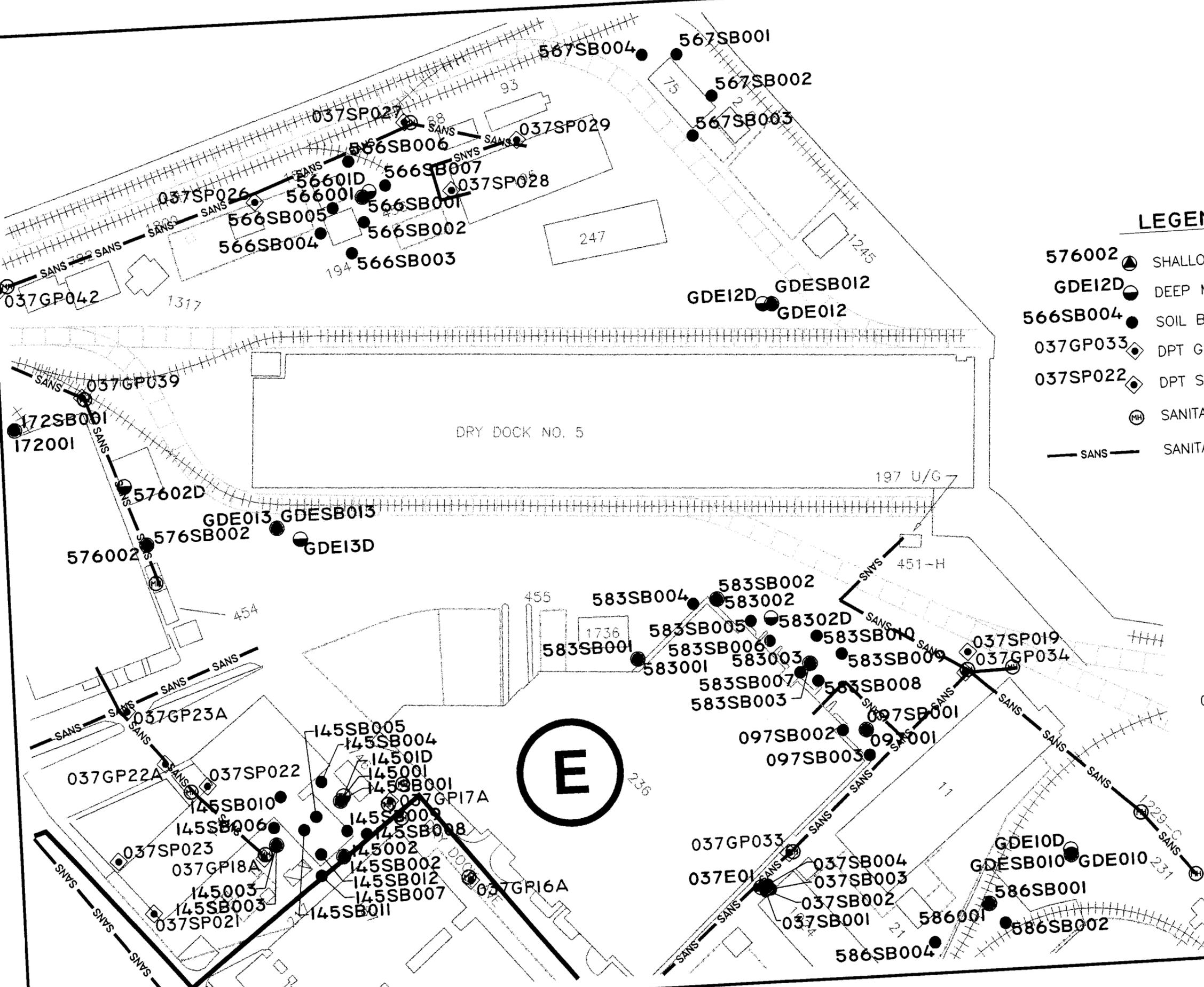


SCALE IN FEET



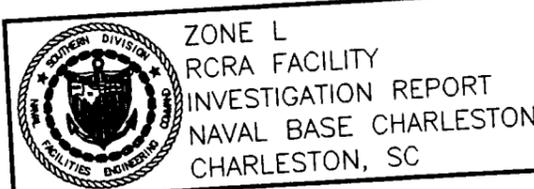
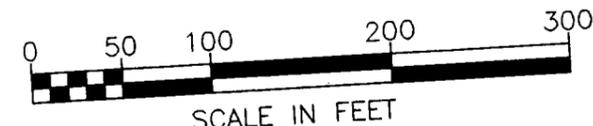
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FIGURE 10.5.7
SWMU 37
WITH RELATED ZONE E
SAMPLE LOCATIONS



LEGEND:

- 576002 ● SHALLOW MONITORING WELL W/ ID NUMBER
- GDEI2D ● DEEP MONITORING WELL W/ ID NUMBER
- 566SB004 ● SOIL BORING W/ ID NUMBER
- 037GP033 ◆ DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 037SP022 ◆ DPT SOIL SAMPLE W/ ID NUMBER
- Ⓜ SANITARY SEWER MANHOLE
- SANS — SANITARY SEWER LINE



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FIGURE 10.5.8
SWMU 37
WITH RELATED ZONE E
SAMPLE LOCATIONS

Date: 11/24/98 DWG Name: 2912C055

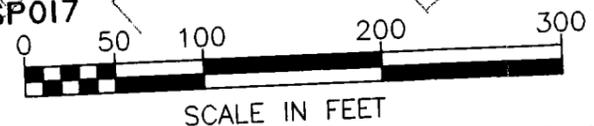


E

F

LEGEND:

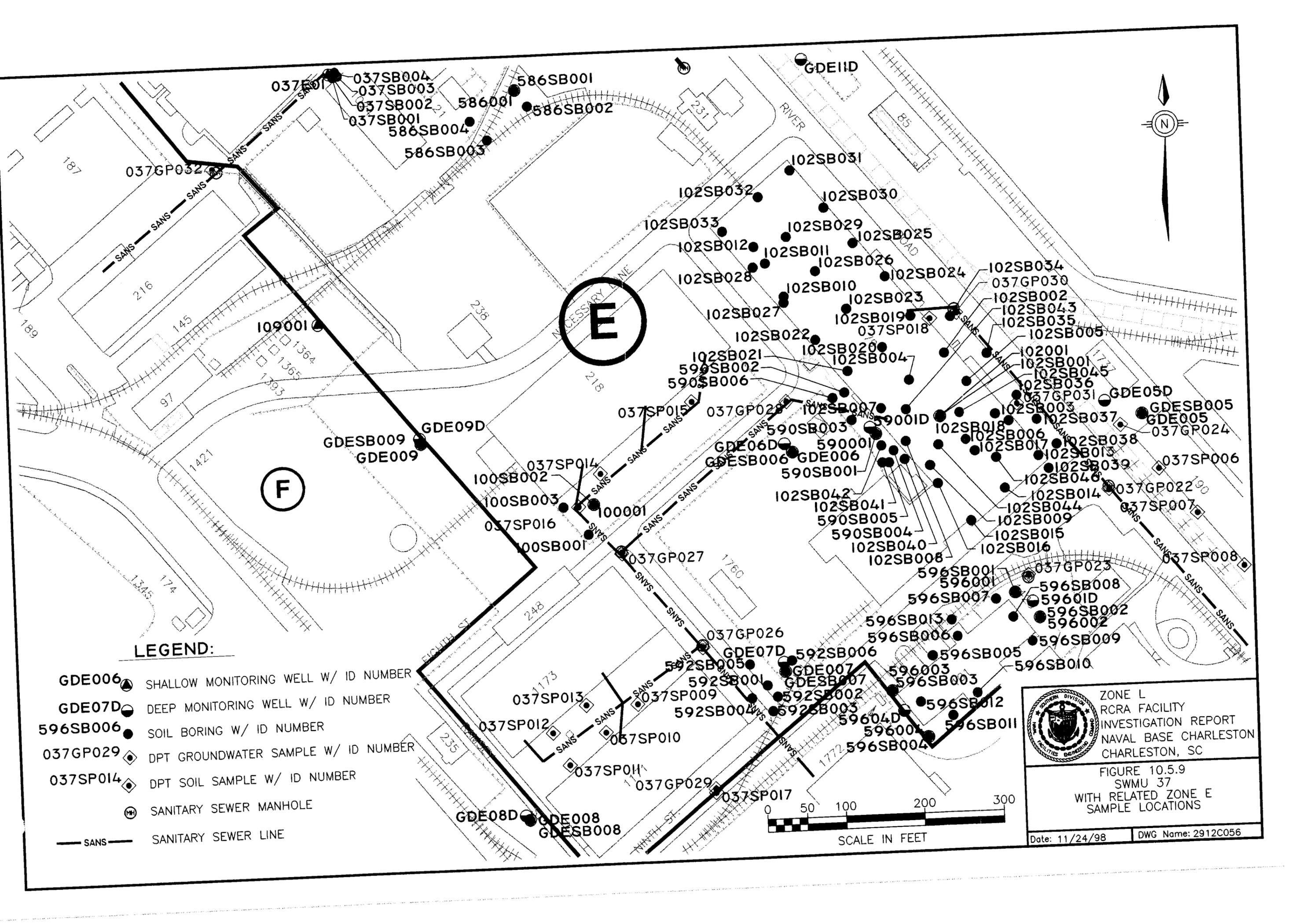
- GDE006 ● SHALLOW MONITORING WELL W/ ID NUMBER
- GDE07D ● DEEP MONITORING WELL W/ ID NUMBER
- 596SB006 ● SOIL BORING W/ ID NUMBER
- 037GP029 ◆ DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 037SP014 ◆ DPT SOIL SAMPLE W/ ID NUMBER
- ⊕ SANITARY SEWER MANHOLE
- SANS — SANITARY SEWER LINE

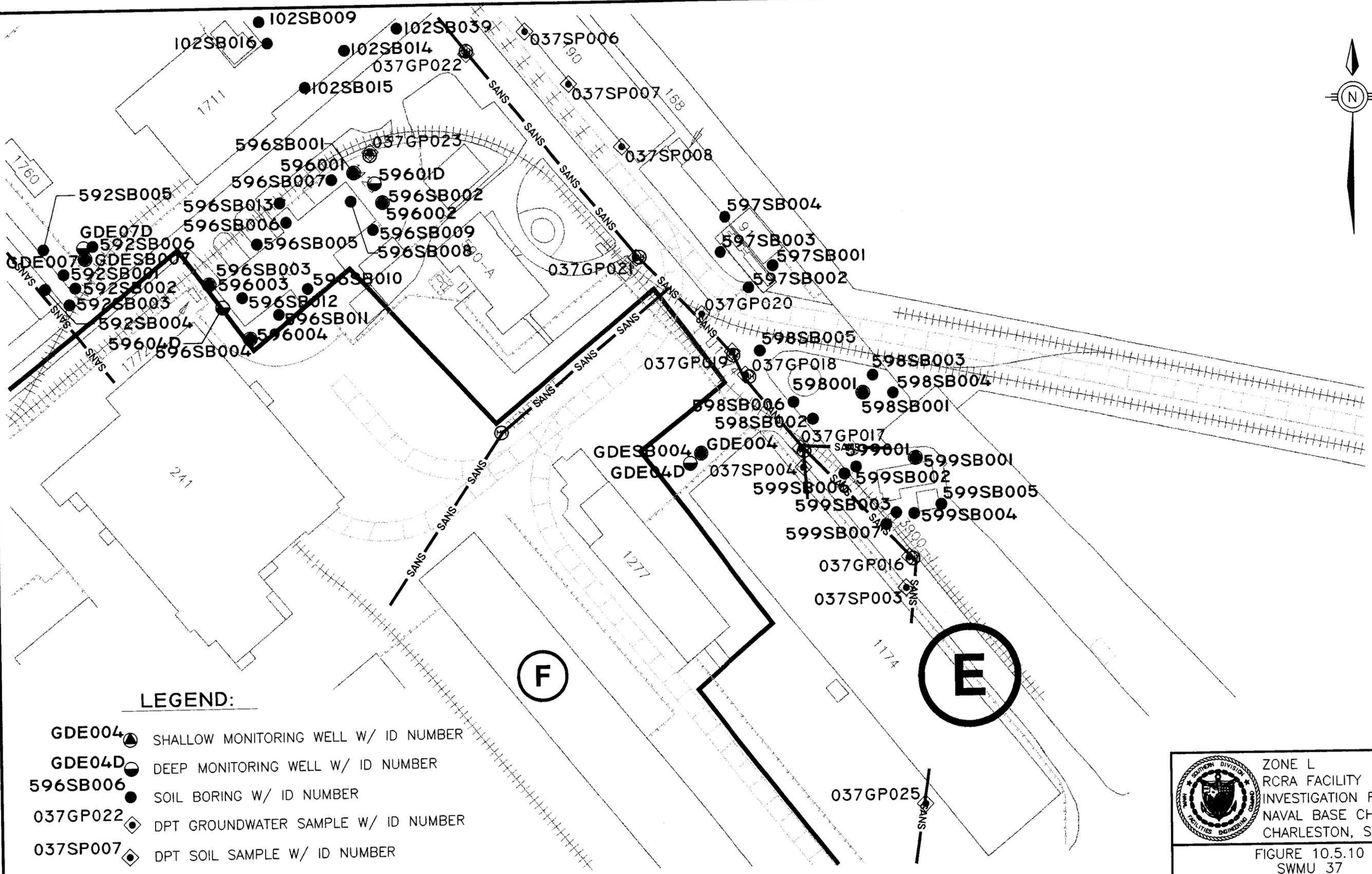


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FIGURE 10.5.9
 SWMU 37
 WITH RELATED ZONE E
 SAMPLE LOCATIONS

Date: 11/24/98 DWG Name: 2912C056





LEGEND:

- GDE004  SHALLOW MONITORING WELL W/ ID NUMBER
- GDE04D  DEEP MONITORING WELL W/ ID NUMBER
- 596SB006  SOIL BORING W/ ID NUMBER
- 037GP022  DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 037SP007  DPT SOIL SAMPLE W/ ID NUMBER
-  SANITARY SEWER MANHOLE
-  SANITARY SEWER LINE



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FIGURE 10.5.10
SWMU 37
WITH RELATED ZONE E
SAMPLE LOCATIONS

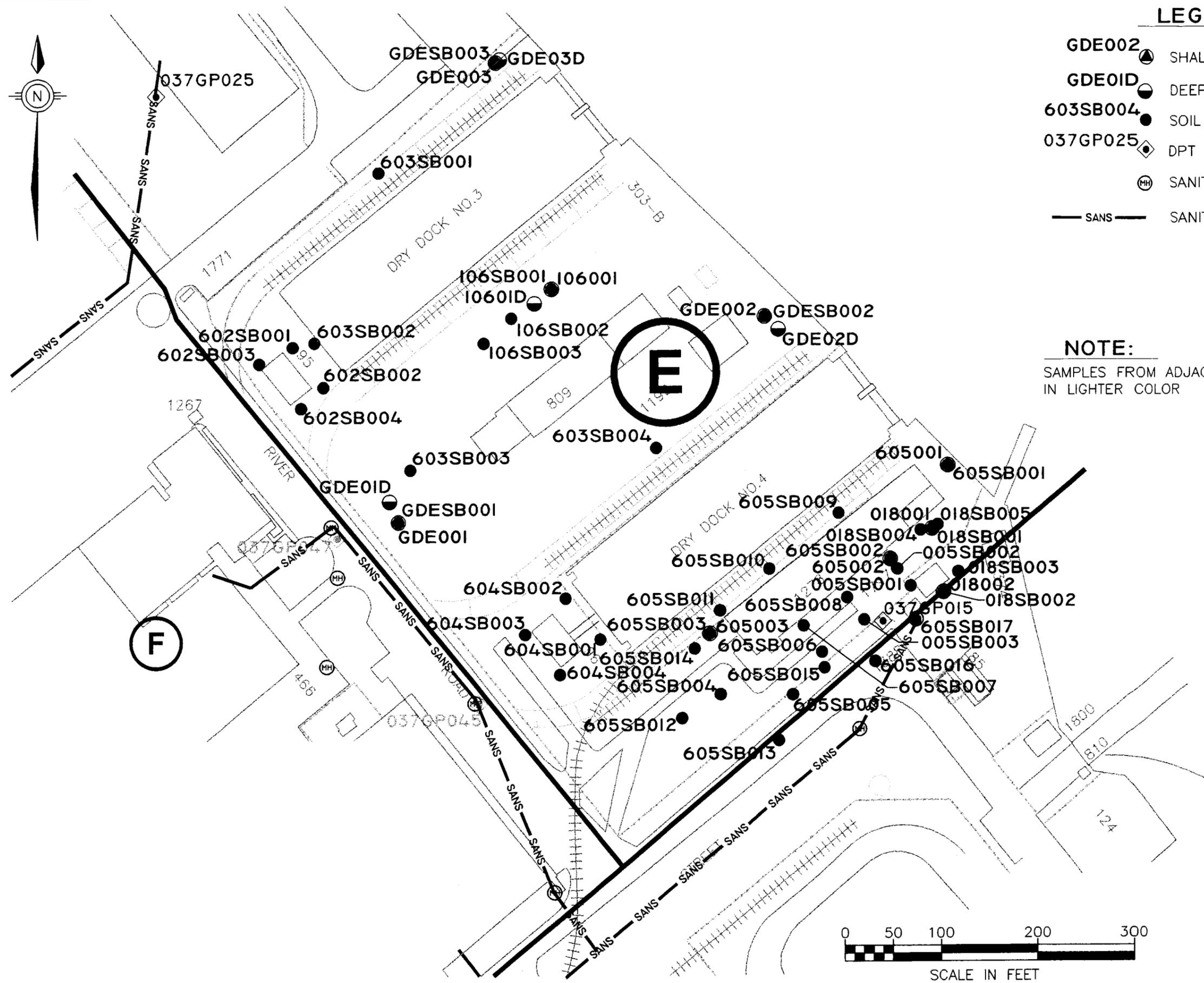


LEGEND:

- GDE002 SHALLOW MONITORING WELL W/ ID NUMBER
- GDE01D DEEP MONITORING WELL W/ ID NUMBER
- 603SB004 SOIL BORING W/ ID NUMBER
- 037GP025 DPT GROUNDWATER SAMPLE W/ ID NUMBER
- SANITARY SEWER MANHOLE
- SANS SANITARY SEWER LINE

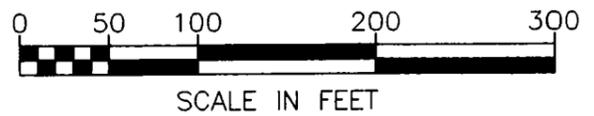
NOTE:

SAMPLES FROM ADJACENT ZONES SHOWN FOR REFERENCE IN LIGHTER COLOR



ZONE L
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FIGURE 10.5.11
 SWMU 37
 WITH RELATED ZONE E
 SAMPLE LOCATIONS



Antimony (5/51), arsenic (5/51), cadmium (1/51), chromium (18/51), lead (2/51), mercury (9/51), and thallium (2/51) have been detected at concentrations in excess of SSL values. These exceedances are also summarized in Table 10.5.3.

Table 10.5.1
SWMU 037, Zone L, Subzone E
Organic Compounds Detected in DPT Soil

Compound	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Volatile Organic Compounds ($\mu\text{g}/\text{kg}$)							
1,1-Dichloroethane	1/51	11.8	11.8	NA	0	11000	NO
2-Butanone (MEK)	3/51	7.79-33.1	20.5	10000000	0	3900 c	NO
Acetone	5/51	22.4-424	129.3	20000000	0	8000	NO
Carbon disulfide	4/51	7.07-23.5	15.9	20000000	0	16000	NO
Tetrachloroethene	1/51	9.86	9.86	110000	0	30	NO
Toluene	5/51	5.28-78.9	32.3	41000000	0	6000	NO
Xylenes (Total)	1/51	17.4	17.4	100000000	0	70000 c	NO

Notes:

- $\mu\text{g}/\text{kg}$ = Micrograms per kilogram
- RBC = Risk-based concentration
- NA = Not applicable
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.2
SWMU 037, Zone L, Subzone E
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)								
Cyanide (CN)	2/51	0.280-0.470	0.375	4100	0.5	0	20	NO
Aluminum (Al)	51/51	955-27000	8331	100000	26600	0	560000 c	NO
Antimony (Sb)	8/51	2.08-15.2	5.26	82.0	1.77	0	2.7	YES
Arsenic (As)	48/51	1.36-37.0	7.25	3.80	23.9	31	15	YES
Barium (Ba)	51/51	5.12-219	37.7	14000	130	0	820	NO
Beryllium (Be)	42/51	0.240-1.49	0.530	16	1.7	0	32	NO
Cadmium (Cd)	16/51	0.450-5.36	1.06	100	1.5	0	4	YES
Calcium (Ca)	51/51	367-198000	27231	NA	NA	NA	NA	NO
Chromium (Cr)	51/51	2.04-50.9	18.4	1000	94.6	0	19	YES
Cobalt (Co)	45/51	0.590-7.84	2.26	12000	19.0	0	990 c	NO
Copper (Cu)	47/51	1.95-270	43.3	8200	66.0	0	5600 c	NO
Iron (Fe)	51/51	1530-37200	9475	61000	NA	0	NA	NO
Lead (Pb)	51/51	2.20-1830	110.2	1300	265	1	400	YES
Magnesium (Mg)	51/51	115-8200	1555	NA	NA	NA	NA	NO
Manganese (Mn)	51/51	6.44-383	110.7	4700	302	0	480 c	NO
Mercury (Hg)	38/51	0.0400-15.1	1.09	61.0	2.60	0	1	YES
Nickel (Ni)	51/51	0.930-36.4	8.19	4100	77.1	0	65	NO
Potassium (K)	51/51	74.6-2030	528.1	NA	NA	NA	NA	NO
Selenium (Se)	16/51	0.600-2.51	1.13	1000	1.7	0	2.6	NO
Silver (Ag)	1/51	1.16	1.16	1000	ND	0	17	NO
Sodium (Na)	51/51	142-1100	365	NA	NA	NA	NA	NO
Thallium (Tl)	2/51	1.59-2.03	1.81	16.0	2.8	0	0.36	YES
Tin (Sn)	8/51	3.63-13.9	7.64	100000	59.4	0	5500 c	NO

Table 10.5.2
SWMU 037, Zone L, Subzone E
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Vanadium (V)	51/51	2.39-81.9	19.8	1400	94.3	0	3000	NO
Zinc (Zn)	51/51	3.18-1420	177.3	61000	827	0	6200	NO

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 NA = Not applicable
 ND = Not detected
 GW = Groundwater
 SSL = Soil screening level
 c = Calculated SSL
 Soil to GW = Generic SSLs based on DAF = 10, adapted from USEPA Soil Screening Guidance: Technical Background Document, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.3
SWMU 37, Zone L, Subzone E DPT Soil Sample Locations with
Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Antimony	037SP004E1	15.2	N	Y	82.0	2.7
	037SP036E1	3.69	N	Y		
	037SP042E1	4.44	N	Y		
	037SP053E1	7.99	N	Y		
	037SP055E1	3.41	N	Y		
Arsenic	037SP003E1	4.74	Y	N	3.80	15.0
	037SP004E1	14.5	Y	N		
	037SP005E1	7.14	Y	N		
	037SP006E1	7.69	Y	N		
	037SP007E1	6.87	Y	N		
	037SP00801	9.30	Y	N		
	037SP009E1	16.0	Y	Y		
	037SP010E1	11.0	Y	N		
	037SP011E1	20.3	Y	Y		
	037SP012E1	3.83	Y	N		

Table 10.5.3
SWMU 37, Zone L, Subzone E DPT Soil Sample Locations with
Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Arsenic	037SP013E1	10.4	Y	N		
	037SP014E1	13.2	Y	N		
	037SP015E1	17.3	Y	Y		
	037SP018E1	37.0	Y	Y		
	037SP019E1	10.7	Y	N		
	037SP023E1	9.39	Y	N		
	037SP026E1	7.82	Y	N		
	037SP027E1	6.85	Y	N		
	037SP030E1	5.20	Y	N		
	037SP031E1	11.1	Y	N		
	037SP035E1	3.96	Y	N		
	037SP036E1	5.24	Y	N		
	037SP041E1	4.94	Y	N		
	037SP047E1	5.62	Y	N		
	037SP048E1	4.11	Y	N		
	037SP049E1	5.13	Y	N		
	037SP050E1	6.52	Y	N		
	037SP051E1	18.4	Y	Y		
	037SP053E1	10.4	Y	N		
	037SP055E1	6.46	Y	N		
037SP056E1	7.02	Y	N			
Cadmium	037SP055E1	5.36	N	Y	100	4.00
Chromium	037SP004E1	26.4	N	Y	1000	19.0
	037SP005E1	23.4	N	Y		
	037SP009E1	41.9	N	Y		
	037SP010E1	37.0	N	Y		
	037SP011E1	44.9	N	Y		
	037SP014E1	30.0	N	Y		
	037SP015E1	29.8	N	Y		

Table 10.5.3
SWMU 37, Zone L, Subzone E DPT Soil Sample Locations with
Metal Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Chromium	037SP018E1	19.1	N	Y		
	037SP019E1	50.9	N	Y		
	037SP026E1	47.4	N	Y		
	037SP031E1	44.2	N	Y		
	037SP033E1	34.6	N	Y		
	037SP041E1	31.3	N	Y		
	037SP042E1	25.6	N	Y		
	037SP047E1	22.7	N	Y		
	037SP050E1	22.4	N	Y		
	037SP051E1	37.7	N	Y		
	037SP053E1	38.1	N	Y		
Lead	037SP003E1	429	N	Y	1300	400
	037SP004E1	1830	Y	Y		
Mercury	037SP003E1	1.37	N	Y	61.0	1.0
	037SP004E1	1.68	N	Y		
	037SP005E1	1.50	N	Y		
	037SP018E1	2.22	N	Y		
	037SP042E1	1.16	N	Y		
	037SP051E1	1.65	N	Y		
	037SP052E1	3.01	N	Y		
	037SP053E1	4.74	N	Y		
	037SP055E1	15.1	N	Y		
Thallium	037SP011E1	2.03	N	Y	16.0	0.36
	037SP015E1	1.59	N	Y		

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 SSL = Soil screening level
 GW = Groundwater
 Soil to GW = Generic SSL based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report.

10.5.1.2 Nature of Contamination in Subzone E, SWMU 37, DPT Groundwater

One hundred and five DPT groundwater samples were collected for analysis of VOCs, metals, and cyanide. The results for organic compounds are shown in Table 10.5.4 and inorganic chemicals are shown in 10.5.6. As stated in Section 10.0, DPT groundwater has not been compared to RBC or MCL values for inorganic parameters.

Volatile Organic Compounds Detected in DPT Groundwater

In the 105 DPT groundwater samples collected, nine VOCs were detected, eight of which exceeded their RBCs. These include 1,1-dichloroethene (2/105), chlorobenzene (1/105), chloroform (8/105), tetrachloroethene (6/105), trichloroethene (8/105), and cis-1,2-dichloroethene (9/105). In addition, MCLs were exceeded by 1,1-dichloroethene (2/105), tetrachloroethene (6/105), trichloroethene (8/105), and cis-1,2-dichloroethene (1/105). Sample locations where VOCs exceeded RBCs and MCLs are summarized in Table 10.5.5.

Metals/Cyanide Detected in DPT Groundwater

The analytical results for inorganic compounds in the DPT groundwater samples are shown in Table 10.5.6. As stated in Section 10.0, inorganic results from DPT groundwater samples were not compared to RBC and MCL values.

Table 10.5.4
SWMU 037, Zone L, Subzone E
Organic Compounds Detected in DPT Groundwater

Compound	Freq of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Volatile Compounds (µg/L)									
1,1-Dichloroethane	3/105	9.00-31.7	19.3	81.0	NA	0	NA	NO	NO
1,1-Dichloroethene	2/105	7.38-27.3	17.3	0.040	7.00	2	2240	YES	NO
Chlorobenzene	1/105	7.06	7.06	3.50	NA	1	105	YES	NO

Table 10.5.4
SWMU 037, Zone L, Subzone E
Organic Compounds Detected in DPT Groundwater

Compound	Freq of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Chloroform	8/105	8.31-35.4	20.5	0.150	100	9	815	YES	NO
Tetrachloroethene	6/105	5.90-2190	404.3	1.10	5.00	6	45	YES	YES
Trichloroethene	8/105	5.19-934	125.9	1.60	5.00	8	NA	YES	NO
cis-1,2-Dichloroethene	9/105	6.33-720	85.5	6.10	70.0	11	NA	YES	NO

Notes:

$\mu\text{g/L}$ = Micrograms per liter
 RBC = Risk-based concentration
 MCL = Maximum contaminant level
 NA = Not applicable

Table 10.5.5
SWMU 37, Zone L, Subzone E, DPT Groundwater Sample Locations with
VOC Detections Exceeding RBCs and/or MCLs

VOC	Sample ID	Concentration Detected ($\mu\text{g/L}$)	RBC Exceeded (Y/N)	MCL Exceeded (Y/N)	RBC ($\mu\text{g/L}$)	MCL ($\mu\text{g/L}$)
1,1-dichloroethene	037GP057E1	27.3	Y	N	0.04	NA
	037GP058E1	7.38	Y	N		
Chlorobenzene	037GP036E1	7.06	Y	N	3.50	NA
Chloroform	037GP055E1	35.2	Y	N	0.15	100
	037GP071E1	20.6	Y	N		
	037GP080E1	35.4	Y	N		
	037GP081E1	11.9	Y	N		
	037GP092E1	8.31	Y	N		
	037GP093E1	17.6	Y	N		
	037GP095E1	14.1	Y	N		
	037GP096E1	32.0	Y	N		
037GP82AE1	9.36	Y	N			
Tetrachloroethene	037GP080E1	28.1	Y	Y	1.10	5.00
	037GP081E1	97.6	Y	Y		
	037GP082E1	32.3	Y	Y		
	037GP089E1	71.9	Y	Y		
	037GP094E1	2190	Y	Y		
	037GP095E1	2.90	Y	Y		

Table 10.5.5
 SWMU 37, Zone L, Subzone E, DPT Groundwater Sample Locations with
 VOC Detections Exceeding RBCs and/or MCLs

VOC	Sample ID	Concentration Detected ($\mu\text{g/L}$)	RBC Exceeded (Y/N)	MCL Exceeded (Y/N)	RBC ($\mu\text{g/L}$)	MCL ($\mu\text{g/L}$)
Trichloroethene	037GP036E1	6.93	Y	Y	1.60	5.00
	037GP045E1	24.1	Y	Y		
	037GP052E1	13.5	Y	Y		
	037GP057E1	6.23	Y	Y		
	037GP058E1	6.43	Y	Y		
	037GP068E1	11.5	Y	Y		
	037GP089E1	5.19	Y	Y		
	037GP094E1	934	Y	Y		
cis-1,2-dichloroethene	037GP001E1	74.7	Y	Y	6.10	70.0
	037GP002E1	6.33	Y	N		
	037GP036E1	17.9	Y	N		
	037GP045E1	34.4	Y	N		
	037GP058E1	8.93	Y	N		
	037GP068E1	33.8	Y	N		
	037GP080E1	8.99	Y	N		
	037GP089E1	9.49	Y	N		
	037GP094E1	720.	Y	Y		

Notes:
 VOC = Volatile organic compounds
 $\mu\text{g/L}$ = Micrograms per liter
 RBC = Risk-based concentration
 MCL = Maximum concentration limit

Table 10.5.6
 SWMU 037, Zone L, Subzone E
 Inorganic Detections for DPT Groundwater

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.
Inorganic Elements ($\mu\text{g/L}$)			
Cyanide (CN)	6/105	5.70-12.1	8.77
Aluminum (Al)	105/105	533-591000	59675
Antimony (Sb)	11/105	8.20-19.5	12.1
Arsenic (As)	74/105	10.5-581	74.6
Barium (Ba)	105/105	17.6-2120	270.9
Beryllium (Be)	44/105	2.10-188	10.5
Cadmium (Cd)	13/105	3.40-203	22.8

Table 10.5.6
SWMU 037, Zone L, Subzone E
Inorganic Detections for DPT Groundwater

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.
Calcium (Ca)	105/105	3840-2510000	228467
Chromium (Cr)	102/105	5.10-1120	166.9
Cobalt (Co)	61/105	5.60-271	30.7
Copper (Cu)	90/105	7.10-792	97.2
Iron (Fe)	105/105	1510-909000	76490
Lead (Pb)	96/105	3.20-12800	325.0
Magnesium (Mg)	105/105	1320-718000	70174
Manganese (Mn)	105/105	13.7-9870	813.1
Mercury (Hg)	32/105	0.210-5.20	0.926
Nickel (Ni)	92/105	4.10-410	56.3
Potassium (K)	102/105	1070-214000	29912
Selenium (Se)	33/105	5.10-58.3	14.2
Silver (Ag)	2/105	30.2-37.0	33.6
Sodium (Na)	104/105	5560-5530000	501807
Thallium (Tl)	22/105	10.1-52.2	17.8
Tin (Sn)	1/105	90.0	90.0
Vanadium (V)	100/105	6.20-1260	141.6
Zinc (Zn)	92/105	20.2-109000	1767.1

Notes:
 µg/L = Micrograms per liter

10.5.1.3 Nature of Contamination in Subzone E, SWMU 37, Soil Borings

Twelve upper interval and four lower-interval samples were collected using a hand auger and analyzed for VOCs, SVOCs, metals, cyanide, chlorinated pesticides, and PCBs. Surface interval sample results were compared to RBC values, and lower-interval soil samples were compared to

SSL values. No VOCs were detected in soil borings samples. The results are summarized in Tables 10.5.7 (organic) and 10.5.9 (inorganic).

Semivolatile Organic Compounds Detected in Soil Borings

Twenty-one SVOCs were detected in the soil boring samples. Exceedances of RBCs were reported for benzo(a)anthracene (1/12), benzo(a)pyrene (4/12), benzo(b)fluoranthene (1/12), dibenz(a,h) anthracene (1/12), indeno(1,2,3-cd)pyrene (1/12). The locations with exceedances are summarized in Table 10.5.8. No concentrations of SVOCs detected in subsurface soil exceeded their respective SSLs.

Chlorinated Pesticides Detected in Soil Borings

Eleven chlorinated pesticides were detected in the 12 surface interval samples analyzed for this parameter. None of these detections, however, exceeded their respective RBC values. Seven chlorinated pesticides were also detected in lower-interval soil samples, but did not exceed their respective SSLs.

Polychlorinated Biphenyls Detected in Soil Borings

Two PCBs, Aroclor-1254 (4/12) and Aroclor-1260 (1/12), were detected in surface soil boring samples. Of these, one detection of Aroclor-1254 collected from 037SB005E1 exceeded the industrial RBC of 740 $\mu\text{g}/\text{kg}$. One detection of Aroclor-1254 found in subsurface soil did not exceed its SSL.

Metals/Cyanide Detected in Soil Borings

Arsenic (8/12) exceeded the RBC value. In addition, antimony (2/4), arsenic (1/4), chromium (2/4), and mercury (2/4) exceeded the SSL values. The locations of samples with detected concentrations exceeding RBC and/or SSL values are summarized in Table 10.5.10.

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Table 10.5.7
SWMU 037, Zone L, Subzone E
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Semivolatile Compounds ($\mu\text{g}/\text{kg}$)								
2-Methyl naphthalene	Upper	3/12	62.0-135	109	8200000	0	230000 c	NO
	Lower	2/4	86.0-15000	7543	NA	NA		
4-Chloro-3-methylphenol	Upper	1/12	42.0	42.0	NA	NA	4300 c	NO
Acenaphthene	Upper	3/12	92.0-1900	696	12000000	0	290000	NO
	Lower	3/4	89.0-1400	530	NA	NA		
Acenaphthylene	Upper	3/12	47.0-2100	746	8200000	0	96000 c	NO
Anthracene	Upper	5/12	110-12000	2562	61000000	0	5900000	NO
	Lower	2/4	120-250	185	NA	NA		
B(a)P Equiv.	Upper	8/12	458-73516	10031	780	5	1600 c	YES
	Lower	3/4	0.16-970	402	NA	NA		
Benzo(a)anthracene	Upper	8/12	220-44000	5958	7800	1	800	YES
	Lower	2/4	180-530	355	NA	NA		
Benzo(a)pyrene	Upper	8/12	300-49000	6679	780	4	4000	YES
	Lower	2/4	190-610	400	NA	NA		
Benzo(b)fluoranthene	Upper	8/12	250-36000	5034	7800	1	2300	YES
	Lower	2/4	160-520	340	NA	NA		
Benzo(g,h,i)perylene	Upper	8/12	200-38000	5173	8200000	0	12000000 c	NO
	Lower	2/4	130-520	325	NA	NA		
Benzo(k)fluoranthene	Upper	8/12	200-47000	6361	78000	0	24000	YES
	Lower	2/4	230-520	375	NA	NA		
Chrysene	Upper	8/12	250-46000	6279	780000	0	80000	NO
	Lower	3/4	160-610	323	NA	NA		
Dibenz(a,h)anthracene	Upper	7/12	91.0-13000	2026	780	1	800	YES
	Lower	1/4	210	210	NA	NA		

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Table 10.5.7
SWMU 037, Zone L, Subzone E
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Dibenzofuran	Lower	1/4	1100	1100	820000	NA	6800 c	NO
Fluoranthene	Upper	9/12	48.0-100000	12026	8200000	0	2100000	NO
	Lower	4/4	91.0-1200	585	NA	NA		
Fluorene	Upper	3/12	78.0-2000	723	8200000	0	280000	NO
	Lower	3/4	140-1700	660	NA	NA		
Indeno(1,2,3-cd)pyrene	Upper	8/12	170-30000	4099	7800	1	7000	YES
	Lower	2/4	110-390	250	NA	NA		
Naphthalene	Upper	3/12	41.0-140	100	8200000	0	42000	NO
	Lower	1/4	83.0	83.0	NA	NA		
Phenanthrene	Upper	8/12	230-46000	6307	8200000	0	660000	NO
	Lower	3/4	86.0-2600	1295	NA	NA		
Phenol	Upper	1/12	300	300	100000000	NA	50000	NO
Pyrene	Upper	10/12	38.0-100000	10798	6100000	0	2100000	NO
	Lower	4/4	92.0-1400	621	NA	NA		
bis(2-Ethylhexyl)phthalate (BEHP)	Upper	3/12	82.0-920	362	410000	0	1800000	NO
	Lower	1/4	540	540	NA	NA		
Chlorinated Pesticides (µg/kg)								
4,4'-DDD	Upper	2/12	3.10-6.10	4.60	24000	0	8000	NO
4,4'-DDE	Upper	5/12	5.30-17.00	13.1	17000	0	27000	NO
	Lower	1/4	6.00	6.00	NA	NA		
4,4'-DDT	Upper	6/12	3.0-24.0	10.0	17000	0	16000	NO
	Lower	1/4	4.70	4.70	NA	NA		
Dieldrin	Upper	6/12	4.90-14.0	9.40	360	0	2	YES
Endosulfan II	Upper	2/12	5.10-10.50	7.80	1200000	0	9000	NO
Endrin	Upper	8/12	4.30-170	45.43	61000	0	500	NO
	Lower	3/4	6.80-290	102.6	NA	NA		

Table 10.5.7
SWMU 037, Zone L, Subzone E
Organic Compounds Detected in Soil

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Endrin aldehyde	Upper	5/12	3.0-7.10	4.70	61000	0	500	NO
Heptachlor	Upper	2/12	9.70-70.0	39.9	1300	0	11000	NO
	Lower	1/4	8.10	8.10	NA	NA		
Heptachlor epoxide	Upper	5/12	2.60-47.0	16.5	630	0	330	NO
	Lower	1/4	43.0	43.0	NA	NA		
alpha-Chlordane	Upper	7/12	13.0-890	223	4400	0	5000	NO
	Lower	3/4	10.9-1400	492.9	NA	NA		
gamma-Chlordane	Upper	8/12	1.80-1150	265.8	4400	0	5000	NO
	Lower	3/4	16.4-1800	635.5	NA	NA		
Polychlorinated biphenyls (µg/kg)								
Aroclor-1254	Upper	4/12	66.0-820	361	740	1	1000	NO
	Lower	1/4	150	150	NA	NA		
Aroclor-1260	Upper	2/12	80.0-91.0	86.0	740	NA	1000	NO

Notes:

- µg/kg = Micrograms per kilogram
- RBC = Risk-based concentration
- NA = Not applicable
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.8
SWMU 37, Zone L, Subzone E Soil Boring Sample Locations with
SVOC Detections Exceeding RBCs

SVOC	Sample ID	Concentration Detected ($\mu\text{g}/\text{kg}$)	RBC Exceeded (Y/N)	RBC ($\mu\text{g}/\text{kg}$)
Benzo(a)anthracene	037SB012E1	44,000	Y	7800
Benzo(a)pyrene	037SB007E1	790	Y	780
	037SB009E1	950	Y	
	037SB010E1	900	Y	
	037SB012E1	49,000	Y	
Benzo(b)fluoranthene	037SB012E1	36,000	Y	7800
Dibenz(a,h)anthracene	037SB012E1	13,000	Y	780
Indeno(1,2,3-cd)pyrene	037SB012E1	30,000	Y	7800

Notes:
 SVOC = Semivolatile organic compound
 $\mu\text{g}/\text{kg}$ = Micrograms per kilogram

Table 10.5.9
SWMU 037, Zone L, Subzone E
Inorganic Detections for Soil Borings

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)									
Aluminum (Al)	Upper	12/12	4590-7940	5711	100000	26600	0	560000 c	NO
	Lower	4/4	3350-8230	6340	NA	41100	NA		
Antimony (Sb)	Upper	8/12	5.50-40.6	18.1	82.00	1.77	0	2.7	YES
	Lower	2/4	6.40-16.3	11.4	NA	1.60	NA		
Arsenic (As)	Upper	8/12	4.00-17.5	6.50	3.80	23.9	8	15	YES
	Lower	3/4	0.690-20.0	8.90	NA	19.9	NA		
Barium (Ba)	Upper	12/12	12.3-61.2	35.5	14000	130	0	820	NO
	Lower	4/4	22.5-56.4	39.4	NA	94.1	NA		
Beryllium (Be)	Upper	9/12	0.310-0.540	0.370	1.30	1.70	0	32	NO
	Lower	3/4	0.450-1.20	0.920	NA	2.71	NA		

Table 10.5.9
SWMU 037, Zone L, Subzone E
Inorganic Detections for Soil Borings

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Cadmium (Cd)	Upper	10/12	0.110-1.40	0.580	100	1.50	0	4	NO
	Lower	3/4	0.300-1.40	0.800	NA	0.96	NA		
Calcium (Ca)	Upper	12/12	3410-48200	18852	NA	NA	NA	NA	NO
	Lower	4/4	2570-46100	24553	NA	NA	NA		
Chromium (Cr)	Upper	12/12	6.20-45.0	23.1	1000	94.6	0	19	YES
	Lower	4/4	5.90-35.7	17.7	NA	75.2	NA		
Cobalt (Co)	Upper	12/12	1.10-33.7	5.20	12000	19	0	990 c	NO
	Lower	4/4	0.720-1.50	1.11	NA	14.9	NA		
Copper (Cu)	Upper	12/12	5.40-4590	450	8200	66	0	5600 c	NO
	Lower	4/4	7.80-136	51.8	NA	152	NA		
Iron (Fe)	Upper	12/12	2170-23000	7940	61000	NA	0	NA	NO
	Lower	4/4	3090-60500	18913	NA	NA	NA		
Lead (Pb)	Upper	12/12	11.9-188	105.1	1300	265	0	400	NO
	Lower	4/4	8.30-133	55.3	NA	173	NA		
Magnesium (Mg)	Upper	12/12	268-1570	632	NA	NA	NA	NA	NO
	Lower	3/4	487-785	641	NA	NA	NA		
Manganese (Mn)	Upper	12/12	13.7-140	55.7	4700	302	0	480 c	NO
	Lower	4/4	16.7-79.3	46.4	NA	881	NA		
Mercury (Hg)	Upper	11/12	0.040-44.8	6.24	61.00	2.60	0	1	YES
	Lower	4/4	0.170-3.40	1.56	NA	1.59	NA		
Nickel (Ni)	Upper	12/12	3.30-65.3	10.3	4100	77.1	0	65	YES
	Lower	4/4	1.90-6.10	4.10	NA	57.0	NA		
Potassium (K)	Upper	12/12	122-570	240	NA	NA	NA	NA	NO
	Lower	4/4	149-298	221	NA	NA	NA		
Selenium (Se)	Upper	10/12	0.350-0.730	0.500	1000	1.70	0	2.6	NO
	Lower	4/4	0.690-1.90	1.30	NA	2.40	NA		

Table 10.5.9
SWMU 037, Zone L, Subzone E
Inorganic Detections for Soil Borings

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Sodium (Na)	Upper	10/12	164-226	191	NA	NA	NA	NA	NO
	Lower	3/4	191-374	264	NA	NA	NA		
Thallium (Tl)	Upper	2/12	0.650-0.740	0.700	16	2.80	0	0.36	YES
Tin (Sn)	Upper	10/12	10.0-516	93.0	100000	59.4	0	5500 c	NO
Vanadium (V)	Upper	12/12	4.50-19.9	10.8	1400	94.3	0	3000	NO
	Lower	4/4	4.60-58.9	21.3	NA	155	NA		
Zinc (Zn)	Upper	12/12	14.5-462	221.2	61000	827	0	6200	NO
	Lower	4/4	26.2-253	119.2	NA	886	NA		

Notes:

- mg/kg = Milligrams per kilogram
- RBC = Risk-based concentration
- NA = Not applicable
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.10
SWMU 37, Zone L, Subzone E, Soil Borings Sample Locations with
Metals Detections Exceeding RBCs or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Antimony	037SB008E2	6.40	N	Y	82.00	2.70
	037SB010E2	16.3	N	Y		
Arsenic	037SB001E1	5.40	Y	N	3.80	15.00
	037SB005E1	4.00	Y	N		
	037SB006E1	5.00	Y	N		
	037SB007E1	17.5	Y	N		
	037SB009E1	5.40	Y	N		
	037SB010E1	5.20	Y	N		
	037SB010E2	20.0	N	Y		
	037SB011E1	5.80	Y	N		
	037SB012E1	4.00	Y	N		

Table 10.5.10
SWMU 37, Zone L, Subzone E, Soil Borings Sample Locations with
Metals Detections Exceeding RBCs or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Chromium	037SB008E2	22.8	N	Y	1000	19.00
	037SB010E2	35.7	N	Y		
Mercury	037SB008E2	2.30	N	Y	61.00	1.00
	037SB010E2	3.40	N	Y		

Notes:
 mg/kg = Milligrams per kilograms
 RBC = Risk-based concentration
 SSL = Soil screening level

10.5.1.4 Nature of Contamination in Subzone E, SWMU 37, Monitoring Well Groundwater 1 2

Two shallow monitoring wells were installed and samples were analyzed for VOCs, SVOCs, chlorinated pesticides, PCBs, metals, and cyanide. The results for detected compounds are summarized in Tables 10.5.11 (organics) and 10.5.12 (inorganics). 3
4
5

Volatile Organic Compounds Detected in Monitoring Well Groundwater 6 7

One VOC, 1,2-dichloroethene (total), was found during the first sampling event at 037001 at a concentration of 2.00 µg/kg. The Tap Water RBC for this compound is 5.5 µg/kg and the MCL is 100.0, neither of which was exceeded. 8
9
10

Table 10.5.11
SWMU 037, Zone L, Subzone E
Organic Compounds Detected in First-Quarter Groundwater
Shallow Monitoring Wells

Compound	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Volatile Compounds (µg/L)									
1,2-Dichloroethene (total)	1/2	2.00	2.00	5.5	100	0	NA	NO	NO
Semivolatile Compounds (µg/L)									
Dibenzofuran	1/2	1.00	1.00	2.4	NA	0	NA	NO	NO
Fluorene	1/2	2.00	2.00	150	NA	0	NA	NO	NO

Notes:

µg/L = Micrograms per liter
 RBC = Risk-based concentration
 MCL = Maximum contaminant level
 NA = Not applicable

Table 10.5.12
SWMU 037, Zone L, Subzone E
Inorganic Detections for First-Quarter Groundwater
Shallow Monitoring Wells

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	Reference Conc.	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Inorganic Elements (µg/L)										
Aluminum (Al)	2/2	359-957	658	3700	2810	NA	0	NA	NO	NO
Antimony (Sb)	2/2	1.90-3.50	2.70	1.5	ND	6	2	NA	YES	NO
Arsenic (As)	2/2	6.90-33.2	20.1	0.045	18.7	50	2	36	YES	NO
Barium (Ba)	2/2	20.5-44.0	32.3	260	211	2000	0	NA	NO	NO
Calcium (Ca)	2/2	88200-155000	121600	NA	NA	NA	NA	NA	NO	NO
Chromium (Cr)	1/2	1.70	1.70	18	12.3	100	0	50	NO	NO
Copper (Cu)	1/2	3.60	3.60	150	2.7	1300	0	2.9	NO	YES
Iron (Fe)	2/2	1150-26000	13575	1100	NA	NA	2	NA	YES	NO
Magnesium (Mg)	2/2	15400-18200	16800	NA	NA	NA	NA	NA	NO	NO

Table 10.5.12
SWMU 037, Zone L, Subzone E
Inorganic Detections for First-Quarter Groundwater
Shallow Monitoring Wells

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	Reference Conc.	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Manganese (Mn)	2/2	303-395	349	73	2560	NA	2	NA	YES	NO
Nickel (Ni)	2/2	0.990-3.50	2.25	73	15.2	100	0	8.3	NO	NO
Potassium (K)	2/2	10800-10800	10800	NA	NA	NA	NA	NA	NO	NO
Sodium (Na)	2/2	11400-21600	16500	NA	NA	NA	NA	NA	NO	NO
Vanadium (V)	2/2	1.70-5.40	3.60	26	11.4	NA	0	NA	NO	NO
Zinc (Zn)	2/2	10.0-22.8	16.4	1100	27.3	NA	0	86	NO	NO

Notes:

- $\mu\text{g/L}$ = Micrograms per liter
- RBC = Risk-based concentration
- MCL = Maximum contaminant level
- NA = Not applicable
- ND = Not detected

Semivolatile Organic Compounds Detected in Monitoring Well Groundwater

Two SVOCs were detected during the first sampling event at monitoring well 037002. Dibenzofuran was detected at a concentration of 1.0 $\mu\text{g/L}$ and did not exceed the RBC of 2.4 $\mu\text{g/L}$. Fluorene was detected at a concentration of 2.0 $\mu\text{g/L}$, also not exceeding its RBC of 150 $\mu\text{g/L}$.

Metals/Cyanide Detected in Monitoring Well Groundwater

Aluminum, antimony, arsenic, barium, calcium, iron, magnesium, manganese, nickel, potassium, vanadium, and zinc were all detected in both 037001 and 037002 as summarized in Table 10.5.12. Chromium and copper were detected in 037001. The concentrations detected for antimony, arsenic, iron, and manganese exceeded their respective Tap Water RBC at both monitoring wells sampled during the first groundwater sampling event. None of these metals detections exceeded their respective MCL.

10.5.2 Subzone E, AOC 699

AOC 699 sampling in Subzone E consisted of 78 soil and 95 groundwater samples collected using DPT and six sediment samples collected from the Cooper River. Six river sediments were collected near storm sewer system outfalls to determine the potential for offsite migration and adverse effects to aquatic ecological receptors. These samples were analyzed for VOCs, metals, and cyanide. The results are addressed in Section 8.0, which incorporates the results from other samples collected nearby in the Cooper River.

DPT samples were analyzed for VOCs, metals, and cyanide. The sample locations are presented in Figures 10.5.12 through 10.5.20.

10.5.2.1 Nature of Contamination in Subzone E, AOC 699, DPT Soil

Organic compound analytical results for soil obtained from DPT are summarized in Table 10.5.13. Inorganic analytical results are summarized in Table 10.5.14. Appendix C contains the complete data report for all samples collected in Zone L.

Volatile Organic Compounds Detected in DPT Soil

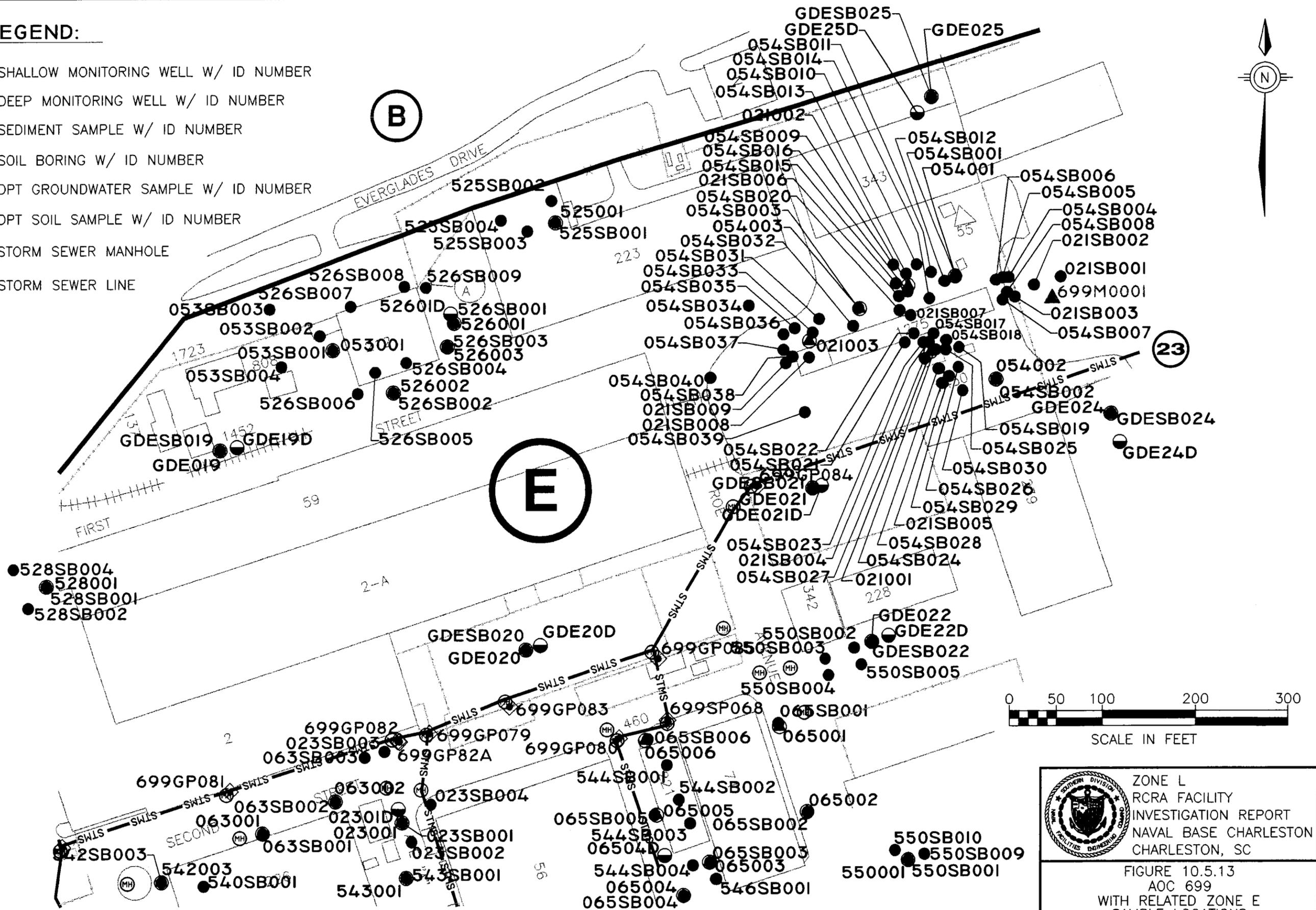
Seven VOCs were detected in the DPT soil samples. None exceeded the RBC values. Tetrachloroethene (1/78) at location 699SP009E1 exceeded the SSL of 30 µg/kg.

Metals/Cyanide Detected in DPT Soil

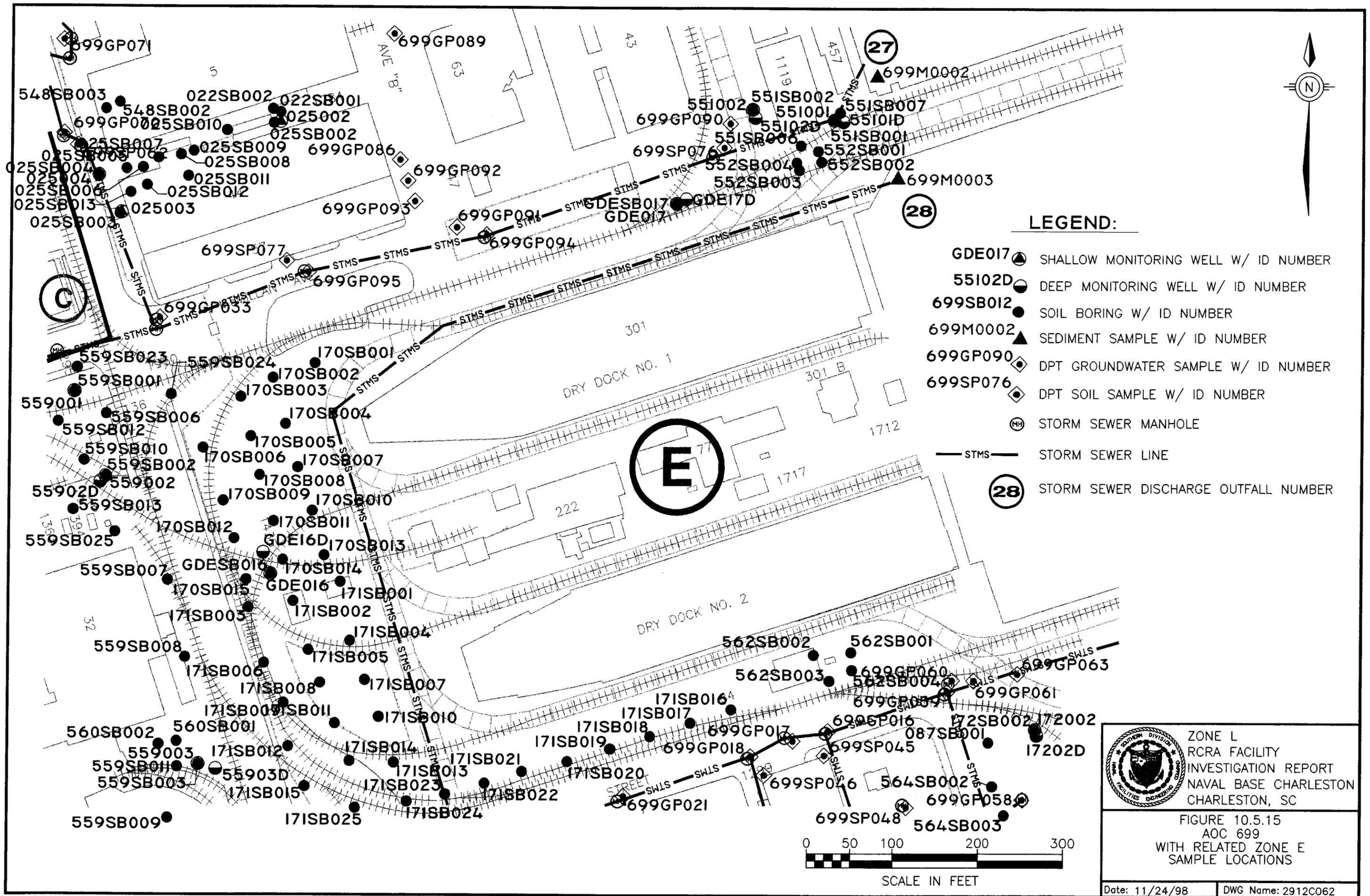
Arsenic (52/78) exceeded the RBC of 3.80 mg/kg and beryllium (1/78) exceeded the RBC of 1.30 mg/kg. Antimony (4/78), arsenic (7/78), chromium (34/78), lead (2/78), manganese (1/78), mercury (3/78), nickel (2/78), selenium (1/78), silver (1/78), and thallium (9/78) exceeded the SSL values. Sample locations are summarized in Table 10.5.15.

LEGEND:

- GDE020  SHALLOW MONITORING WELL W/ ID NUMBER
- GDE22D  DEEP MONITORING WELL W/ ID NUMBER
- 699M0001  SEDIMENT SAMPLE W/ ID NUMBER
- 054SB040  SOIL BORING W/ ID NUMBER
- 699GP080  DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 699SP068  DPT SOIL SAMPLE W/ ID NUMBER
-  STORM SEWER MANHOLE
-  STMS STORM SEWER LINE



	<p>ZONE L RCRA FACILITY INVESTIGATION REPORT NAVAL BASE CHARLESTON CHARLESTON, SC</p>
	<p>FIGURE 10.5.13 AOC 699 WITH RELATED ZONE E SAMPLE LOCATIONS</p>
<p>Date: 11/24/98 DWG Name: 2912C060</p>	



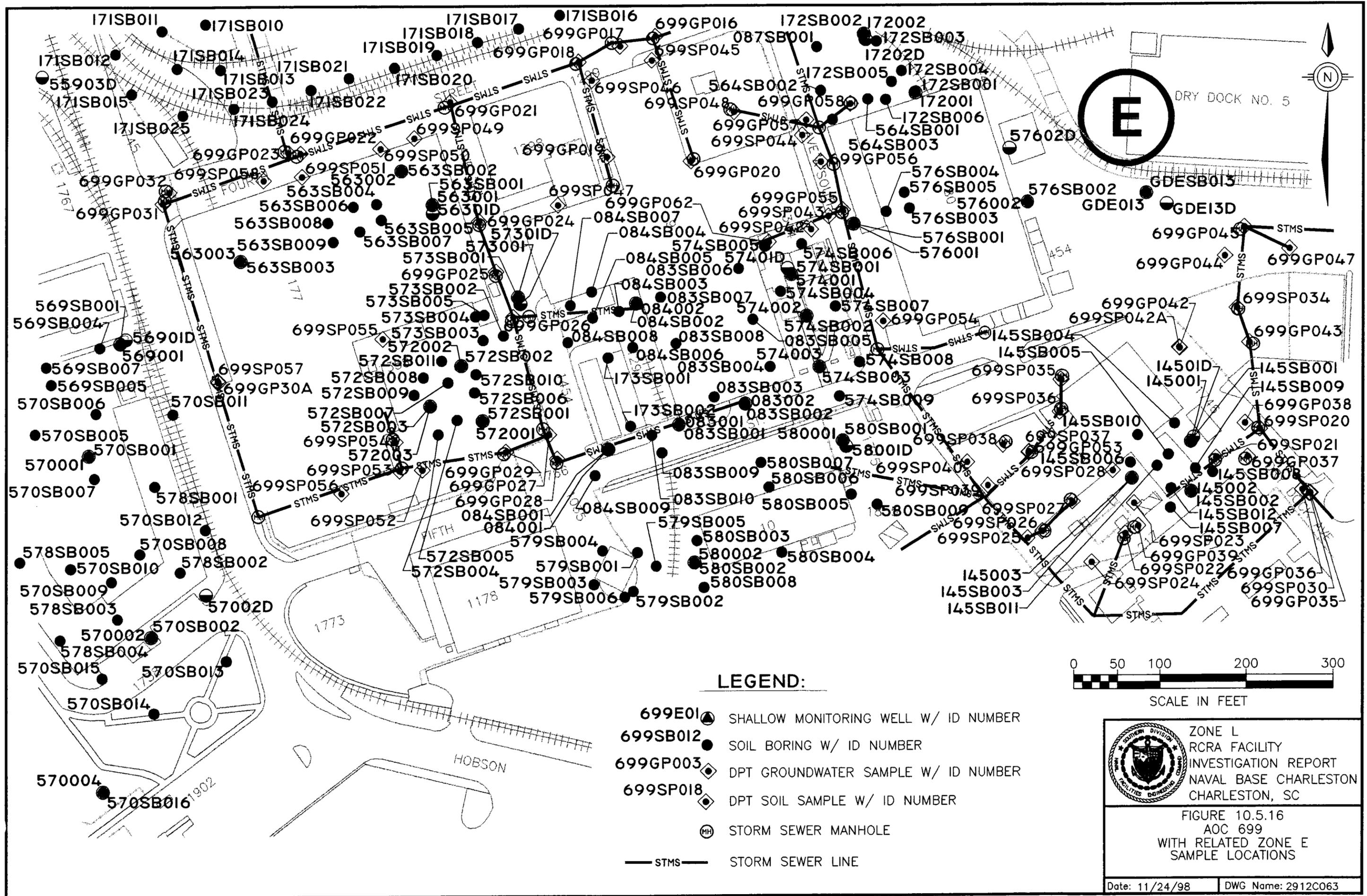
LEGEND:

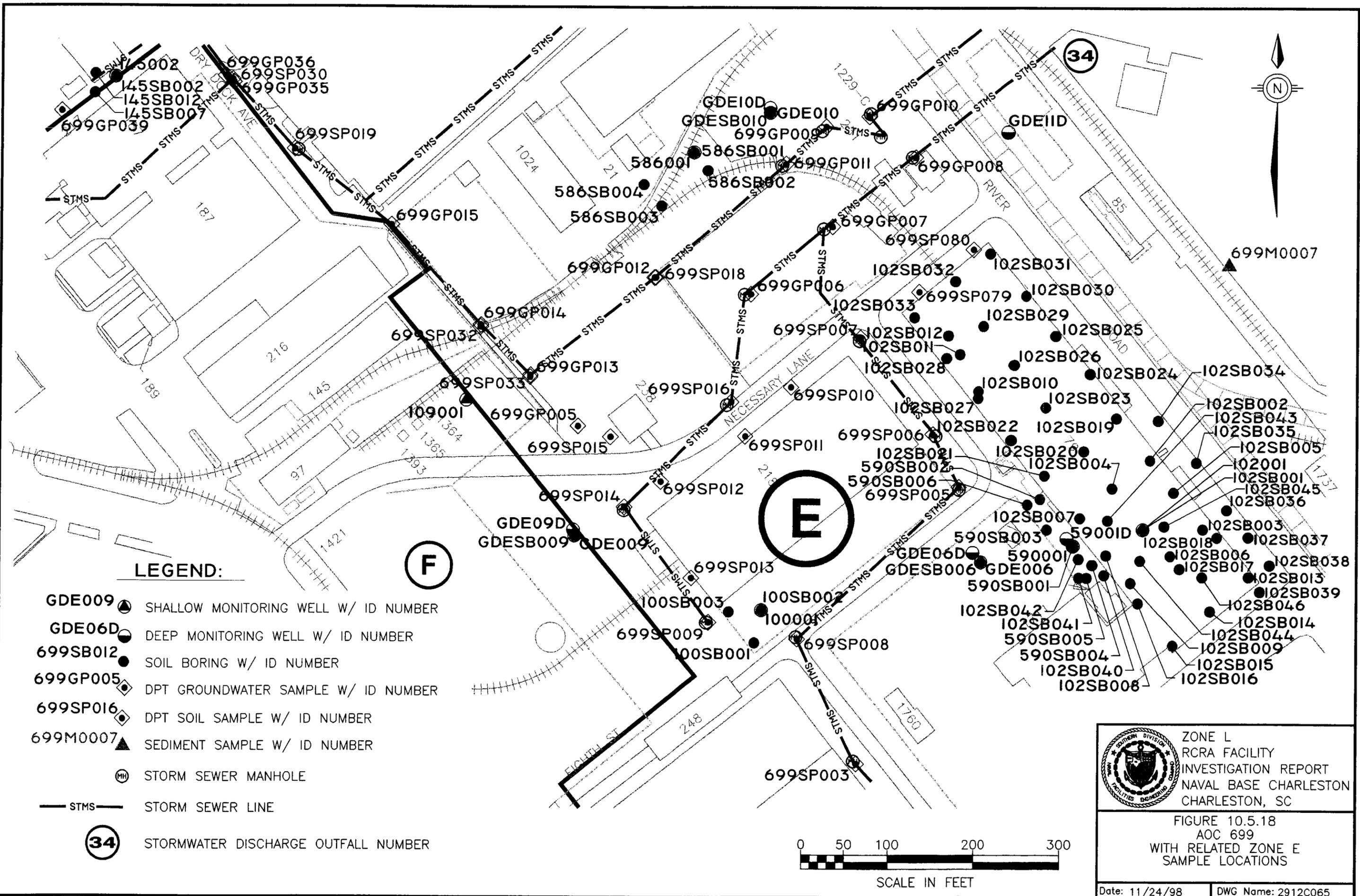
- GDE017 ▲ SHALLOW MONITORING WELL W/ ID NUMBER
- 55102D ● DEEP MONITORING WELL W/ ID NUMBER
- 699SB012 ● SOIL BORING W/ ID NUMBER
- 699M0002 ▲ SEDIMENT SAMPLE W/ ID NUMBER
- 699GP090 ◆ DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 699SP076 ◆ DPT SOIL SAMPLE W/ ID NUMBER
- ⊕ STORM SEWER MANHOLE
- STMS — STORM SEWER LINE
- 28 ○ STORM SEWER DISCHARGE OUTFALL NUMBER

ZONE L
 RCRA FACILITY
 INVESTIGATION REPORT
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.15
 AOC 699
 WITH RELATED ZONE E
 SAMPLE LOCATIONS

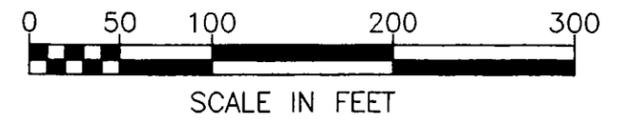
Date: 11/24/98 DWG Name: 2912C062



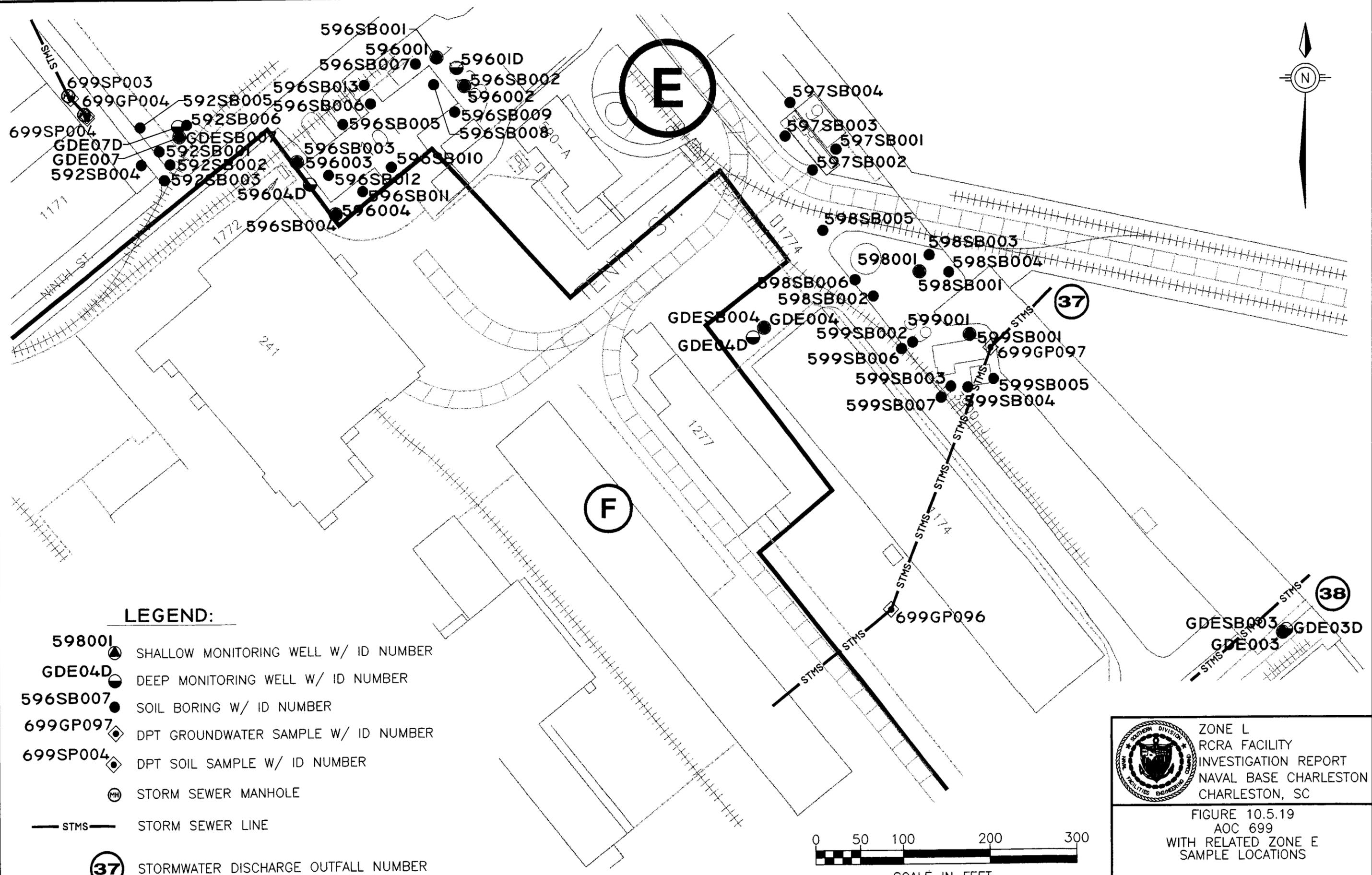


LEGEND:

- GDE009 ● SHALLOW MONITORING WELL W/ ID NUMBER
- GDE06D ● DEEP MONITORING WELL W/ ID NUMBER
- 699SB012 ● SOIL BORING W/ ID NUMBER
- 699GP005 ◆ DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 699SP016 ◆ DPT SOIL SAMPLE W/ ID NUMBER
- 699M0007 ▲ SEDIMENT SAMPLE W/ ID NUMBER
- Ⓜ STORM SEWER MANHOLE
- STMS — STORM SEWER LINE
- Ⓢ STORMWATER DISCHARGE OUTFALL NUMBER

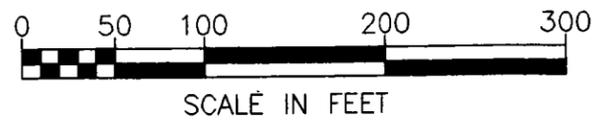


	<p>ZONE L RCRA FACILITY INVESTIGATION REPORT NAVAL BASE CHARLESTON CHARLESTON, SC</p>
	<p>FIGURE 10.5.18 AOC 699 WITH RELATED ZONE E SAMPLE LOCATIONS</p>
<p>Date: 11/24/98</p>	<p>DWG Name: 2912C065</p>

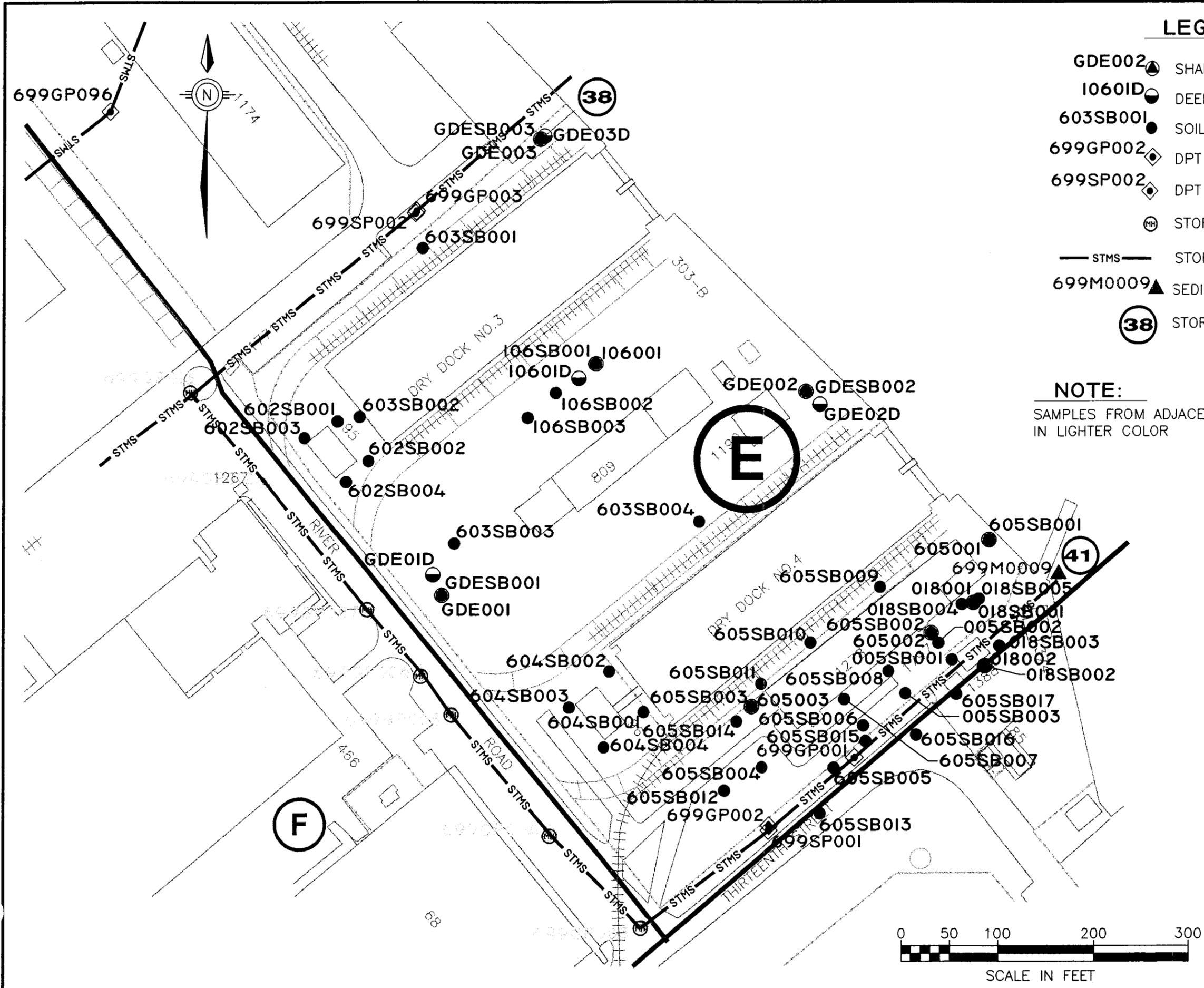


LEGEND:

- 598001 ● SHALLOW MONITORING WELL W/ ID NUMBER
- GDE04D ● DEEP MONITORING WELL W/ ID NUMBER
- 596SB007 ● SOIL BORING W/ ID NUMBER
- 699GP097 ◊ DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 699SP004 ◊ DPT SOIL SAMPLE W/ ID NUMBER
- Ⓜ STORM SEWER MANHOLE
- STMS — STORM SEWER LINE
- Ⓧ STORMWATER DISCHARGE OUTFALL NUMBER



	ZONE L RCRA FACILITY INVESTIGATION REPORT NAVAL BASE CHARLESTON CHARLESTON, SC
	FIGURE 10.5.19 AOC 699 WITH RELATED ZONE E SAMPLE LOCATIONS
Date: 11/24/98	DWG Name: 2912C066



LEGEND:

- GDE002 ● SHALLOW MONITORING WELL W/ ID NUMBER
- 1060ID ● DEEP MONITORING WELL W/ ID NUMBER
- 603SB001 ● SOIL BORING W/ ID NUMBER
- 699GP002 ◆ DPT GROUNDWATER SAMPLE W/ ID NUMBER
- 699SP002 ◆ DPT SOIL SAMPLE W/ ID NUMBER
- Ⓜ STORM SEWER MANHOLE
- STMS — STORM SEWER LINE
- 699M0009 ▲ SEDIMENT SAMPLE W/ ID NUMBER
- Ⓢ STORMWATER DISCHARGE OUTFALL NUMBER

NOTE:

SAMPLES FROM ADJACENT ZONES SHOWN FOR REFERENCE IN LIGHTER COLOR



ZONE L
RCRA FACILITY
INVESTIGATION REPORT
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.20
AOC 699
WITH RELATED ZONE E
SAMPLE LOCATIONS

Date: 11/24/98

DWG Name: 2912C067

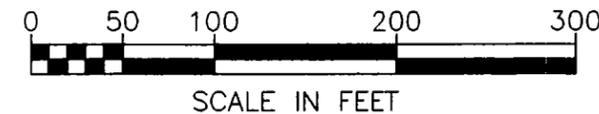


Table 10.5.13
AOC 699, Zone L, Subzone E
Organic Compounds Detected in DPT Soil

Compound	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Volatile Organic Compounds ($\mu\text{g}/\text{kg}$)							
2-Butanone (MEK)	6/78	6.95-14.7	10.4	100000000	0	3900 c	NO
Acetone	7/78	11.7-55.9	30.6	20000000	0	8000	NO
Carbon disulfide	2/78	12.8-25.4	19.1	20000000	0	16000	NO
Tetrachloroethene	1/78	30.4	30.4	110000	0	30	YES
Toluene	3/78	5.71-390	137.8	41000000	0	6000	NO
Trichloroethene	2/78	9.03-10.5	9.77	520000	0	30	NO
cis-1,2-Dichloroethene	1/78	12.9	12.9	20000000	0	200	NO

Notes:

- $\mu\text{g}/\text{kg}$ = Micrograms per kilogram
- RBC = Risk-based concentration
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.14
AOC 699, Zone L, Subzone E
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)								
Cyanide (CN)	9/78	0.290-1.63	0.598	4100	0.5	0	20	NO
Aluminum (Al)	78/78	1080-28600	6865	100000	26600	0	560000 c	NO
Antimony (Sb)	4/78	2.77-12.0	5.24	82.0	1.77	0	2.7	YES
Arsenic (As)	75/78	1.21-69.4	8.54	3.80	23.9	52	15	YES
Barium (Ba)	78/78	5.09-120	31.3	14000	130	0	820	NO
Beryllium (Be)	61/78	0.230-1.41	0.549	1.30	1.7	1	32	NO
Cadmium (Cd)	30/78	0.350-2.30	0.786	100	1.5	0	4	NO

Table 10.5.14
AOC 699, Zone L, Subzone E
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Calcium (Ca)	78/78	418-316000	38283	NA	NA	NA	NA	NO
Chromium (Cr)	78/78	1.77-367	30.4	1000	94.6	0	19	YES
Cobalt (Co)	68/78	0.610-9.28	2.37	12000	19.0	0	990 c	NO
Copper (Cu)	75/78	1.78-399	37.8	8200	66.0	0	5600 c	NO
Iron (Fe)	78/78	897-29400	8774	61000	NA	0	NA	NO
Lead (Pb)	78/78	1.56-819	67.8	1300	265	0	400	NO
Magnesium (Mg)	78/78	78.9-26600	2107	NA	NA	NA	NA	NO
Manganese (Mn)	78/78	4.99-490	99.4	4700	302	0	480 c	YES
Mercury (Hg)	56/78	0.040-5.30	0.335	61.0	2.60	0	1	YES
Nickel (Ni)	77/78	0.730-189	12.9	4100	77.1	0	65	YES
Potassium (K)	78/78	74.8-2570	522.7	NA	NA	NA	NA	NO
Selenium (Se)	30/78	0.560-2.64	0.973	1000	1.7	0	2.6	YES
Silver (Ag)	3/78	1.88-105	36.5	1000	ND	0	17	YES
Sodium (Na)	78/78	133-4070	391	NA	NA	NA	NA	NO
Thallium (Tl)	9/78	1.38-2.45	1.80	16.0	2.8	0	0.36	YES
Tin (Sn)	17/78	3.44-144	17.1	100000	59.4	0	5500 c	NO
Vanadium (V)	78/78	1.87-68.5	17.2	1400	94.3	0	3000	NO
Zinc (Zn)	78/78	2.08-3620	155.9	61000	827	0	6200	NO

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 NA = Not applicable
 ND = Not detected
 GW = Groundwater
 SSL = Soil screening level
 c = Calculated SSL
 Soil to GW = Generic SSLs based on DAF = 10, adapted from USEPA Soil Screening Guidance: Technical Background Document, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.15
AOC 699, Zone L, Subzone E, DPT Soil Sample Locations with
Metals Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Antimony	699SP042E1	2.77	N	Y	82.0	2.7
	699SP048E1	3.17	N	Y		
	699SP057E1	3.02	N	Y		
	699SP068E1	12.0	N	Y		
Arsenic	699SP001E1	13.9	Y	N	3.80	15
	699SP003E1	19.4	Y	Y		
	699SP004E1	19.9	Y	Y		
	699SP007E1	6.53	Y	N		
	699SP008E1	8.98	Y	N		
	699SP009E1	7.55	Y	N		
	699SP010E1	4.04	Y	N		
	699SP011E1	7.63	Y	N		
	699SP012E1	8.04	Y	N		
	699SP014E1	3.84	Y	N		
	699SP015E1	14.5	Y	N		
	699SP016E1	11.6	Y	N		
	699SP018E1	12.2	Y	N		
	699SP019E1	6.79	Y	N		
	699SP020E1	5.62	Y	N		
	699SP021E1	13.2	Y	N		
	699SP022E1	5.55	Y	N		
	699SP023E1	4.11	Y	N		
	699SP026E1	4.96	Y	N		
	699SP027E1	4.88	Y	N		
	699SP028E1	9.59	Y	N		
	699SP029E1	23.8	Y	Y		
	699SP030E1	10.5	Y	N		
	699SP031E1	5.66	Y	N		
699SP033E1	6.76	Y	N			
699SP034E1	6.47	Y	N			

Table 10.5.15
AOC 699, Zone L, Subzone E, DPT Soil Sample Locations with
Metals Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Arsenic	699SP035E1	16.8	Y	Y		
	699SP038E1	4.09	Y	N		
	699SP039E1	5.59	Y	N		
	699SP040E1	4.10	Y	N		
	699SP042E1	12.3	Y	N		
	699SP044E1	4.16	Y	N		
	699SP045E1	4.46	Y	N		
	699SP046E1	5.69	Y	N		
	699SP047E1	6.36	Y	N		
	699SP048E1	3.88	Y	N		
	699SP049E1	6.32	Y	N		
	699SP050E1	8.04	Y	N		
	699SP051E1	4.41	Y	N		
	699SP052E1	25.0	Y	Y		
	699SP053E1	6.68	Y	N		
	699SP054E1	4.71	Y	N		
	699SP057E1	69.4	Y	Y		
	699SP064E1	7.16	Y	N		
	699SP067E1	9.60	Y	N		
	699SP068E1	9.11	Y	N		
	699SP069E1	7.76	Y	N		
	699SP072E1	64.4	Y	Y		
	699SP073E1	16.5	Y	Y		
699SP074E1	11.4	Y	N			
699SP080E1	7.13	Y	N			
699SP42AE1	6.20	Y	N			
Beryllium	699SP003E1	1.41	Y	N	1.30	32
Chromium	699SP001E1	34.8	N	Y	1000	19
	699SP003E1	50.2	N	Y		
	699SP004E1	34.3	N	Y		

Table 10.5.15
AOC 699, Zone L, Subzone E, DPT Soil Sample Locations with
Metals Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Chromium	699SP007E1	21.3	N	Y		
	699SP008E1	59.2	N	Y		
	699SP009E1	23.9	N	Y		
	699SP010E1	20.2	N	Y		
	699SP011E1	24.9	N	Y		
	699SP012E1	22.9	N	Y		
	699SP013E1	206	N	Y		
	699SP016E1	34.5	N	Y		
	699SP018E1	40.3	N	Y		
	699SP020E1	32.6	N	Y		
	699SP021E1	124	N	Y		
	699SP022E1	24.7	N	Y		
	699SP026E1	39.1	N	Y		
	699SP027E1	20.1	N	Y		
	699SP028E1	59.2	N	Y		
	699SP029E1	23.5	N	Y		
	699SP030E1	66.2	N	Y		
	699SP031E1	149	N	Y		
	699SP032E1	367	N	Y		
	699SP033E1	28.5	N	Y		
	699SP035E1	29.6	N	Y		
	699SP042E1	27.1	N	Y		
	699SP049E1	24.3	N	Y		
	699SP050E1	31.5	N	Y		
	699SP057E1	25.6	N	Y		
	699SP062E1	69.3	N	Y		
	699SP064E1	19.6	N	Y		
	699SP068E1	82.7	N	Y		
	699SP074E1	29.6	N	Y		
	699SP075E1	20.2	N	Y		

Table 10.5.15
AOC 699, Zone L, Subzone E, DPT Soil Sample Locations with
Metals Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Chromium	699SP42AE1	47.7	N	Y		
Lead	699SP068E1	819	N	Y	1300	400
Manganese	699SP001E1	490.0	N	Y	4700	480 c
Mercury	699SP027E1	1.17	N	Y	61.0	1
	699SP046E1	1.59	N	Y		
	699SP067E1	5.30	N	Y		
Nickel	699SP013E1	189	N	Y	4100	65
	699SP068E1	124	N	Y		
Selenium	699SP008E1	2.64	N	Y	1000	2.6
Silver	699SP053E1	105	N	Y	1000	17
Thallium	699SP003E1	1.93	N	Y	16.0	0.36
	699SP010E1	1.48	N	Y		
	699SP012E1	1.38	N	Y		
	699SP016E1	1.88	N	Y		
	699SP029E1	1.48	N	Y		
	699SP035E1	1.46	N	Y		
	699SP050E1	2.45	N	Y		
	699SP053E1	2.41	N	Y		
	699SP068E1	1.73	N	Y		

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 SSL = Soil screening level
 c = Calculated SSL
 GW = Groundwater
 Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report.

10.5.2.2 Nature of Contamination in Subzone E, AOC 699, DPT Groundwater

Ninety-five DPT groundwater samples were analyzed for VOCs, metals, and cyanide. Detected VOCs are shown in Table 10.5.16; detected inorganic chemicals are shown in Table 10.5.18.

Volatile Organic Compounds Detected in DPT Groundwater

VOCs exceeding RBC values were 1,1-dichloroethene (2/95), benzene (3/95), bromodichloromethane (4/95), chlorobenzene (4/95), chloroform (5/95), dibromochloromethane (1/95), tetrachloroethene (6/95), trichloroethene (6/95), vinyl chloride (1/95), cis-1,2-dichloroethene (4/95). Table 10.5.17 presents the locations and concentrations of these samples.

Metal/Cyanide Detected in DPT Groundwater

Analytical results for inorganic compounds in the DPT groundwater samples are shown in Table 10.5.18. As stated in Section 10.0, the metals and cyanide results from DPT groundwater samples were not compared to RBC or MCL values.

Table 10.5.16
 AOC 699, Zone L, Subzone E
 Organic Compounds Detected in DPT Groundwater

Compound	Freq of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Volatile Compounds (µg/L)									
1,1,1-Trichloroethane	3/95	11.6-39.7	30.3	54.0	200	0	312	NO	NO
1,1-Dichloroethane	4/95	6.31-17.6	12.5	80.0	NA	0	NA	NO	NO
1,1-Dichloroethene	2/95	5.39-8.00	6.69	0.044	7.00	2	2240	YES	NO
Acetone	1/95	118	118	370	NA	0	NA	NO	NO
Benzene	3/95	5.85-10.0	8.54	0.360	5.00	3	109	YES	NO
Bromodichloromethane	4/95	7.17-14.8	11.5	0.17	NA	4	NA	YES	NO
Chlorobenzene	4/95	11.9-610	247.7	3.50	NA	4	105	YES	YES
Chloroform	5/95	7.60-57.6	27.6	0.150	100	5	815	YES	NO
Dibromochloromethane	1/95	18.2	18.2	0.13	NA	1	NA	YES	NO

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 Revision: 0

Table 10.5.16
AOC 699, Zone L, Subzone E
Organic Compounds Detected in DPT Groundwater

Compound	Freq of Detection	Range of Detected Conc.	Mean of Detected Conc.	Tap Water RBC	MCL	Number of Samples Exceeding RBC	Salt Wtr. Surf. Wtr. Chronic	Ground-water Migration Concern	Surface Water Migration Concern
Ethylbenzene	2/95	10.1-10.5	10.3	130	700	0	4.3	NO	YES
Tetrachloroethene	6/95	6.52-227	51.3	1.10	5.00	6	45	YES	YES
Toluene	1/95	5.91	5.91	75.0	1000	0	37	NO	NO
Trichloroethene	6/95	5.51-168	45.1	1.60	5.00	6	NA	YES	NO
Vinyl Chloride	1/95	7.94	7.94	0.019 0	2.00	1	NA	YES	NO
Xylenes (Total)	1/95	36.9	36.9	1200	10000	0	NA	NO	NO
cis-1,2-Dichloroethene	5/95	5.53-365	151.7	6.10	70.0	4	NA	YES	NO
trans-1,2-Dichloroethene	1/95	5.48	5.48	12.0	5.00	0	NA	NO	NO

Notes:

µg/L = Micrograms per liter
 RBC = Risk-based concentration
 MCL = Maximum contaminant level
 NA = Not applicable

Table 10.5.17
AOC 699, Zone L, Subzone E, DPT Groundwater Sample Locations with
VOC Detections Exceeding RBCs and/or MCLs

VOC	Sample ID	Concentration Detected (µg/L)	RBC Exceeded (Y/N)	MCL Exceeded (Y/N)	RBC (µg/L)	MCL (µg/L)
1,1-Dichloroethene	699GP067E1	8.00	Y	Y	0.04	7.00
	699GP076E1	5.39	Y	N		
Benzene	699GP006E1	9.77	Y	Y	0.36	5.00
	699GP087E1	5.85	Y	Y		
	699GP088E1	10.0	Y	Y		
Bromodichloromethane	699GP082E1	12.5	Y	N	0.17	NA
	699GP086E1	14.8	Y	N		
	699GP092E1	7.17	Y	N		
Chlorobenzene	699GP058E1	11.9	Y	N	3.50	NA
	699GP087E1	256	Y	N		
	699GP088E1	113	Y	N		
	699GP089E1	610.	Y	N		

Table 10.5.17
AOC 699, Zone L, Subzone E, DPT Groundwater Sample Locations with
VOC Detections Exceeding RBCs and/or MCLs

VOC	Sample ID	Concentration Detected ($\mu\text{g/L}$)	RBC Exceeded (Y/N)	MCL Exceeded (Y/N)	RBC ($\mu\text{g/L}$)	MCL ($\mu\text{g/L}$)
Chloroform	699GP034E1	7.60	Y	N	0.15	100.00
	699GP082E1	8.31	Y	N		
	699GP086E1	57.6	Y	N		
	699GP092E1	32.3	Y	N		
	699GP093E1	32.4	Y	N		
Dibromochloromethane	699GP082E1	18.2	Y	N	0.13	NA
Tetrachloroethene	699GP032E1	6.53	Y	Y	1.10	5.00
	699GP058E1	9.40	Y	Y		
	699GP086E1	227	Y	Y		
	699GP091E1	44.9	Y	Y		
	699GP093E1	13.5	Y	Y		
	699GP094E1	6.52	Y	Y		
Trichloroethene	699GP022E1	168	Y	Y	1.60	5.00
	699GP023E1	11.8	Y	Y		
	699GP058E1	11.9	Y	Y		
	699GP079E1	67.2	Y	Y		
	699GP085E1	5.51	Y	Y		
	699GP094E1	6.28	Y	Y		
Vinyl chloride	699GP094E1	7.94	Y	Y	0.02	2.00
Cis-1,2-dichloroethene	699GP022E1	6.76	Y	N	6.10	70.00
	699GP058E1	122	Y	Y		
	699GP079E1	365	Y	Y		
	699GP094E1	259	Y	Y		

Notes:

- VOC = Volatile organic compound
- $\mu\text{g/L}$ = Micrograms per liter
- RBC = Risk-based concentration
- MCL = Maximum contaminant level

Table 10.5.18
AOC 699, Zone L, Subzone E
Inorganic Detections for DPT Groundwater

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.
Inorganic Elements ($\mu\text{g/L}$)			
Cyanide (CN)	9/95	5.50-30.0	11.8
Aluminum (Al)	95/95	296-355000	42597

Table 10.5.18
AOC 699, Zone L, Subzone E
Inorganic Detections for DPT Groundwater

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.
Antimony (Sb)	8/95	8.20-36.7	15.9
Arsenic (As)	68/95	10.0-572	52.2
Barium (Ba)	95/95	8.80-3470	247.4
Beryllium (Be)	30/95	2.00-19.6	5.69
Cadmium (Cd)	7/95	5.00-25.8	10.6
Calcium (Ca)	95/95	1860-1530000	142768
Chromium (Cr)	92/95	7.50-778	104.4
Cobalt (Co)	49/95	5.30-200	28.7
Copper (Cu)	80/95	7.30-4550	106.9
Iron (Fe)	95/95	487-727000	55473
Lead (Pb)	89/95	3.30-5460	134.7
Magnesium (Mg)	95/95	1040-1010000	101717
Manganese (Mn)	95/95	8.70-6840	638.8
Mercury (Hg)	16/95	0.200-1.30	0.456
Nickel (Ni)	79/95	4.10-435	39.9
Potassium (K)	95/95	1660-214000	38268
Selenium (Se)	31/95	5.00-41.6	10.7
Silver (Ag)	1/95	6.20	6.20
Sodium (Na)	91/95	926-7460000	837936
Thallium (Tl)	9/95	10.4-46.80	23.5
Tin (Sn)	1/95	396	396
Vanadium (V)	89/95	7.00-1030	98.2
Zinc (Zn)	85/95	20.5-8590	395.4

Notes:
 µg/L = Micrograms per liter

10.5.3 Subzone E, AOC 504

AOC 504 sampling in Subzone E consisted of five soil samples collected using DPT methods and nine soil borings collected using a hand auger. The DPT samples were analyzed for VOCs, metals, and cyanide, and the soil boring samples were analyzed for VOCs, SVOCs, pest/PCBs, metals, cyanide, and herbicides. The sample locations are presented in Figures 10.5.21 through 10.5.24.

10.5.3.1 Nature of Contamination in Subzone E, AOC 504, DPT Soil

Analytical results collected from DPT are summarized in Table 10.5.19. Appendix C contains the complete data report for all samples collected for the Zone L investigation. VOCs and cyanide were not detected in the five DPT soil samples.

Metals/Cyanide Detected in DPT Soil

Arsenic (1/5) exceeded its RBC value of 3.80 mg/kg and chromium (2/5), mercury (2/5), and thallium (1/5) exceeded the SSL values. The sample locations where these exceedances occurred are summarized in Table 10.5.20.

10.5.3.2 Nature of Contamination in Subzone E, AOC 504, Soil Borings

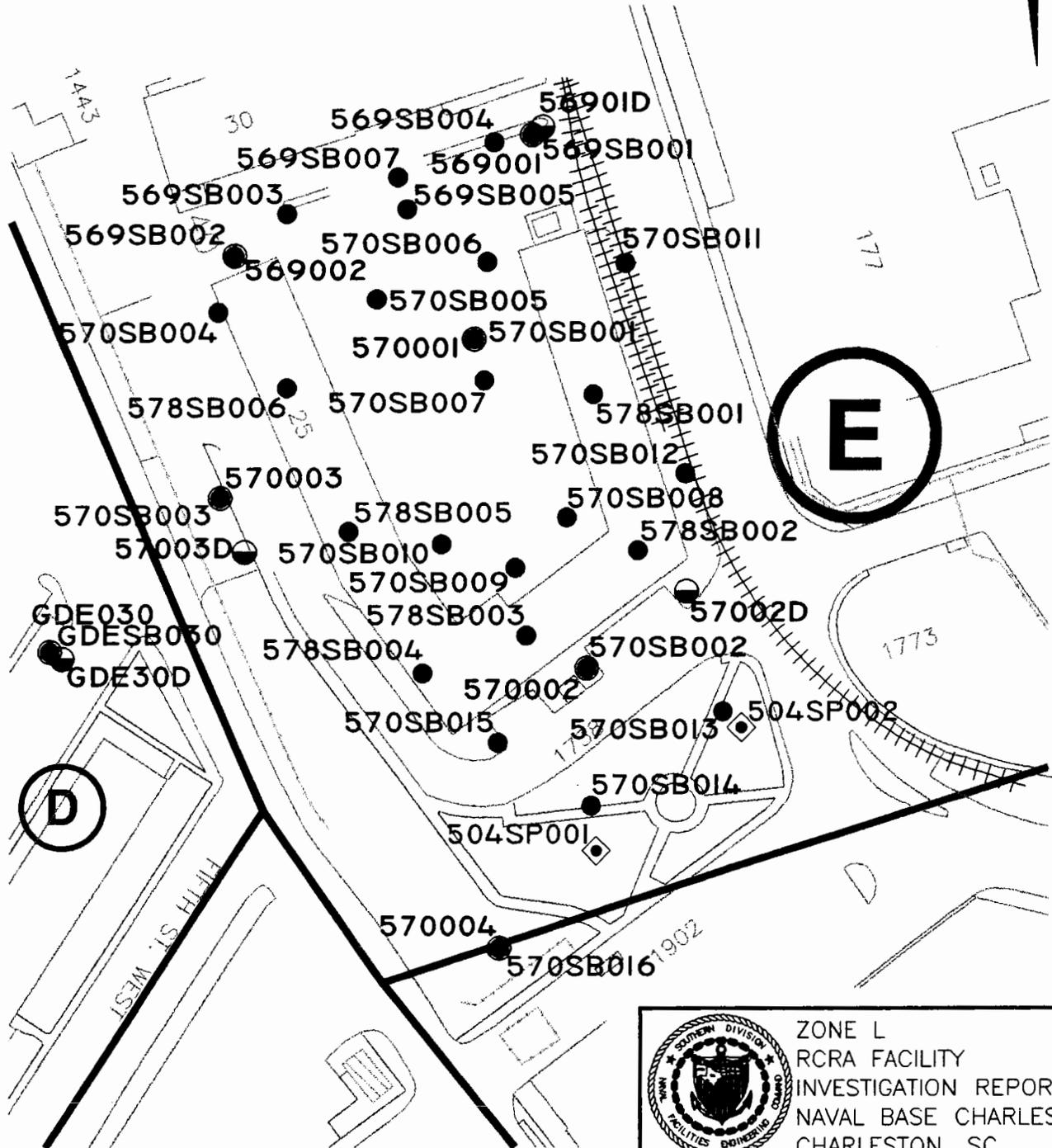
Nine upper-interval and eight lower-interval soil boring samples were analyzed for VOCs, SVOCs, chlorinated pesticides, PCBs, metals, cyanide, and herbicides. The analytical results are summarized in Tables 10.5.21 and 10.5.22. Herbicides were not detected above detection limits in any of the samples. The lower-interval soil samples were compared to SSLs.

Volatile Organic Compounds Detected in Soil Borings

Carbon disulfide, 2-butanone (MEK), and xylene (total) were detected in upper-interval soil samples; 2-butanone was also detected in a lower-interval soil sample. None of the detected concentrations exceeded RBC or SSL values.

LEGEND:

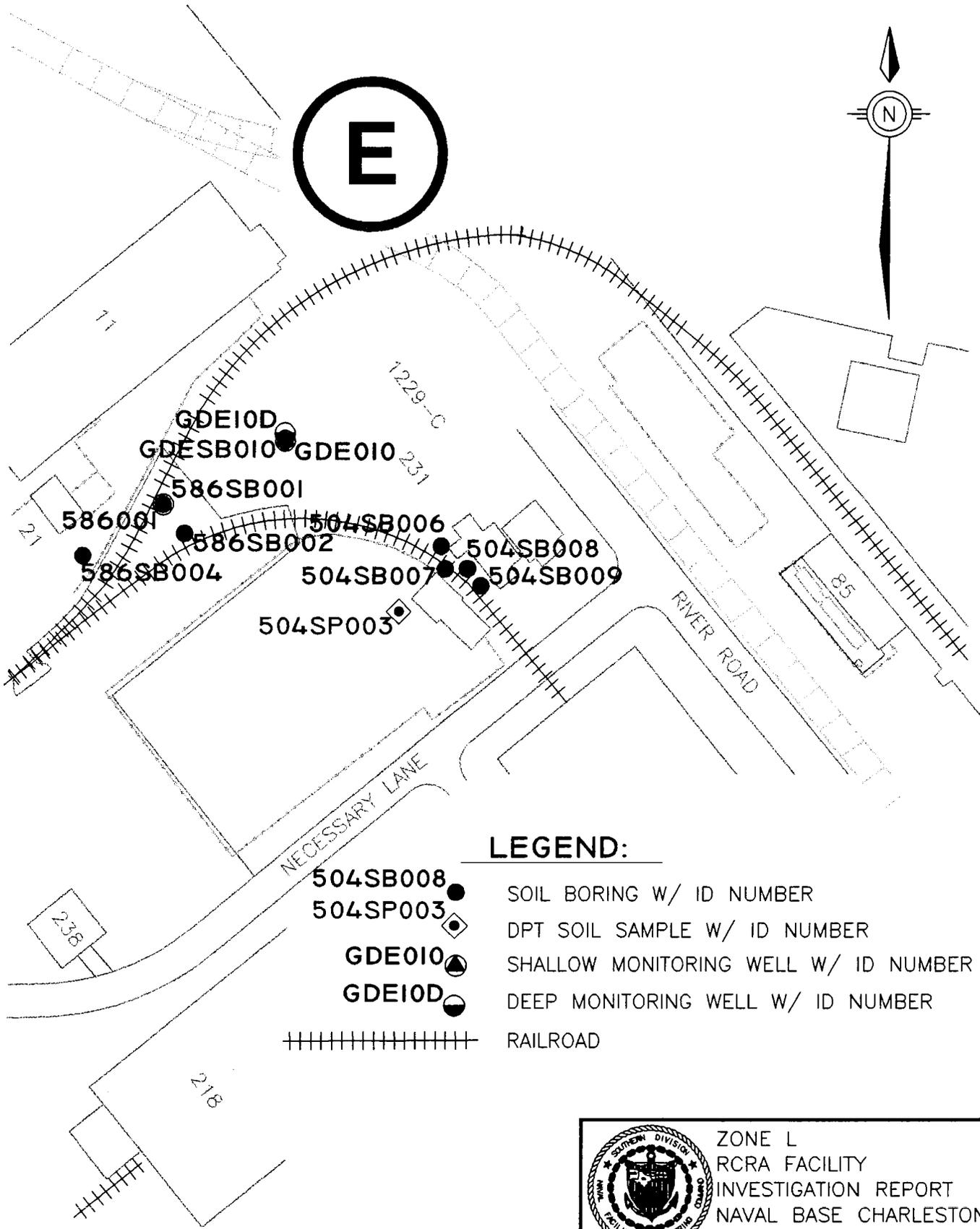
- 569SB005 ● SOIL BORING W/ ID NUMBER
- 504SP002 ◊ DPT SOIL SAMPLE W/ ID NUMBER
- 569001 ▲ SHALLOW MONITORING WELL W/ ID NUMBER
- 56901D ● DEEP MONITORING WELL W/ ID NUMBER
- +++++ RAILROAD



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FIGURE 10.5.22
 AOC 504
 WITH RELATED ZONE E
 SAMPLE LOCATIONS

E



LEGEND:

- 504SB008 SOIL BORING W/ ID NUMBER
- ◆ 504SP003 DPT SOIL SAMPLE W/ ID NUMBER
- ▲ GDE010 SHALLOW MONITORING WELL W/ ID NUMBER
- ◐ GDE10D DEEP MONITORING WELL W/ ID NUMBER
- ++++ RAILROAD



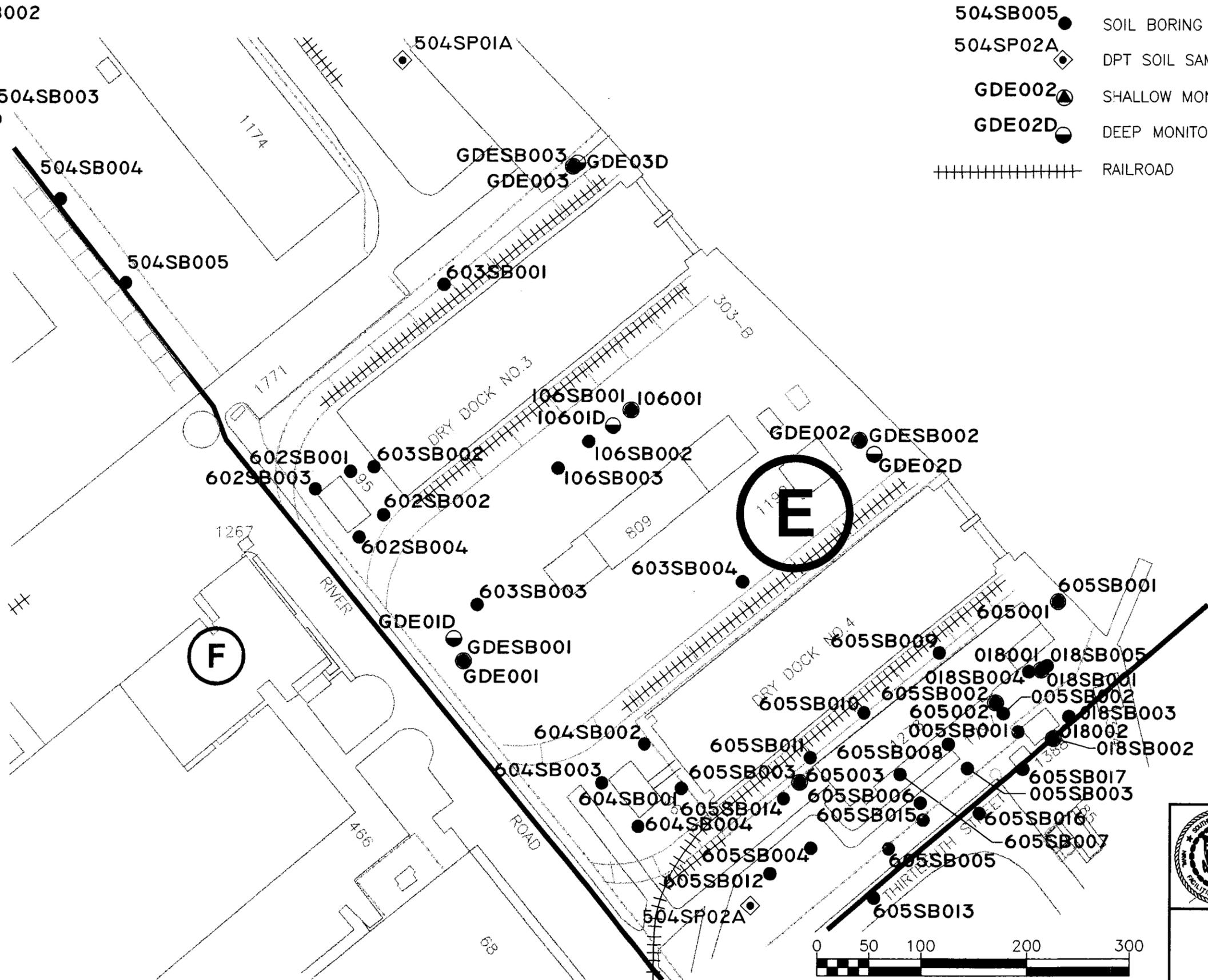
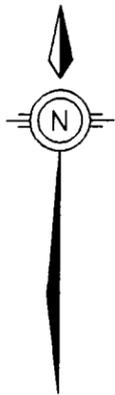
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FIGURE 10.5.23
AOC 504
WITH RELATED ZONE E
SAMPLE LOCATIONS

● 504SB001

LEGEND:

- 504SB005 SOIL BORING W/ ID NUMBER
- ◊ 504SP02A DPT SOIL SAMPLE W/ ID NUMBER
- GDE002 SHALLOW MONITORING WELL W/ ID NUMBER
- GDE02D DEEP MONITORING WELL W/ ID NUMBER
- ++++ RAILROAD




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FIGURE 10.5.24
 AOC 504
 WITH RELATED ZONE E
 SAMPLE LOCATIONS

Table 10.5.19
AOC 504, Zone L, Subzone E
Inorganic Detections for DPT Soil

Element	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)								
Aluminum (Al)	5/5	7350-9590	8546	100000	26600	0	560000 c	NO
Arsenic (As)	5/5	4.56-11.8	7.72	3.80	23.9	5	15	NO
Barium (Ba)	5/5	23.4-74.8	39.9	14000	130	0	820	NO
Beryllium (Be)	5/5	0.460-0.660	0.542	1.30	1.7	0	32	NO
Cadmium (Cd)	1/5	0.540	0.540	100	1.5	0	4	NO
Calcium (Ca)	5/5	1140-46300	16264	NA	NA	NA	NA	NO
Chromium (Cr)	5/5	10.4-25.8	18.3	1000	94.6	0	19	YES
Cobalt (Co)	5/5	1.37-4.23	2.71	12000	19.0	0	990 c	NO
Copper (Cu)	5/5	18.3-60.9	35.4	8200	66.0	0	5600 c	NO
Iron (Fe)	5/5	6210-13300	10390	61000	NA	0	NA	NO
Lead (Pb)	5/5	26.8-338	123.4	1300	265	0	400	NO
Magnesium (Mg)	5/5	621-5110	1854	NA	NA	NA	NA	NO
Manganese (Mn)	5/5	89.2-188	140.7	4700	302	0	480 c	NO
Mercury (Hg)	4/5	0.160-1.05	0.575	61.0	2.60	0	1	YES
Nickel (Ni)	5/5	4.33-18.3	9.46	4100	77.1	0	65	NO
Potassium (K)	5/5	399-1130	686	NA	NA	NA	NA	NO
Selenium (Se)	3/5	0.710-1.04	0.857	1000	1.7	0	2.6	NO
Sodium (Na)	5/5	221-645	400	NA	NA	NA	NA	NO
Thallium (Tl)	1/5	1.37	1.37	16.0	2.8	0	0.36	YES
Tin (Sn)	2/5	7.97-8.82	8.39	100000	59.4	0	5500 c	NO
Vanadium (V)	5/5	13.1-30.1	21.5	1400	94.3	0	3000	NO
Zinc (Zn)	5/5	36.9-345	159.4	61000	827	0	6200	NO

Notes:

- mg/kg = Milligrams per kilogram
- RBC = Risk-based concentration
- NA = Not applicable
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.20
AOC 504, Zone L, Subzone E, DPT Soil Sample Locations with
Metals Detections Exceeding RBCs and/or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Arsenic	504SP001E1	4.56	Y	N	3.80	15.0
	504SP002E1	7.91	Y	N		
	504SP003E1	7.06	Y	N		
	504SP01AE1	7.25	Y	N		
	504SP02AE1	11.8	Y	N		
Chromium	504SP003E1	25.8	N	Y	1000	19.0
	504SP02AE1	25.4	N	Y		
Mercury	504SP02AE1	1.05	N	Y	61.0	1
Thallium	504SP02AE1	1.37	N	Y	16.0	0.36

Notes:

- mg/kg = Milligrams per kilogram
- RBC = Risk-based concentration
- SSL = Soil screening level
- GW = Groundwater
- Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.21
AOC 504, Zone L, Subzone E
Organic Compounds Detected in Soil Borings

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Volatile Compounds (µg/kg)								
2-Butanone (MEK)	Upper	3/9	7.00-20.0	14.7	100000000	0	3900	NO
	Lower	1/8	14.0	14.0	NA	NA		
Carbon disulfide	Upper	2/9	2.00	2.00	NA	NA	16000	NO
Xylene (Total)	Upper	1/9	2.00	2.00	100000000	0	70000 c	NO
Semivolatile Compounds (µg/kg)								
Acenaphthene	Upper	2/9	43.0-155	99.0	12000000	0	290000	NO

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**Table 10.5.21
AOC 504, Zone L, Subzone E
Organic Compounds Detected in Soil Borings**

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Acenaphthylene	Upper	2/9	72.0-140	106	8200000	0	96000 c	NO
Anthracene	Upper	5/9	51.0-230	142.8	61000000	0	5900000	NO
	Lower	1/8	57.0	57.0	NA	NA		
B(a)P Equiv.	Upper	8/9	0.410-895	345	780	1	1600 c	NO
	Lower	3/8	14.2-271	122	NA	NA		
Benzo(a)anthracene	Upper	6/9	82.0-660	266.7	7800	0	800	NO
	Lower	3/8	54.0-210	111.3	NA	NA		
Benzo(a)pyrene	Upper	7/9	61.0-615	275.3	780	0	4000	NO
	Lower	2/8	66.0-220	143	NA	NA		
Benzo(b)fluoranthene	Upper	7/9	62.0-660	283.3	7800	0	2300	NO
	Lower	3/8	66.0-150	101.7	NA	NA		
Benzo(g,h,i)perylene	Upper	6/9	62.0-345	205.5	8200000	0	12000000 c	NO
	Lower	1/8	310	310	NA	NA		
Benzo(k)fluoranthene	Upper	8/9	41.0-620	243.6	78000	0	24000	NO
	Lower	3/8	51.0-110	74.0	NA	NA		
Benzyl alcohol	Upper	1/9	420	420	NA	NA	25000 c	NO
Butylbenzylphthalate	Upper	8/9	49.0-2200	389.5	NA	NA	930000	NO
	Lower	3/8	46.0-140	105.3	NA	NA		
Chrysene	Upper	7/9	51.0-680	283.6	780000	0	80000	NO
	Lower	3/8	62.0-330	174	NA	NA		
Di-n-butylphthalate	Upper	1/9	58.0	58.0	20000000	NA	2300000	NO
Dibenz(a,h)anthracene	Upper	3/9	100-130	115	780	0	800	NO
Dibenzofuran	Upper	1/9	49.0	49.0	820000	0	6800 c	NO
Fluoranthene	Upper	8/9	43.0-1700	500.6	8200000	0	2100000	NO
	Lower	4/8	73.0-260	145.8	NA	NA		
Fluorene	Upper	1/9	82.0	82.0	8200000	0	280000	NO

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Table 10.5.21
 AOC 504, Zone L, Subzone E
 Organic Compounds Detected in Soil Borings

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Indeno(1,2,3-cd)pyrene	Upper	6/9	51.0-315	176.3	7800	0	7000	NO
	Lower	1/8	140	140	NA	NA		
Phenanthrene	Upper	6/9	64.0-835	269.2	8200000	0	660000 c	NO
	Lower	3/8	53.0-160	104.3	NA	NA		
Pyrene	Upper	7/9	44.0-1350	512.0	6100000	0	2100000	NO
	Lower	4/8	68.0-1200	419.5	NA	NA		
bis(2-Ethylhexyl)phthalate (BEHP)	Upper	1/9	120	120	410000	0	1800000	NO
	Lower	1/8	460	460	NA	NA		
Chlorinated Pesticides (µg/kg)								
4,4'-DDD	Upper	4/9	6.20-26.5	16.4	24000	0	8000	NO
	Lower	2/8	25.0-97.0	61.0	NA	NA		
4,4'-DDE	Upper	3/9	3.10-19.5	10.9	17000	0	27000	NO
	Lower	2/8	5.10-110	57.6	NA	NA		
4,4'-DDT	Upper	1/9	23.0	23.0	17000	0	16000	NO
	Lower	2/8	3.60-38.0	20.8	NA	NA		
Dieldrin	Upper	1/9	5.10	5.10	360	0	2	YES
	Lower	1/8	5.40	5.40	NA	NA		
Endrin	Lower	1/8	3.90	3.90	NA	NA	500	NO
Endrin aldehyde	Upper	3/9	3.40-14.0	7.77	61000	0	500	NO
	Lower	1/8	3.70	3.70	NA	NA		
Heptachlor	Upper	1/9	2.10	2.10	1300	0	11000	NO
	Lower	1/8	9.40	9.40	NA	NA		
Heptachlor epoxide	Upper	1/9	1.80	1.80	630	0	330	NO
alpha-Chlordane	Upper	3/9	2.20-8.60	4.37	4400	0	5000	NO
	Lower	1/8	18.0	18.0	NA	NA		
gamma-BHC (Lindane)	Lower	1/8	7.20	7.20	NA	NA	4.5	YES

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Table 10.5.21
 AOC 504, Zone L, Subzone E
 Organic Compounds Detected in Soil Borings

Compound	Sampling Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
gamma-Chlordane	Upper	5/9	2.00-12.0	6.37	4400	0	5000	NO
	Lower	1/8	150	150	NA	NA		
Polychlorinated biphenyls (µg/kg)								
Aroclor-1260	Upper	1/9	218.5	218.5	740	0	1000	NO

Notes:

- µg/kg = Micrograms per kilogram
- RBC = Risk-based concentration
- NA = Not applicable
- GW = Groundwater
- SSL = Soil screening level
- c = Calculated SSL
- Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Table 10.5.22
 AOC 504, Zone L, Subzone E
 Inorganic Detections for Soil Borings

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Inorganic Elements (mg/kg)									
Cyanide (CN)	Upper	7/9	0.110-0.410	0.201	4100	0.50	0		
	Lower	6/8	0.140-1.30	0.363	NA	NA	NA	20	NO
Aluminum (Al)	Upper	9/9	4380-11600	7502	100000	26600	0	560000	NO
	Lower	8/8	3900-18600	9838	NA	41100	NA	c	
Antimony (Sb)	Upper	3/9	0.440-4.90	2.01	82.0	1.77	0		
	Lower	1/8	0.390	0.390	NA	1.60	NA	2.7	YES
Arsenic (As)	Upper	9/9	3.70-43.5	13.5	3.80	23.9	8		
	Lower	8/8	4.90-20.95	11.0	NA	19.9	NA	15	YES
Barium (Ba)	Upper	9/9	15.5-46.3	24.1	14000	130	0		
	Lower	8/8	9.80-31.4	19.9	NA	94.1	NA	820	NO

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**Table 10.5.22
AOC 504, Zone L, Subzone E
Inorganic Detections for Soil Borings**

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Beryllium (Be)	Upper	2/9	0.260-0.270	0.265	1.30	1.70	0	32	NO
	Lower	4/8	0.500-1.09	0.768	NA	2.71	NA		
Cadmium (Cd)	Upper	9/9	0.110-0.550	0.301	100	1.50	0	4	NO
	Lower	7/8	0.080-0.580	0.369	NA	0.96	NA		
Calcium (Ca)	Upper	9/9	3120-83800	22981	NA	NA	NA	NA	NO
	Lower	8/8	2780-202000	53282	NA	NA	NA		
Chromium (Cr)	Upper	9/9	18.2-44.9	29.7	1000	94.6	0	19	YES
	Lower	8/8	16.2-37.0	28.5	NA	75.2	NA		
Cobalt (Co)	Upper	9/9	0.650-8.80	3.59	12000	19	0	990 c	NO
	Lower	8/8	1.00-5.90	3.15	NA	14.9	NA		
Copper (Cu)	Upper	9/9	6.40-88.9	24.6	8200	66	0	5600 c	NO
	Lower	7/8	6.20-45.9	18.2	NA	152	NA		
Iron (Fe)	Upper	9/9	3610-22300	11197	61000	NA	0	NA	NO
	Lower	8/8	4090-23900	14276	NA	NA	NA		
Lead (Pb)	Upper	9/9	14.65-96.8	49.6	1300	265	0	400	NO
	Lower	8/8	7.40-64.3	28.7	NA	173	NA		
Magnesium (Mg)	Upper	9/9	382.5-2250	1152.1	NA	NA	NA	NA	NO
	Lower	8/8	1240-15100	4344	NA	NA	NA		
Manganese (Mn)	Upper	9/9	29.05-174	94.8	4700	302	0	480 c	NO
	Lower	8/8	31.6-346	197.3	NA	881	NA		
Mercury (Hg)	Upper	6/9	0.050-5.10	0.963	61.0	2.60	0	1	YES
	Lower	4/8	0.080-0.840	0.385	NA	1.59	NA		
Nickel (Ni)	Upper	9/9	3.00-16.3	7.97	4100	77.1	0	65	NO
	Lower	8/8	3.10-13.2	9.24	NA	57.0	NA		
Potassium (K)	Upper	9/9	222-1290	539	NA	NA	NA	NA	NO
	Lower	8/8	544-2015	1134	NA	NA	NA		

Table 10.5.22
AOC 504, Zone L, Subzone E
Inorganic Detections for Soil Borings

Element	Sample Interval	Freq. of Detection	Range of Detected Conc.	Mean of Detected Conc.	Industrial RBC	Reference Conc.	Number of Samples Exceeding RBC	Soil to GW SSL	Leaching Potential
Selenium (Se)	Upper	8/9	0.270-0.690	0.449	1000	1.70	0	2.6	NO
	Lower	8/8	0.460-1.40	0.848	NA	2.40	NA		
Sodium (Na)	Upper	9/9	201.5-998	417.1	NA	NA	NA	NA	NO
	Lower	8/8	512-1795	901.6	NA	NA	NA		
Tin (Sn)	Upper	9/9	1.35-10.1	3.00	100000	59.4	0	5500 ^c	NO
	Lower	8/8	1.10-4.70	1.94	NA	9.23	NA		
Vanadium (V)	Upper	9/9	6.90-46.8	19.6	1400	94.3	0	3000	NO
	Lower	8/8	12.5-52.8	30.6	NA	155	NA		
Zinc (Zn)	Upper	9/9	21.15-231	101.3	61000	827	0	6200	NO
	Lower	8/8	19.0-179	66.9	NA	886	NA		

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 NA = Not applicable
 GW = Groundwater
 SSL = Soil screening level
 c = Calculated SSL
 Soil to GW = Generic SSLs based on DAF = 10, adapted from *USEPA Soil Screening Guidance: Technical Background Document*, May 1996 (first preference), or calculated using values from Table 6.2 in Zone E RFI Report

Semivolatile Organic Compounds Detected in Soil Borings

None of the detected concentrations exceeded the RBC or SSL.

Chlorinated Pesticides Detected in Soil Borings

Dieldrin, found in subsurface soil sample 504SB003E2, exceeded its SSL of 2.00 with a concentration of 5.40 µg/kg. Gamma-BHC exceeded its SSL of 4.5 µg/kg at location 504SB003E2 with a detection of 7.20 µg/kg.

Polychlorinated Biphenyls Detected in Soil Borings

None of the detected concentrations exceeded the RBC or SSL.

Metals/Cyanide Detected in Soil Borings

Detected concentrations of arsenic exceeded the RBC in eight of the nine surface samples. All eight detected concentrations of chromium in subsurface soil exceeded the SSL. Sample locations are summarized in Table 10.5.23.

Sample locations with detected concentrations of analytes that exceed either RBC, or SSL, or MCL values are shown in Figures 10.5.25 through 10.5.84.

Table 10.5.23
AOC 504, Zone L, Subzone E, Soil Boring Sample Locations with
Metals Detections Exceeding RBCs or SSLs

Metal	Sample ID	Concentration Detected (mg/kg)	RBC Exceeded (Y/N)	SSL Exceeded (Y/N)	RBC (mg/kg)	SSL (mg/kg)
Arsenic	504SB001E1	4.60	Y	N	3.80	15
	504SB002E1	43.5	Y	N		
	504SB003E1	17.3	Y	N		
	504SB003E2	17.6	N	Y		
	504SB004E1	15.2	Y	N		
	504SB005E1	14.9	Y	N		
	504SB005E2	20.95	N	Y		
	504SB006E1	5.70	Y	N		
	504SB007E1	12.6	Y	N		
504SB009E1	4.10	Y	N			
Chromium	504SB002E2	28.20	N	Y	1000	19.00
	504SB003E2	37.00	N	Y		
	504SB004E2	22.50	N	Y		
	504SB005E2	34.95	N	Y		
	504SB006E2	28.30	N	Y		
	504SB007E2	28.50	N	Y		
	504SB008E2	32.70	N	Y		
504SB009E2	16.20	N	Y			

Notes:
 mg/kg = Milligrams per kilogram
 RBC = Risk-based concentration
 SSL = Soil screening level

10.5.4 Fate and Transport Assessment for SWMU 37 and AOCs 504, 699 in Subzone E

Section 10.5 contains short descriptions of the portions of SWMU 37 and AOCs 504 and 699 within Subzone E. Environmental media sampled as part of the RFI for these sites include surface soil, subsurface soil (soil borings and DPT samples), and shallow groundwater (monitoring wells and DPT samples). Potential constituent migration pathways investigated for SWMU 37 and AOCs 504 and 699 include soil to groundwater and groundwater to surface water. Soil to air and soil to sediment cross media fate and transport were determined not to be a concern.

The fate and transport screening comparison for SWMU 37, AOC 504, and AOC 699 soil and groundwater samples included referencing of previous Zone RFI Reports when applicable. Contaminants of potential concern were identified for each sample media and sampling method in Section 10.5. The Zone E RFI Report was consulted to identify any sites within the subzone E that are associated geographically with the Zone L sample points. Analytical results from samples with overlapping sites were compared to data generated during the Zone E RFI. If concentrations at Zone L sample points associated with overlapping sites were higher than those of the referenced Zone E RFI Report or if new fate and transport COPCs were identified, further evaluation will be deferred to the Zone E RFI and included as an addendum. If Zone L sample concentrations were less than or equal to those in the Zone E RFI Report, it was assumed that the Zone L fate and transport conclusions would be similar to those of the Zone E RFI and no further evaluation is needed. Zone L sampling locations that are not associated with any overlapping sites are summarized in the fate and transport COPC tables and fate and transport evaluations provided in the following sections.

10.5.4.1 Soil to Groundwater Cross-Media Transport

SWMU 37

In Section 10.5, Tables 10.5.1, 10.5.2, 10.5.7, and 10.5.9 compare maximum detected organic and inorganic constituent concentrations in conventional and DPT soil samples from SWMU 37

to SSLs considered protective of groundwater. To provide a conservative screen, generic soil screening levels were used; leachate entering the aquifer was assumed to be diluted by a ratio of 10:1, with no attenuation of constituents in soil (DAF=10). Background reference values for inorganics were noted but did not enter into the screening process.

The screening comparisons in the four tables mentioned above identify the constituents with the potential to impact groundwater quality. Table 10.5.24 provides a summary of SWMU 37 soil samples reporting SSL exceedances, along with the names of associated Zone E sites overlapping the areas where some of these soil samples were collected. For samples with no overlapping Zone E sites, fate and transport concerns are evaluated below. In these evaluations, shallow groundwater monitoring wells within 200 feet downgradient of Zone L sampling locations were used for comparing local groundwater quality to soil concentrations.

Arsenic was detected in 48 of 51 DPT soil samples and exceeded its soil to groundwater SSL of 15 mg/kg at four locations – 037SP009 (16 mg/kg), 037SP011 (20.3 mg/kg), 037SP015 (17.3 mg/kg), and 037SP051 (18.4 mg/kg). No shallow groundwater monitoring wells exist downgradient from any of these four DPT locations from which to evaluate the soil to groundwater pathway; however, all four arsenic detections are less than the Zone E arsenic background reference concentration of 23.9 mg/kg.

Thallium was detected in two of 12 soil boring samples and two of 51 DPT soil samples, and exceeded its soil to groundwater SSL of 0.36 mg/kg at one upper-interval soil boring sample, 037SB001 (0.74 mg/kg), and both DPT soil samples, 037SP015 (1.59 mg/kg) and 037SP011 (2.03 mg/kg), 037SB001 is associated with a Zone L shallow well location, 037001, which had no thallium detected in first round groundwater samples, indicating no leaching of thallium from soil to groundwater has occurred. No shallow groundwater monitoring wells exist within 200 feet

Table 10.5.24
SWMU 37, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
Soil Borings				
037SB001	None	Thallium	Yes	None
037SB005	AOCs 540,541,542	Antimony Dieldrin Mercury Nickel	Yes Yes Yes No ^a	Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1*
037SB006	AOCs 540,541,542	Antimony Mercury	Yes Yes	Table 10.4.5.1* Table 10.4.5.1*
037SB007	AOCs 540,541,542	Arsenic Antimony Mercury Dieldrin	Yes Yes Yes Yes	Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1*
037SB008	AOCs 540,541,542	Antimony Mercury	Yes Yes	Table 10.4.5.1* Table 10.4.5.1*
037SB009	AOCs 540,541,542	Antimony Mercury Dieldrin Thallium Benzo(a)anthracene Benzo(a)pyrene Benzo(b)fluoranthrene Benzo(k)fluoranthrene Dibenzo(a,h)anthracene Indeno(1,2,3 cd)pyrene	Yes Yes Yes Yes Yes Yes Yes Yes Yes Yes	Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1*
037SB010	AOCs 540,541,542	Arsenic Antimony Mercury Dieldrin	Yes Yes Yes Yes	Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1*
037SB011	AOCs 540,541,542	Antimony Mercury Dieldrin	Yes Yes Yes	Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1*

Table 10.5.24
SWMU 37, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
037SB012	AOCs 540,541,542	Antimony	Yes	Table 10.4.5.1*
		Chromium	Yes	Table 10.4.5.1*
		Mercury	Yes	Table 10.4.5.1*
		Dieldrin	Yes	Table 10.4.5.1*
		Benzo(a)anthracene	Yes	Table 10.4.5.1*
		Benzo(a)pyrene	Yes	Table 10.4.5.1*
		Benzo(b)fluorathrene	Yes	Table 10.4.5.1*
		Benzo(k)fluorathrene	Yes	Table 10.4.5.1*
		Dibenzo(a,h,)anthracene	Yes	Table 10.4.5.1*
Indeno(1,2,3 cd)pyrene	Yes	Table 10.4.5.1*		
DPT Soil				
037SP003	AOCs 598,599	Lead	Yes	Table 10.47.7.1*
		Mercury	Yes	Table 10.47.7.1*
037SP004	AOCs 598,599	Antimony	Yes	Table 10.47.7.1*
		Lead	Yes	Table 10.47.7.1*
		Mercury	Yes	Table 10.47.7.1*
037SP005	AOCs 598,599	Mercury	Yes	Table 10.47.7.1*
037SP009	None	Arsenic	Yes	None
037SP011	None	Arsenic	Yes	None
		Thallium	Yes	None
037SP015	None	Arsenic	Yes	None
		Thallium	Yes	None
037SP018	SWMU 102	Arsenic	No ^a	Table 10.14.7.1*
		Mercury	No ^a	Table 10.14.7.1*
037SP036	SWMU 23, AOC 543; SWMU65, AOC 544	Antimony	No ^a ; Yes	Tbls 10.4.5.1;10.6.9.1*
037SP042	SWMU 65; AOC 550	Antimony	Yes; Yes	Tbls10.6.9.1;10.24.5.1*
		Mercury	Yes; Yes	Tbls10.6.9.1;10.24.5.1*
037SP051	None	Arsenic	Yes	None
		Mercury	Yes	None
037SP052	None	Mercury	Yes	None
037SP053	None	Antimony	Yes	None
		Mercury	Yes	None

Table 10.5.24
SWMU 37, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
037SP055	None	Antimony Cadmium Mercury	Yes Yes Yes	None None None
Groundwater				
037GW001	None	Arsenic Copper	Yes Yes	None None
037GW002	AOC 542	Antimony Arsenic	Yes Yes	Table 10.4.5.1* Table 10.4.5.1*
DPT Groundwater				
037GP001	AOC 559	cis-1,2 -Dichloroethene	Yes	Table 10.29.7.1*
037GP036	SWMU 172	Trichloroethene	Yes	Table 10.11.9.1*
037GP045	AOC 563	Trichloroethene	Yes	Table 10.31.5.1*
037GP052	AOC 559	Trichloroethene	Yes	Table 10.29.7.1*
037GP055	None	Chloroform	Yes	None
037GP057	AOCs 538,539	1,1-Dichloroethene Trichloroethene	Yes Yes	Table 10.23.11.1* Table 10.23.11.1*
037GP058	AOCs 538,539	1,1-Dichloroethene Trichloroethene	Yes Yes	Table 10.23.11.1* Table 10.23.11.1*
037GP068	SWMU 23, AOC 543; SWMU 65	Trichloroethene	Yes;Yes	TbIs 10.4.5.1; 10.6.9.1*
037GP071	AOC 526	Chloroform	Yes	Table 10.5.5.1*
037GP080	SWMU 25	Chloroform Tetrachloroethene	Yes Yes	Table 10.3.12.1* Table 10.3.12.1*
037GP081	SWMU 25	Chloroform Tetrachloroethene	Yes Yes	Table 10.3.12.1* Table 10.3.12.1*
037GP082	SWMU 25; AOC 549	Tetrachloroethene	Yes;Yes	TbIs 10.3.12.1;10.8.5.1*
037GP089	AOC 551	Tetrachloroethene Trichloroethene	Yes Yes	Table 10.25.5.1* Table 10.25.5.1*
037GP092	AOC 551	Chloroform	Yes	Table 10.25.5.1*
037GP093	AOC 551	Chloroform	Yes	Table 10.25.5.1*

Table 10.5.24
SWMU 37, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
037GP094	SWMU 25	Tetrachloroethene	Yes	Table 10.3.12.1*
		Trichloroethene	Yes	Table 10.3.12.1*
		cis-1,2-Dichloroethene	Yes	Table 10.3.12.1*
037GP095	SWMU 25	Chloroform	Yes	Table 10.3.12.1*
		Tetrachloroethene	Yes	Table 10.3.12.1*
037GP096	SWMU 25	Chloroform	Yes	Table 10.3.12.1*

Notes:

* Zone E RFI Report (EnSafe, 1997)

^a Zone L concentrations are within range of those in reference document.

downgradient of the two DPT soil samples from which to evaluate the soil to groundwater pathway; however, both thallium detections are less than the Zone E thallium background reference concentration of 2.8 mg/kg.

Four DPT sample locations – 037SP051, 037SP052, 037SP053, and 037SP055 – are located around Building 77, which is situated between Drydocks 1 and 2. Mercury, antimony, and cadmium were detected in DPT soil samples at this location at concentrations exceeding their respective soil to groundwater SSLs. Mercury was detected in four samples – 037SP051 (1.65 mg/kg), 037SP052 (3.01 mg/kg), 037SP053 (4.74 mg/kg), and 037SP055 (15.10 mg/kg) – which each exceeded both its SSL of 1.00 mg/kg and Zone E background concentration in subsurface soil of 1.59 mg/kg. Antimony exceeded its soil to groundwater SSL of 2.70 mg/kg and Zone E background concentration in subsurface soil (1.60 mg/kg) in two DPT soil samples, 037SP053 (7.99 mg/kg) and 037SP055 (3.41 mg/kg). Cadmium was detected at 5.36 mg/kg in one sample, 037SP055, which exceeded its soil to groundwater SSL of 4.00 mg/kg and its Zone E background concentration in subsurface soil of 0.96 mg/kg. No shallow groundwater monitoring wells exist within 200 feet downgradient from any of these DPT

locations. Groundwater flow in this area of Zone E is highly influenced by drains and fill material associated with drydock construction. As a result, the soil to groundwater pathway cannot be evaluated.

AOC 504

In Section 10.5, Tables 10.5.19, 10.5.21 and 10.5.22 compare maximum detected organic and inorganic constituent concentrations in soil borings and DPT soil samples from AOC 504 to SSLs considered protective of groundwater, using the conventions described above. Table 10.5.25 provides a summary of AOC 504 soil samples reporting SSL exceedances, along with the names of any overlapping Zone E sites. As presented in Table 10.5.25, there are no AOC 504 soil constituents exceeding soil to groundwater SSLs collected from locations not associated with Zone E sites.

AOC 699

In Section 10.5, Tables 10.5.13 and 10.5.14 compare maximum detected organic and inorganic constituent concentrations in DPT soil samples from AOC 699 to SSLs considered protective of groundwater, using the conventions described above. The screening comparisons in these two tables identify the constituents with the potential to impact groundwater quality. Table 10.5.26 provides a summary of AOC 699 DPT soil samples reporting SSL exceedances, along with the names of any overlapping Zone E sites. Fate and transport concerns at Zone L sample locations not associated with any overlapping Zone E sites are evaluated below. In these evaluations, shallow groundwater monitoring wells within 200 feet downgradient of Zone L sampling locations were used for comparing local groundwater quality to soil concentrations.

Arsenic was detected in 75 of 78 DPT soil samples and exceeded its soil to groundwater SSL of 15 mg/kg at two locations, 699SP003 (19.4 mg/kg) and 699SP004 (19.9 mg/kg). The nearest shallow monitoring well to 699SP003, 100001, is 200 feet away and had a range of arsenic

concentrations between 12.0 and 22.3 $\mu\text{g/l}$ during its quarterly sampling history. The Zone E background concentration for arsenic in shallow groundwater of 18.7 $\mu\text{g/l}$ was exceeded only during the second quarter at 22.3 $\mu\text{g/l}$. There are no downgradient shallow monitoring wells within 200 feet of 699SP004, so the soil to groundwater pathway cannot be evaluated. However, the arsenic concentration in soil at 699SP004 is equal to the Zone E arsenic background concentration in subsurface soil of 19.9 mg/kg

Table 10.5.25
AOC 504, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
Soil Borings				
504SB001	SWMU 175, AOCs 613,615	Dieldrin	Yes	Table 10.7.12*
		Chromium	No ^a	Table 10.7.12*
504SB002	SWMU 175, AOCs 613,615	Antimony	Yes	Table 10.7.12*
		Arsenic	No ^a	Table 10.7.12*
		Chromium	No ^a	Table 10.7.12*
504SB003	SWMU 175, AOCs 613,615	Dieldrin	Yes	Table 10.7.12*
		gamma -BHC	Yes	Table 10.7.12*
		Arsenic	No ^a	Table 10.7.12*
		Chromium	No ^a	Table 10.7.12*
504SB004	SWMU 175, AOCs 613, 615	Arsenic	No ^a	Table 10.7.12*
		Chromium	No ^a	Table 10.7.12*
504SB005	SWMU 175, AOCs 613,615	Arsenic	No ^a	Table 10.7.12*
		Mercury	Yes	Table 10.7.12*
504SB006	SWMU 102	Chromium	No ^a	Table 10.14.7.1 ^f
504SB007	SWMU 102	Chromium	No ^a	Table 10.14.7.1 ^f
504SB008	SWMU 102	Chromium	No ^a	Table 10.14.7.1 ^f
504SB009	SWMU 102	Chromium	No ^a	Table 10.14.7.1 ^f
DPT Soil				
504SP02A	AOC 605	Chromium	No ^a	Table 10.1.5.1 ^f
		Mercury	No ^a	Table 10.1.5.1 ^f
		Thallium	Yes	Table 10.1.5.1 ^f

Table 10.5.25
AOC 504, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
504SP003	SWMU 102	Chromium	No ^a	Table 10.14.7.1 ^f

Notes:

*Zone F RFI Report (EnSafe, 1997)

^fZone E RFI Report (EnSafe, 1997)

^aZone L concentrations are within range of those in reference document.

Table 10.5.26
AOC 699, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
DPT Soil				
699SP001	SWMU 18, AOC 605	Chromium Manganese	Yes No ^b	Table 10.1.5.1* Table 10.1.5.1*
699SP003	None	Arsenic Chromium Thallium	Yes Yes Yes	None None None
699SP004	None	Arsenic Chromium	Yes Yes	None None
699SP007	SWMU 102	Chromium Selenium	Yes Yes	Table 10.14.7.1* Table 10.14.7.1*
699SP008	SWMU 100	Chromium Selenium	Yes No ^a	Table 10.13.5.1* Table 10.13.5.1*
699SP009	SWMU 100	Chromium Tetrachloroethene	Yes Yes	Table 10.13.5.1* Table 10.13.5.1*
699SP010	None	Chromium Thallium	Yes Yes	None None
699SP011	None	Chromium	Yes	None
699SP012	None	Chromium Thallium	Yes Yes	None None

Table 10.5.26
AOC 699, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
699SP013	SWMU 100	Chromium Nickel	Yes Yes	Table 10.13.5.1* Table 10.13.5.1*
699SP016	None	Chromium Thallium	Yes Yes	None None
699SP018	AOC 586	Chromium	Yes	Table 10.42.5.1*
699SP020	SWMU 145	Chromium	Yes	Table 10.16.7.1*
699SP021	SWMU 145	Chromium	Yes	Table 10.16.7.1*
699SP022	SWMU 145	Chromium	Yes	Table 10.16.7.1*
699SP026	SWMU 145	Chromium	Yes	Table 10.16.7.1*
699SP027	SWMU 145	Chromium Mercury	Yes Yes	Table 10.16.7.1* Table 10.16.7.1*
699SP028	SWMU 145	Chromium	Yes	Table 10.16.7.1*
699SP029	SWMU 145	Arsenic Chromium Thallium	Yes Yes Yes	Table 10.16.7.1* Table 10.16.7.1* Table 10.16.7.1*
699SP030	SWMU 145	Chromium	Yes	Table 10.16.7.1*
699SP031	SWMU 97	Chromium	Yes	Table 10.12.5.1*
699SP032	SWMU 109	Chromium	Yes	Table 10.3.12 ^f
699SP033	None	Chromium	Yes	None
699SP035	SWMU 145	Arsenic Chromium Thallium	Yes Yes Yes	Table 10.16.7.1* Table 10.16.7.1* Table 10.16.7.1*
699SP042	SWMU 83; AOCs 574, 576	Antimony Chromium	Yes; Yes Yes; Yes	Tables 10.10.9.1; 10.38.5.1* Tables 10.10.9.1; 10.38.5.1*
699SP42A	SWMU 145	Chromium	Yes	Table 10.16.7.1*
699SP046	None	Mercury	Yes	None
699SP048	SWMU 87; AOC 574	Antimony	Yes; Yes	Tables 10.11.9.1; 10.10.9.1*
699SP049	AOC 563	Chromium	Yes	Tables 10.31.5.1*

Table 10.5.26
AOC 699, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
699SP050	AOC 563	Chromium Thallium	Yes Yes	Tables 10.31.5.1* Tables 10.31.5.1*
699SP052	AOC 572	Arsenic	Yes	Table 10.36.7.1*
699SP053	AOC 572	Silver Thallium	Yes Yes	Table 10.36.7.1* Table 10.36.7.1*
699SP057	AOCs 569,570,578	Antimony Arsenic Chromium	Yes No ^a Yes	Table 10.34.5.1* Table 10.34.5.1* Table 10.34.5.1*
699SP062	SWMU 25; AOC 548	Chromium	No; Yes	Table 10.3.12.1; 10.8.5.1*
699SP064	SWMU 70	Chromium	Yes	Table 10.8.5.1*
699SP067	AOC 530	Mercury	No ^a	Table 10.21.5.1*
699SP068	SWMU 65, AOC 544	Antimony Chromium Lead Nickel Thallium	Yes Yes Yes Yes Yes	Table 10.6.9.1* Table 10.6.9.1* Table 10.6.9.1* Table 10.6.9.1* Table 10.6.9.1*
699SP074	AOC 543	Chromium	Yes	Table 10.4.5.1*
699SP075	AOC 543	Chromium	Yes	Table 10.4.5.1*
DPT Groundwater				
699GP006	AOC 586	Benzene Ethylbenzene	Yes Yes	Table 10.42.5.1* Table 10.42.5.1*
699GP017	AOC 563	Ethylbenzene	Yes	Table 10.31.5.1*
699GP022	AOC 563	Trichloroethene	Yes	Table 10.31.5.1*
699GP023	AOC 563	Trichloroethene	Yes	Table 10.31.5.1*
699GP032	AOC 563	Tetrachloroethene	Yes	Table 10.31.5.1*
699GP034	SWMU 70	Chloroform	Yes	Table 10.8.5.1*
699GP058	AOCs 574; 576	Trichloroethene Tetrachloroethene cis-1,2-Dichloroethene	Yes; Yes Yes; Yes Yes; Yes	Tables 10.10.9.1; 10.38.5.1* Tables 10.10.9.1; 10.38.5.1* Tables 10.10.9.1; 10.38.5.1*
699GP067	AOC 539	1,1-Dichloroethene	Yes	Table 10.23.11.1*

Table 10.5.26
AOC 699, Zone L, Subzone E
Fate and Transport COPCs

Exceedance Location	Overlapping Site	Fate and Transport COPCs	COPCs to be further Evaluated?	Reference Document
699GP068	AOC 539	1,1-Dichloroethene	Yes	Table 10.23.11.1*
699GP071	SWMU 70	Chloroform	Yes	Table 10.8.5.1*
699GP079	SWMUs 23,63	Trichloroethene cis-1,2-Dichloroethene	Yes Yes	Table 10.4.5.1* Table 10.4.5.1*
699GP082	SWMUs 23,63	Bromodichloromethane Chloroform Dibromochloromethane	Yes Yes Yes	Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1*
699GP82A	SWMUs 23,63	Bromodichloromethane Chloroform Dibromochloromethane	Yes Yes Yes	Table 10.4.5.1* Table 10.4.5.1* Table 10.4.5.1*
699GP085	SWMU 65, AOC 544	Trichloroethene	Yes	Table 10.6.9.1*
699GP086	SWMU 25	Bromodichloromethane Chloroform Tetrachloroethene	Yes Yes Yes	Table 10.3.12.1* Table 10.3.12.1* Table 10.3.12.1*
699GP087	SWMU 25; AOC 549	Benzene Chlorobenzene	Yes; Yes Yes; Yes	Tables 10.3.12.1; 10.8.5.1* Tables 10.3.12.1; 10.8.5.1*
699GP088	SWMU 25; AOC 549	Benzene Chlorobenzene	Yes; Yes Yes; Yes	Tables 10.3.12.1; 10.8.5.1* Tables 10.3.12.1; 10.8.5.1*
699GP089	SWMU 25; AOC 549	Chlorobenzene	Yes; Yes	Tables 10.3.12.1; 10.8.5.1*
699GP091	SWMU 25	Tetrachloroethene cis-1,2-Dichloroethene	Yes Yes	Table 10.3.12.1* Table 10.3.12.1*
699GP092	SWMU 25	Bromodichloromethane Chloroform	Yes Yes	Table 10.3.12.1* Table 10.3.12.1*
699GP093	SWMU 25; AOC 551	Chloroform Tetrachloroethene	Yes; Yes Yes; Yes	Tables 10.3.12.1; 10.25.5.1* Tables 10.3.12.1; 10.25.5.1*
699GP094	SWMU 25; AOC 551	Tetrachloroethene Trichloroethene Vinyl Chloride cis-1,2-Dichloroethene	Yes; Yes Yes; Yes Yes; Yes Yes; Yes	Tables 10.3.12.1; 10.25.5.1* Tables 10.3.12.1; 10.25.5.1* Tables 10.3.12.1; 10.25.5.1* Tables 10.3.12.1; 10.25.5.1*

Notes:

* Zone E RFI Report (EnSafe, 1997)

[†] Zone F RFI Report (EnSafe, 1997)

[‡] Zone L concentrations are within range of those in reference document.

[§] Zone L concentrations are below corresponding regulatory limits.

Chromium was detected in all 78 DPT soil samples and exceeded its soil to groundwater SSL of 19 mg/kg at seven locations – 699SP003 (50.2 mg/kg), 699SP004 (34.3 mg/kg), 699SP010 (20.2 mg/kg), 699SP011 (24.9 mg/kg), 699SP012 (22.9 mg/kg), 699SP016 (34.5 mg/kg), and 699SP033 (28.5 mg/kg) – none of which are associated with any overlapping Zone E sites. Five samples are located in areas with no downgradient monitoring wells within 200 feet and as a result, the soil to groundwater pathway cannot be evaluated. However, the chromium concentrations for these five locations (699SP004, 699SP010, 699SP011, 699SP012, and 699SP016) are significantly less than the Zone E chromium background concentration for subsurface soil of 75.2 mg/kg. Shallow well 100001 is the nearest downgradient well from 699SP003 and is approximately 200 feet away. Chromium concentrations from the quarterly sampling history at 100001 ranged between non-detect (quarters 1 and 4) to 0.89 µg/l (quarter 2). Shallow well GDE009 is the nearest downgradient well from 699SP033 (180 feet). Quarterly sampling results for chromium in this well ranged between non-detect (quarters 1 and 4) and 2.7 µg/l (quarter 2). These quarterly chromium concentrations at 100001 and GDE009 are well below the Zone E chromium background concentration for shallow groundwater 12.3 µg/l, indicating incomplete soil to groundwater pathways at both of these locations.

Mercury was detected in 56 of 78 DPT soil samples and exceeded its soil to groundwater SSL of 1.0 mg/kg at one location, 699SP046 (1.59 mg/kg). There are no downgradient shallow monitoring wells within 200 feet of this DPT sampling point; therefore, the soil to groundwater pathway cannot be evaluated. However, this mercury concentration is equal to the Zone E mercury background concentration of 1.59 mg/kg.

10.5.4.2 Groundwater to Surface Water Cross-Media Transport

SWMU 37

In Section 10.5, Tables 10.5.4, 10.5.6, 10.5.11 and 10.5.12 compare maximum detected organic and inorganic constituent concentrations in DPT and monitoring well groundwater samples from

SWMU 37 to RBCs, and to chronic ambient saltwater quality criteria values for the protection of aquatic life (saltwater surface water chronic screening values). For inorganics, maximum concentrations in groundwater are compared to the greater of (a) RBCs, or (b) background reference concentrations for groundwater, as well as to the saltwater surface water chronic values. To provide a conservative screen, no attenuation or dilution of constituents in groundwater is assumed before comparison to the relevant standards.

The screening comparisons in the four tables mentioned above identify the constituents with the potential to impact downgradient groundwater quality and surface water quality. Table 10.5.24 provides a summary of SWMU 37 groundwater samples reporting exceedances of RBCs or surface water screening levels, along with the names of overlapping Zone E sites. Fate and transport concerns at Zone L groundwater sampling locations not associated with any overlapping Zone E sites are evaluated below. In these evaluations, shallow groundwater monitoring wells within 200 feet of the Zone L sampling location were used for comparison since the Zone L sampling point may be downgradient or cross-gradient from similar groundwater concentrations.

A first quarter groundwater sample from shallow well 037E01 revealed concentrations of arsenic and copper at concentrations that are great enough to be potential migration concerns. Arsenic was detected at a concentration of 6.9 $\mu\text{g/l}$ (RBC = 0.045 $\mu\text{g/l}$), but is was over 2.5 times less than its Zone E background concentration for shallow groundwater of 18.7 $\mu\text{g/l}$. Copper was detected at 3.6 $\mu\text{g/l}$ (RBC = 150 $\mu\text{g/l}$), which exceeds the its Zone E background concentration in shallow groundwater of 2.5 $\mu\text{g/l}$. The nearest downgradient shallow groundwater monitoring well, 097001, is approximately 200 feet away. Arsenic concentrations in this well have declined from a second quarter maximum of 38.7 $\mu\text{g/l}$ to non-detect in the fourth quarter, indicating that while a groundwater to surface water pathway has been completed, it has been diminishing over time. Copper concentrations in 097001 have increased from non-detect in the first three quarters to an estimated fourth quarter value of 2.9 $\mu\text{g/l}$. Although the copper concentration in 037001E1

is nearly 42 times lower than its RBC, it exceeds its saltwater surface water chronic value of 2.9 $\mu\text{g}/\text{l}$, indicating that the potential for groundwater to surface water cross media transport. The Cooper River is approximately 330 feet from 097001 and approximately 530 feet from 037E01.

Chloroform was detected in nine of 105 DPT groundwater samples and exceeded its RBC of 0.15 $\mu\text{g}/\text{l}$ at one DPT location (037GP055) that was not associated with any overlapping Zone E sites. There are four shallow monitoring wells within 200 feet of 037GP055 that lie upgradient: 070001, 070002, 549003, and 549002. No chloroform was detected at any of these well locations during their quarterly sampling history, indicating that chloroform at 037GP055 did not originate from an upgradient location. There is one downgradient well, 539001, that lies within 200 feet of 037GP055. Chloroform was never detected in any of the quarterly groundwater samples of this well during the Zone E RFI, indicating that chloroform was encountered at a single location.

AOC 699

In Section 10.5, Tables 10.5.16 and 10.5.17 compare maximum detected organic and inorganic constituent concentrations in DPT groundwater samples from AOC 699 to RBCs, and to chronic ambient saltwater quality criteria values for the protection of aquatic life (saltwater surface water chronic screening values) using the conventions described in the previous subsection. Table 10.5.26 provides a summary of AOC 699 groundwater samples reporting exceedances of RBCs or surface water screening levels, along with the names of overlapping Zone E sites. For Subzone E, all AOC 699 DPT groundwater samples are associated with overlapping Zone E sites.

10.5.4.3 Fate and Transport Summary

Six inorganics – thallium, arsenic, chromium, mercury, cadmium, and antimony – were reported at concentrations exceeding their soil to groundwater SSLs from Subzone E soil samples at locations not associated with existing Zone E sites. The inorganics were detected at several locations where no downgradient groundwater monitoring wells existed at a sufficient distance to

evaluate the soil to groundwater pathway; however, at most of these locations, the soil concentrations of each constituent was equal to or less than its respective Zone E background concentration for subsurface soil indicating that if any soil to groundwater pathway existed, it would still be protective of groundwater quality.

Four DPT soil samples, located between Drydocks 1 and 2 near Building 77, revealed concentrations of mercury, antimony, cadmium, and arsenic greater than their respective soil to groundwater SSLs and background concentrations in subsurface soil. No groundwater data is available in this locale due to the absence of any nearby monitoring wells. Groundwater flow in this region is expected to be complex due to the prevalence of drains and fill material associated with drydock construction.

Chloroform was the only organic compound detected in Zone L groundwater samples exceeding its RBC. No chloroform was detected in any surrounding upgradient or downgradient monitoring wells, indicating there is no persistence of chloroform in groundwater other than a single point detection.

Arsenic was the only inorganic compound detected at a Zone L shallow well location (037E01) exceeding its RBC and background value. However, the nearest downgradient well (097001) has shown diminishing arsenic concentrations over time (non-detect in final quarter) indicating that arsenic in groundwater may be confined to the near vicinity of the 037E01. Although a copper detection in 037E01 is far below its RBC, it is high enough to be a concern should groundwater migration impact surface water bodies. Additional sampling of 097001 and 037E01 will assist in determining the degree of any threats to groundwater quality may exist at these locations.

Samples collected from locations with overlapping Zone E sites will be evaluated in an addendum to the Zone E RFI report.

10.5.5 Human Health Risk Assessment for SWMU 37, AOC 699, and AOC 504, Subzone E

10.5.5.1 Site Background and Investigative Approach

Section 10.5 provides a description for SWMU 37, AOC 699, and AOC 504 as well as a discussion of the sampling activities that took place during the Zone L RFI activities.

10.5.5.2 COPC Identification

SWMU 37 Soil

Based on the screening comparisons described in Section 7 of this RFI and presented in Tables 10.5.2, 10.5.7, and 10.5.9, arsenic, BEQs, and lead, were identified as COPCs for soil. Table 10.5.27 provides a summary of SWMU 37 soil samples that reported exceedances along with any associated sites that overlapped the area where these soil samples were taken. All of the soil samples that reported exceedances were collected in the vicinity of an existing Zone E site. For soil COPCs identified for SWMU 37 subzone E, data generated during the Zone L RFI were compared to data generated during the Zone E RFI and the results of these comparisons are provided on Table 10.5.27. A reference to the Zone E RFI report is also provided so that these comparisons can be easily verified. It was assumed that if the data generated during the Zone L RFI were less than or within the range of the data generated during the Zone E RFI, then the conclusions for Zone L would be the similar and therefore no further evaluation would be necessary. Conversely, if for any reason the data generated during the Zone L RFI revealed something that was not evaluated during the Zone E RFI (data reported higher than that presented in the Zone E RFI, or new COPCs), then further evaluation should be deferred to the Zone E RFI and included as an addendum. Recommendations are provided in Section 11.

AOC 699 Soil

Based on the screening comparisons described in Section 7 of this RFI and presented in Table 10.5.14, arsenic was identified as a COPC for soil. Table 10.5.29 provides a summary of AOC 699 soil samples that reported exceedances along with any associated sites that overlapped

Table 10.5.27
SMWU 37, Zone L, Subzone E
Risk Assessment COPCs

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
Soil Boring				
037SB007	AOC540; AOC541; AOC 542	BEQs	Yes	Table 10.4.6.1*
037SB009	AOC540; AOC541; AOC 542	BEQs	Yes	Table 10.4.6.1*
037SB010	AOC540; AOC541; AOC 542	BEQs	Yes	Table 10.4.6.1*
037SB012	AOC540; AOC541; AOC 542	BEQs	Yes	Table 10.4.6.1*
DPT Soil				
037SP004	AOC 598; AOC 599	Lead	Yes	Table 10.47.8.1*
037SP018	SWMU 102	Arsenic	Yes	Table 10.14.8.1*
DPT Groundwater				
037GP001	AOC 559	cis-1,2-Dichloroethene	Yes	Table 10.29.8.2*
037GP002	AOC 559	cis-1,2-Dichloroethene	Yes	10.29.8.2*
037GP036	SWMU 172	Chlorobenzene cis-1,2-Dichloroethene Trichloroethene	No*	Table 10.11.10.4* Table 10.11.10.4* Table 10.11.10.4*
037GP045	AOC 563	cis-1,2-Dichloroethene Trichloroethene	Yes Yes	Table 10.31.6.3* Table 10.23.12.3*
037GP052	AOC 559	Trichloroethene	Yes	Table 10.29.8.2*
037GP057	AOC 538, 539	1,1-Dichloroethene Trichloroethene	Yes Yes	Table 10.23.12.3* Table 10.23.12.3*
037GP058	AOC 538, 539	1,1-Dichloroethene Trichloroethene	Yes Yes	Table 10.23.12.3* Table 10.23.12.3*

Table 10.5.27
SMWU 37, Zone L, Subzone E
Risk Assessment COPCs

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
037GP068	SWMU 23,65; AOC 543	cis-1,2-Dichloroethene	Yes; Yes	Tables 10.4.6.4; 10.6.10.4*
		Trichloroethene	Yes; Yes	Tables 10.4.6.4; 10.6.10.4*
037GP071	AOC 526	Chloroform	Yes	Table 10.5.6.4*
037GP080	SWMU 25	Chloroform	Yes	Table 10.3.13.3*
		cis-1,2-Dichloroethene	Yes	Table 10.3.13.3*
		Tetrachloroethene	Yes	Table 10.3.13.3*
037GP081	SWMU 25	Chloroform	Yes	Table 10.3.13.3*
		Terachloroethene	Yes	
037GP082	SWMU 25; AOC 549	Terachloroethene	Yes	Tables 10.3.13.3; 10.8.6.4*
037GP089	AOC 551	Tetrachloroethene	Yes	Table 10.25.6.3*
		Trichloroethene	Yes	Table 10.25.6.3*
		cis-1,2-Dichloroethene	Yes	Table 10.25.6.3*
037GP092	AOC 551	Chloroform	Yes	Table 10.25.6.3*
037GP093	AOC 551	Chloroform	Yes	Table 10.25.6.3*
037GP094	SWMU 25	Tetrachloroethene	Yes	Table 10.3.13.3*
		Trichloroethene	Yes	Table 10.3.13.3*
		cis-1,2-Dichloroethene	Yes	Table 10.3.13.3*
037GP095	SWMU 25	Tetrachloroethene	Yes	Table 10.3.13.3*
		Chloroform	Yes	Table 10.3.13.3*
037GP096	SWMU 25	Chloroform	Yes	Table 10.3.13.3*
Groundwater				
037GW002	AOC 542	Antimony	Yes	Table 10.4.6.4*
		Arsenic	Yes	Table 10.4.6.4*

Notes:

*Zone E RFI Report (EnSafe, 1997)

^a Zone L concentrations are within range of concentrations in referenced document.

the area where these soil samples were taken. All of the soil samples that reported exceedances were collected in the vicinity of an existing Zone E site. For soil COPCs identified for AOC 699 subzone E, data generated during the Zone L RFI were compared to data generated during the Zone E RFI and the results of these comparisons are provided on Table 10.5.29. A reference to the Zone E RFI report is also provided so that these comparisons can be easily verified. It was assumed that if the data generated during the Zone L RFI were less than or within the range of the data generated during the Zone E RFI, then the conclusions for Zone L would be the similar and therefore no further evaluation would be necessary. Conversely, if for any reason the data generated during the Zone L RFI revealed something that was not evaluated during the Zone E RFI (data reported higher than that presented in the Zone E RFI, or new COPCs), then further evaluation should be deferred to the Zone E RFI and included as an addendum. Recommendations are provided in Section 11.

AOC 504 Soil

Based on the screening comparisons described in Section 7 of this RFI and presented in Tables 10.5.19, 10.5.21, and 10.5.22, arsenic and BEQs were identified as COPCs for soil. Table 10.5.28 provides a summary of AOC 504 soil samples that reported exceedances along with any associated sites that overlapped the area where these soil samples were taken. All of the soil samples that reported exceedances were collected in the vicinity of an existing Zone E site. For soil COPCs identified for AOC 504 subzone E, data generated during the Zone L RFI were compared to data generated during the Zone E RFI and the results of these comparisons are provided on Table 10.5.28. A reference to the Zone E RFI report is also provided so that these comparisons can be easily verified. It was assumed that if the data generated during the Zone L RFI were less than or within the range of the data generated during the Zone E RFI, then the conclusions for Zone L would be the similar and therefore no further evaluation would be necessary. Conversely, if for any reason the data generated during the Zone L RFI revealed something that was not evaluated during the Zone E RFI (data reported higher than that presented

Table 10.5.28
AOC 504, Zone L, Subzone E
Risk Assessment COPCs

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
Soil Boring				
037SB001	SWMU 175, AOC 613, 615	BEQs	No ^a	Table 10.7.14*
504SB002	SWMU 175, AOC 613, 615	Arsenic	No ^a	Table 10.7.14*
504SB0051	SWMU 175, AOC 613, 615	Arsenic	No ^a	Table 10.7.14*

Notes:

* Zone F RFI Report (EnSafe 1997)

^a Zone L concentrations are in range of concentrations in referenced document.

Table 10.5.29
AOC 699, Zone L, Subzone E
Risk Assessment COPCs

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
DPT Soil				
699SP052	AOC 572	Arsenic	Yes	Table 10.36.8.1*
699SP057	AOC 569, 570, 578	Arsenic	No ^a	Table 10.34.6.1*
DPT Groundwater				
699GP006	AOC 586	Benzene	Yes	Table 10.42.6.4*
699GP022	AOC 563	Trichloroethene	Yes	Table 10.31.6.3*
		cis-1,2-Dichloroethene	Yes	Table 10.31.6.3*
699GP023	AOC 563	Trichloroethene	Yes	Table 10.31.6.3*
699GP032	AOC 563	Tetrachloroethene	Yes	Table 10.31.6.3*
699GP034	SWMU 70	Chloroform	Yes	Table 10.8.6.4
699GP058	AOC 574,576	Tetrachloroethene	Yes	Table 10.38.6.3*
		Trichloroethene	Yes	Table 10.38.6.3*
		cis-1,2- Dichloroethene	Yes	Table 10.38.6.3*
		Chlorobenzene	Yes	Table 10.38.6.3*
699GP067	AOC 539	1,1-Dichloroethene	Yes	Table 10.23.12.3*

Table 10.5.29
AOC 699, Zone L, Subzone E
Risk Assessment COPCs

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
699GP068	AOC 539	1,1-Dichloroethene	Yes	Table 10.23.12.3*
699GP071	SWMU 70	Chloroform	Yes	Table 10.23.12.3*
699GP079	SWMU 25,63	cis-1,2-Dichloroethene Trichloroethene	Yes Yes	Table 10.4.6.4* Table 10.4.6.4*
699GP082	SWMU 25,63	Bromodichloromethane Dibromochloromethane Chloroform	Yes Yes Yes	Table 10.4.6.4* Table 10.4.6.4* Table 10.4.6.4*
699GP82A	SWMU 25,63	Bromodichloromethane Dibromochloromethane Chloroform	Yes Yes Yes	Table 10.4.6.4* Table 10.4.6.4* Table 10.4.6.4*
699GP085	SWMU 65,544	Trichloroethene	Yes	Table 10.6.10.4*
699GP086	SWMU 25	Bromodichloromethane Chloroform Trichloroethene	Yes Yes Yes	Table 10.3.13.3* Table 10.3.13.3* Table 10.3.13.3*
699GP087	SWMU 25;549	Benzene Chlorobenzene	Yes; Yes Yes; Yes	Tables10.3.13.3; 10.8.6.4*
699GP088	SWMU 25;549	Benzene Chlorobenzene	Yes; Yes Yes; Yes	Tables10.3.13.3;10.8.6.4*
699GP089	SWMU 25;549	Chlorobenzene	Yes; Yes	Tables10.3.13.3; 10.8.6.4*
699GP091	SWMU 25	Tetrachloroethene cis-1,2-Dichloroethene	Yes Yes	Table 10.3.13.3*
699GP092	SWMU 25	Bromodichloromethane Chloroform	Yes Yes	Table 10.3.13.3*
699GP093	SWMU 25;551	Tetrachloroethene Chloroform	Yes Yes	Tables10.3.13.3; 10.25.6.3* Tables10.3.13.3; 10.25.6.3*

Table 10.5.29
AOC 699, Zone L, Subzone E
Risk Assessment COPCs

Exceedance Location	Overlapping Site	Risk Assessment COPCs	COPCs to be further Evaluated?	Reference Document
699GP094	SWMU 25; 551	Tetrachloroethene	Yes	Tables 10.3.13.3;
		Trichloroethene	Yes	10.25.6.3*
		Vinyl chloride	Yes	Tables 10.3.13.3;
		cis-1,2-Dichloroethene	Yes	10.25.6.3*
				Tables 10.3.13.3;
				10.25.6.3*
				Tables 10.3.13.3;
				10.25.6.3*

Notes:

* Zone E RFI Report (EnSafe, 1997)

^a Zone L concentrations are in range of concentrations in referenced document.

in the Zone E RFI, or new COPCs), then further evaluation should be deferred to the Zone E RFI and included as an addendum. Recommendations are provided in Section 11.

SWMU 37 Groundwater

Based on the screening comparisons described in Section 7 of this RFI and presented in Table 10.5.4, chlorobenzene, chloroform, 1,1-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, and trichloroethene were identified as COPCs for groundwater. Table 10.5.27 provides a summary of SWMU 37 groundwater samples that reported exceedances along with any associated sites that overlapped the area where these samples were taken. As shown, all groundwater sample were collected in the vicinity of an existing Zone E site. Groundwater data generated during the Zone L RFI were compared to data generated during the Zone E RFI and the results of these comparisons are provided on Table 10.5.27. A reference to the Zone E RFI report is also provided so that these comparisons can be easily verified. It was assumed that if the data generated during the Zone L RFI were less than or within the range of the data generated during the Zone E RFI, then the conclusions for Zone L would be the similar and therefore no further

evaluation would be necessary. Conversely, if for any reason the data generated during the Zone L RFI revealed something that was not evaluated during the Zone E RFI (data reported higher than that presented in the Zone E RFI, or new COPCs), then further evaluation should be deferred to the Zone E RFI and included as an addendum. Recommendations are provided in Section 11.

AOC 699 Groundwater

Based on the screening comparisons described in Section 7 of this RFI and presented in Table 10.5.16, benzene, bromodichloromethane, chlorobenzene, chloroform, dibromochloromethane, 1,1-dichloroethene, cis-1,2-dichloroethene, tetrachloroethene, trichloroethene, and vinyl chloride were identified as COPCs for groundwater. Table 10.5.29 provides a summary of AOC 699 groundwater samples that reported exceedances along with any associated sites that overlapped the area where these samples were taken. As shown, all groundwater samples were collected in the vicinity of an existing Zone E site. Groundwater data generated during the Zone L RFI were compared to data generated during the Zone E RFI and the results of these comparisons are provided on Table 10.5.29. A reference to the Zone E RFI report is also provided so that these comparisons can be easily verified. It was assumed that if the data generated during the Zone L RFI were less than or within the range of the data generated during the Zone E RFI, then the conclusions for Zone L would be the similar and therefore no further evaluation would be necessary. Conversely, if for any reason the data generated during the Zone L RFI revealed something that was not evaluated during the Zone E RFI (data reported higher than that presented in the Zone E RFI, or new COPCs), then further evaluation should be deferred to the Zone E RFI and included as an addendum. Recommendations are provided in Section 11.



LEGEND

● ZONE L DPT GROUNDWATER LOCATION

SUBZONE BOUNDARY RAILROAD ⊙ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

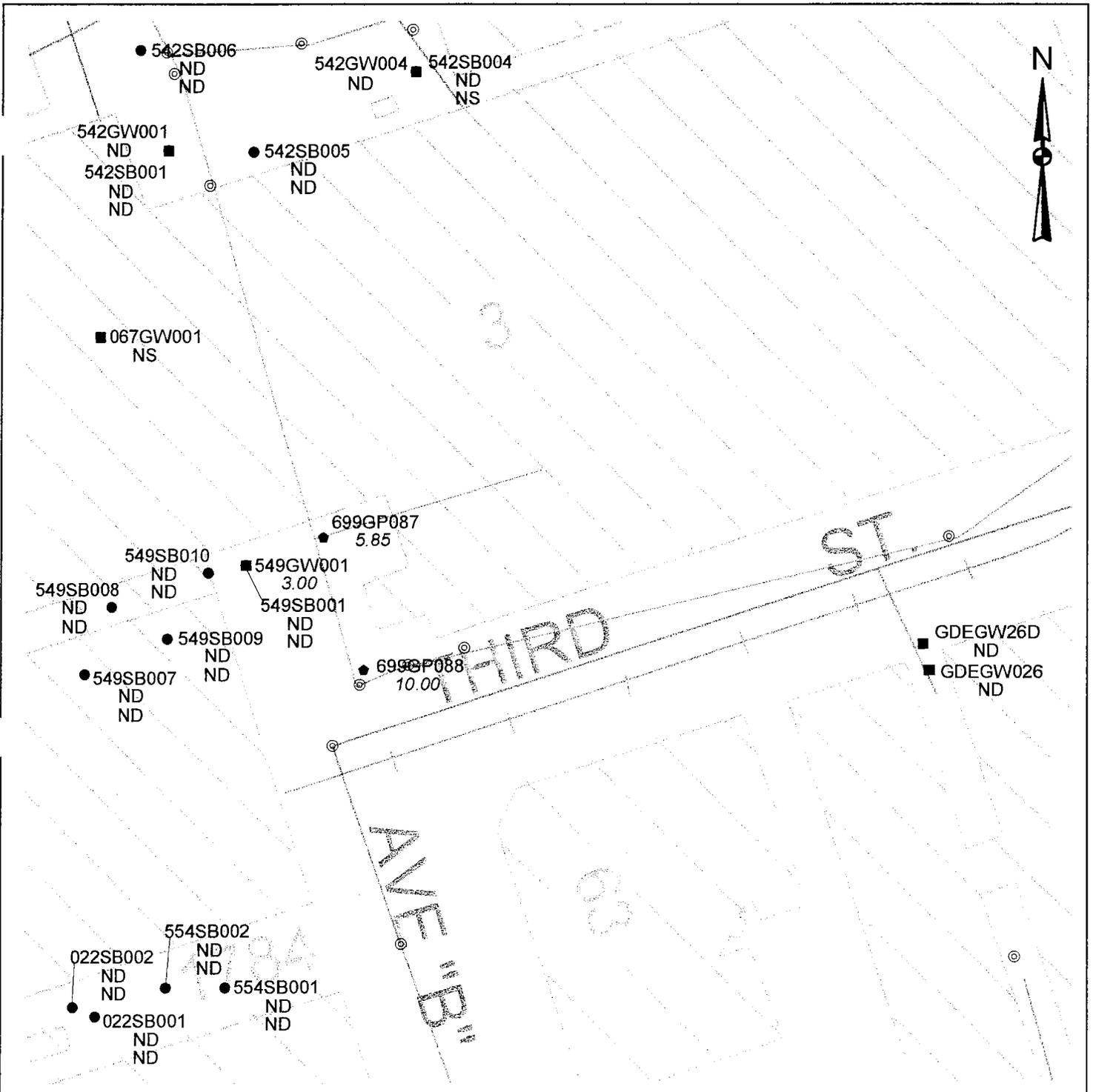
500 0 500 1000 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.25
 ZONE L - SUBZONE E
 BENZENE
 ZONE L EXCEEDANCES

RBC = 200000 ug/kg SSL = 15.0 ug/kg MCL = 5.00 ug/L



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD ⊙ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

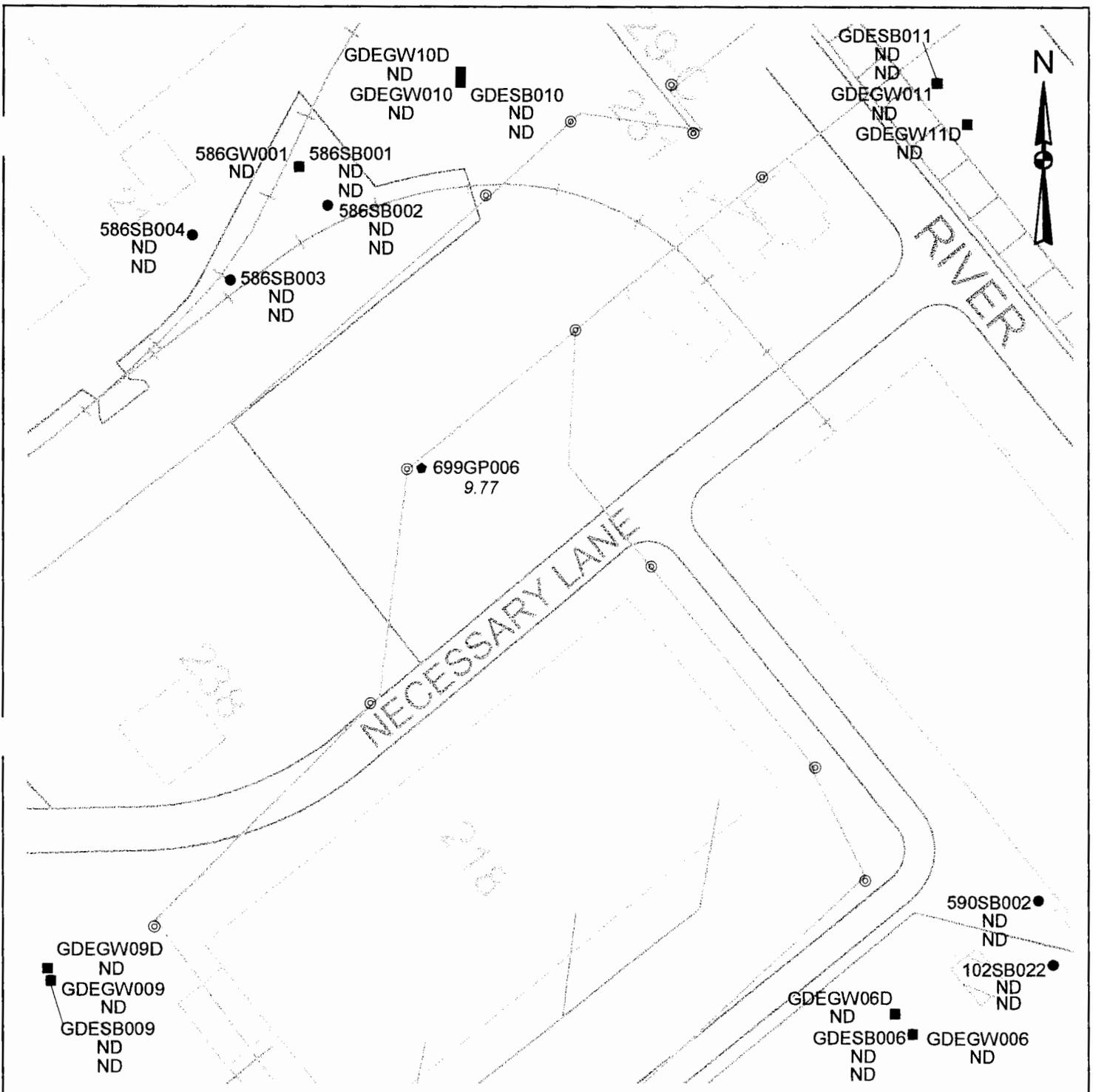
50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

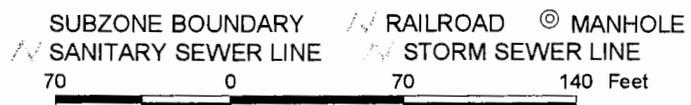
FIGURE 10.5.26
 ZONE L - SUBZONE E
 BENZENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=200000 ug/kg SSL=15.0 mg/kg MCL=5.00 ug/L



LEGEND

- ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

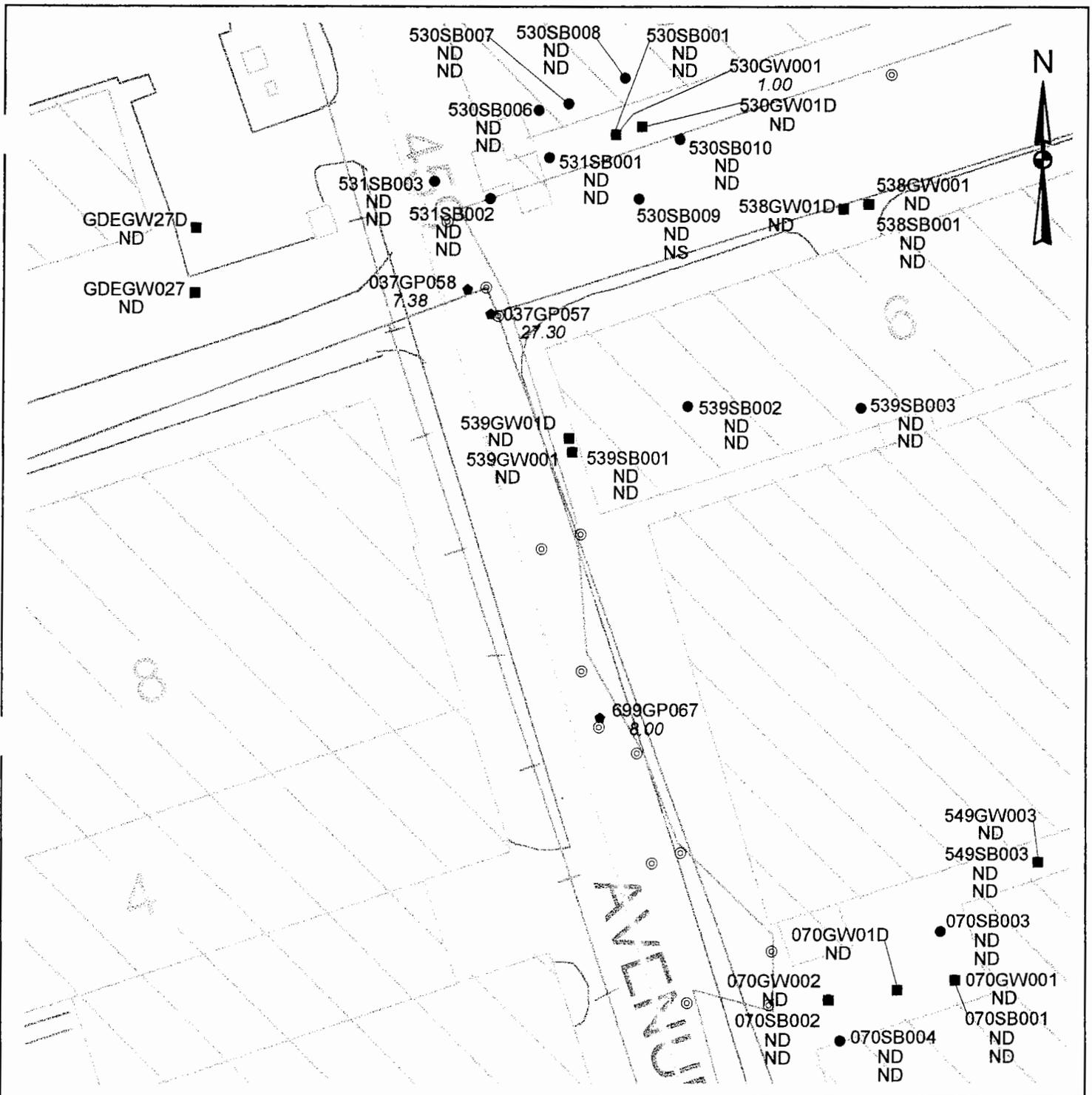


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.27
ZONE L - SUBZONE E
BENZENE
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC=200000 ug/kg SSL=15.0 mg/kg MCL=5.00 ug/L

70 0 70 140 Feet



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD ⊙ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.28
 ZONE L - SUBZONE E
 1,1-DICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=9500 ug/kg SSL=30.0 mg/kg MCL=7.00 ug/L



LEGEND

● ZONE L DPT GROUNDWATER LOCATION

--- SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

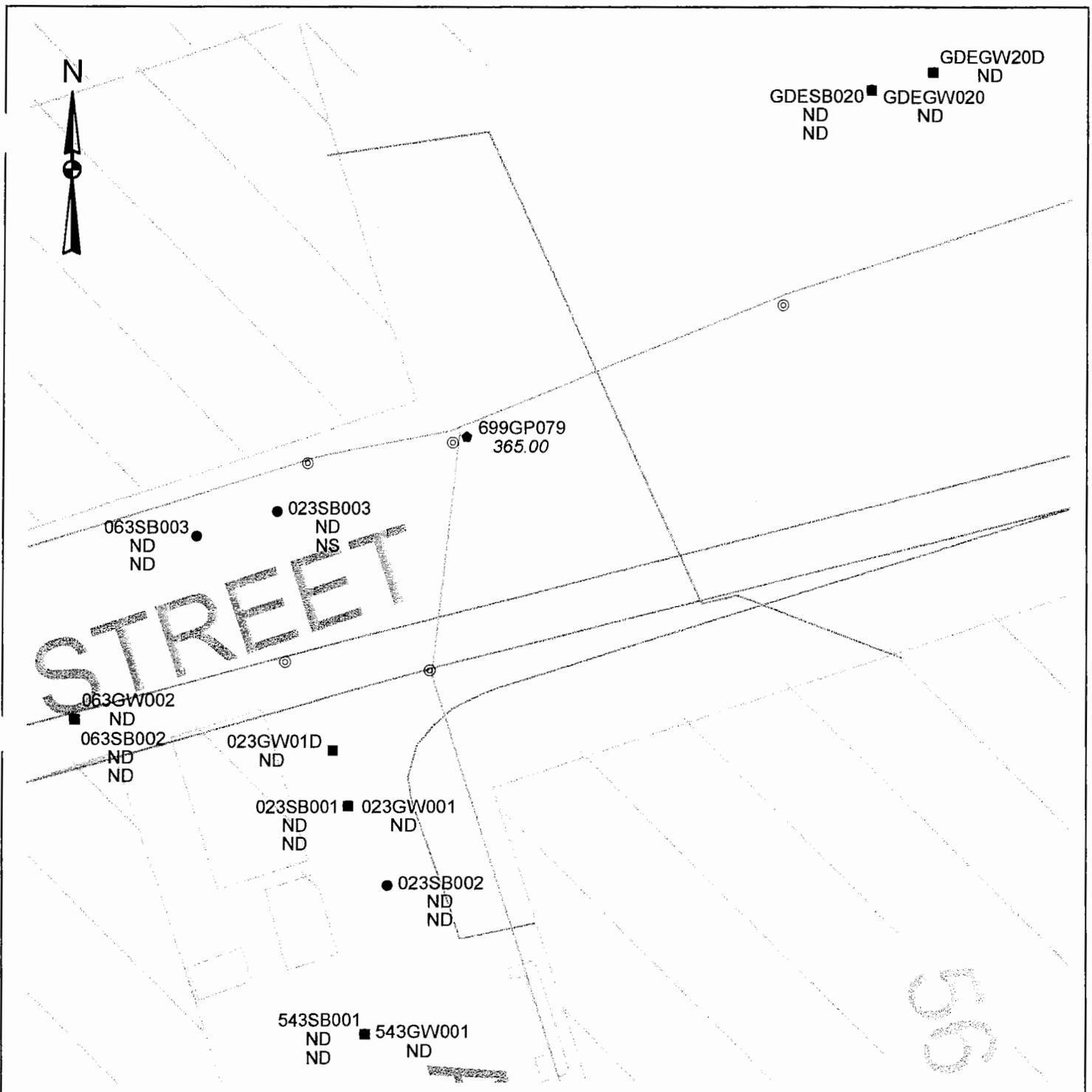
500 0 500 1000 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.29
 ZONE L - SUBZONE E
 CIS-1,2-DICHLOROETHENE
 ZONE L EXCEEDANCES

RBC=2000000 ug/kg SSL=200 ug/kg MCL=70.0 ug/L



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

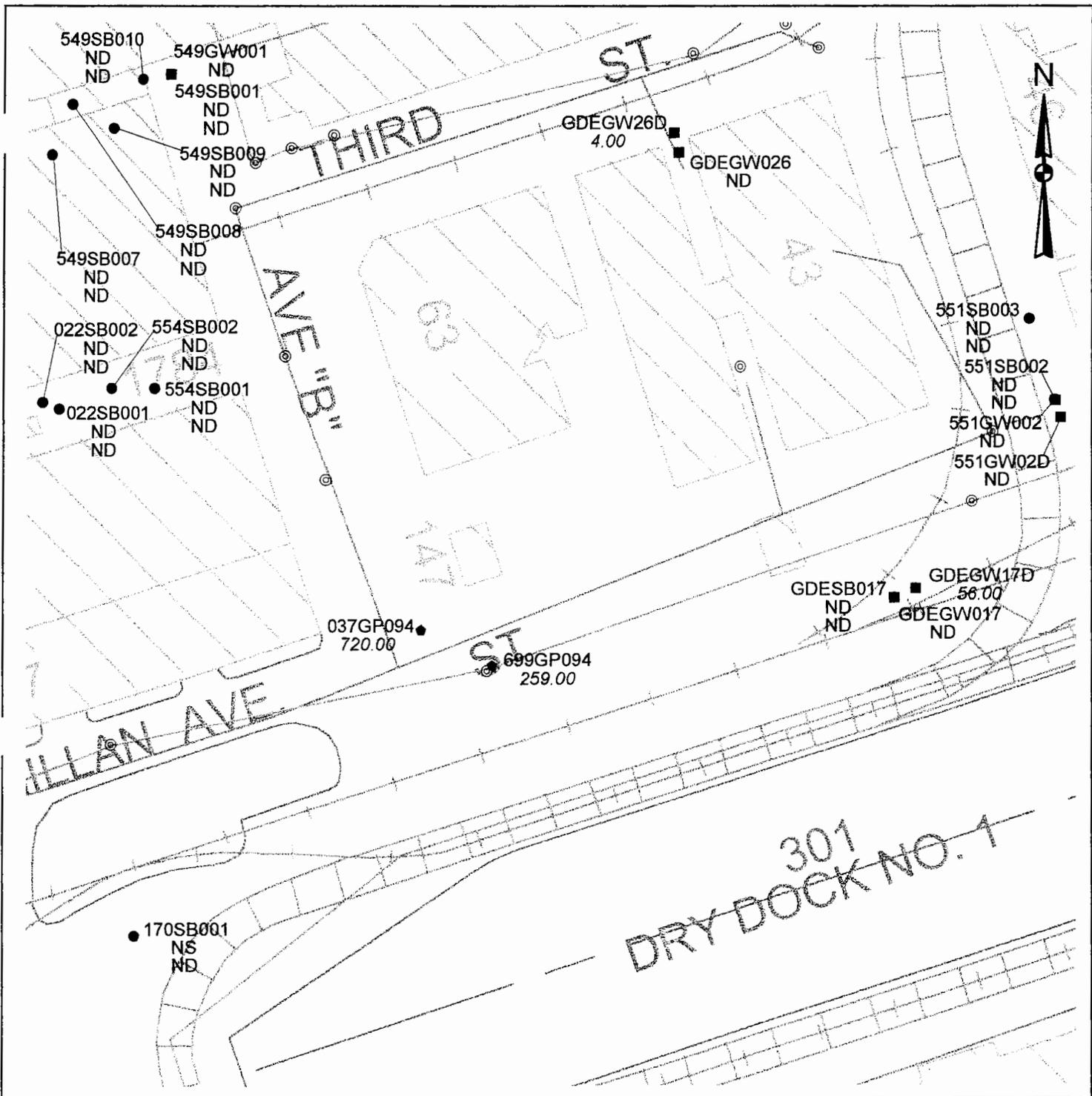
30 0 30 60 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.30
ZONE L - SUBZONE E
CIS-1,2-DICHLOROETHENE
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC=2000000 ug/kg SSL=200 mg/kg MCL=70.0 ug/L



LEGEND

- ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

— SUBZONE BOUNDARY — RAILROAD © MANHOLE
 - - - SANITARY SEWER LINE - - - STORM SEWER LINE

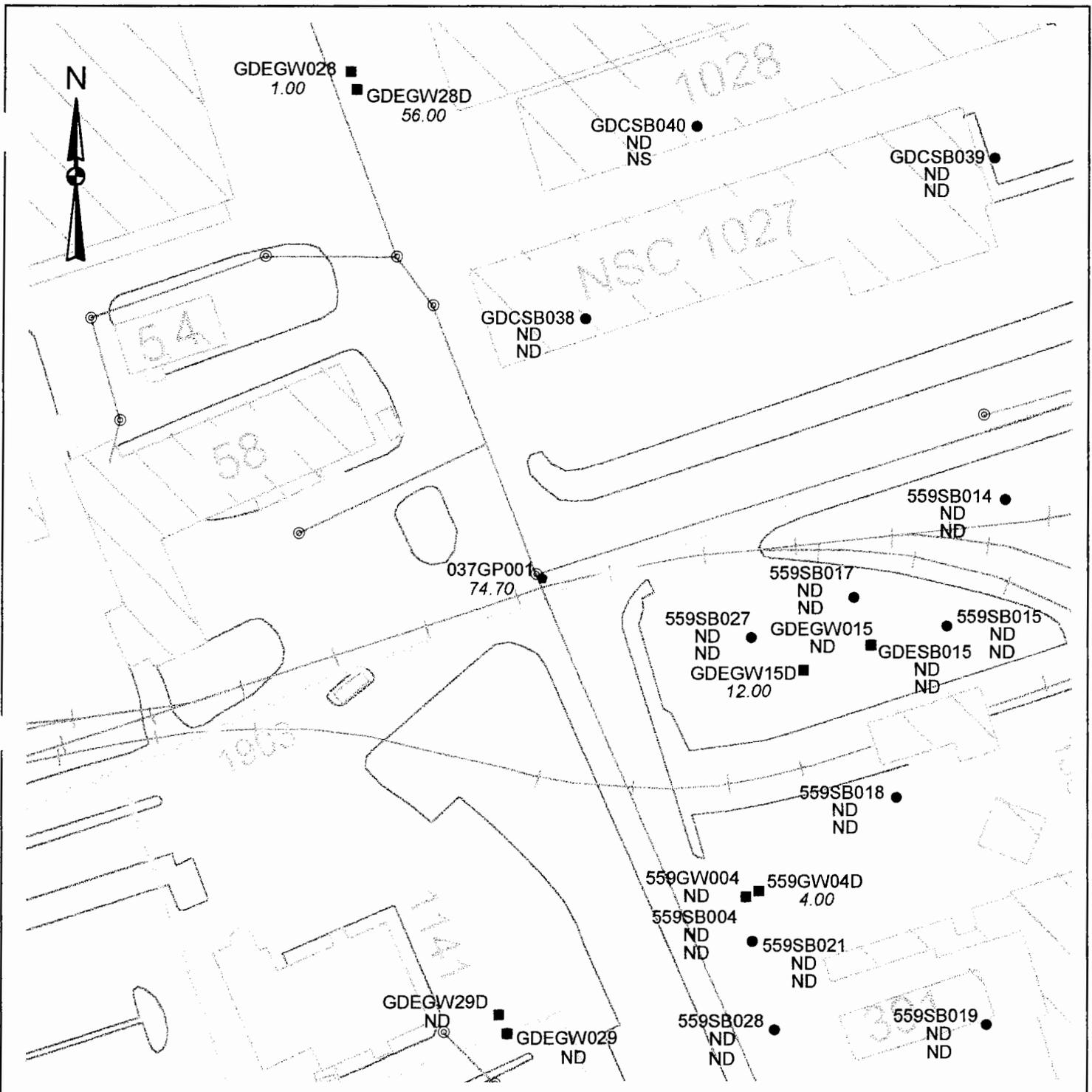
70 0 70 140 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.31
 ZONE L - SUBZONE E
 CIS-1,2-DICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=2000000 ug/kg SSL=200 mg/kg MCL=70.0 ug/L



LEGEND

- ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

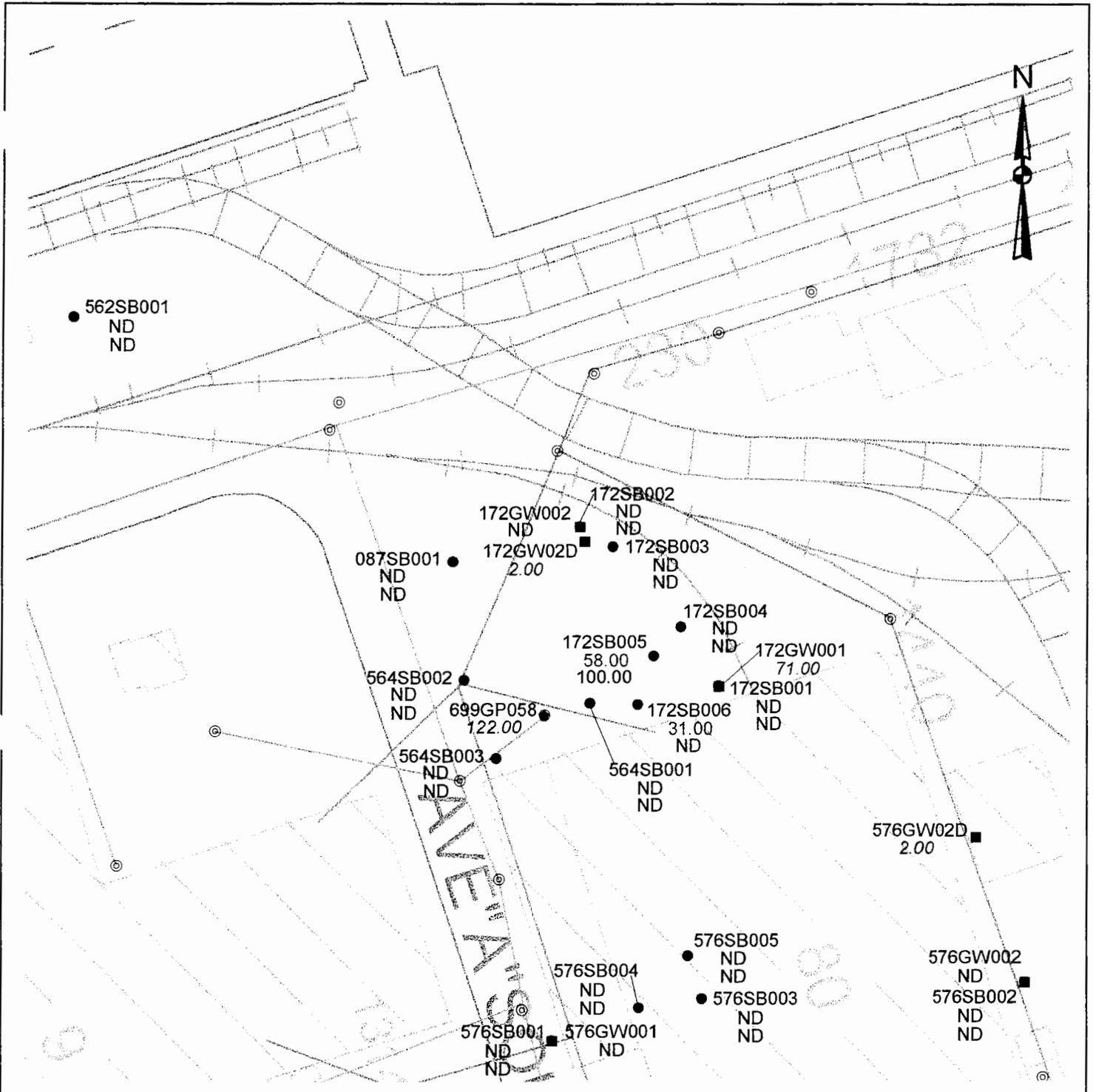
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.32
ZONE L - SUBZONE E
CIS-1,2-DICHLOROETHENE
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC=2000000 ug/kg SSL=200 mg/kg MCL=70.0 ug/L



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.33
 ZONE L - SUBZONE E
 CIS-1,2-DICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=2000000 ug/kg SSL=200 mg/kg MCL=70.0 ug/L



LEGEND

● ZONE L DPT GROUNDWATER LOCATION

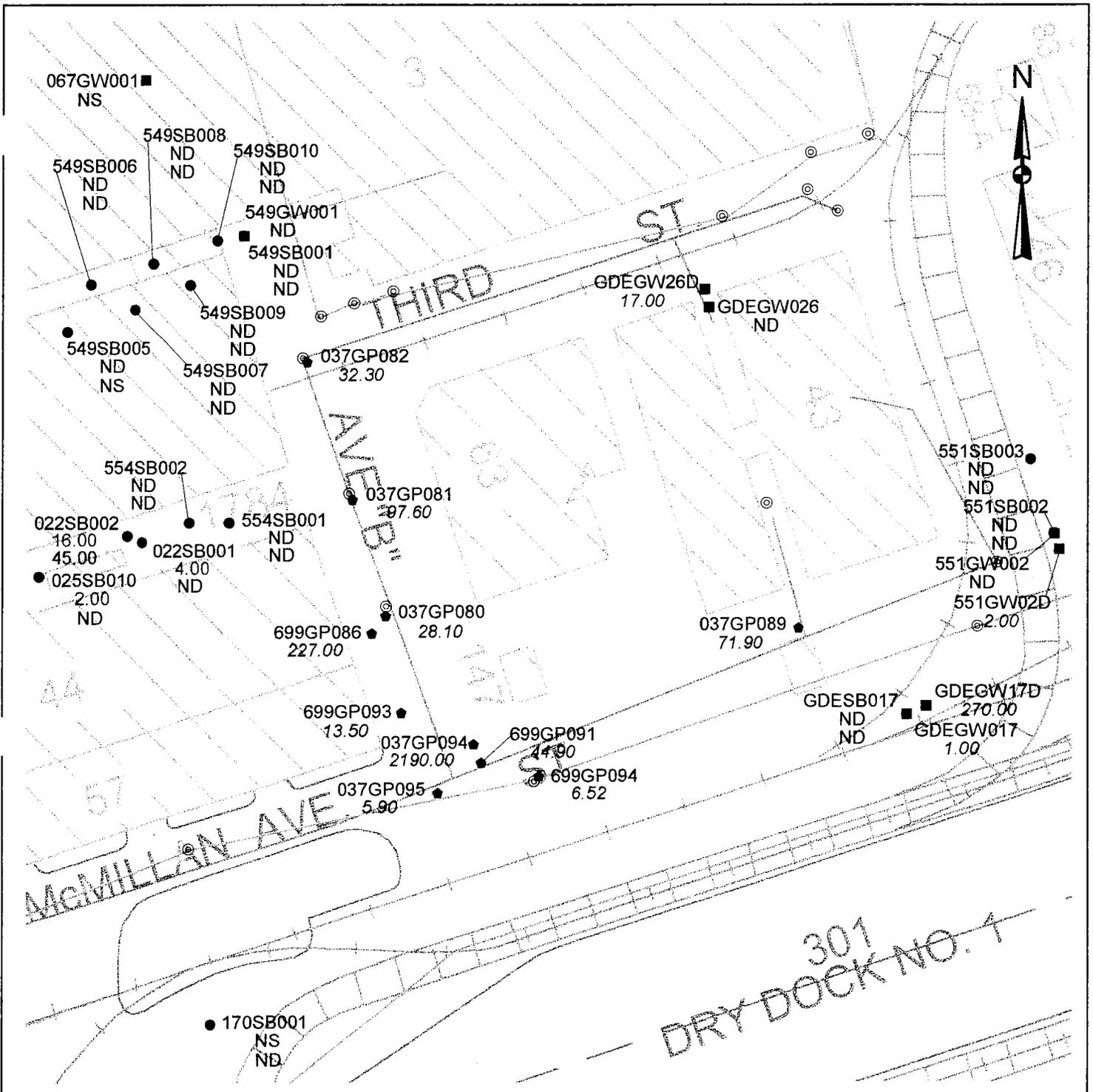
SUBZONE BOUNDARY / / RAILROAD © MANHOLE
 / / SANITARY SEWER LINE / / STORM SEWER LINE
 500 0 500 1000 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.34
 ZONE L - SUBZONE E
 TETRACHLOROETHENE
 ZONE L EXCEEDANCES

RBC=110000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L

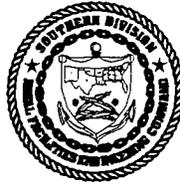


LEGEND

- ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY / RAILROAD © MANHOLE
 SANITARY SEWER LINE / STORM SEWER LINE

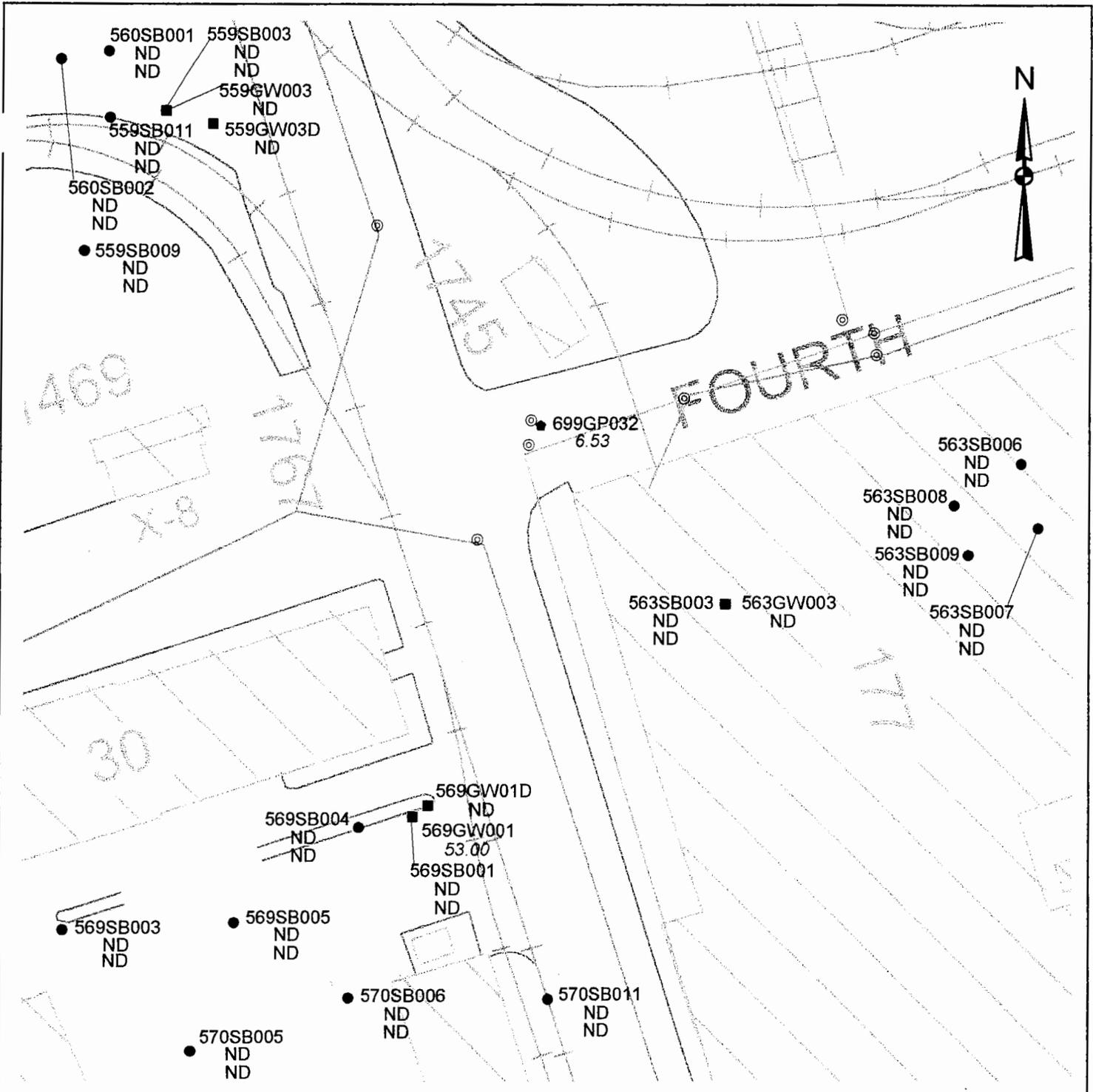
70 0 70 140 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.35
 ZONE L - SUBZONE E
 TETRACHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=110000 ug/kg SSL=30.0 mg/kg MCL=5.00 ug/L



LEGEND

- ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

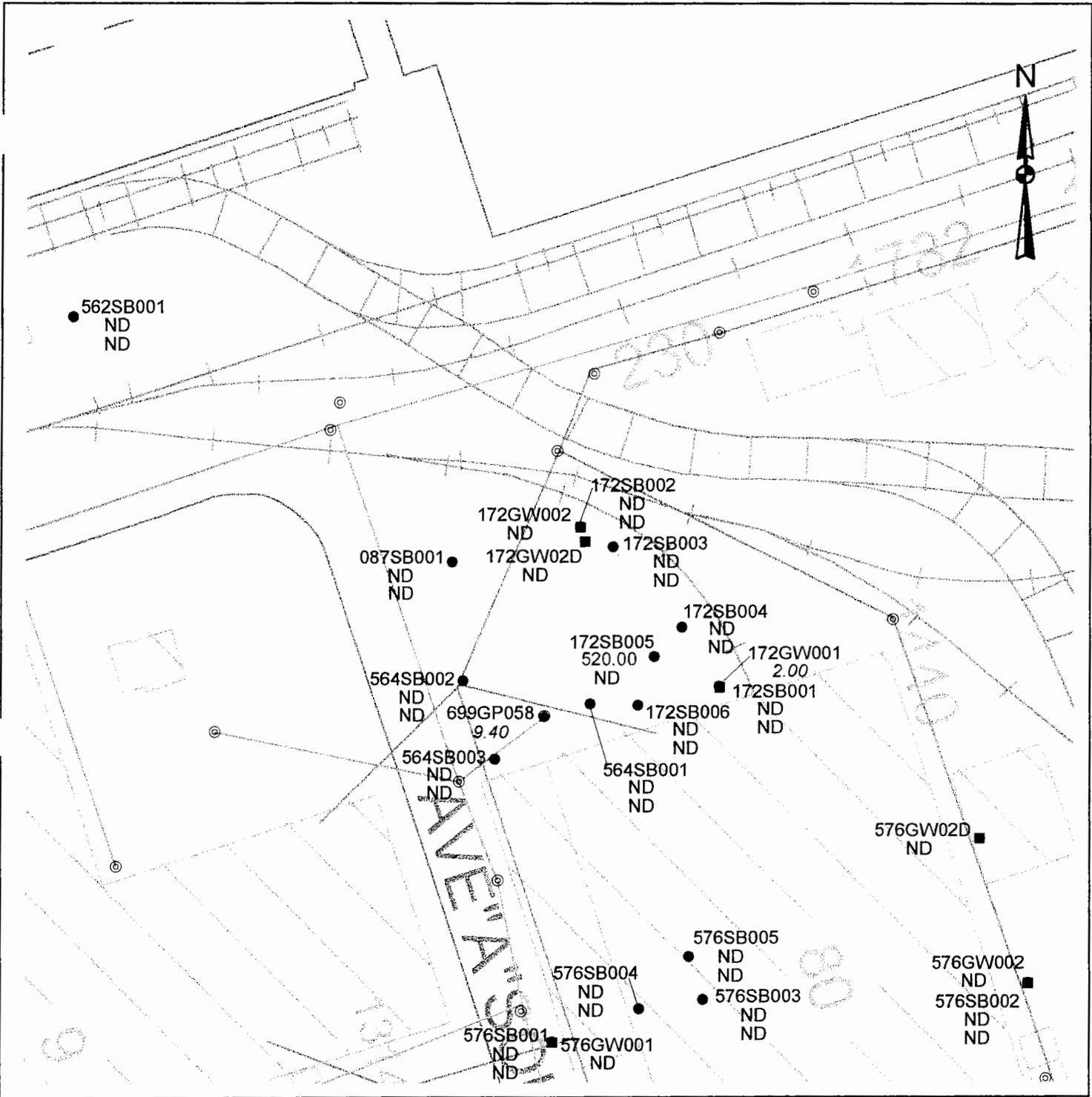
--- SUBZONE BOUNDARY - - - RAILROAD ⊙ MANHOLE
 - - - SANITARY SEWER LINE - - - STORM SEWER LINE



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.36
 ZONE L - SUBZONE E
 TETRACHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=110000 ug/kg SSL=30.0 mg/kg MCL=5.00 ug/L



LEGEND

- ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD ⊙ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.37
 ZONE L - SUBZONE E
 TETRACHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=110000 ug/kg SSL=30.0 mg/kg MCL=5.00 ug/L



LEGEND

● ZONE L DPT GROUNDWATER LOCATION

SUBZONE BOUNDARY / / RAILROAD ⊙ MANHOLE
 / / SANITARY SEWER LINE / / STORM SEWER LINE

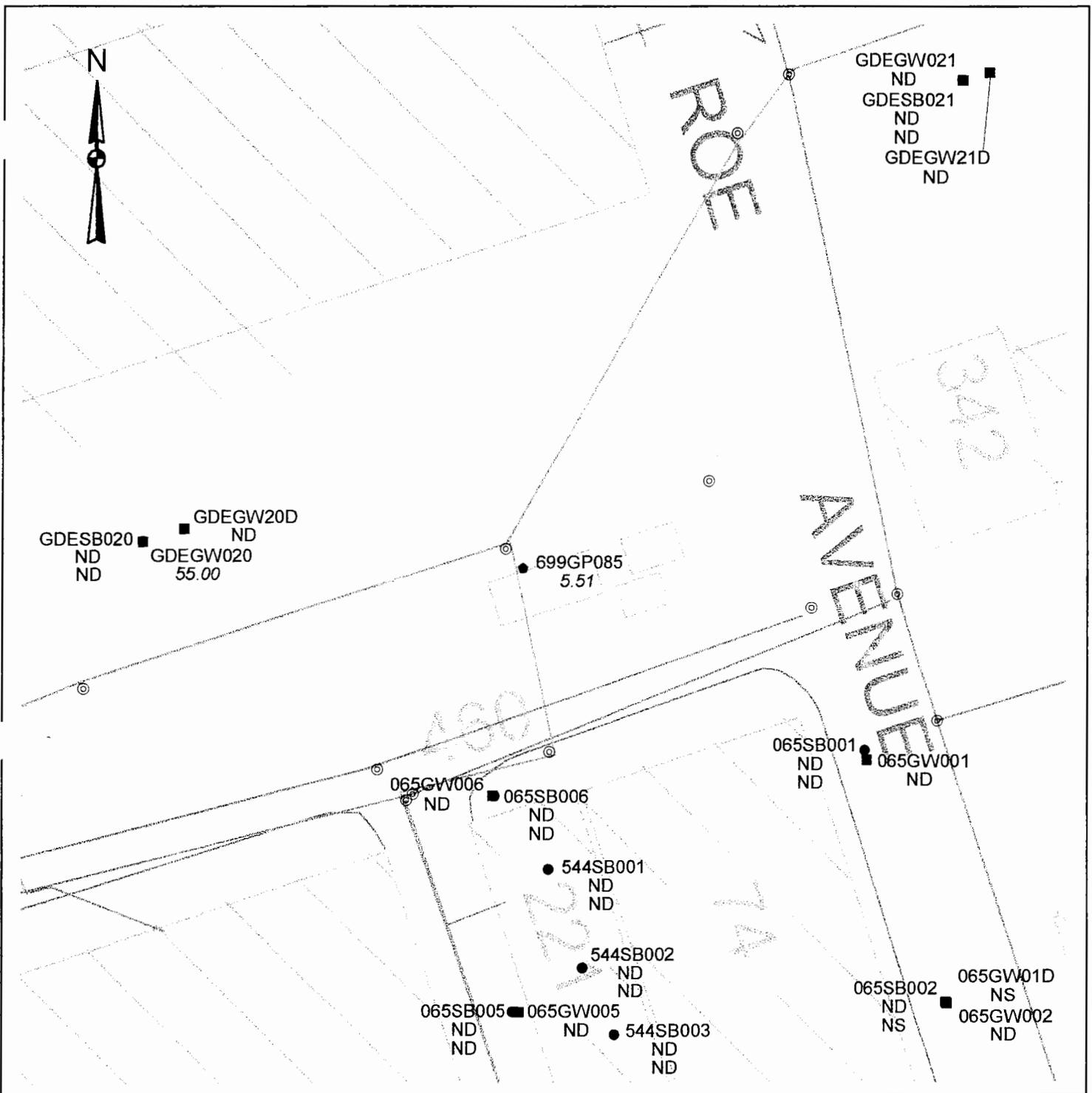
500 0 500 1000 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.38
 ZONE L - SUBZONE E
 TRICHLOROETHENE
 ZONE L EXCEEDANCES

RBC=520000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD ☉ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

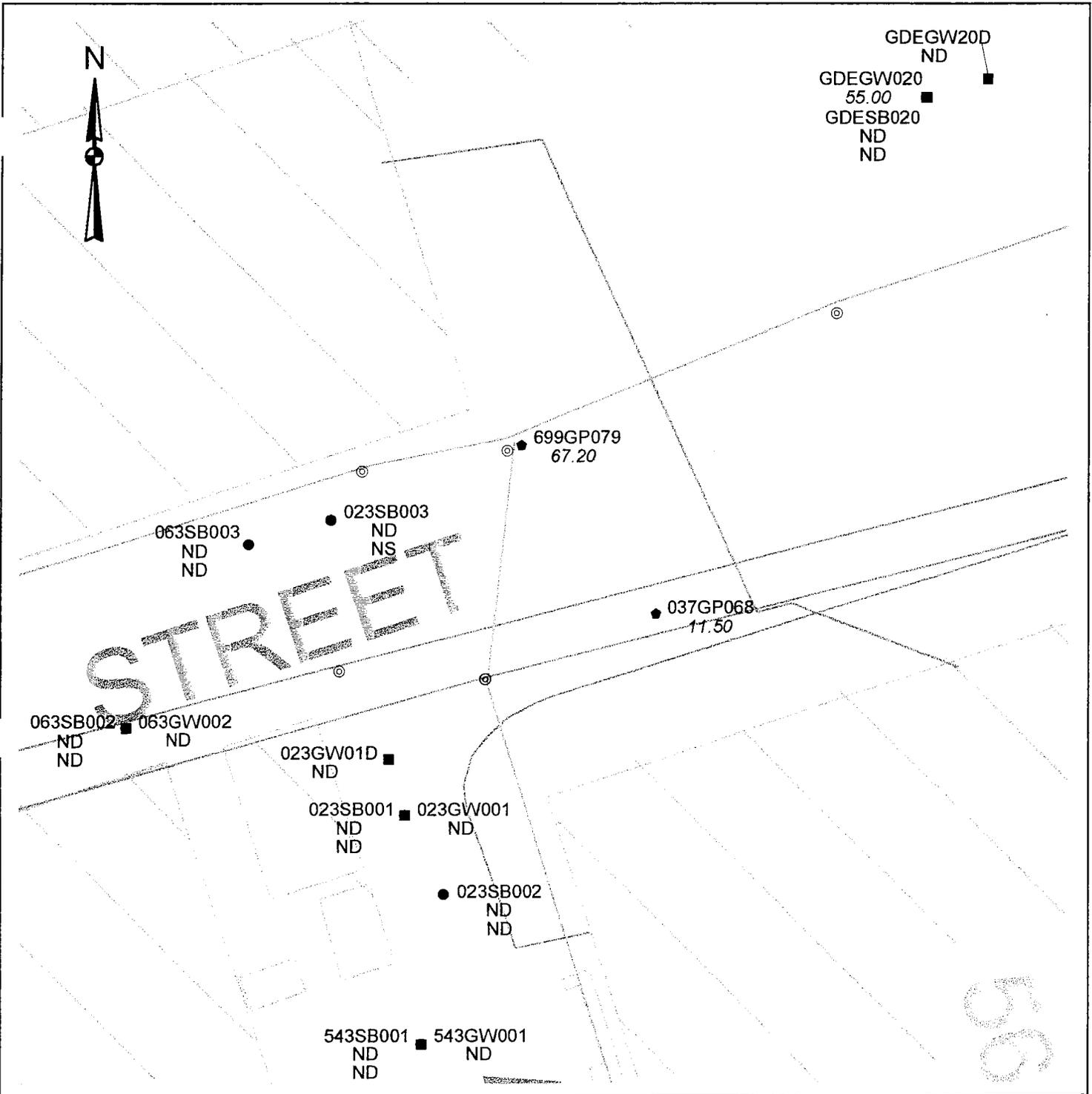
50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.39
 ZONE L - SUBZONE E
 TRICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=520000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD © MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

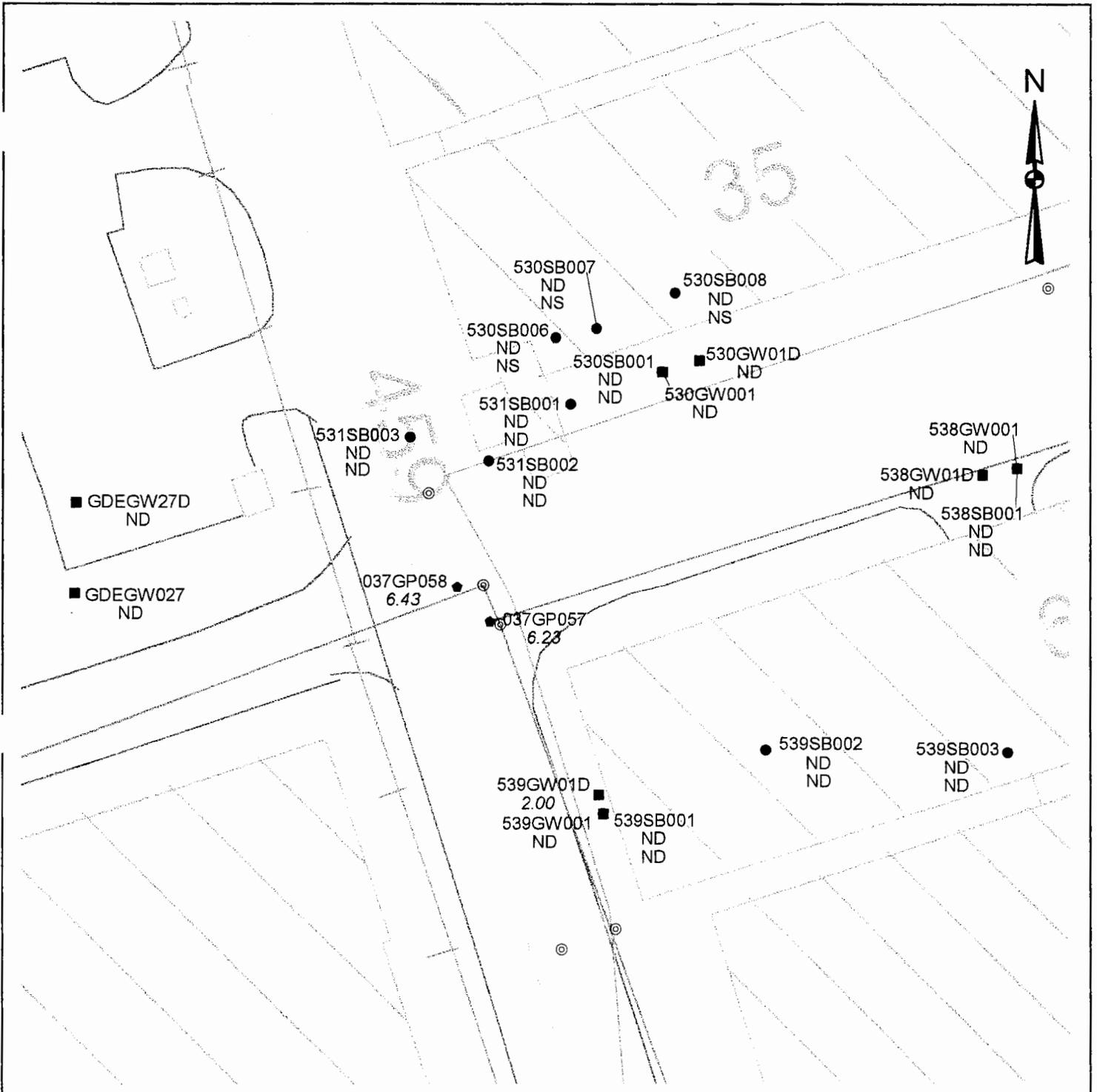
30 0 30 60 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.40
 ZONE L - SUBZONE E
 TRICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=520000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L



LEGEND

- ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD © MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

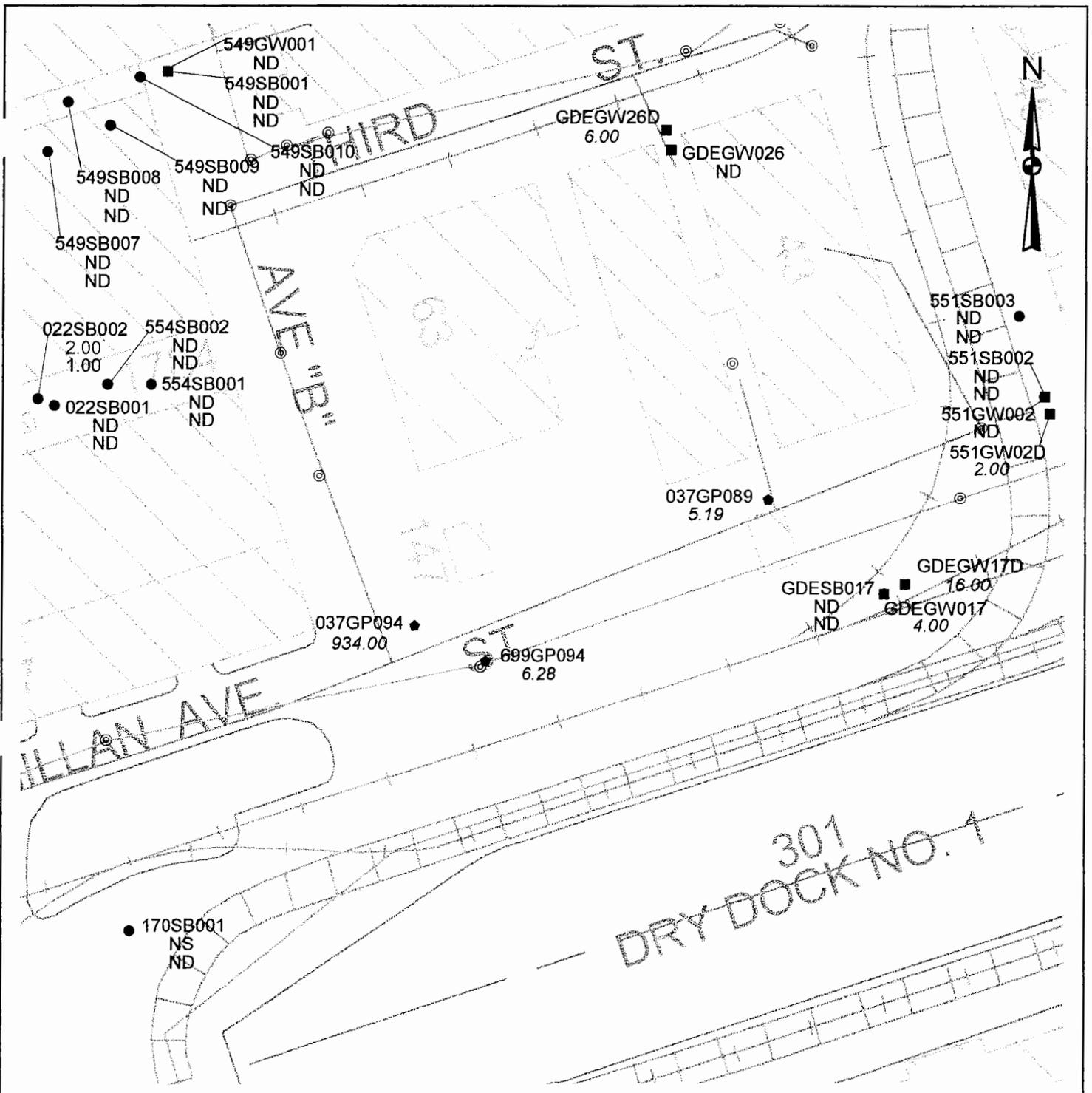
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.41
 ZONE L - SUBZONE E
 TRICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=520000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

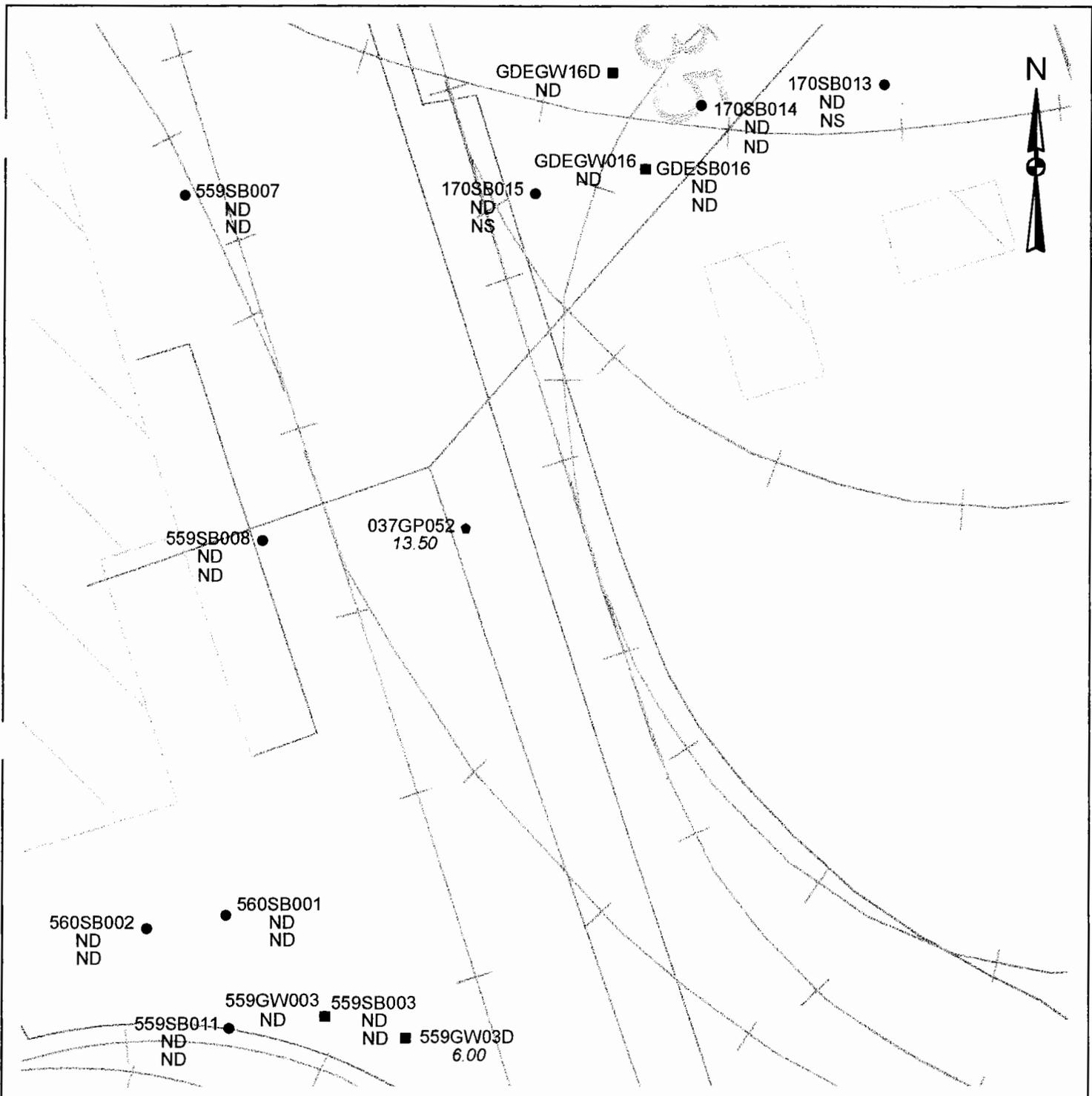
70 0 70 140 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.42
 ZONE L - SUBZONE E
 TRICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=520000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD © MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

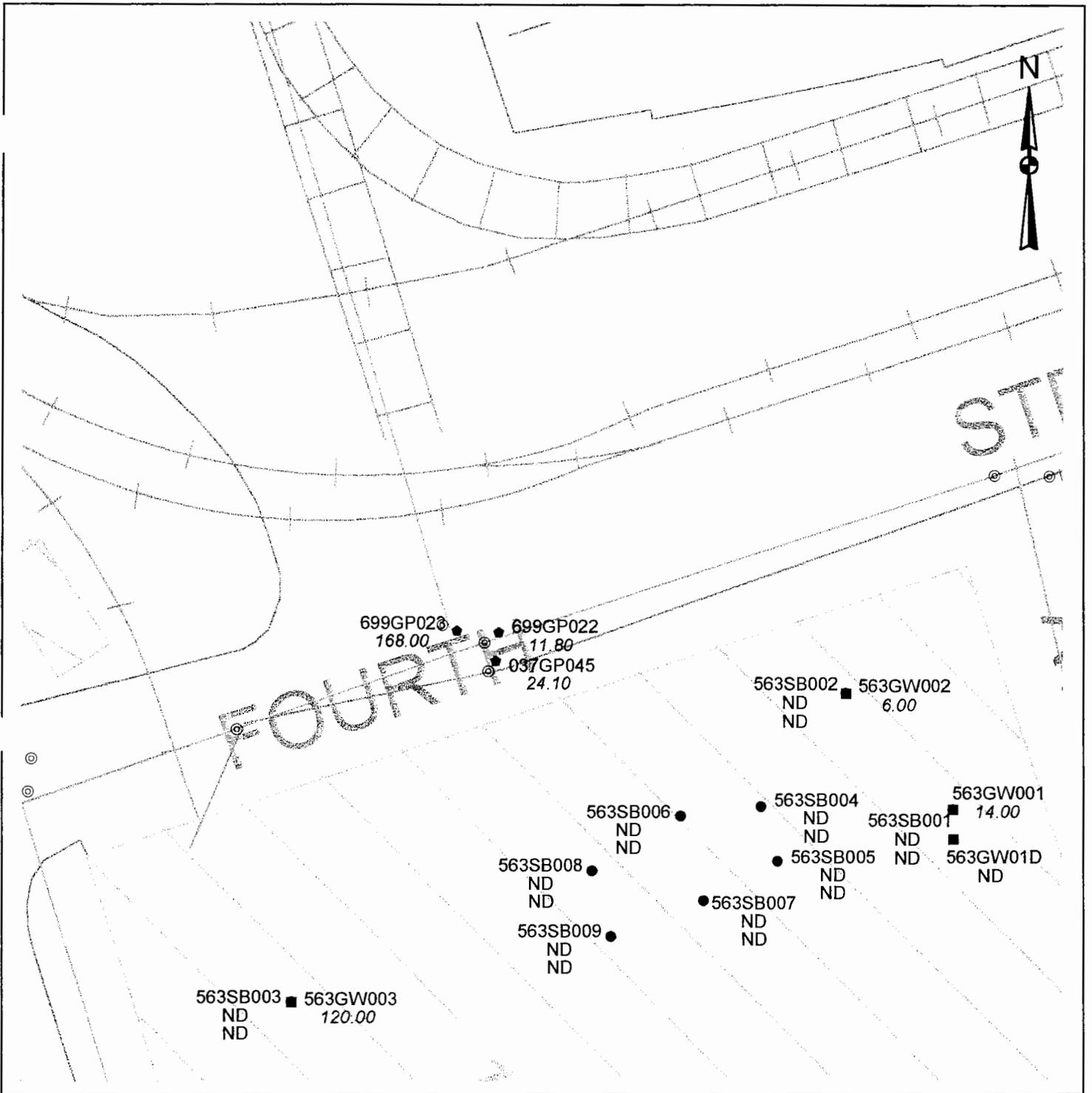
30 0 30 60 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.43
 ZONE L - SUBZONE E
 TRICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=520000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L



LEGEND

- ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD © MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

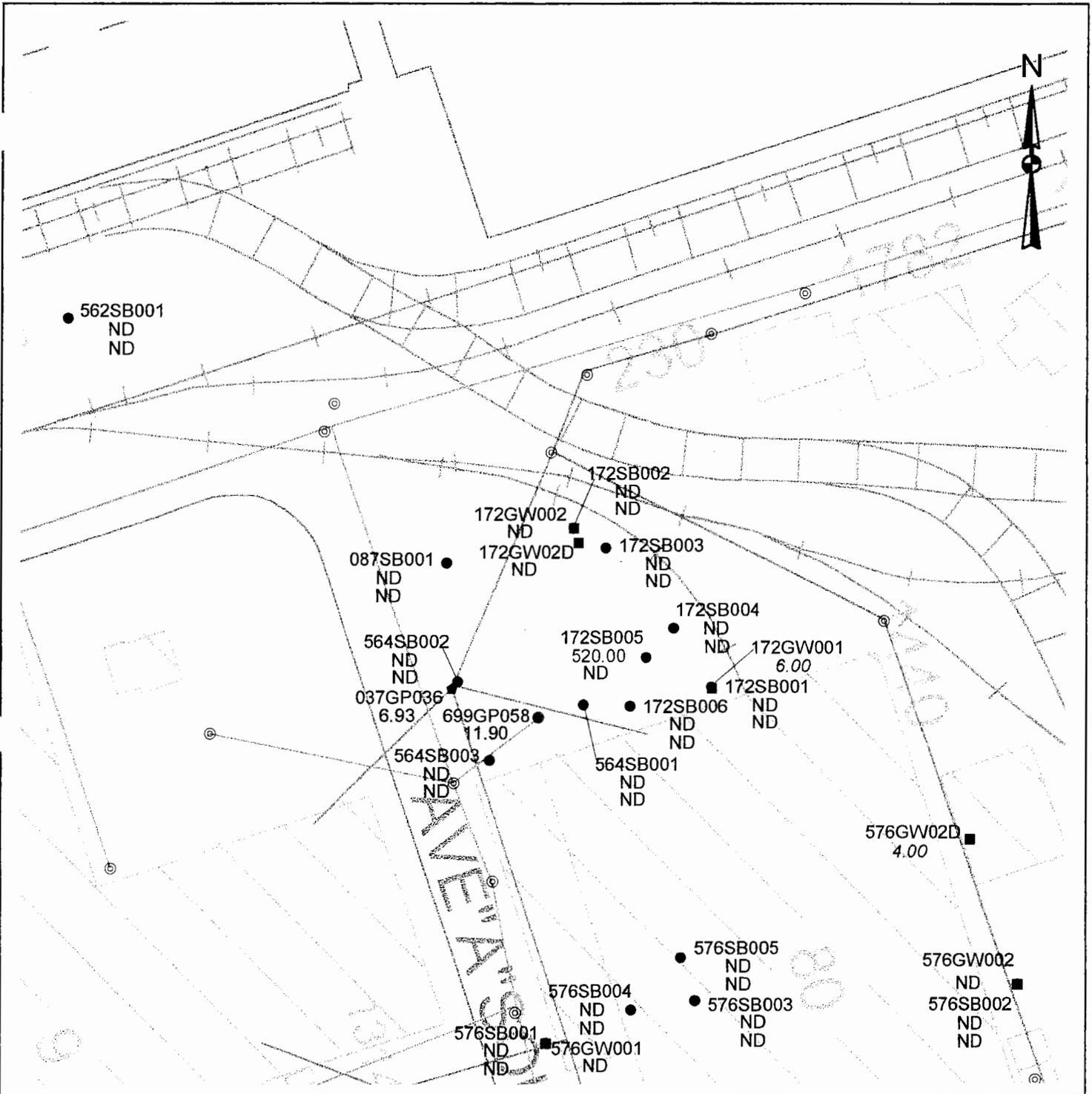
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.44
 ZONE L - SUBZONE E
 TRICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=520000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L

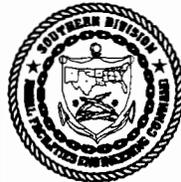


LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

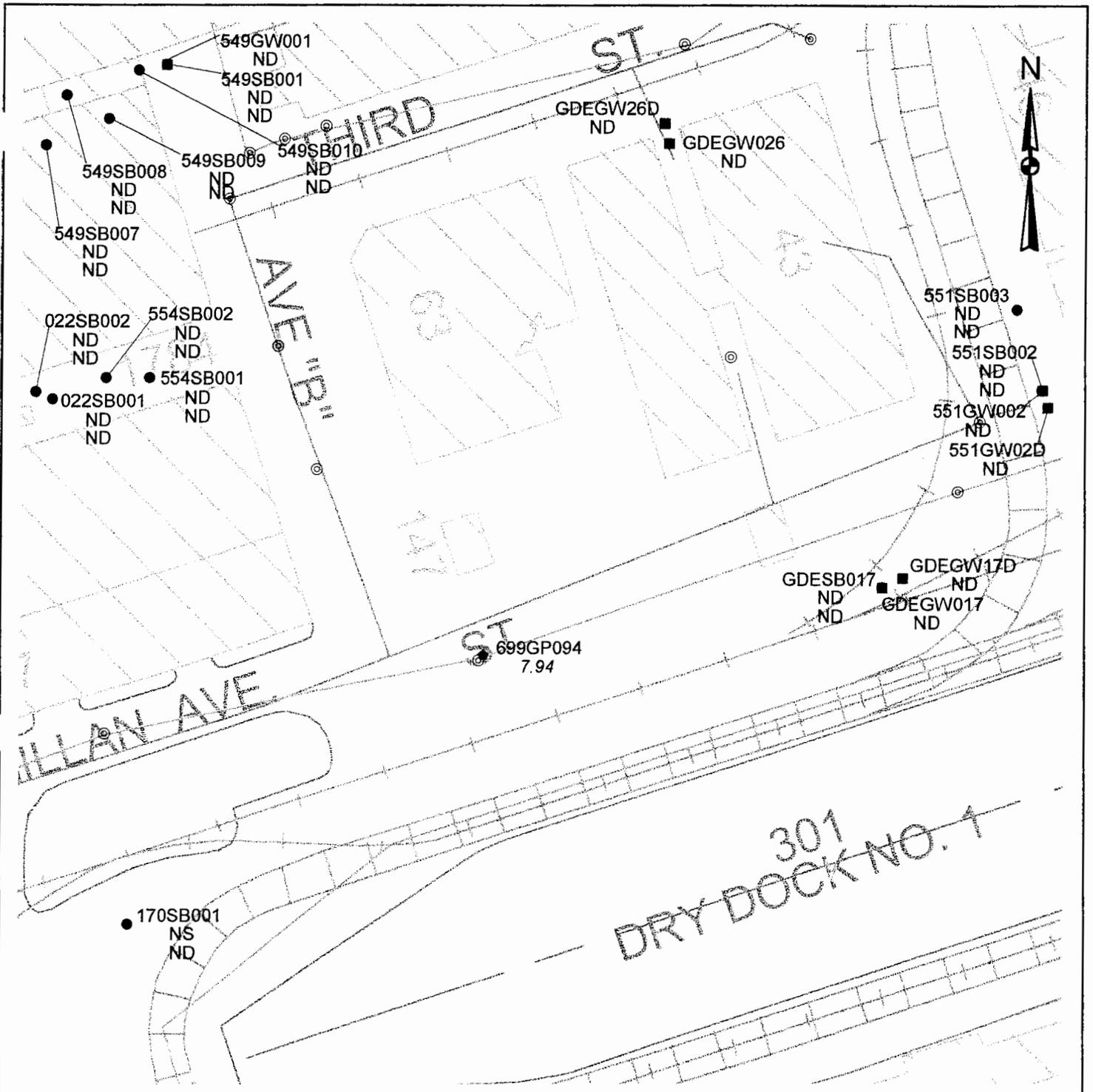
50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.45
 ZONE L - SUBZONE E
 TRICHLOROETHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=520000 ug/kg SSL=30.0 ug/kg MCL=5.00 ug/L



LEGEND

- ◆ ZONE L DPT GROUNDWATER LOCATION
- 12.30 ZONE L DPT GROUNDWATER CONC. (ug/L)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

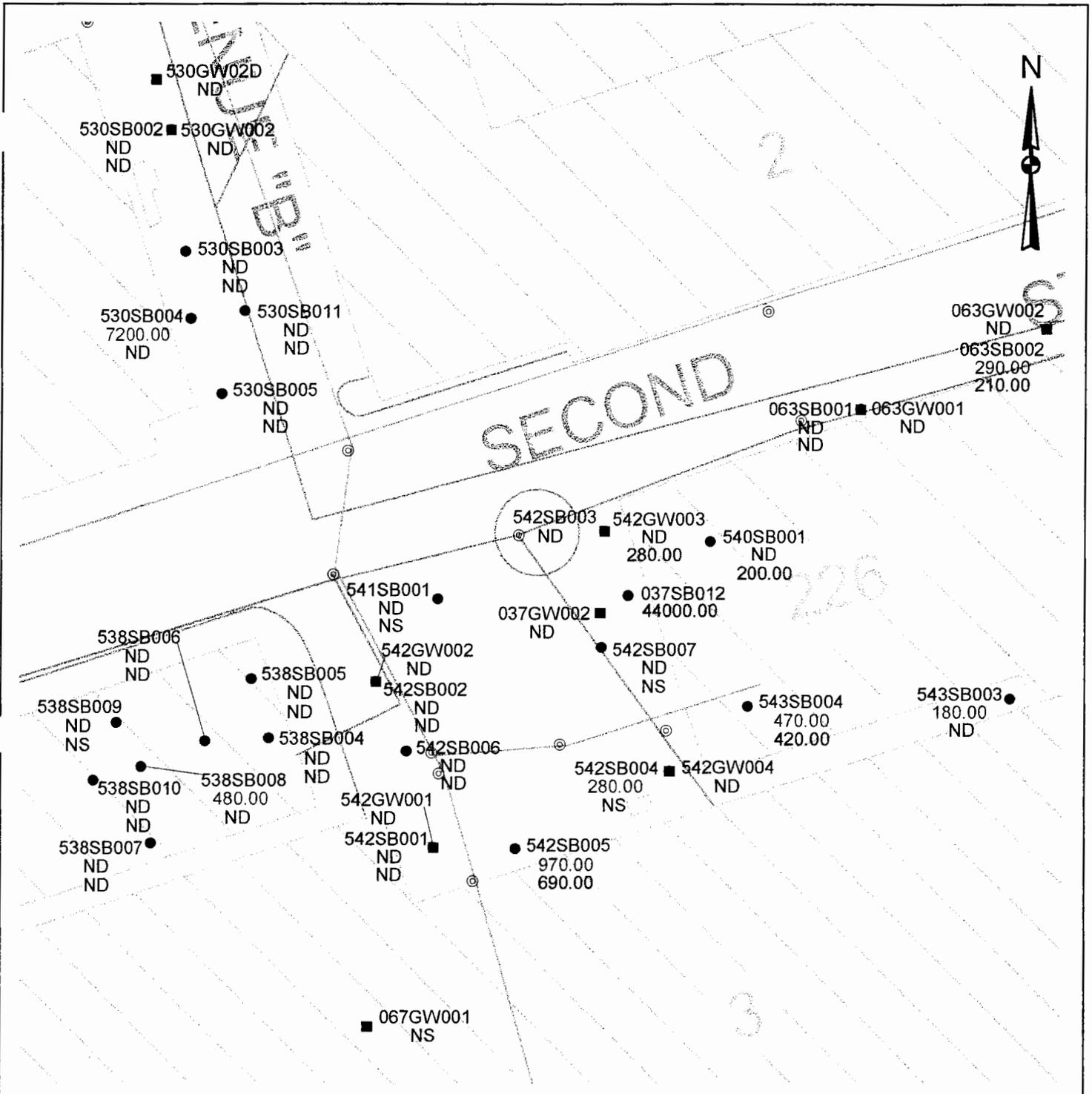
60 0 60 120 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.46
 ZONE L - SUBZONE E
 VINYL CHLORIDE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=3000 ug/kg SSL=6.50 ug/kg MCL=2.00 ug/L



LEGEND

- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

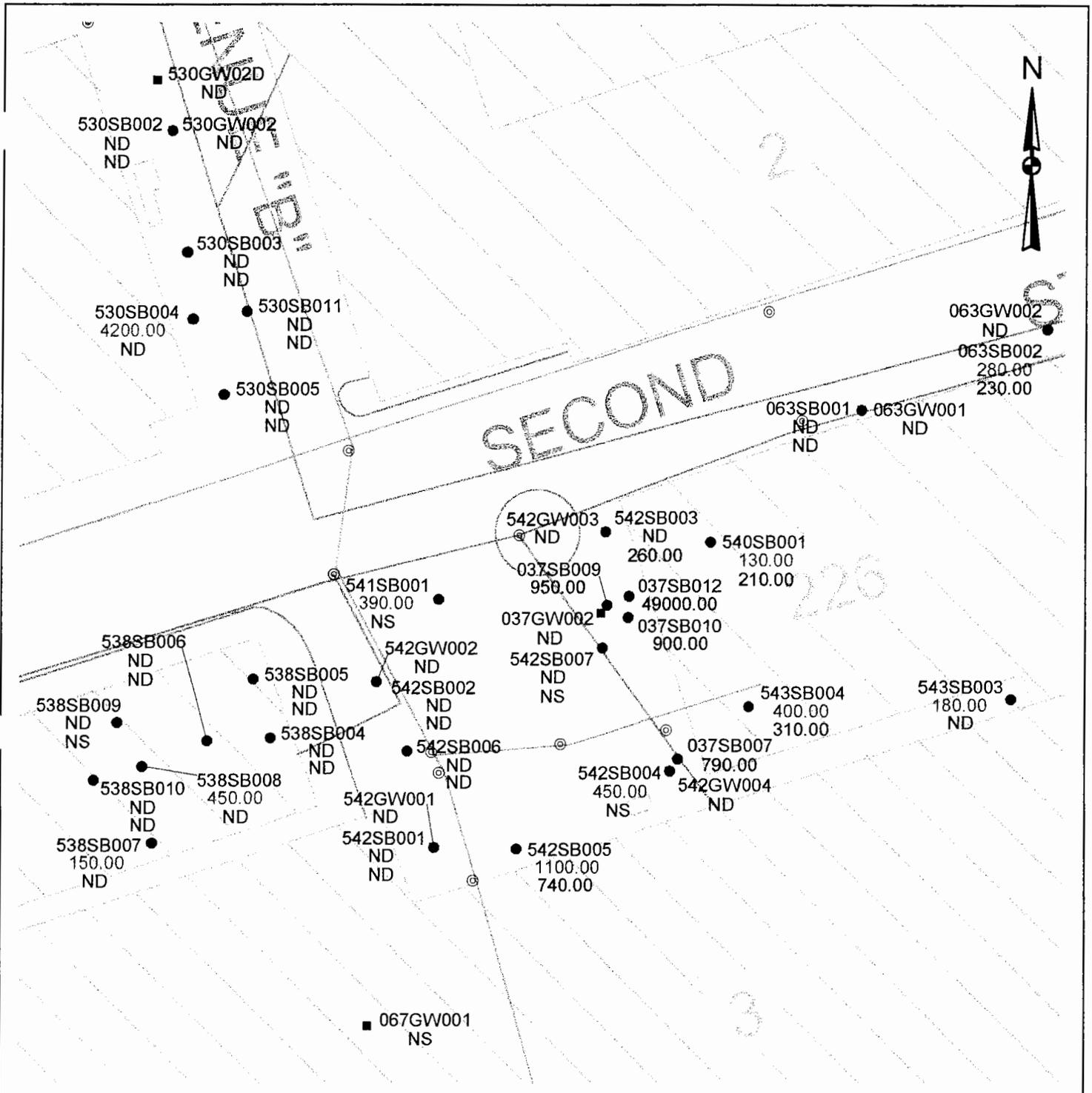
SUBZONE BOUNDARY RAILROAD ⊙ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.47
 ZONE L - SUBZONE E
 BENZO(A)ANTHRACENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=7800 ug/kg SSL=800 ug/kg MCL=NONE



LEGEND

- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY / RAILROAD ⊙ MANHOLE
 / SANITARY SEWER LINE / STORM SEWER LINE

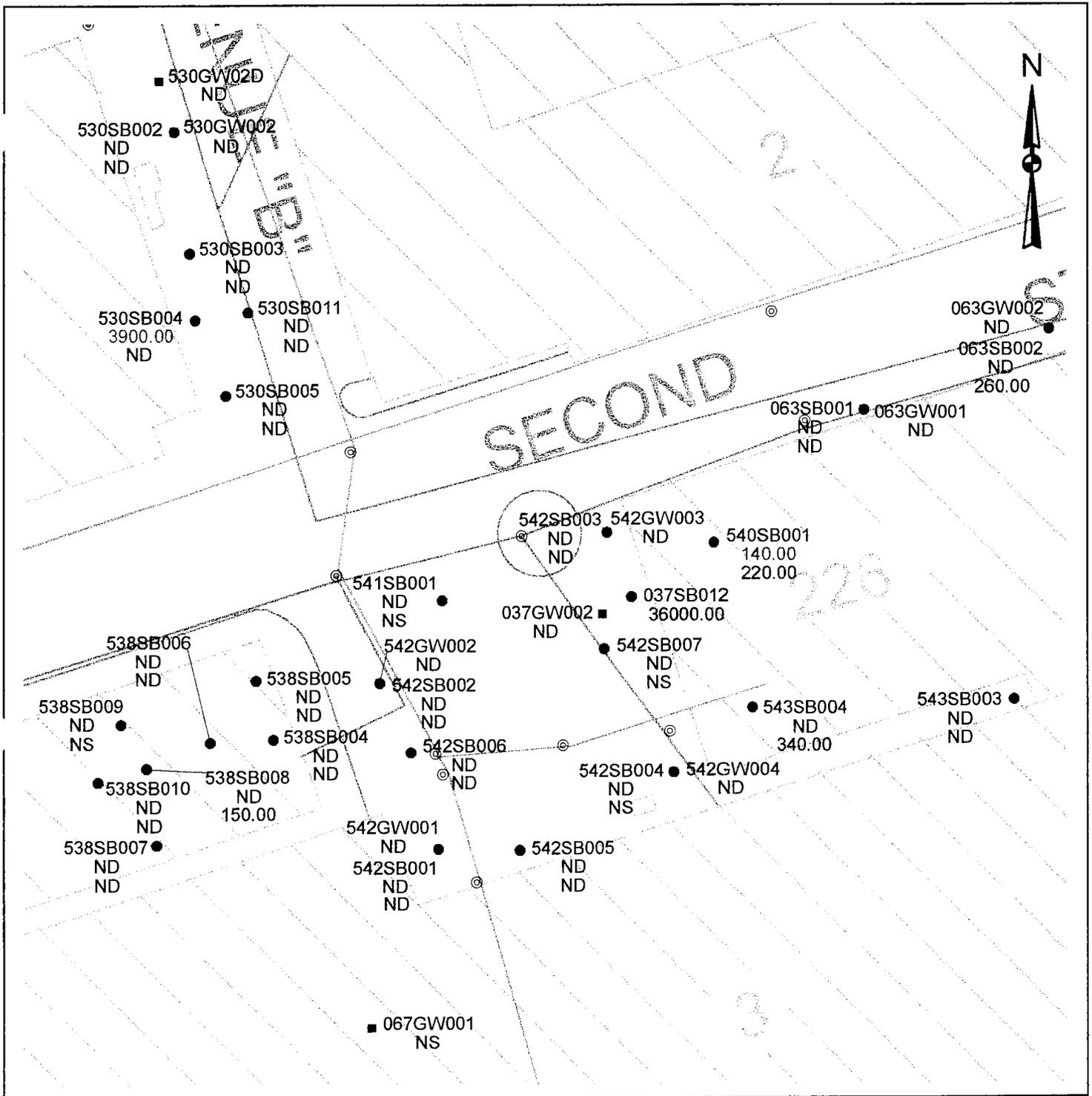
50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.48
 ZONE L - SUBZONE E
 BENZO(A)PYRENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=780 ug/kg SSL=4000 ug/kg MCL=0.20 ug/L



LEGEND

- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY / RAILROAD ⊙ MANHOLE
 / SANITARY SEWER LINE / STORM SEWER LINE

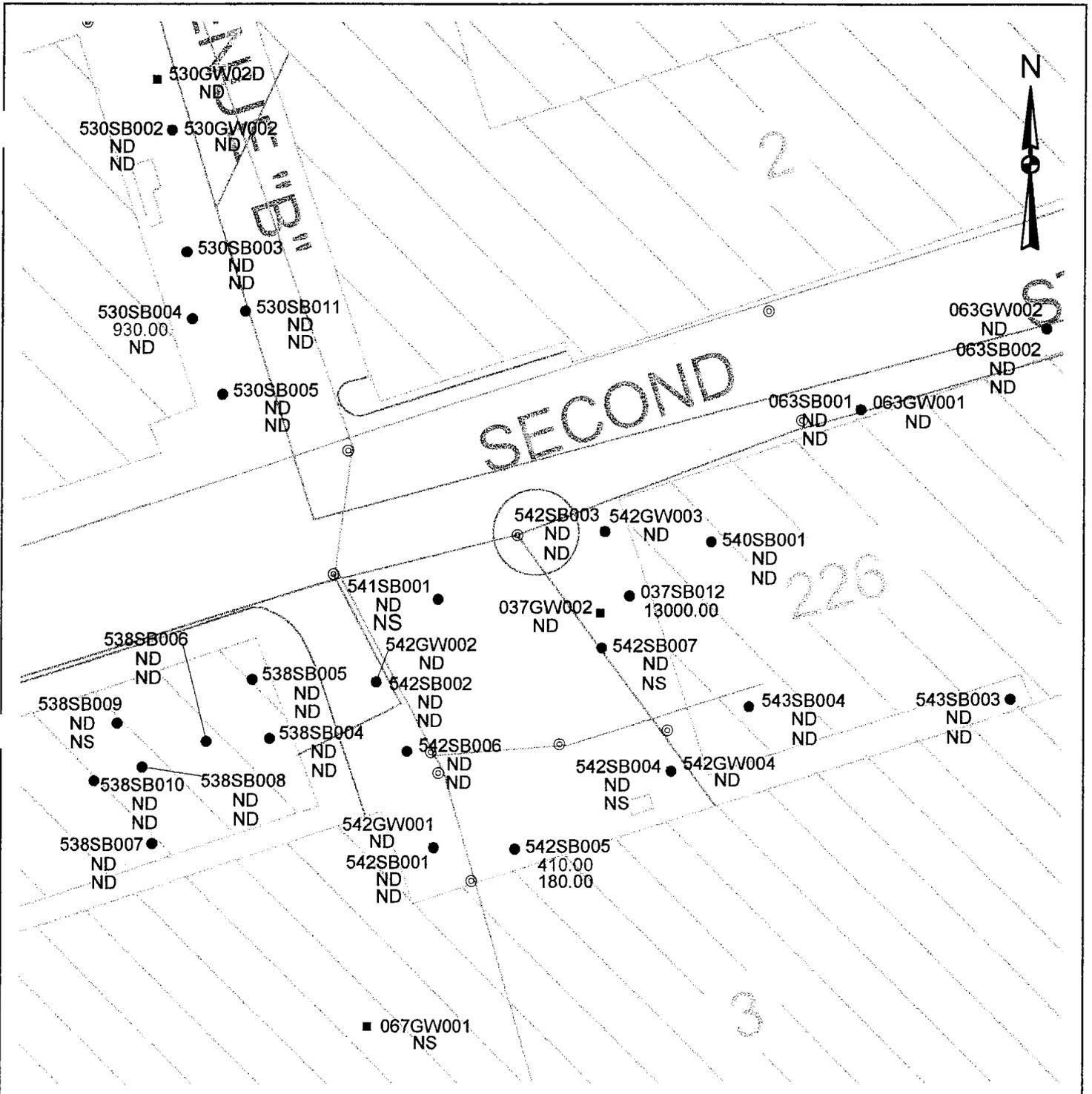
50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.49
 ZONE L - SUBZONE E
 BENZO(B)FLUORANTHENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=7800 ug/kg SSL=2300 ug/kg MCL=NONE



LEGEND

- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

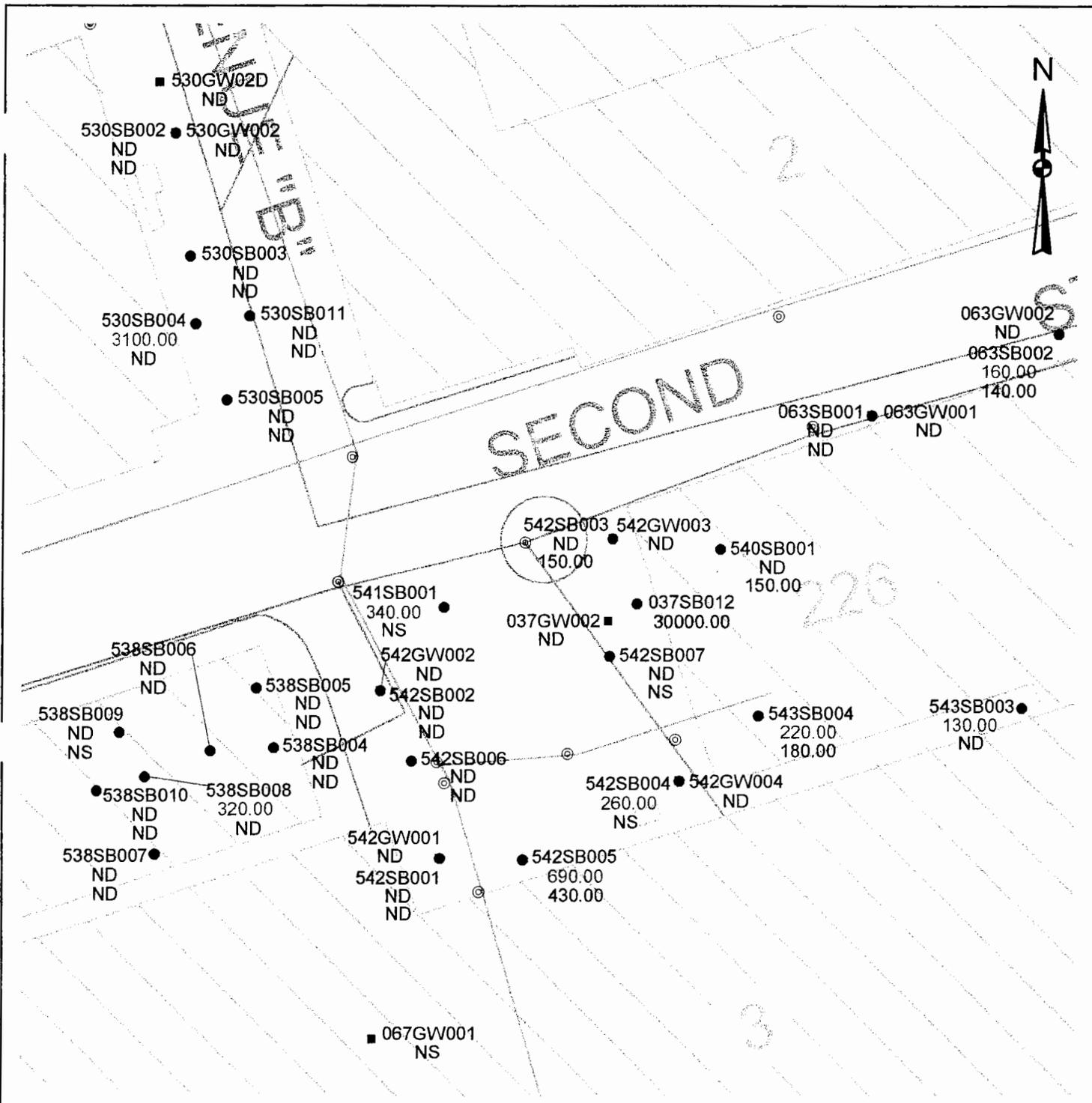
SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.50
 ZONE L - SUBZONE E
 DIBENZ(A,H)ANTHRACENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=780 ug/kg SSL=800 ug/kg MCL=NONE



LEGEND

- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY / RAILROAD ⊙ MANHOLE
 / SANITARY SEWER LINE / STORM SEWER LINE

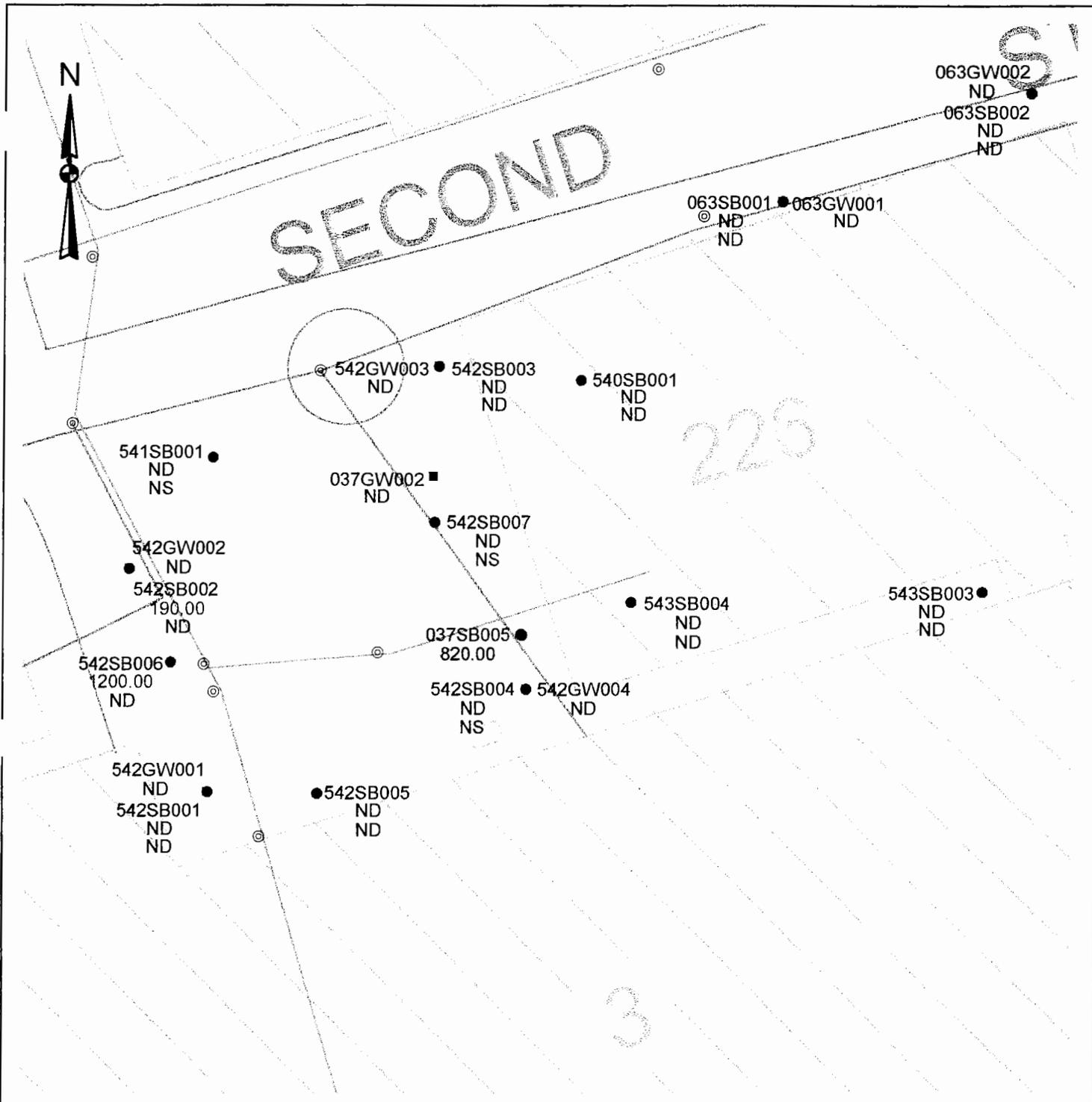
50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.51
 ZONE L - SUBZONE E
 INDENO(1,2,3-CD)PYRENE
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=7800 ug/kg SSL=7000 ug/kg MCL=NONE



LEGEND

- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

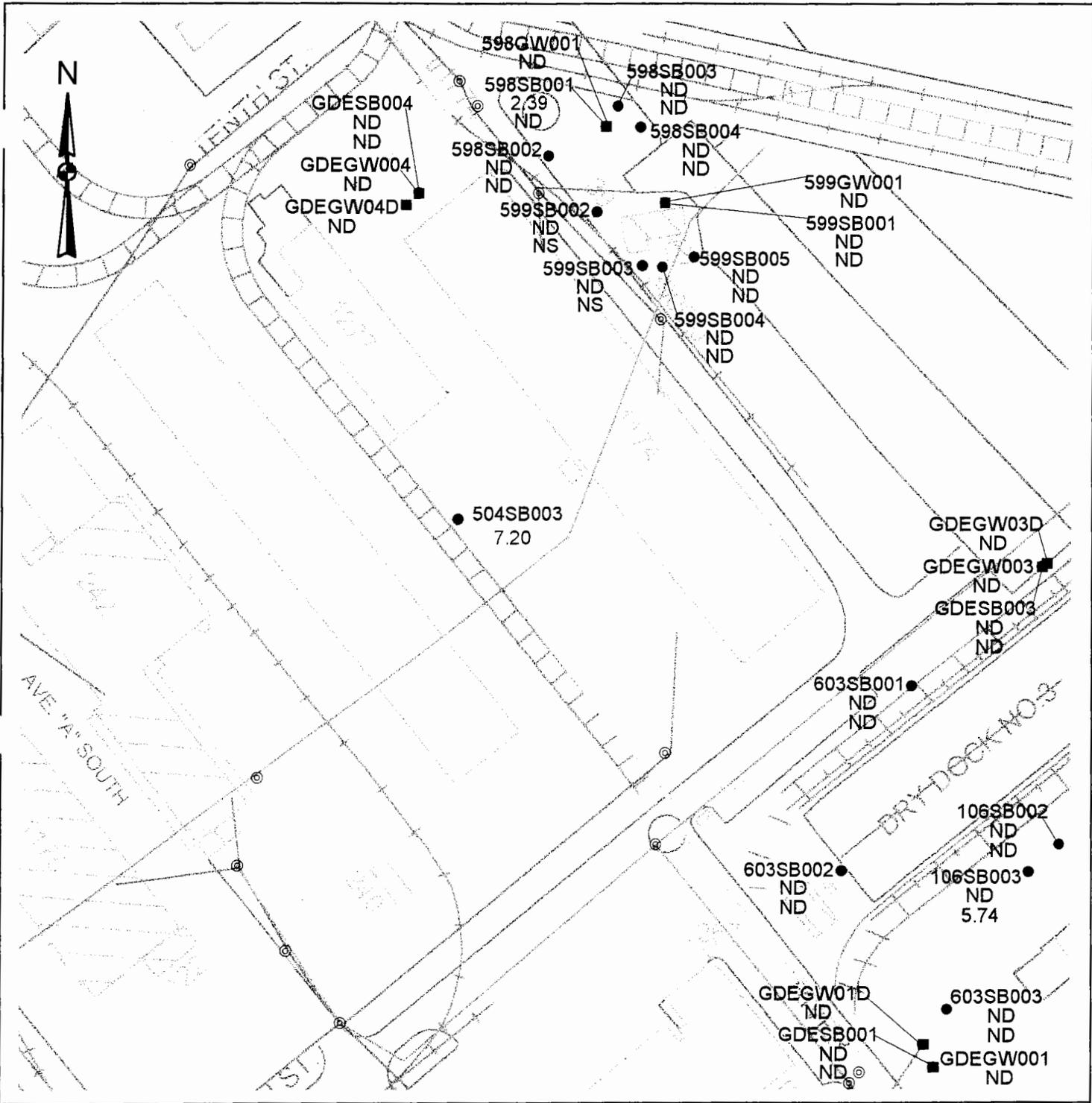
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.52
 ZONE L - SUBZONE E
 AROCLOR-1254
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

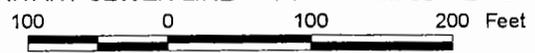
RBC=740 ug/kg SSL=1000 ug/kg MCL=0.50 ug/L



LEGEND

- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

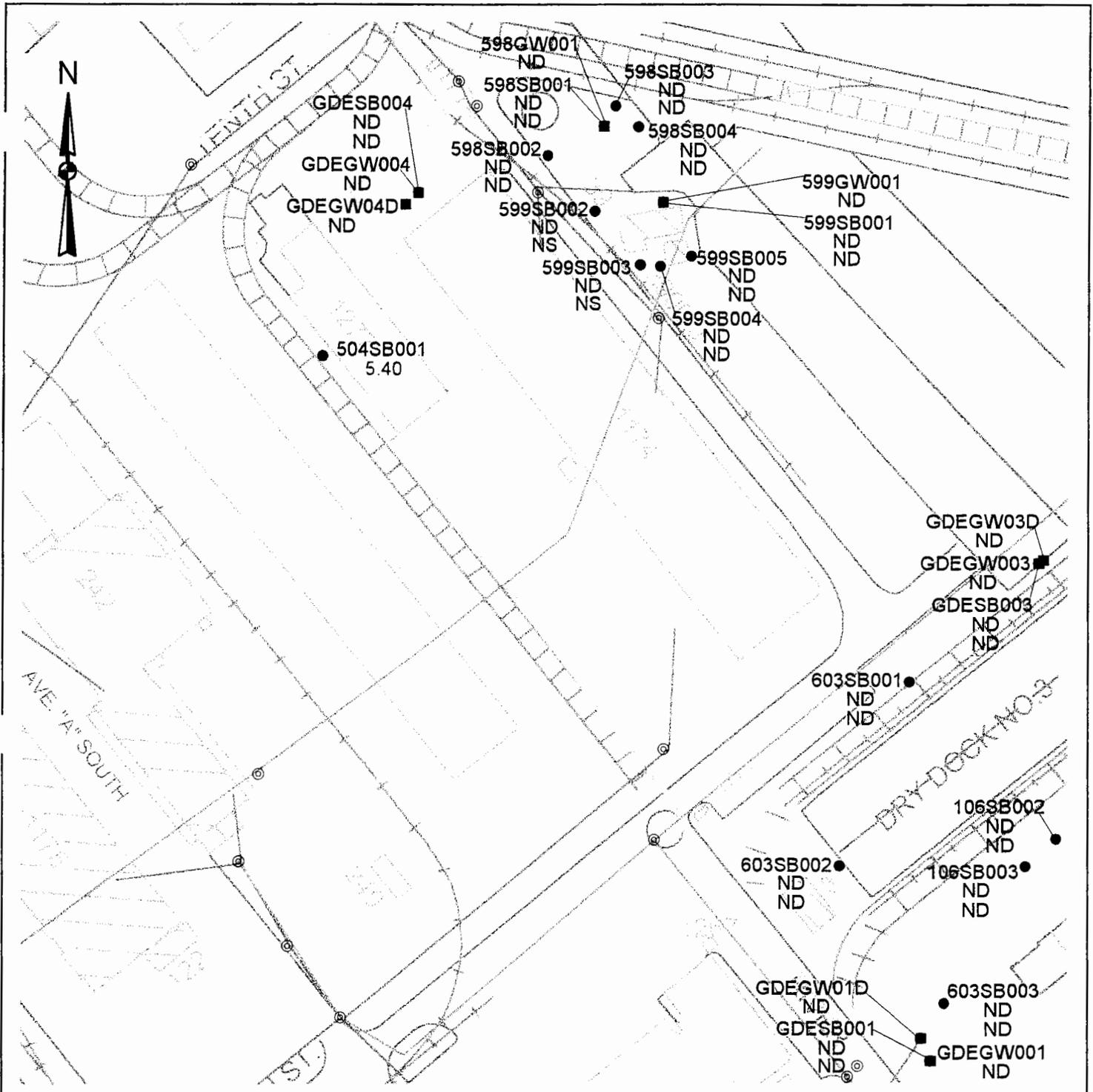
— SUBZONE BOUNDARY — RAILROAD ⊙ MANHOLE
 - - - SANITARY SEWER LINE - - - STORM SEWER LINE



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.53
 ZONE L - SUBZONE E
 GAMMA-BHC (LINDANE)
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=4400 ug/kg SSL=4.50 ug/kg MCL=0.20 ug/L



LEGEND

- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (ug/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (ug/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (ug/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

— SUBZONE BOUNDARY — RAILROAD ⊙ MANHOLE
 — SANITARY SEWER LINE — STORM SEWER LINE

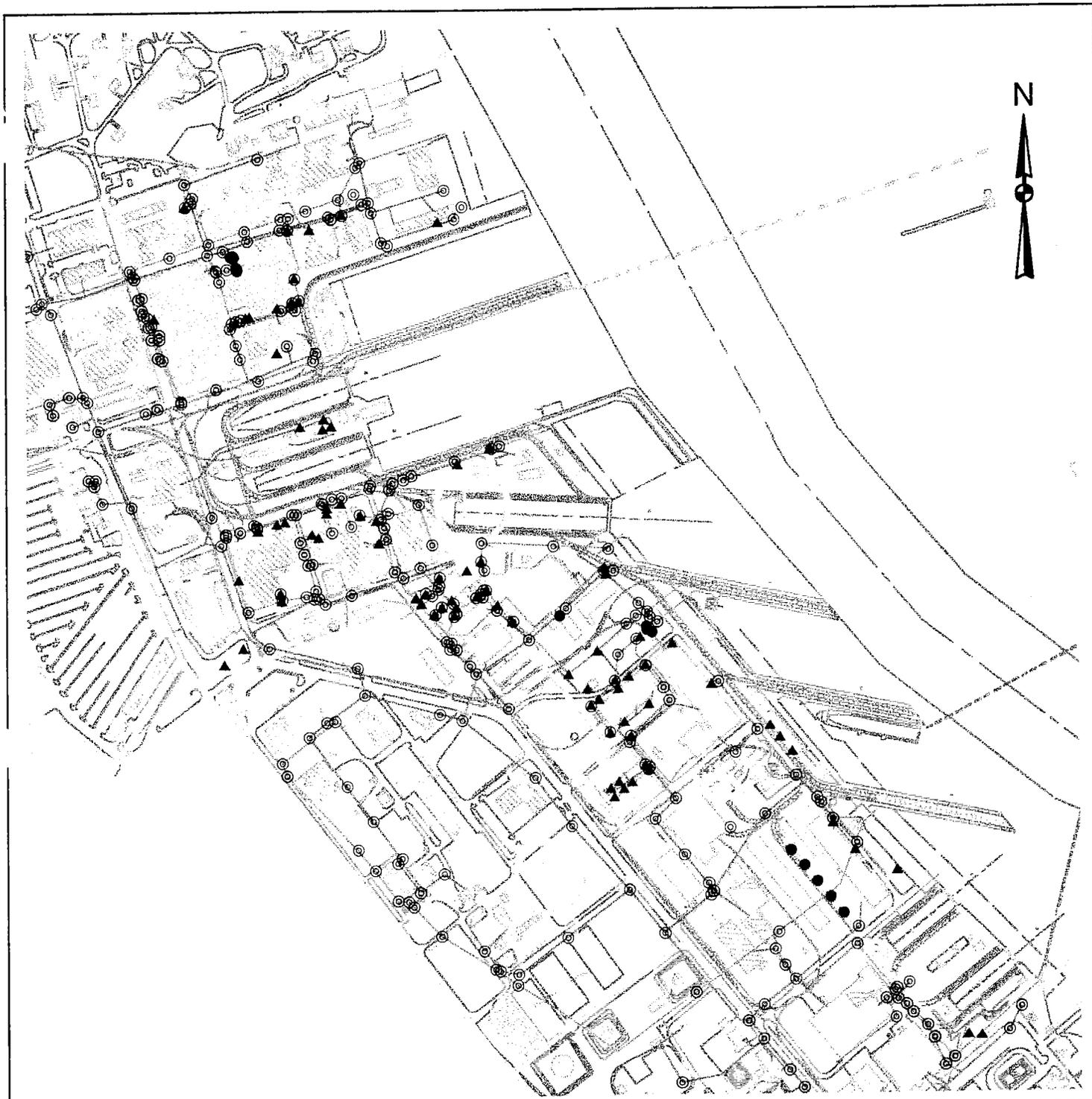
100 0 100 200 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.54
 ZONE L - SUBZONE E
 DIELDRIN
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC=360 ug/kg SSL=2.00 ug/kg MCL=NONE



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION

- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

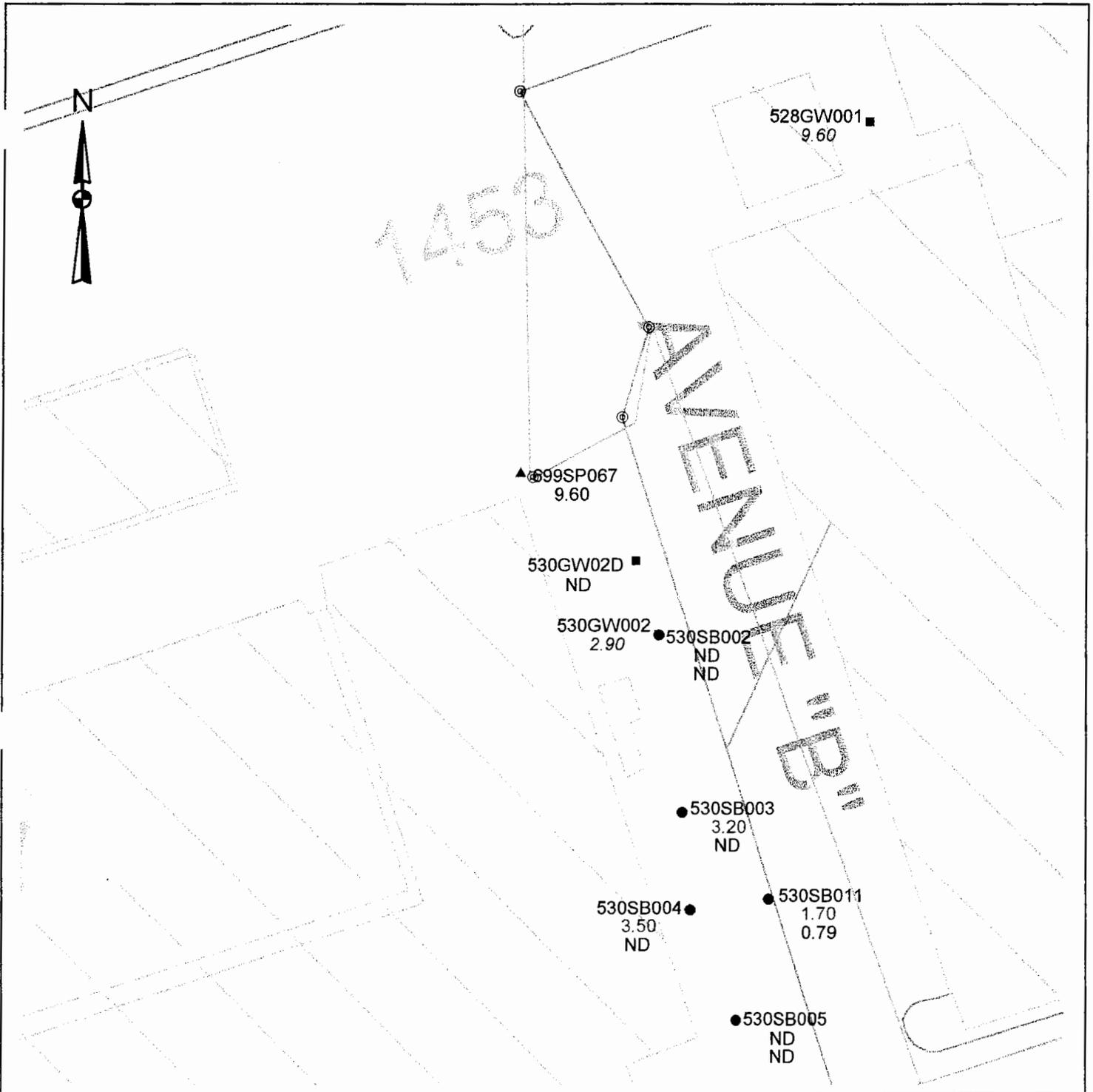
500 0 500 1000 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.55
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY / RAILROAD © MANHOLE
 / SANITARY SEWER LINE / STORM SEWER LINE

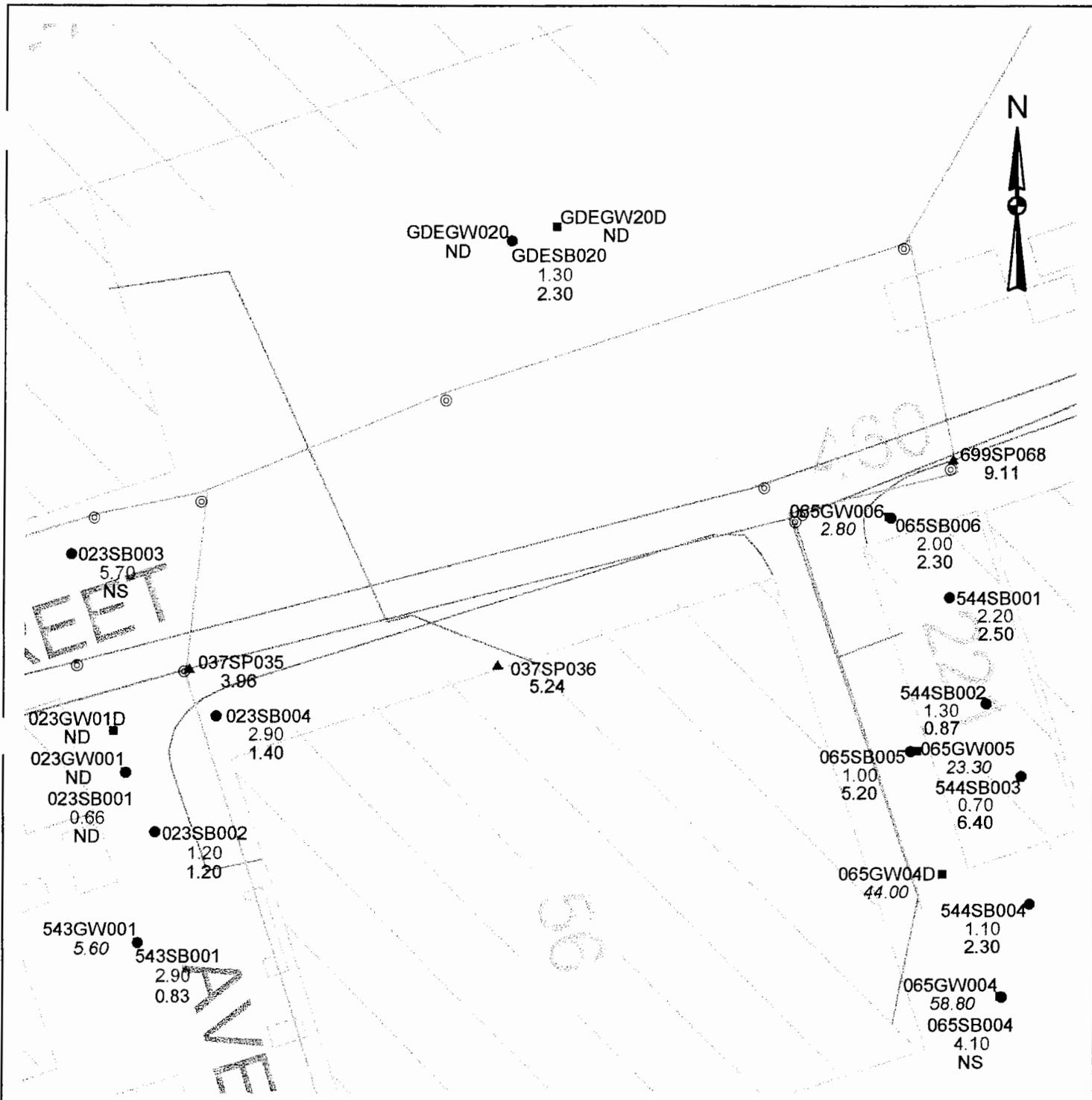
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.56
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

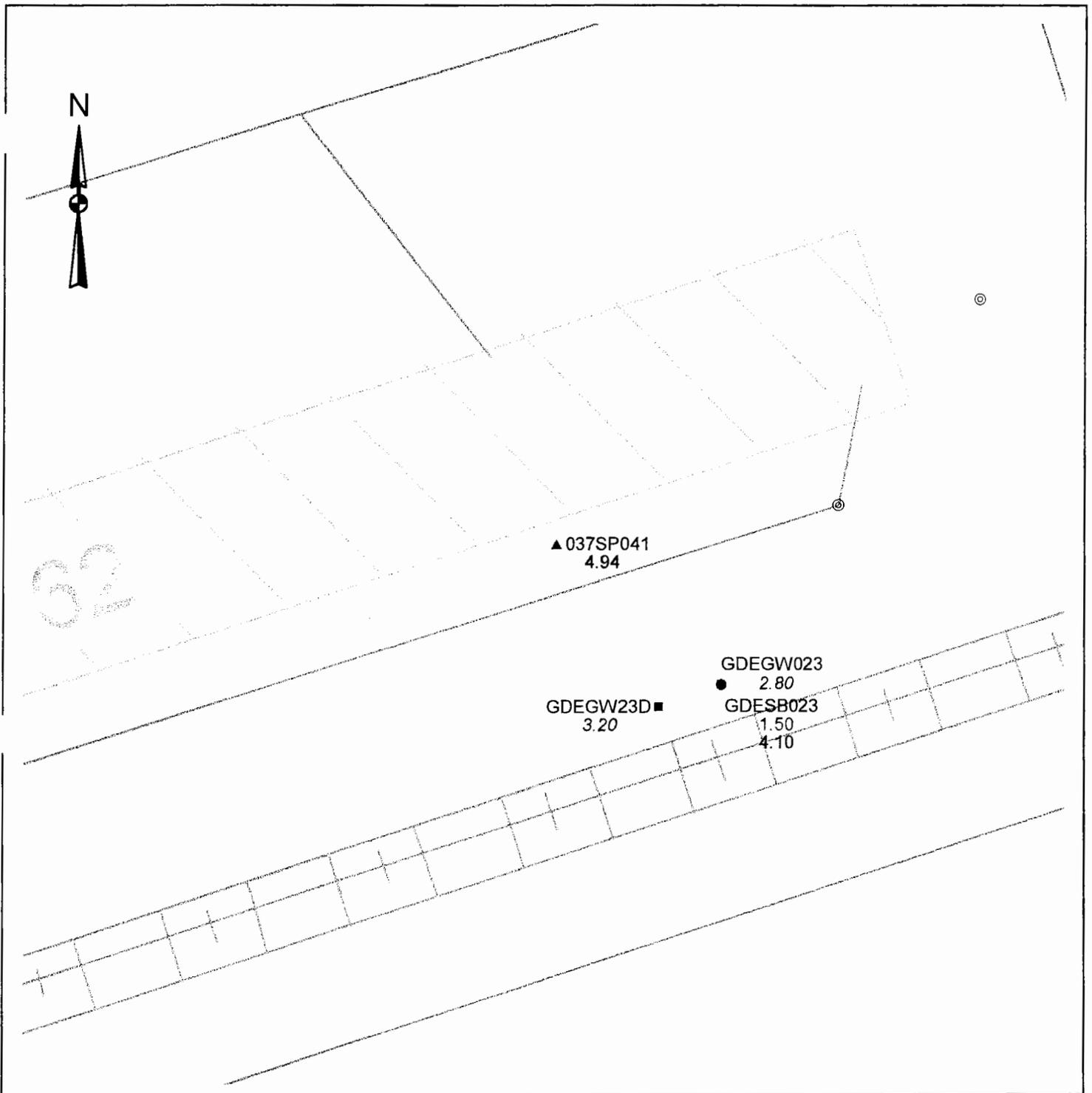


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.57
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS



RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- SANITARY SEWER LINE
- STORM SEWER LINE
- ◎ MANHOLE

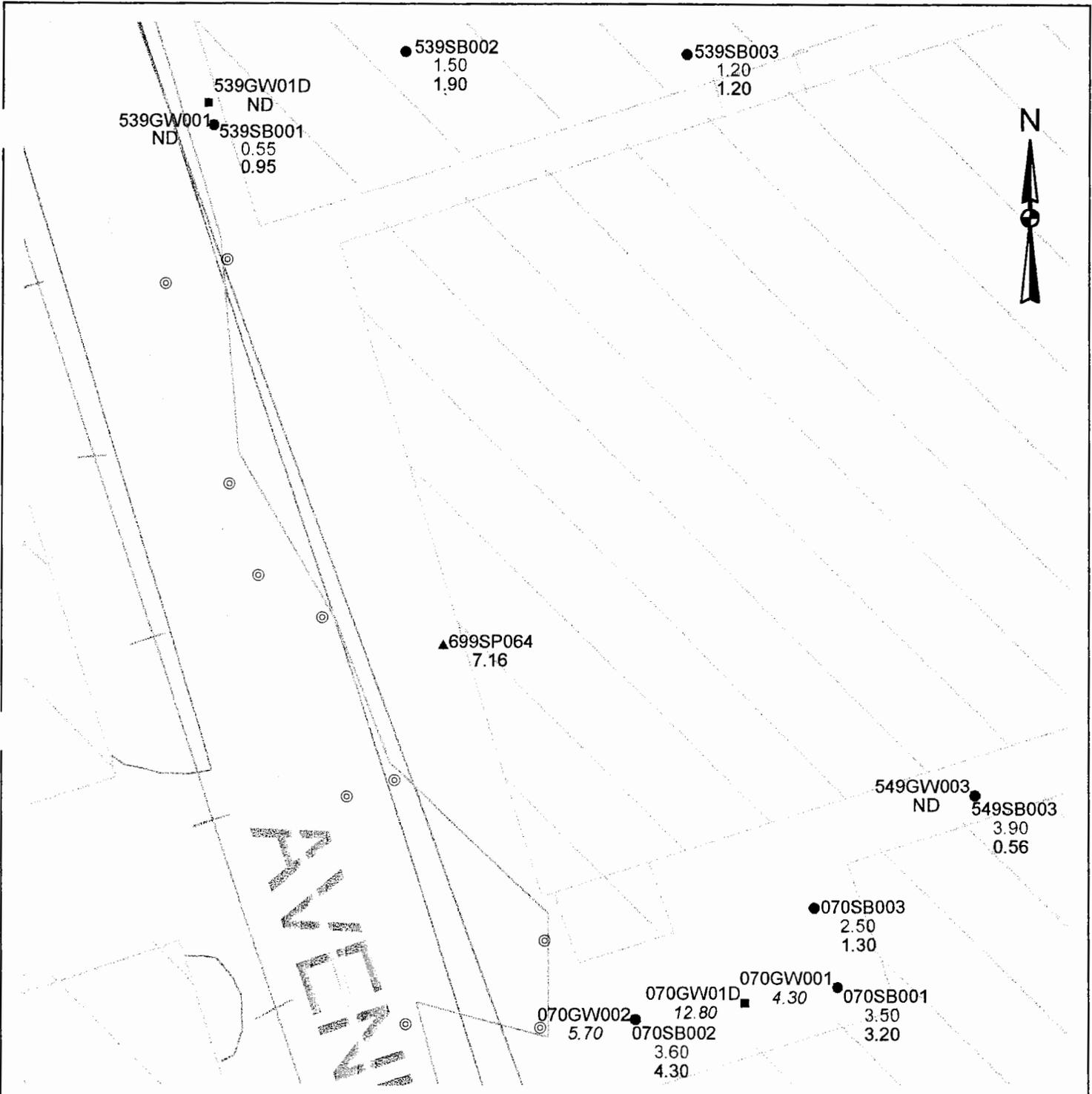
30 0 30 60 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.58
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

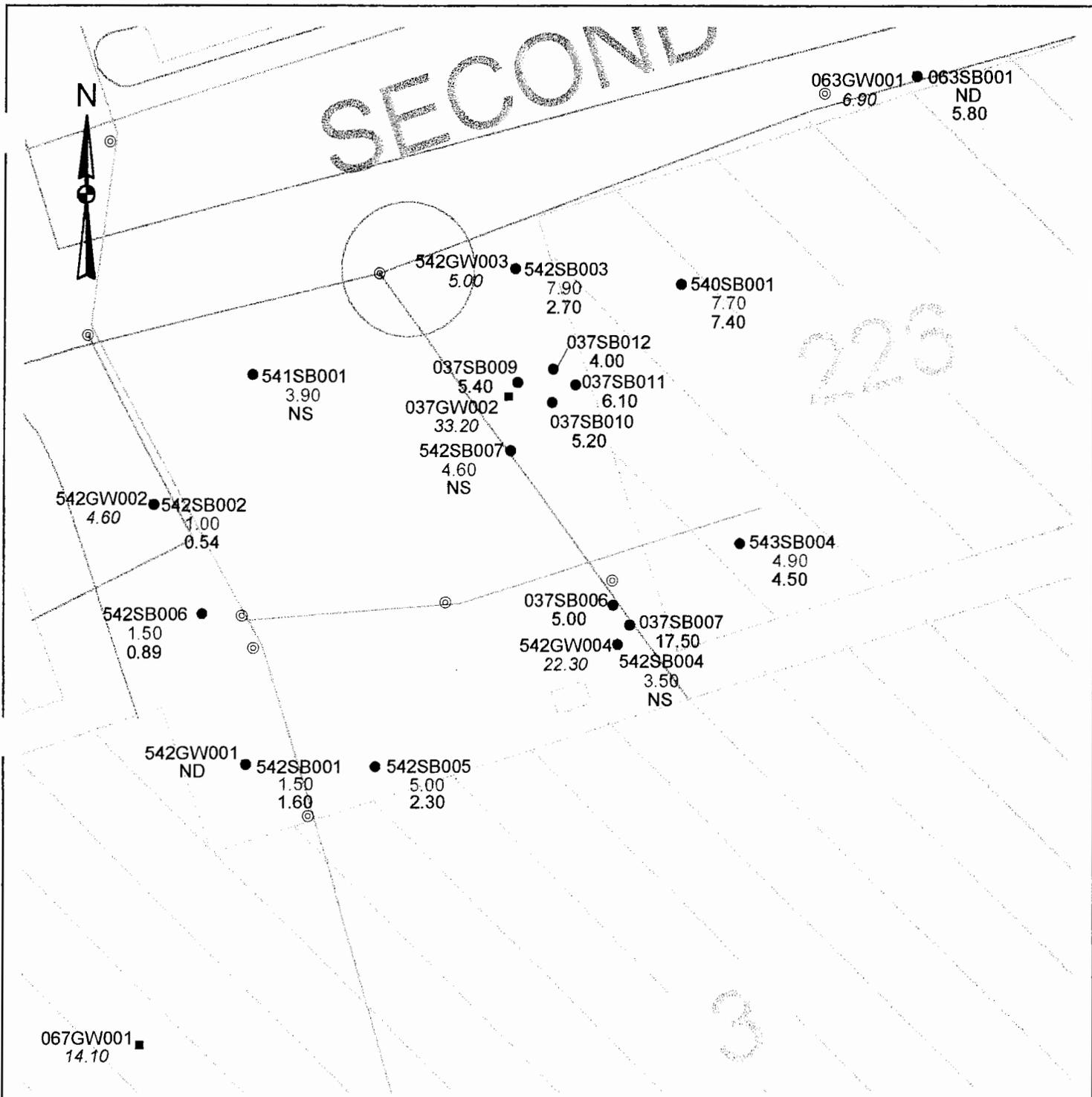
- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.59
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY / RAILROAD © MANHOLE
 / SANITARY SEWER LINE / STORM SEWER LINE

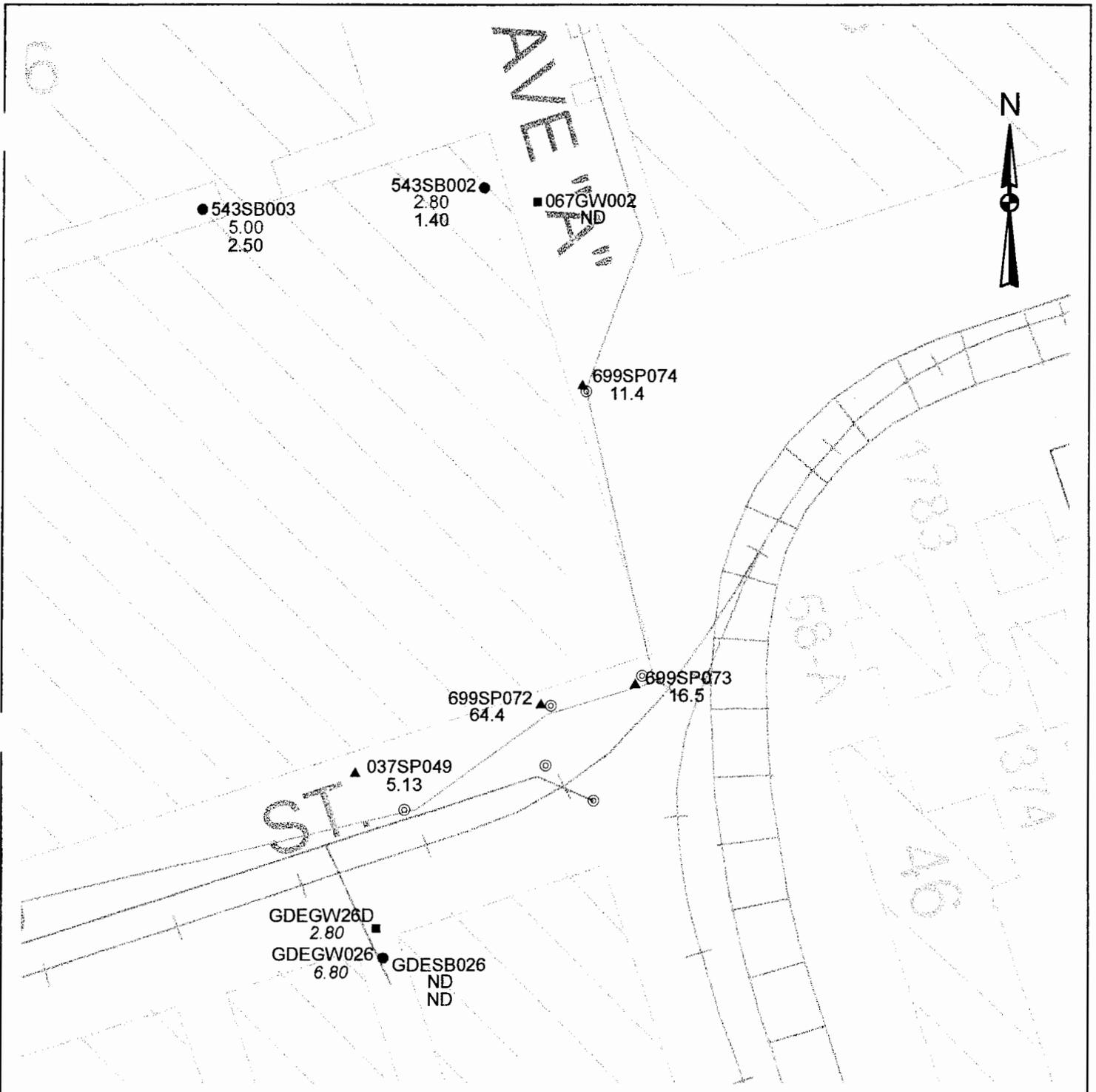
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.60
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

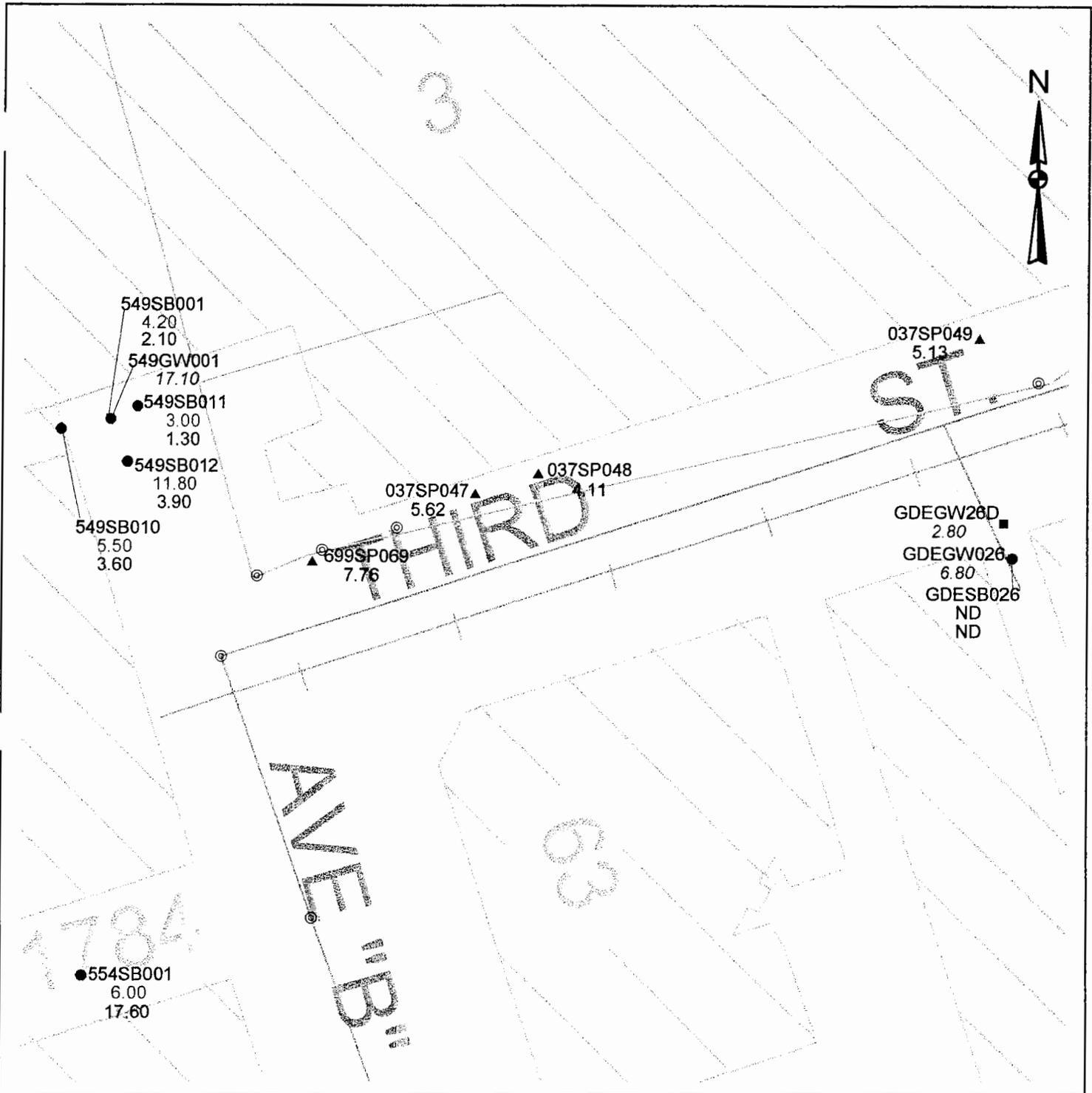
50 0 50 100 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.61
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



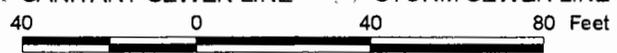
LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

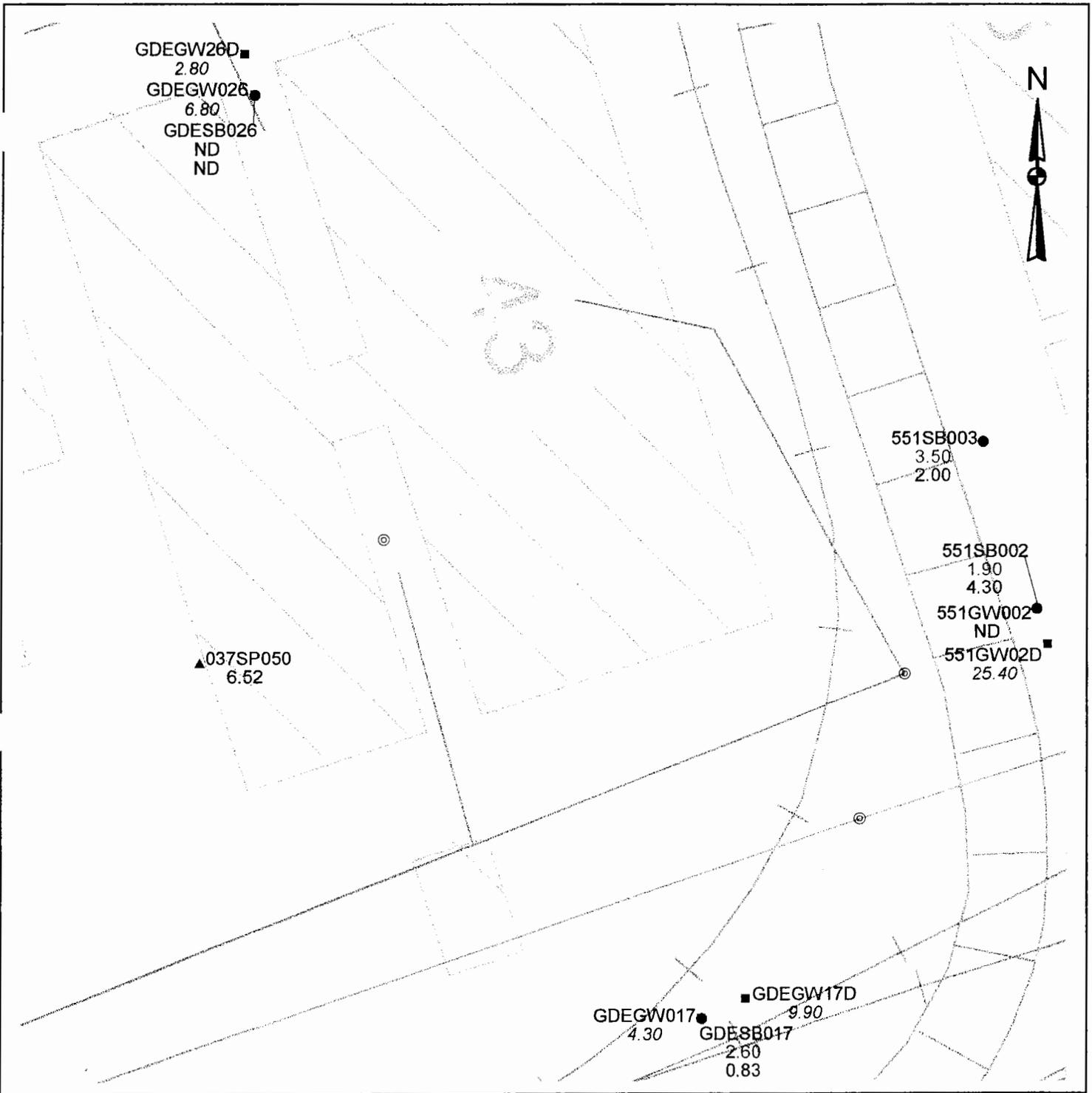


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.62
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

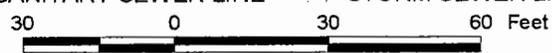


RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

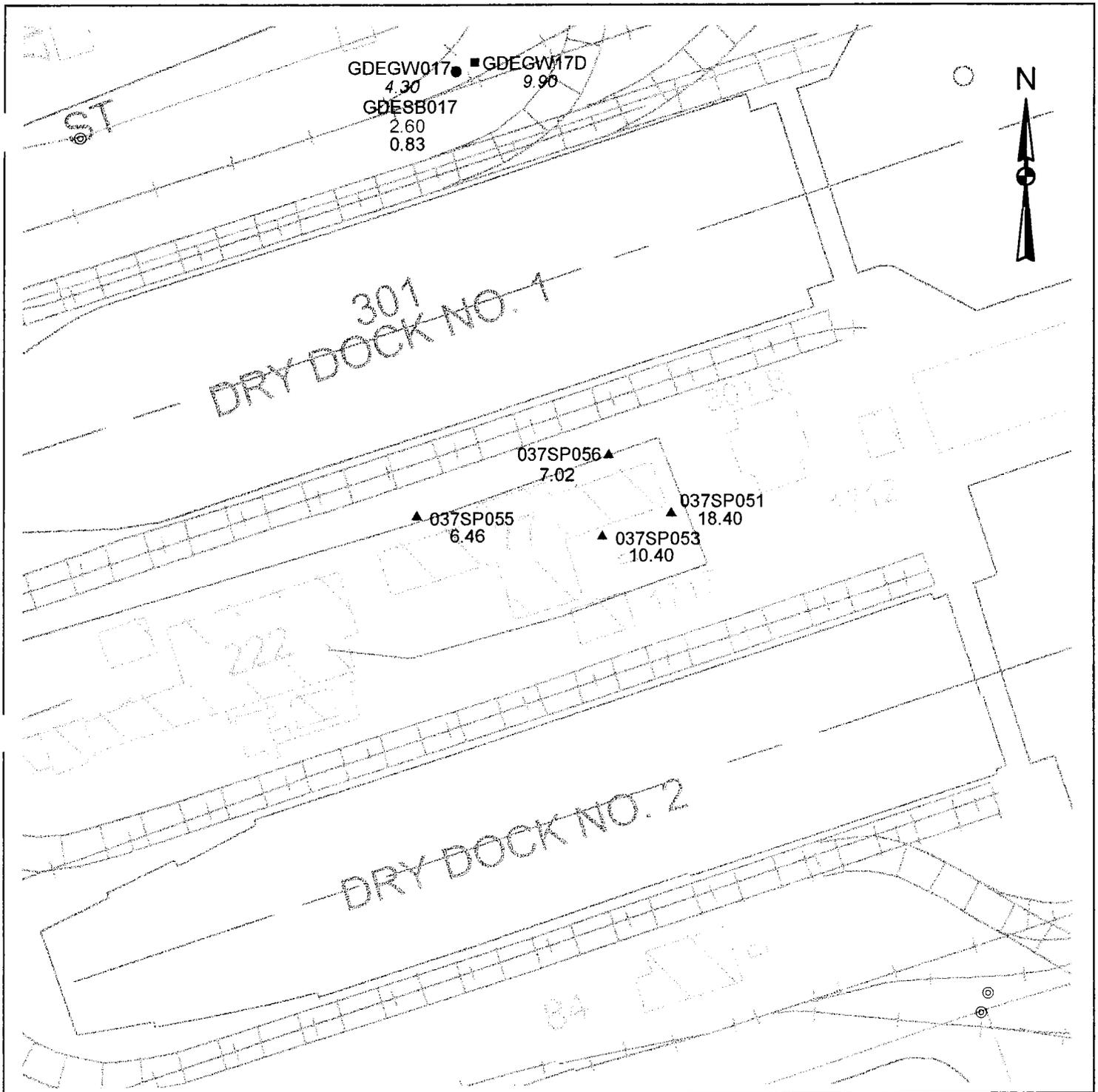
- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.63
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

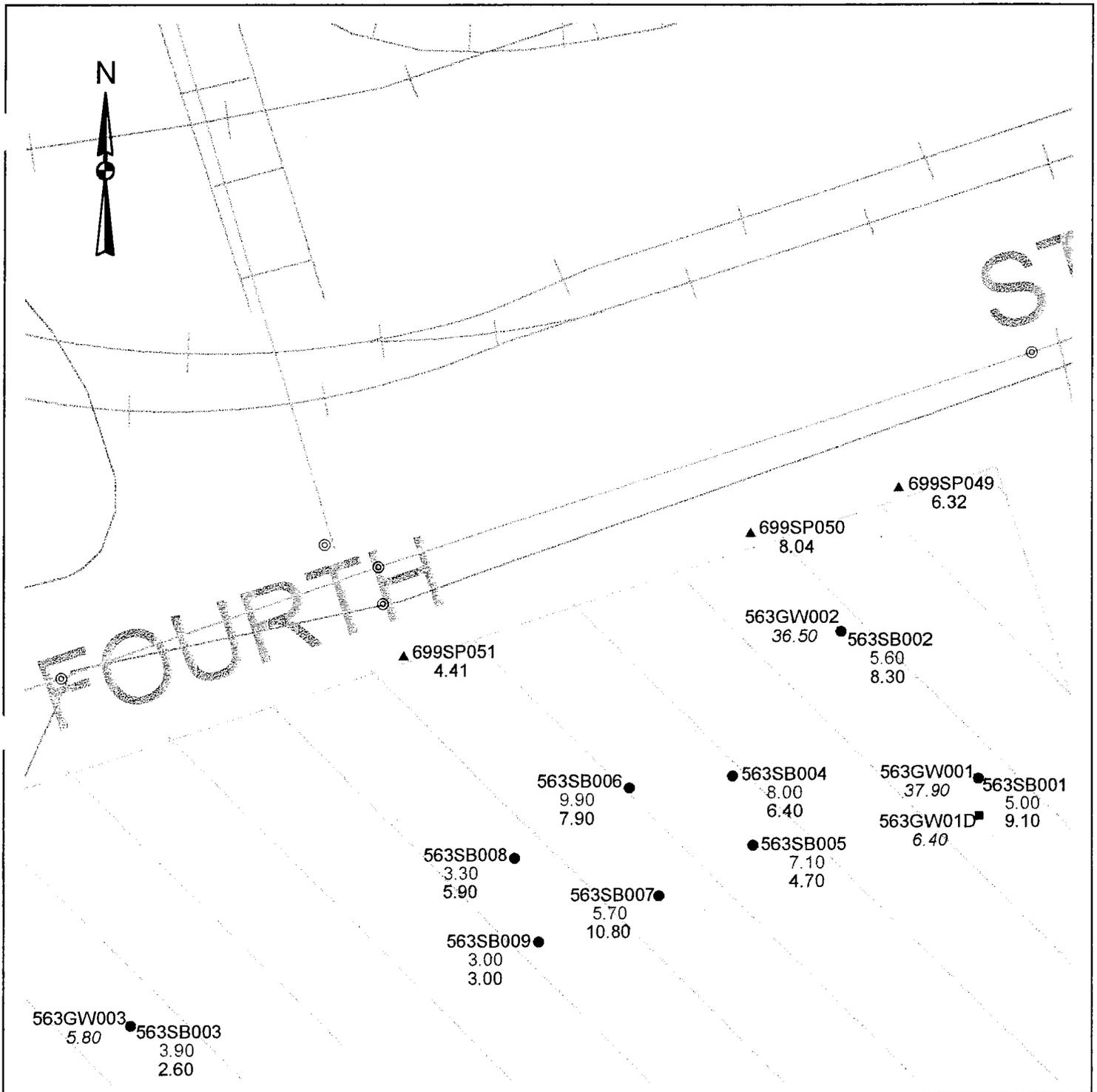
80 0 80 160 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.64
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

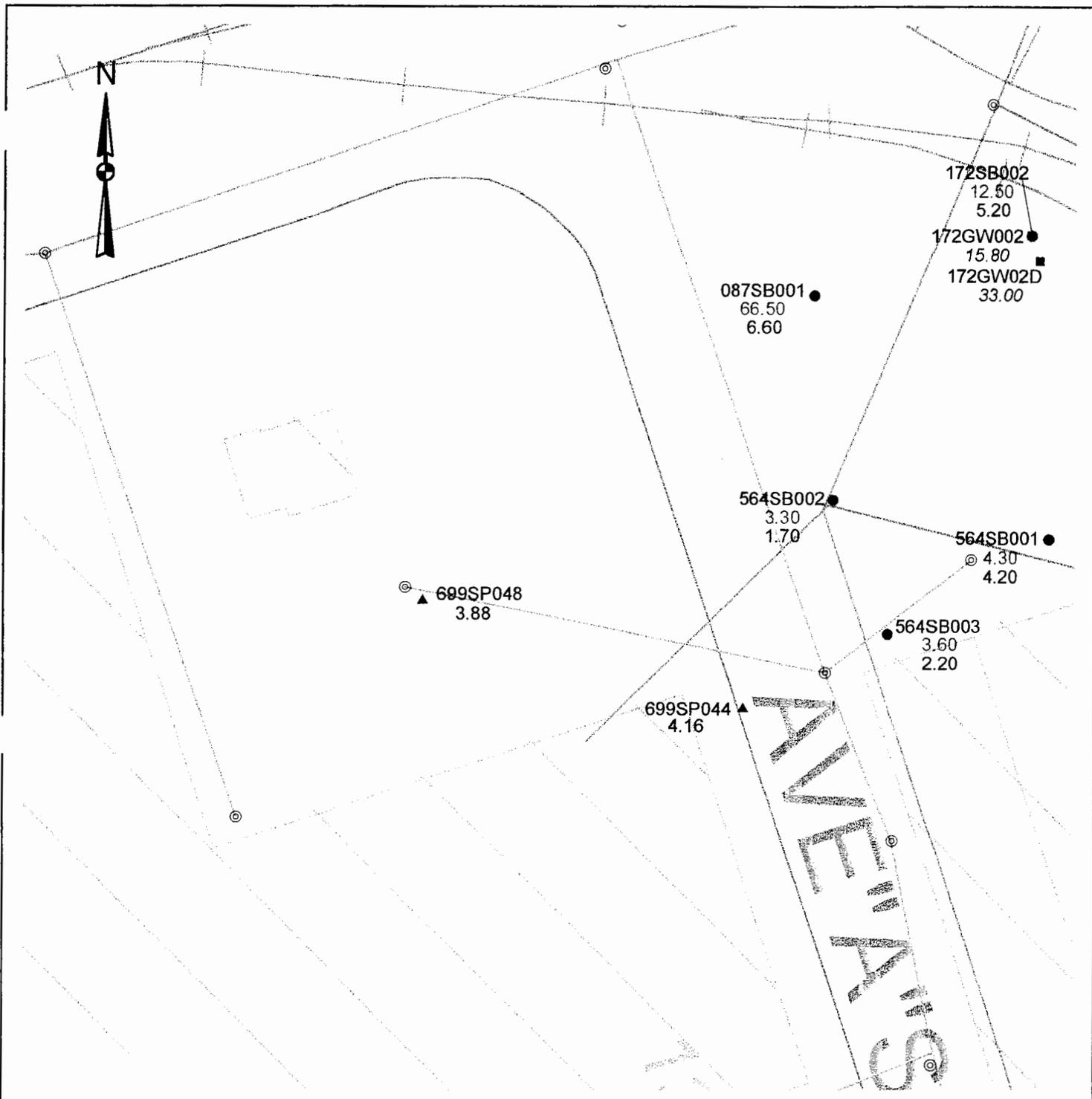
30 0 30 60 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.65
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

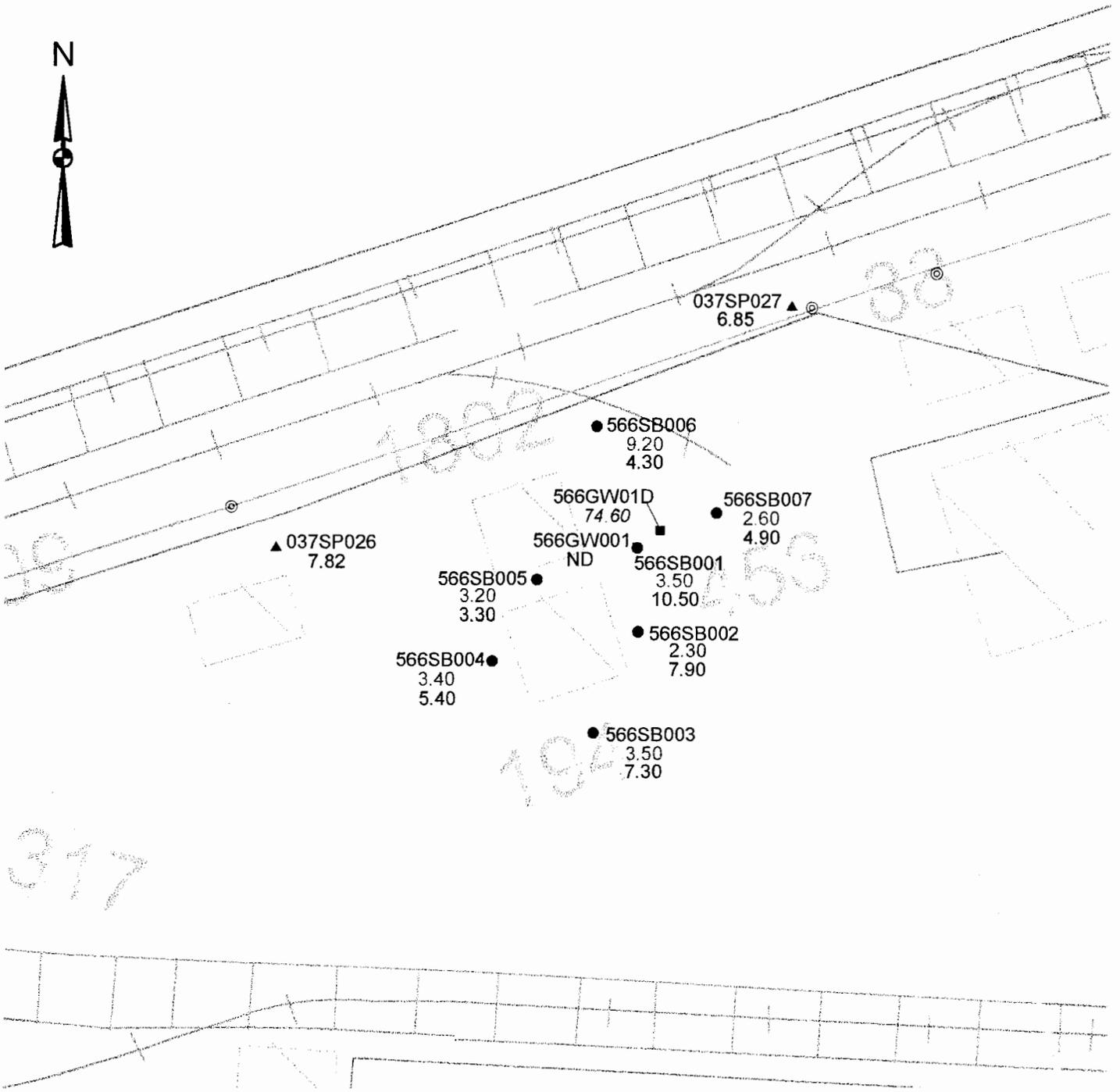
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ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

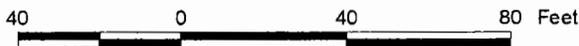
FIGURE 10.5.66
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

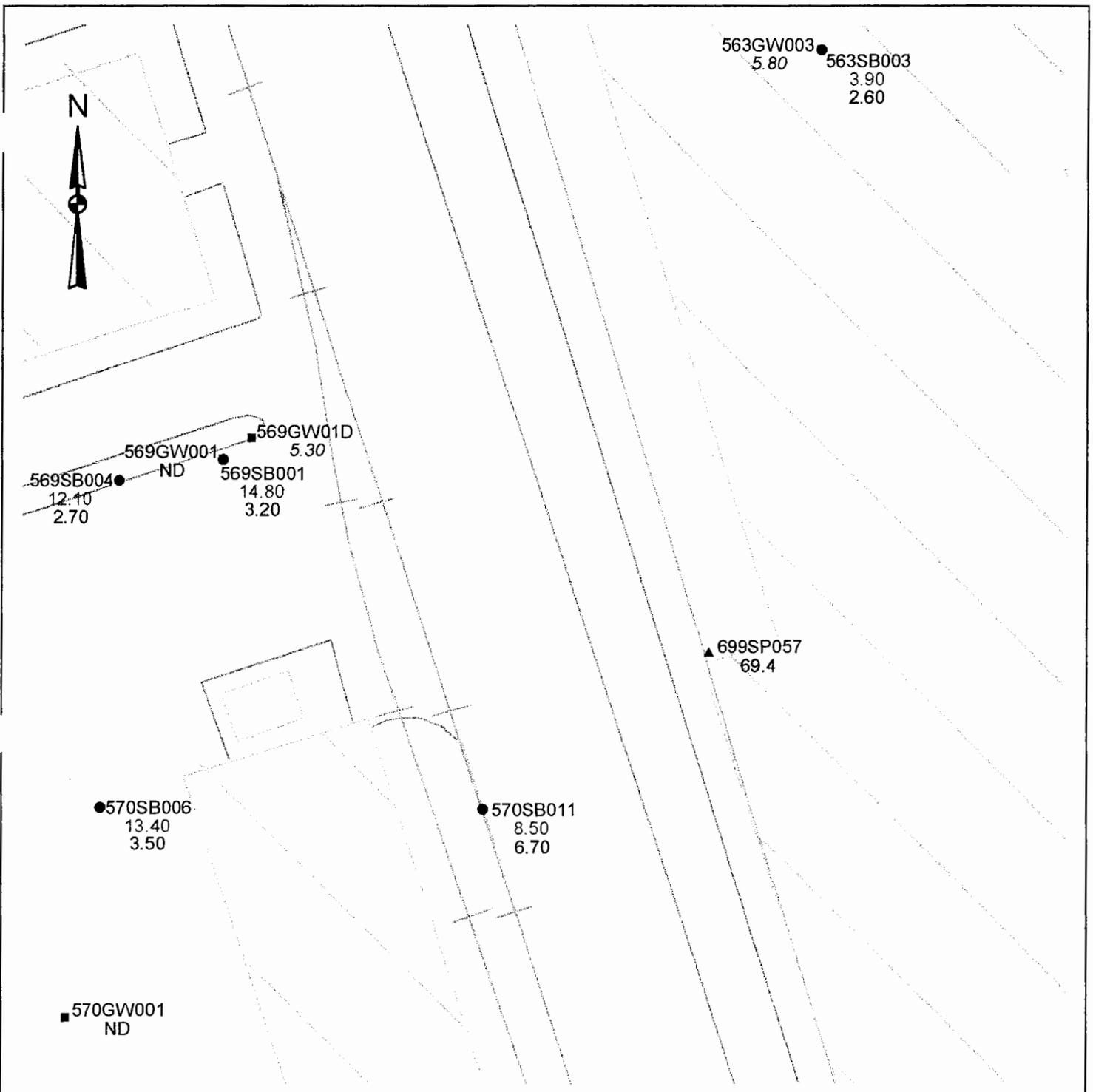
- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.67
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD © MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

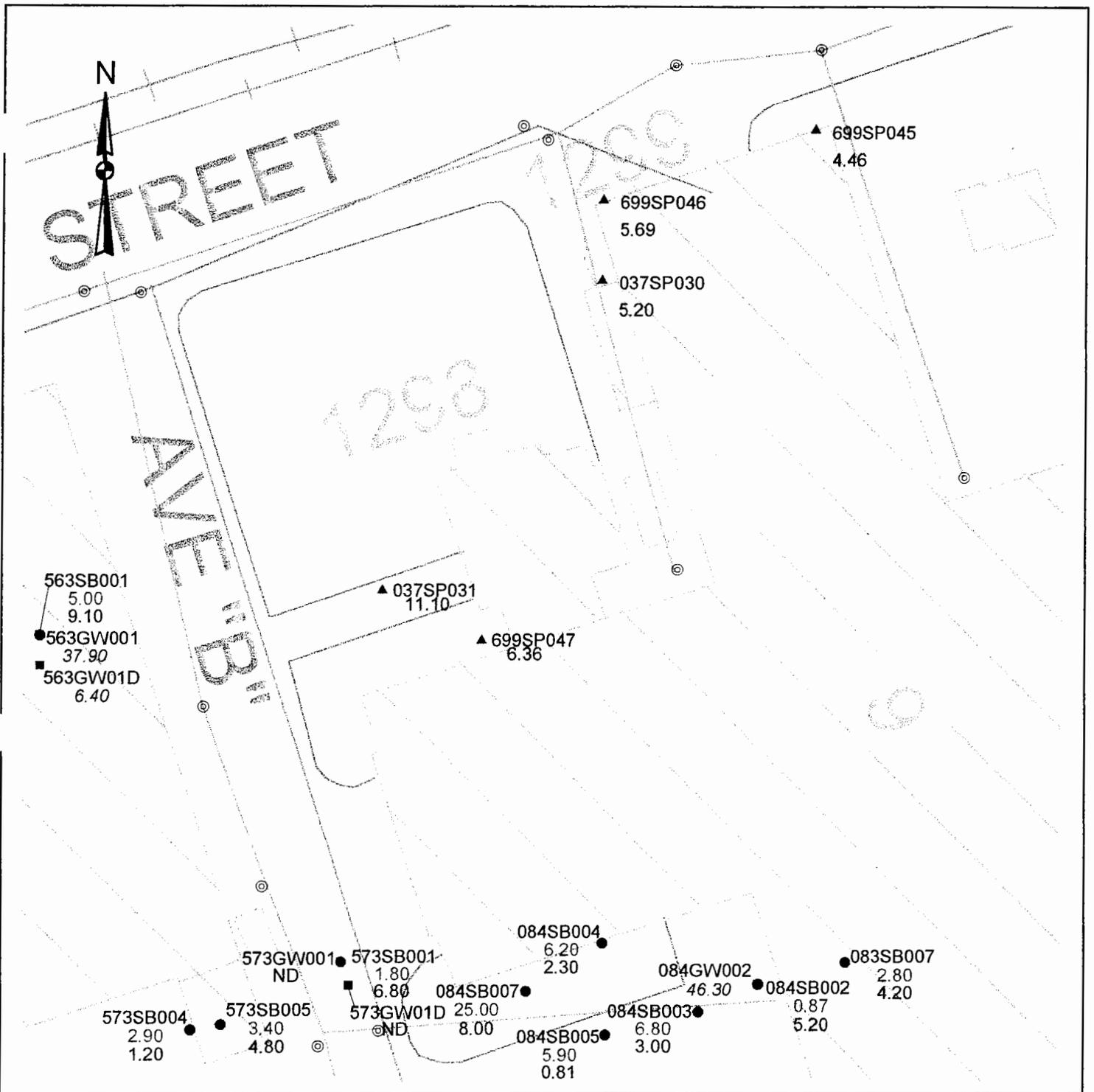
30 0 30 60 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.68
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



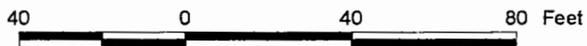
LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

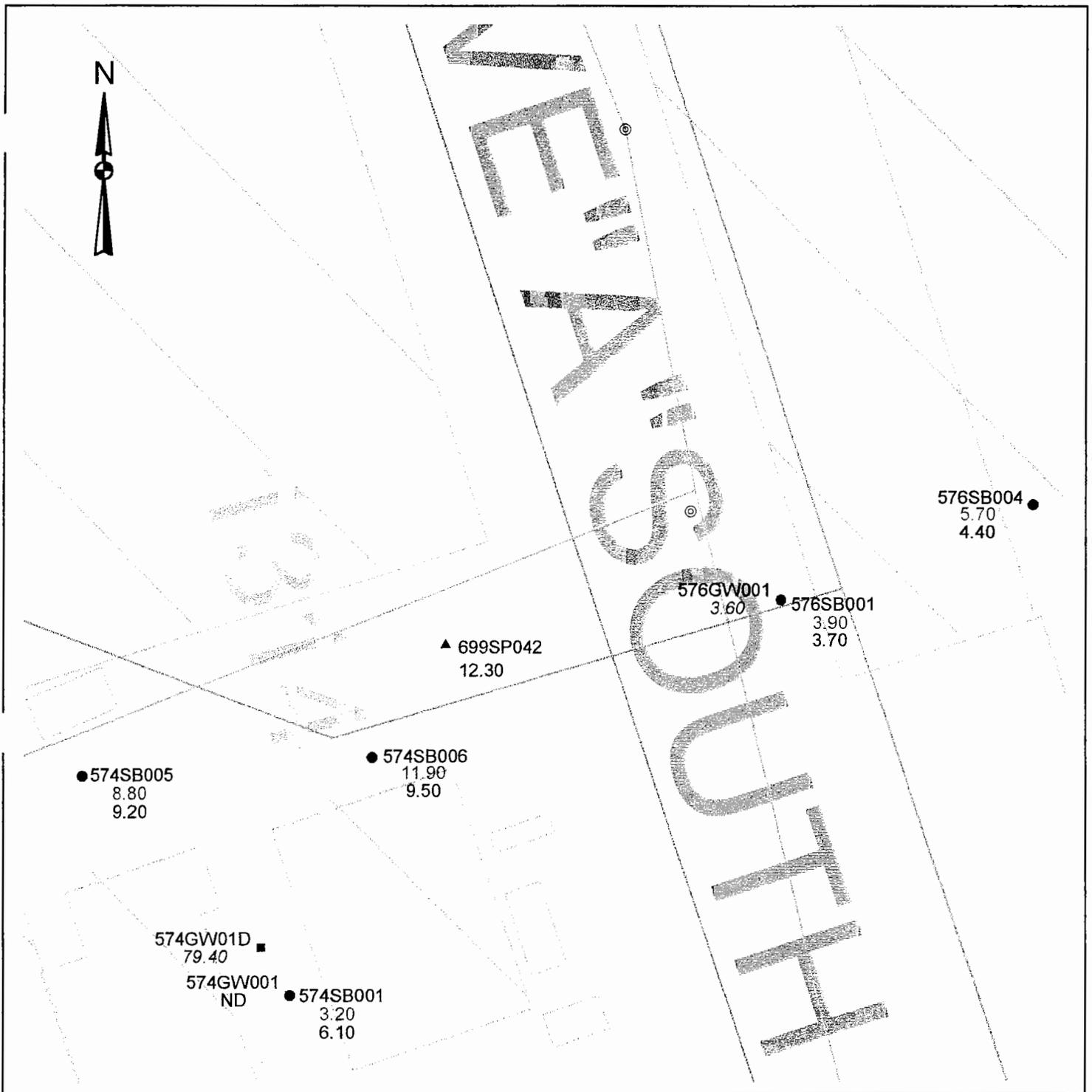


ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.69
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS



RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

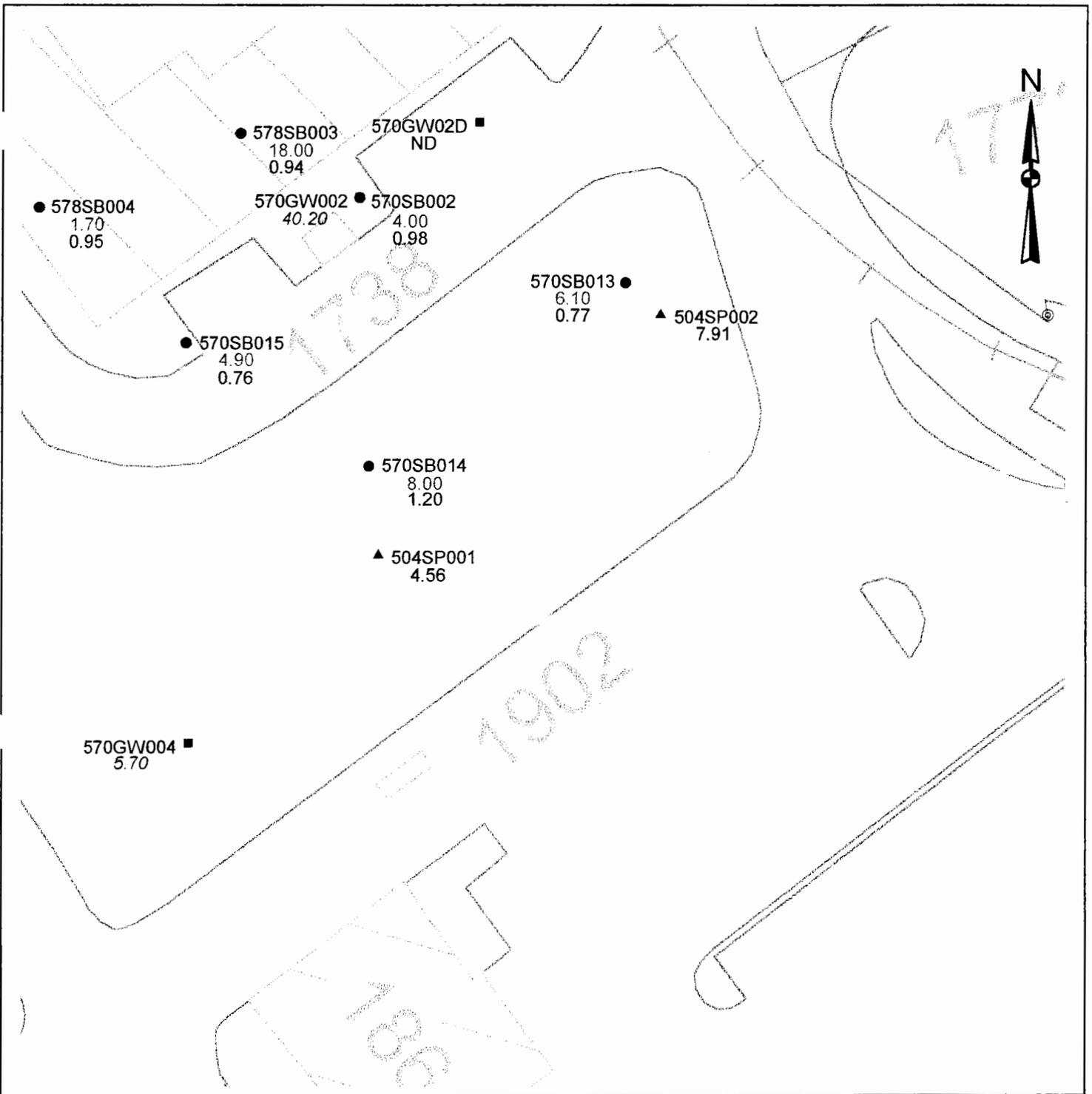


ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.70
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

20 0 20 40 Feet

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

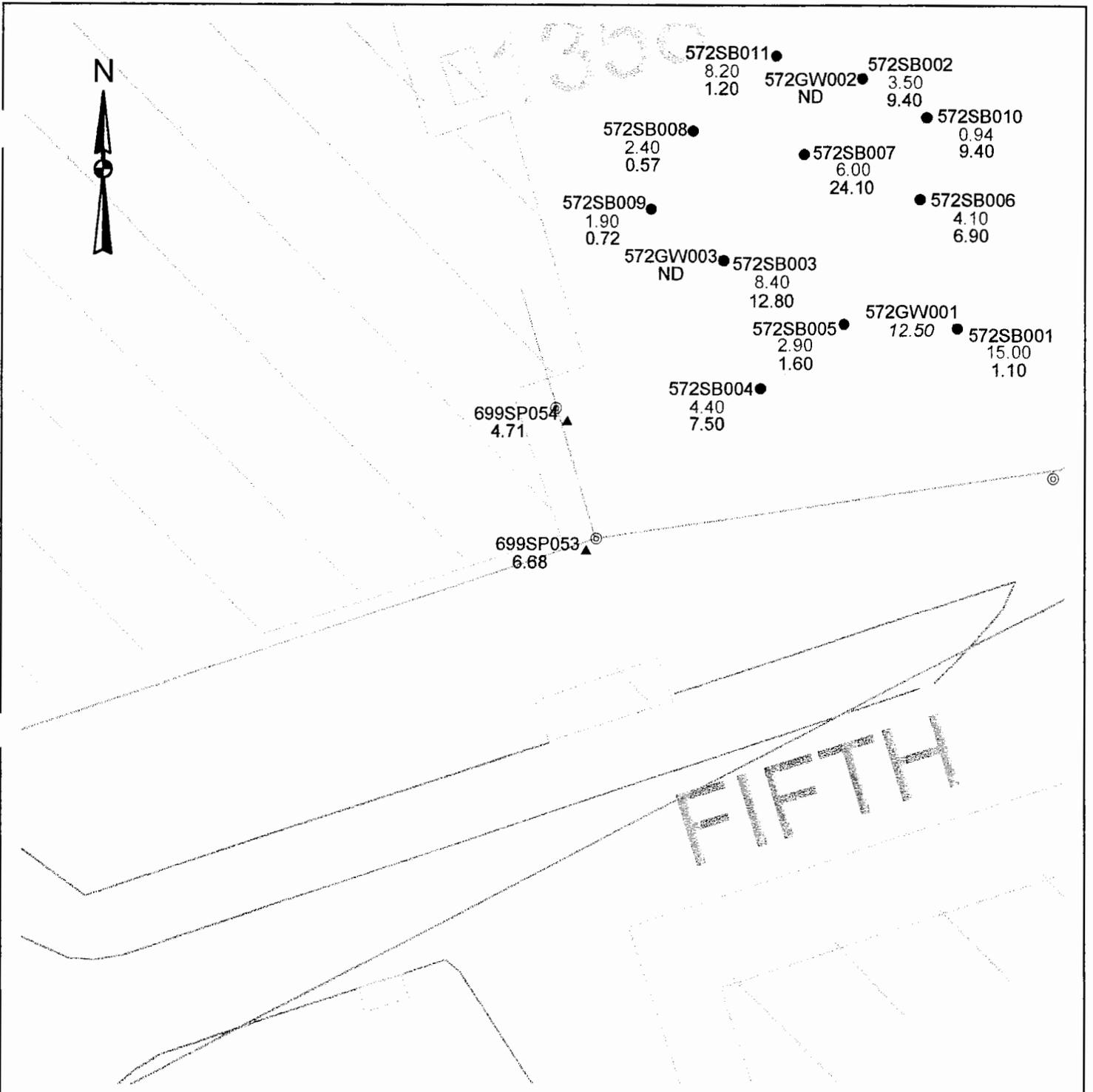
40 0 40 80 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.71
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

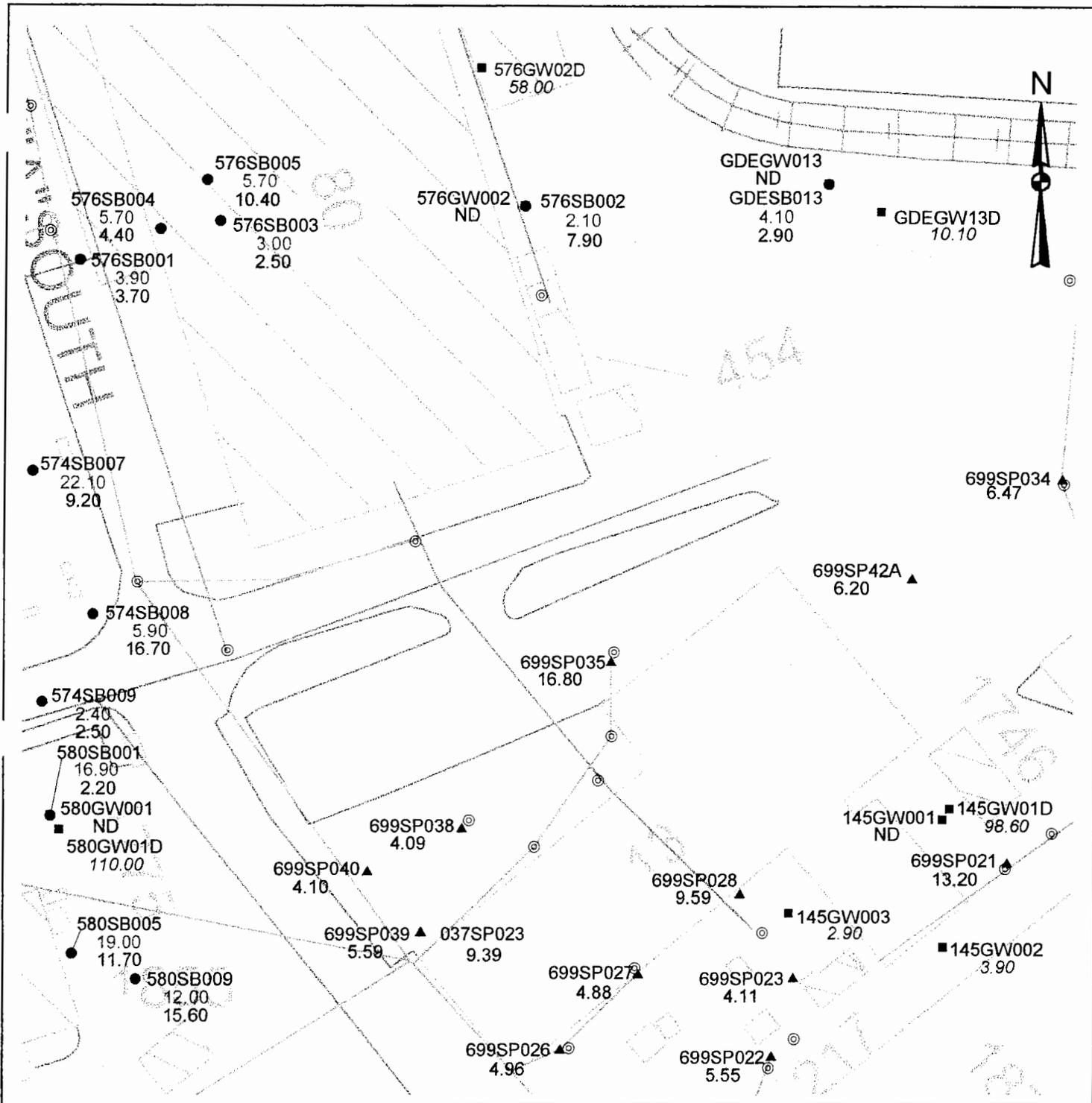
- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- MONITORING WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.72
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD © MANHOLE

SANITARY SEWER LINE STORM SEWER LINE

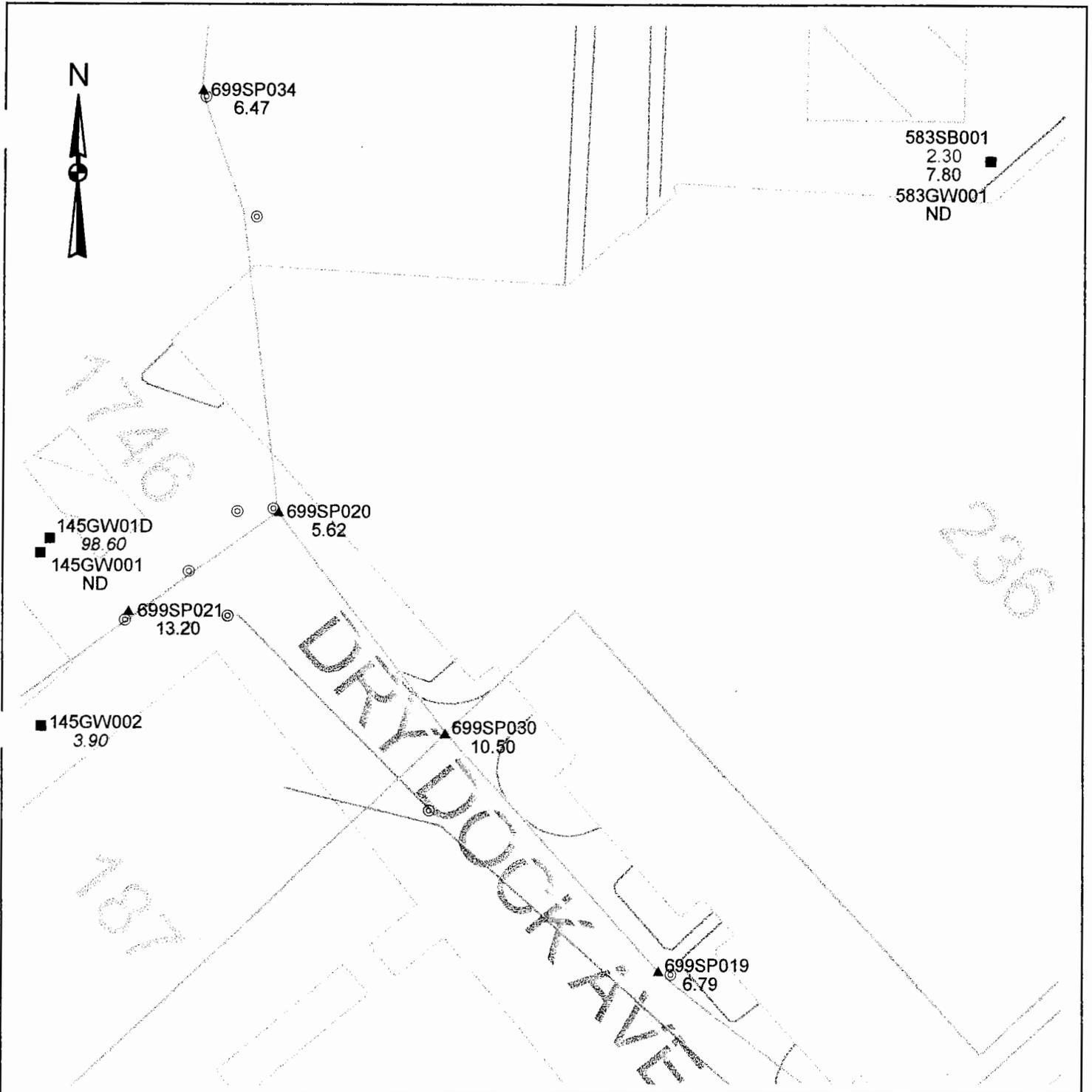
60 0 60 120 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.73
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY / RAILROAD © MANHOLE
 / SANITARY SEWER LINE / STORM SEWER LINE

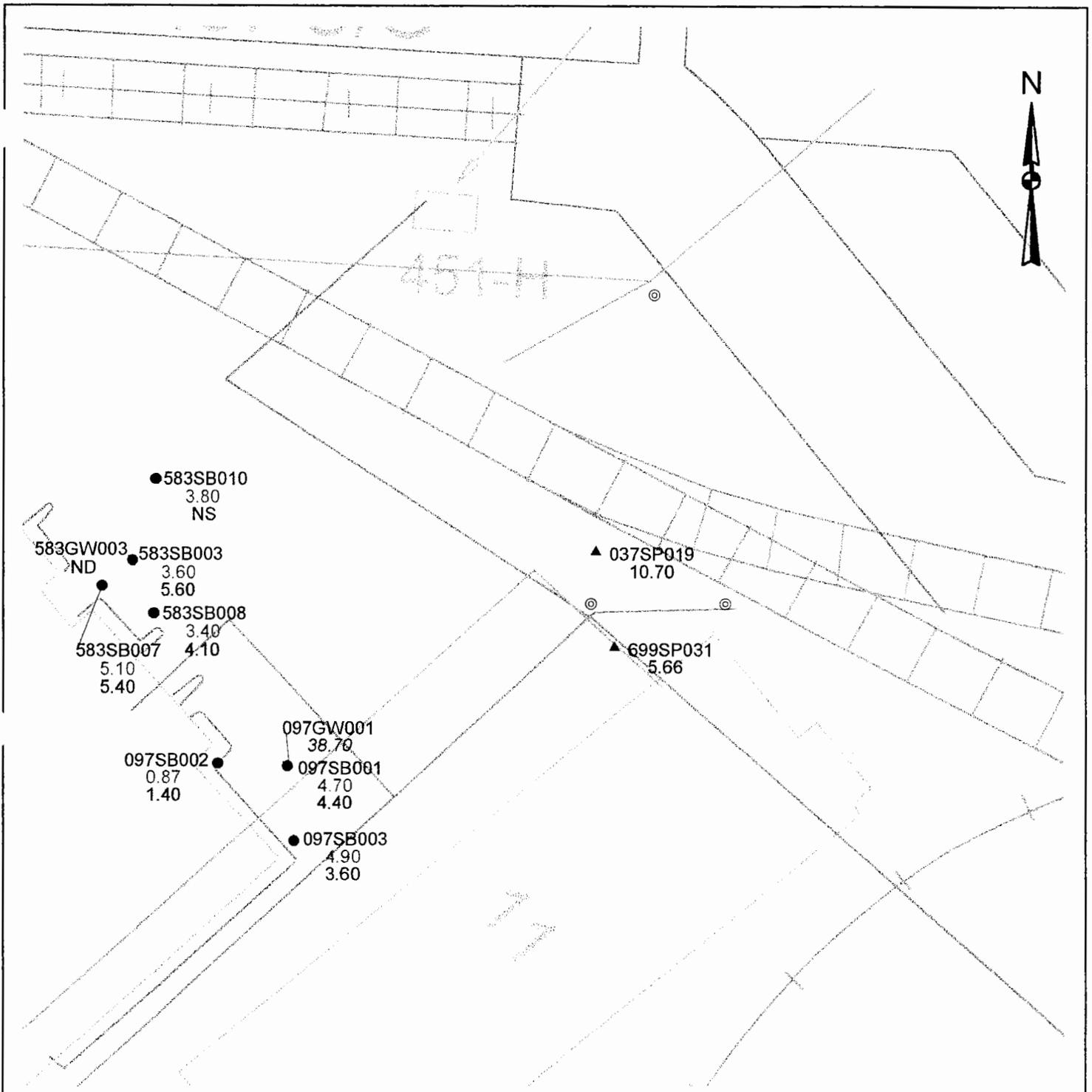
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.74
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

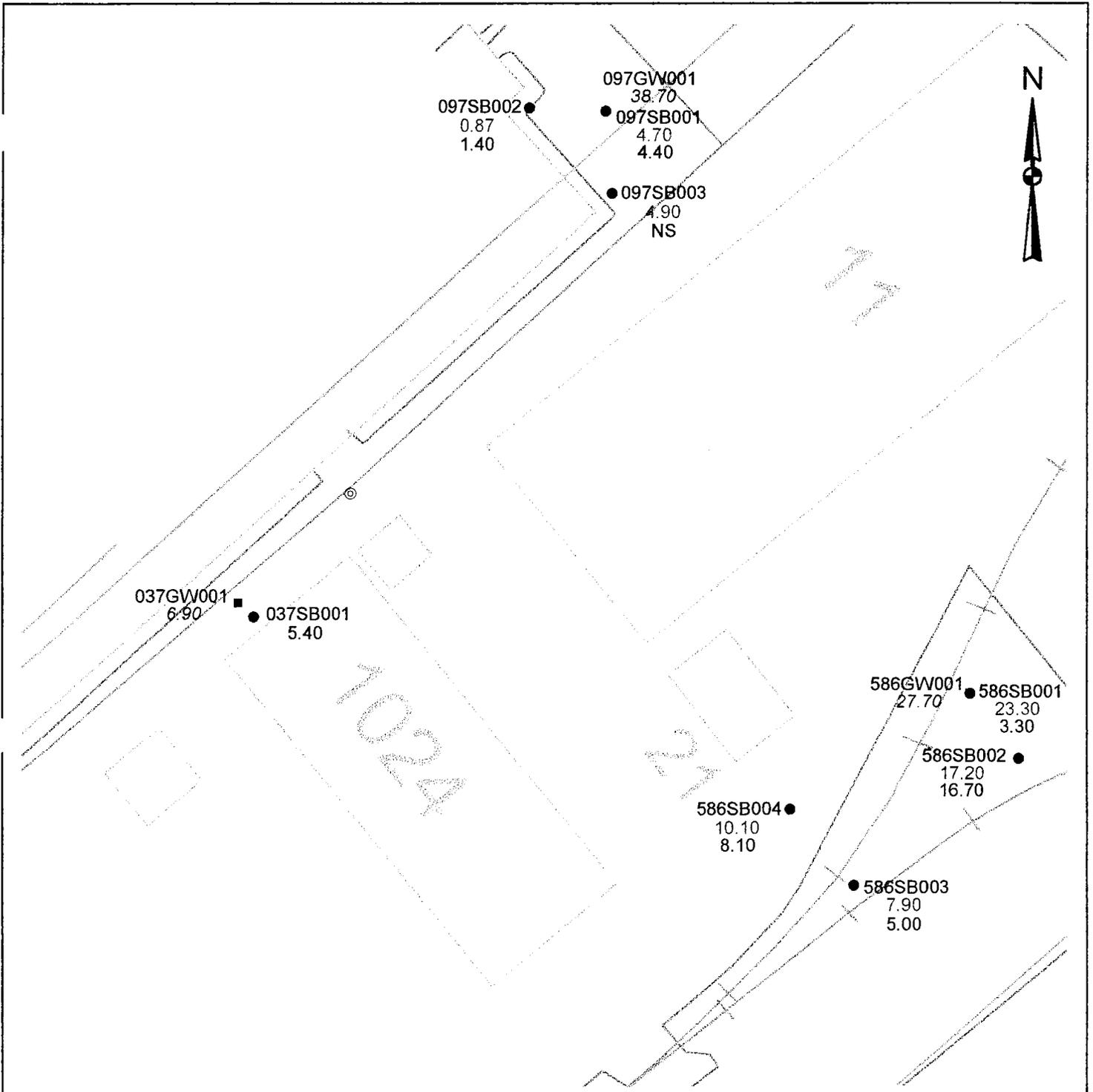
50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.75
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE

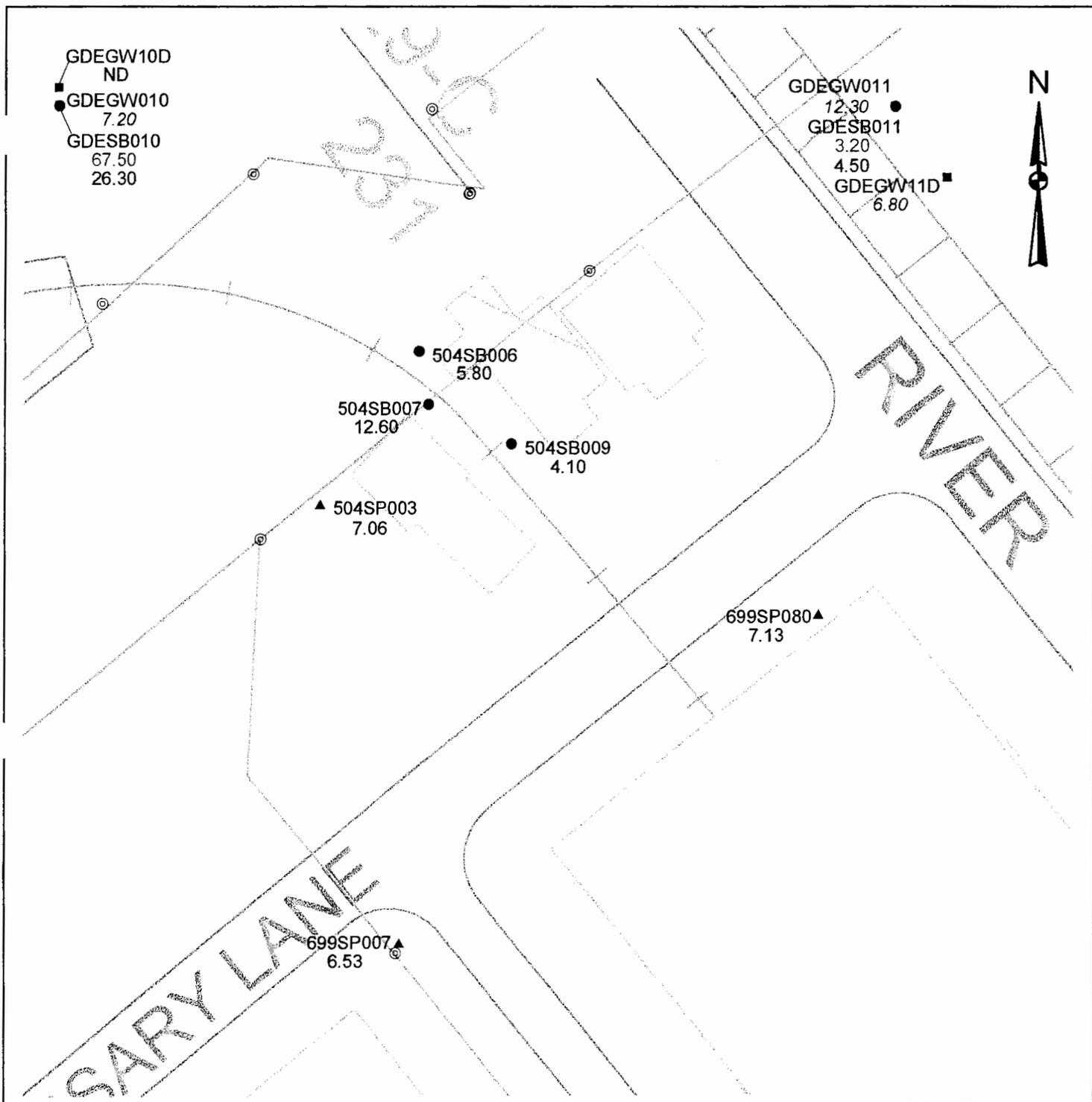
40 0 40 80 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.76
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

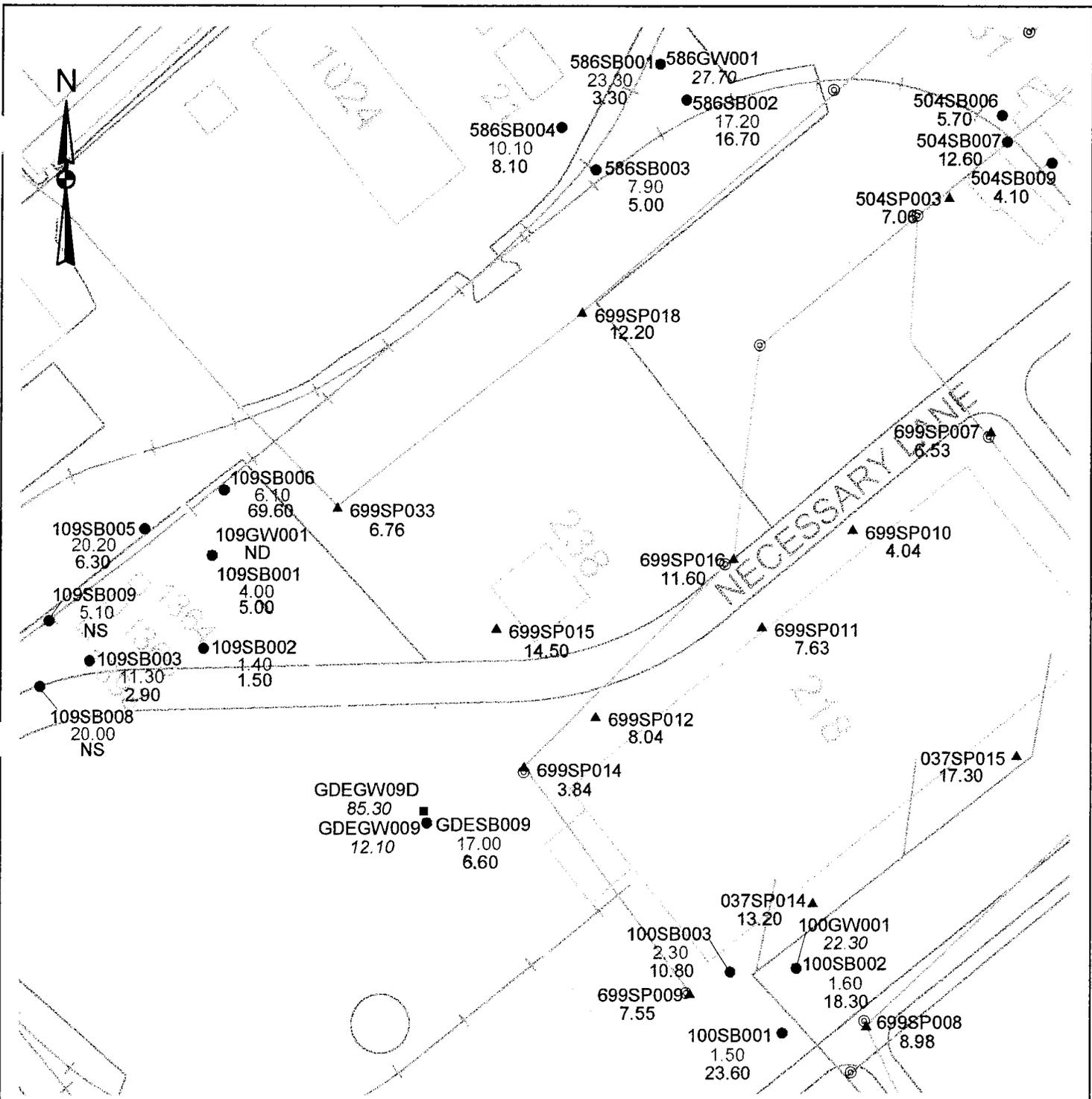
SUBZONE BOUNDARY /- RAILROAD ⊙ MANHOLE
 /- SANITARY SEWER LINE /- STORM SEWER LINE



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.77
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

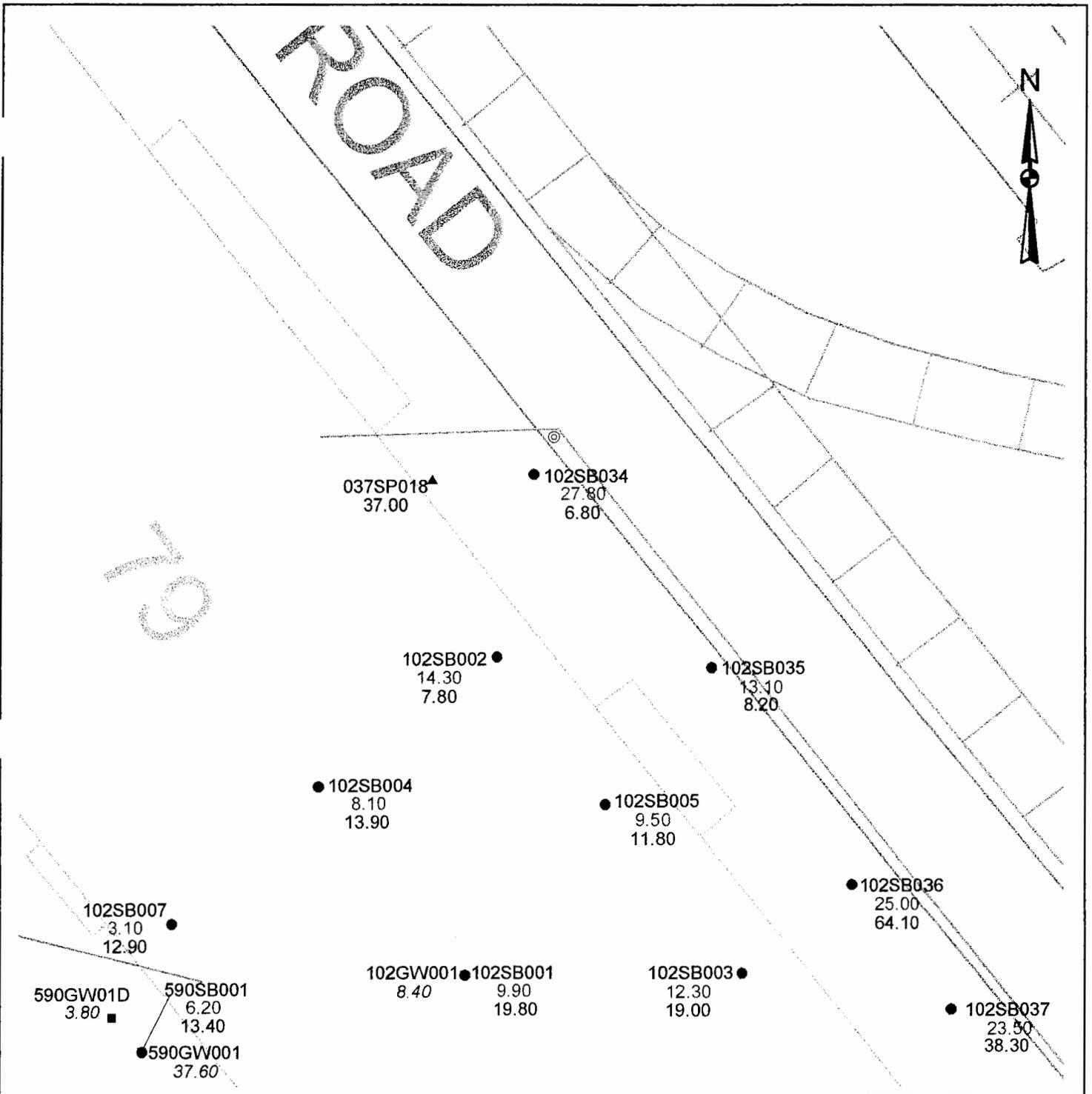
- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN
- SUBZONE BOUNDARY
- RAILROAD
- MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.78
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

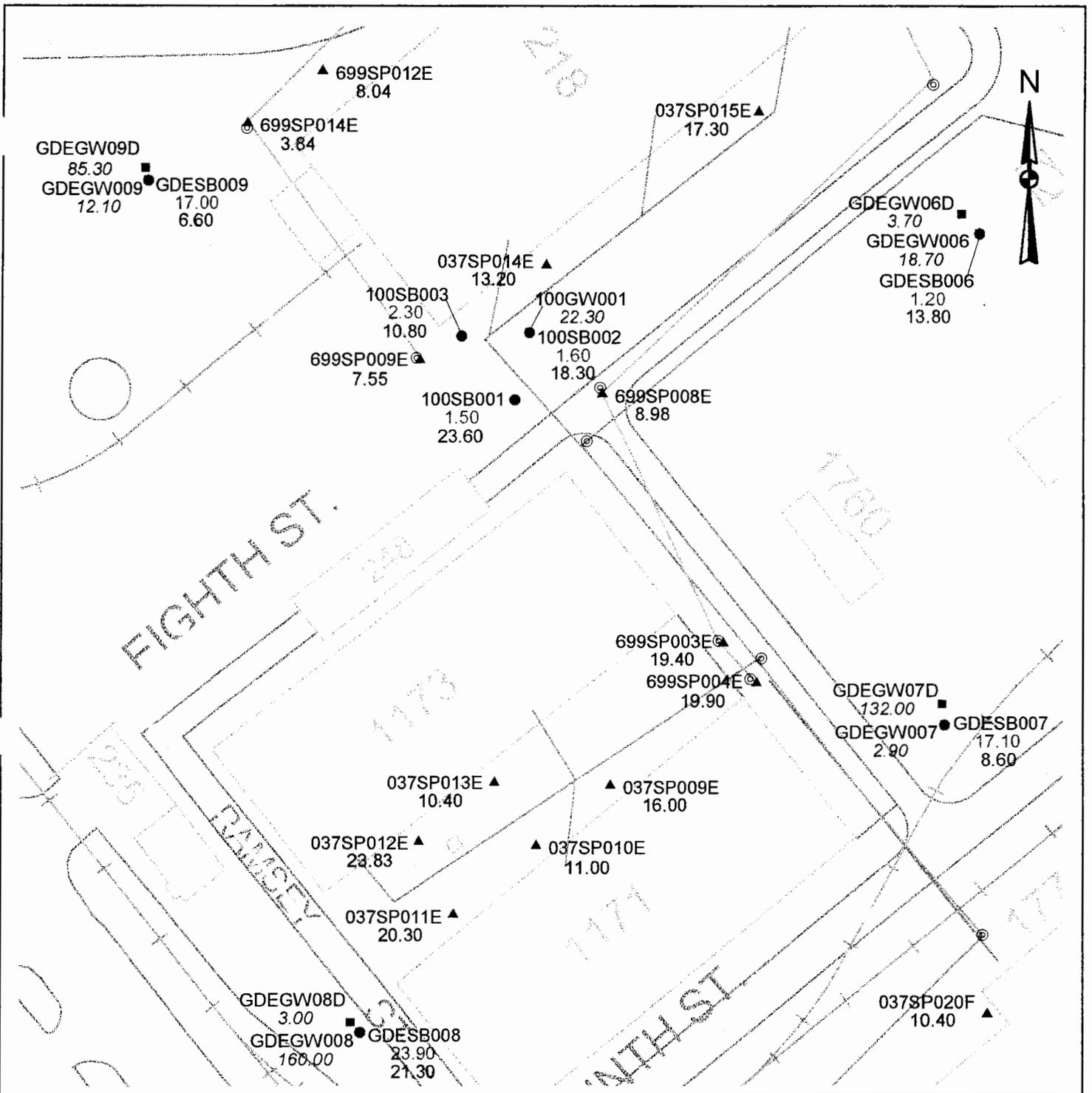
- ▲ ZONE L DPT SOIL LOCATION
 - ZONE L SOIL BORING LOCATION
 - 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
 - 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
 - GROUNDWATER WELL LOCATION
 - 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
 - ZONE E SOIL BORING LOCATION
 - 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
 - 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
 - ND NOT DETECTED
 - NS NO SAMPLE TAKEN
 - SUBZONE BOUNDARY
 - RAILROAD
 - MANHOLE
 - SANITARY SEWER LINE
 - STORM SEWER LINE
- 30 0 30 60 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.79
ZONE L - SUBZONE E
ARSENIC
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY / RAILROAD ⊙ MANHOLE
 / SANITARY SEWER LINE / STORM SEWER LINE

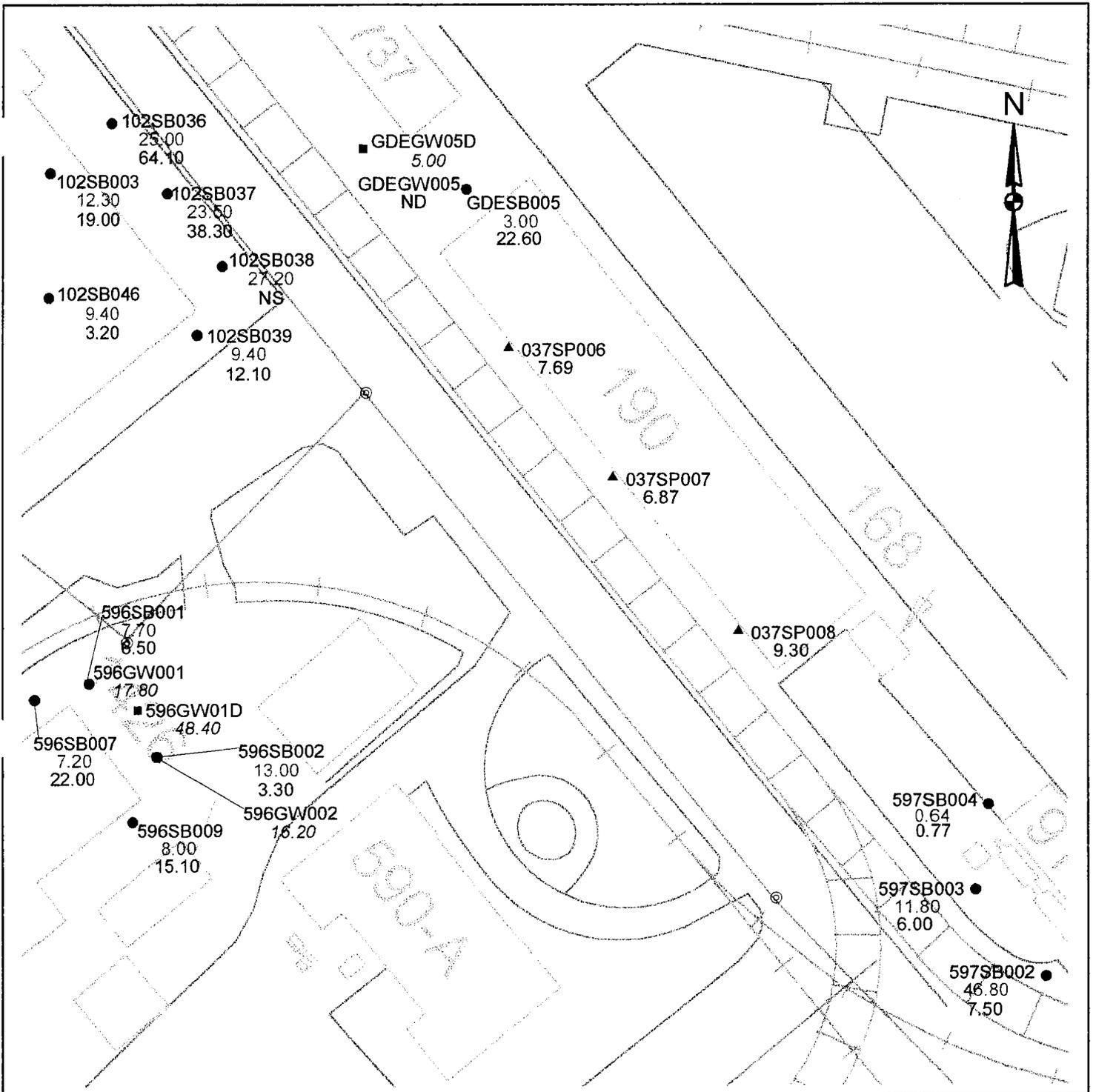
70 0 70 140 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.80
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD ☉ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

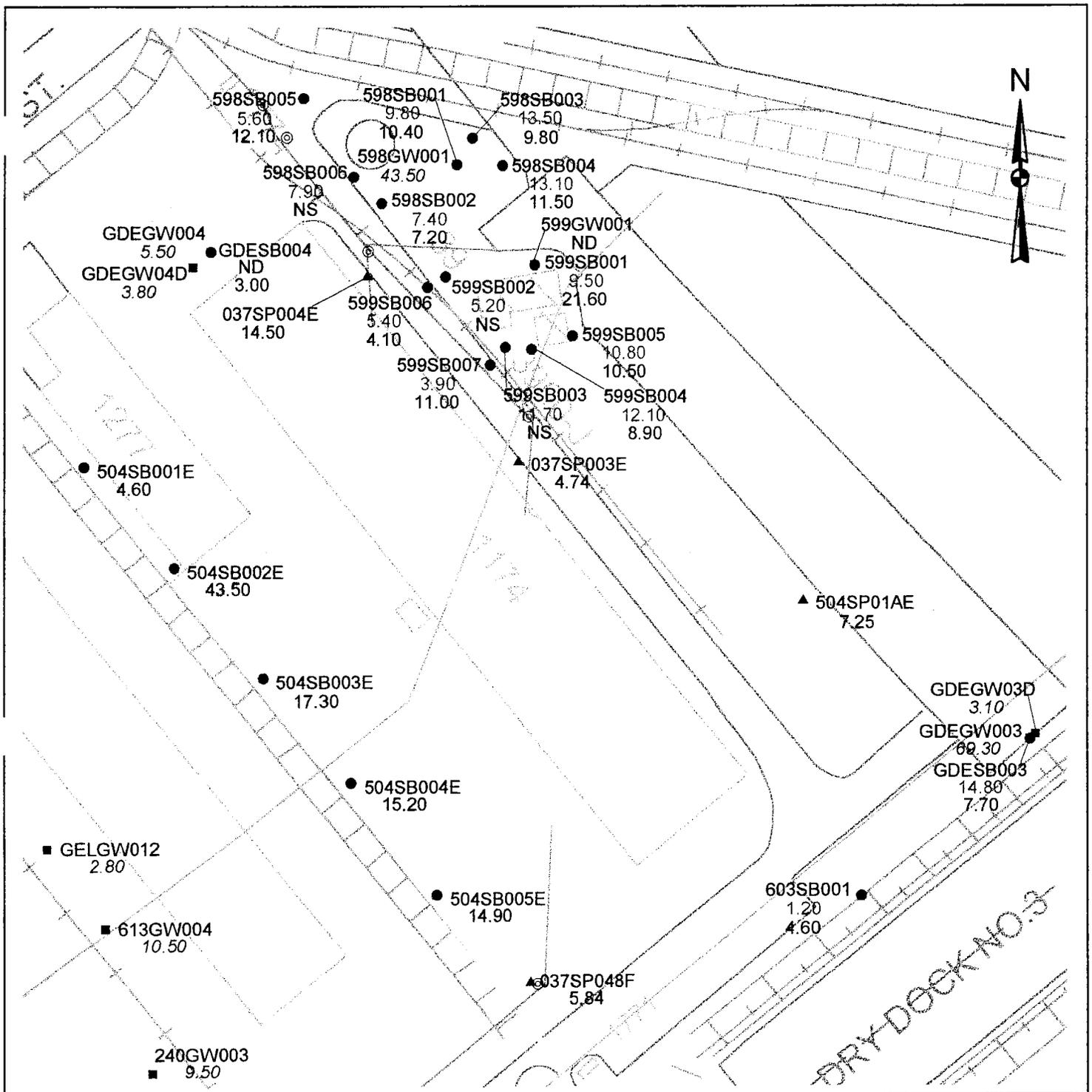
60 0 60 120 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.81
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD ◎ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

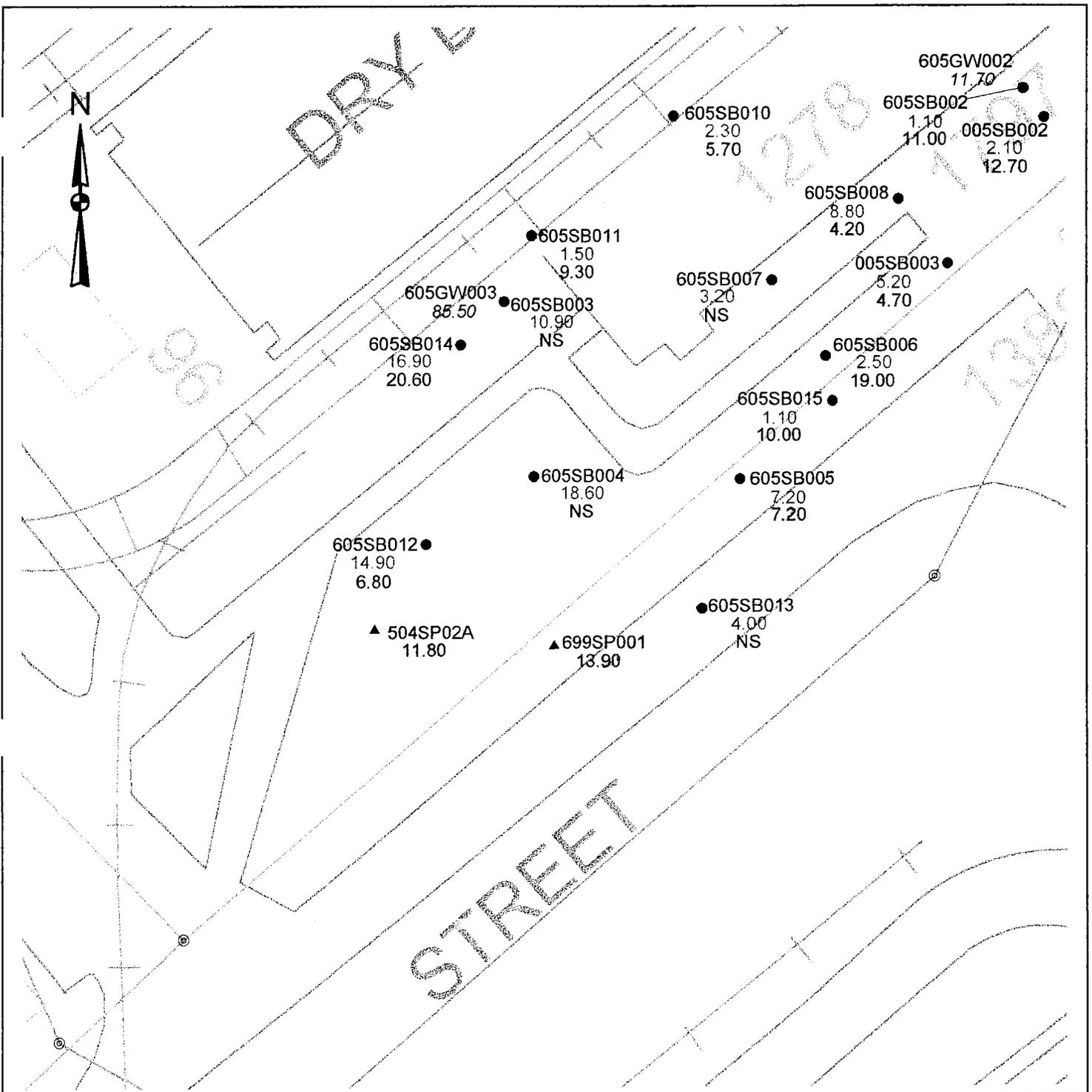
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ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.82
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONES E AND F
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

SUBZONE BOUNDARY RAILROAD ⊙ MANHOLE
 SANITARY SEWER LINE STORM SEWER LINE

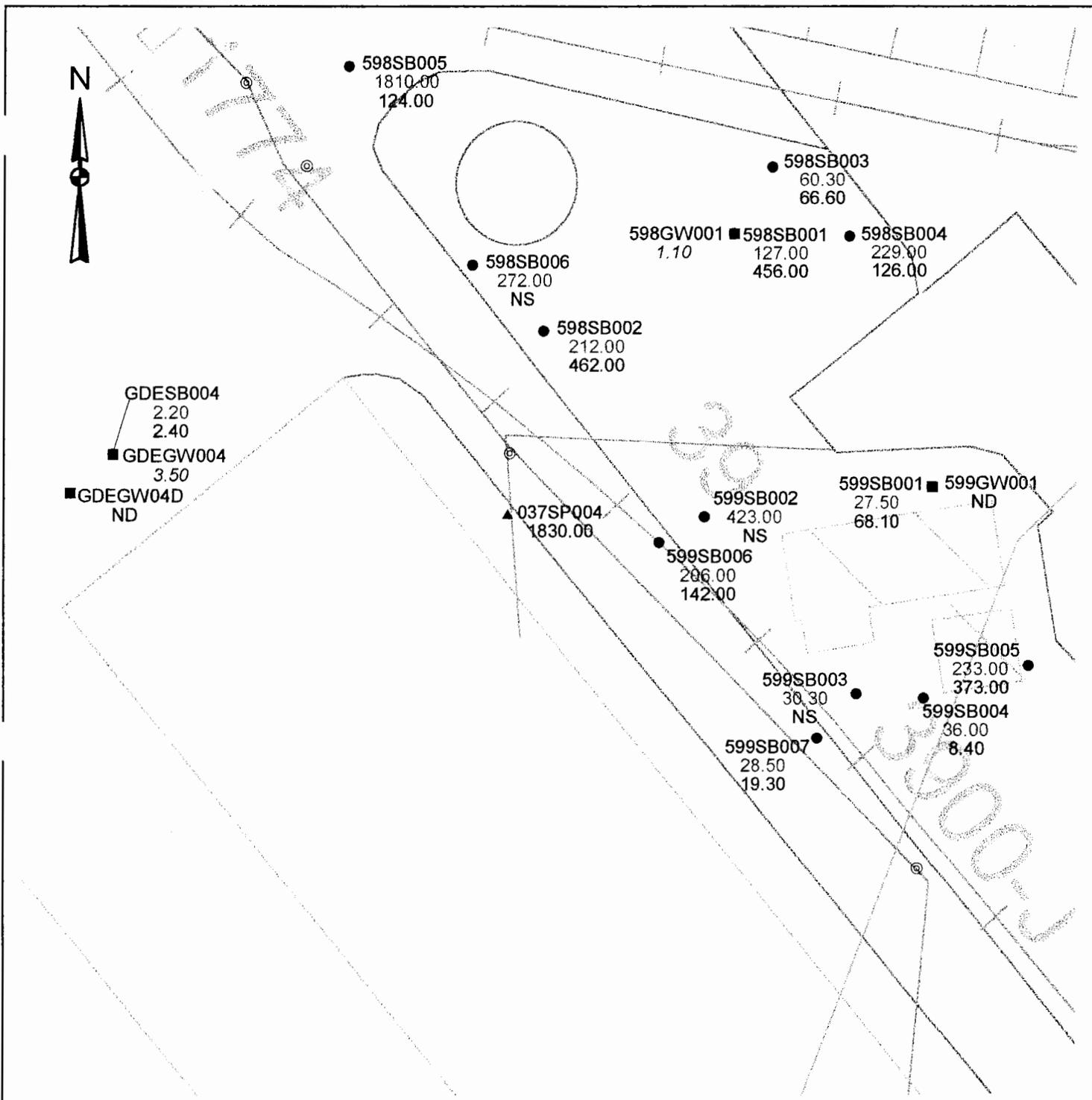
50 0 50 100 Feet



ZONE L - RCRA
 FACILITY INVESTIGATION
 NAVAL BASE CHARLESTON
 CHARLESTON, SC

FIGURE 10.5.83
 ZONE L - SUBZONE E
 ARSENIC
 ZONE L EXCEEDANCES WITH ZONE E
 SOIL AND GW CONCENTRATIONS

RBC = 3.80 mg/kg SSL = 15.0 mg/kg MCL = 50.0 ug/L



LEGEND

- ▲ ZONE L DPT SOIL LOCATION
- ZONE L SOIL BORING LOCATION
- 12.30 ZONE L DPT OR SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE L SUBSURFACE SOIL CONC. (mg/kg)
- GROUNDWATER WELL LOCATION
- 12.30 MAXIMUM QUARTERLY GW CONC. (ug/L)
- ZONE E SOIL BORING LOCATION
- 12.30 ZONE E SURFACE SOIL CONC. (mg/kg)
- 12.30 ZONE E SUBSURFACE SOIL CONC. (mg/kg)
- ND NOT DETECTED
- NS NO SAMPLE TAKEN

- SUBZONE BOUNDARY
- RAILROAD
- ⊙ MANHOLE
- SANITARY SEWER LINE
- STORM SEWER LINE

30 0 30 60 Feet



ZONE L - RCRA
FACILITY INVESTIGATION
NAVAL BASE CHARLESTON
CHARLESTON, SC

FIGURE 10.5.84
ZONE L - SUBZONE E
LEAD
ZONE L EXCEEDANCES WITH ZONE E
SOIL AND GW CONCENTRATIONS

RBC = 1300 mg/kg SSL = 400 mg/kg MCL = 15.0 ug/L