SUPPLEMENTAL INVESTIGATION REPORT FOR THE SOURCE AREA

Abbott Laboratories
Laurinburg, North Carolina

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Prepared for:

Abbott Laboratories
16900 North US 15-401 Bypass
PO Box 1009
Laurinburg, NC 28352
Scotland County

Prepared by:

Radian Engineering, Inc.
P.O. Box 13000
Research Triangle Park, North Carolina 27709
(919) 461-1100

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4.0 TECHNICAL APPROACH

This section includes an overview of the technical approach implemented during the soils and groundwater investigation. A summary of field procedures used in the soil investigation is provided in Appendix A.

4.1 Sample Locations

Prior to sampling, a sample location grid was established to optimize data collection. Figure 4-1 shows the sample location grid for both soil and groundwater samples. In establishing the grid, consideration was given to data collected during previous investigations and monitoring events. Soil sample locations were chosen to delineate the lateral and vertical extent of contaminated soils in the vicinity of the former pit operation with particular interest on the area previously treated with MecTool. Groundwater sample locations were selected to delineate areas of dissolved VOCs within the interbedded unit and sand unit that exceed PRGs by more than one order of magnitude.

4.2 Soil Sampling

During the week of September 25 through September 29, 2000, soil sampling was conducted to delineate the horizontal and vertical extent of contaminated soil; to characterize soil lithology; and to evaluate the potential to expand bioremediation in the area of the former solvent pit. Soil samples were collected using Direct Push Technology (DPT) at the sampling locations shown in Figure 4-1. Ten sample locations were selected based on their proximity to the former solvent disposal pit and the MecTool area.

Table 4-1 summarizes sample locations, sample depths and analyses performed. Soil sample depths varied with sample location and were selected based on depth to groundwater, site lithology, and proximity to the MecTool area. Soil samples collected at the 2-foot depth characterize the concentration of adsorbed contaminants in unsaturated soils within the MecTool area. Samples from the five-foot depth provide data at the capillary fringe. Soil

samples collected at depths of 15, 25, and 35 feet bgs measure the vertical distribution of VOCs in the saturated zone. Sample collection procedures are described in Appendix A.

DPT borings at sample locations 1,2,3, and 14 were sampled continuously to develop detailed geologic logs for interpreting the stratigraphy of underlying sedimentary deposits and to compare soils formerly treated in the MecTool area to surrounding soils. Geologic logs are provided in Appendix B.

4.3 Groundwater Sampling

During the week of September 25 through September 29, 2000, groundwater sampling was conducted to define the lateral and vertical extent of VOCs that exceeded PRGs by more than one order of magnitude (10 times the PRG). DPT was utilized to collect groundwater samples at discrete depths. The samples were analyzed for VOCs by EPA Method 8260 by an on-site mobile laboratory.

Groundwater sample locations are shown in Figure 4–1. Table 4-2 summarizes the groundwater sampling matrix. Initially, groundwater samples were collected at sample locations 1 through 10. The initial groundwater sampling depths were 15, 35, and 50 feet bgs. The sampling depth of 15 feet was chosen to characterize the VOC distribution in the interbedded unit. Samples collected from 35 and 50 feet provided information on the vertical distribution of VOCs in the underlying sand unit. Subsequently, when the on-site mobile laboratory data indicated that the 15-ft interval of a sample location exceeded the groundwater PRG by more than one order of magnitude for any VOC, the sampling grid was expanded laterally. The final locations included sample locations 1 to 10, 11 through 13, 15 through 19, and 26. Similarly, sampling locations 2, 4, and 8 were advanced to a depth of 65-ft bgs to further delineate the vertical extent of VOCs. Replicate samples were collected from six sample locations and submitted to an off-site laboratory for VOC analysis to verify the on-site screening results.

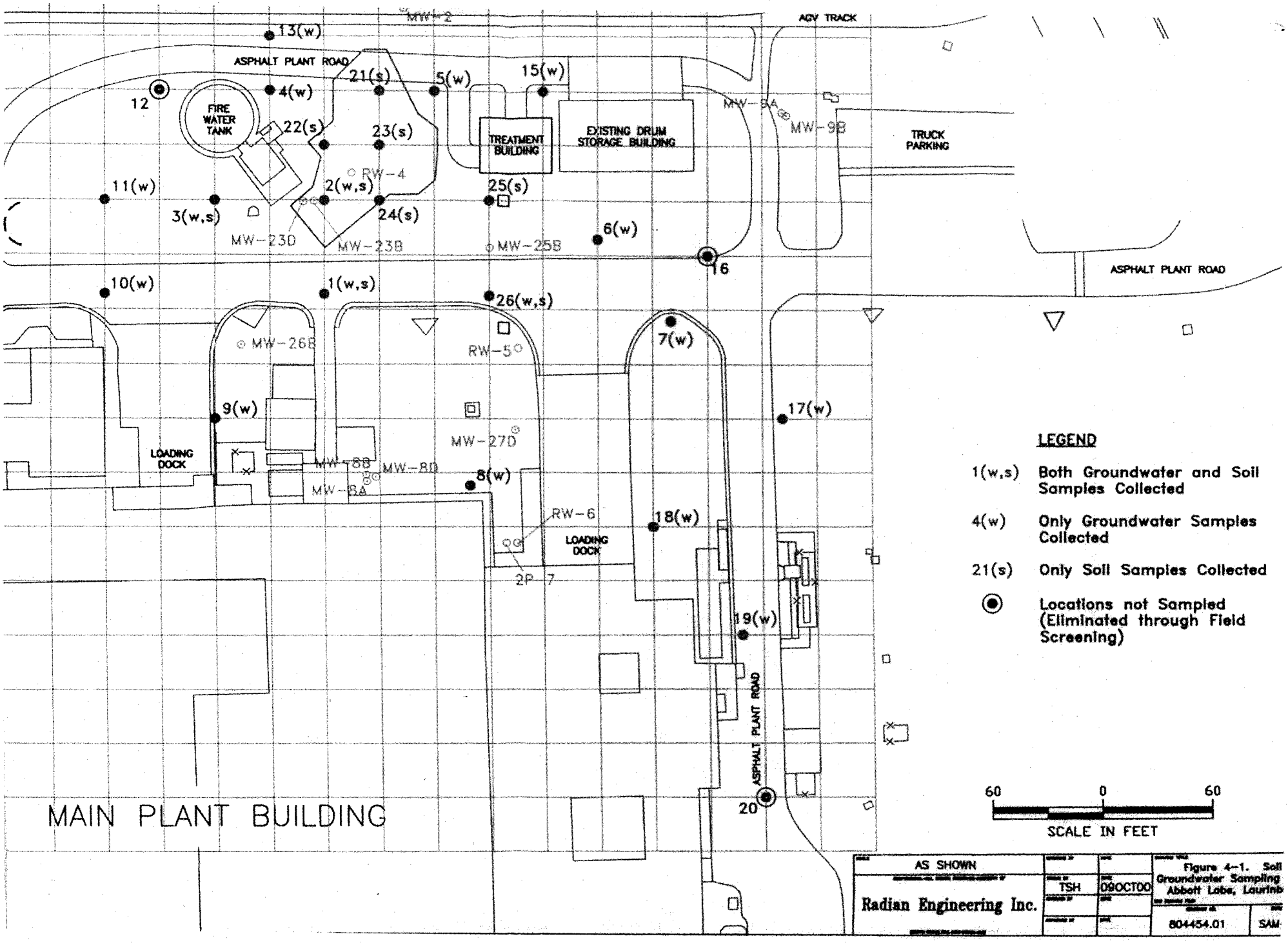
MW-2
AGV TRACK
13(w)
ASPHALT PLANT ROAD
21(s)
5(w)
15(w)
12
4(w)
FIRE WATER TANK
22(s)
23(s)
TREATMENT BUILDING
EXISTING DRUM STORAGE BUILDING
MW-9A
MW-9B
TRUCK PARKING
RW-4
11(w)
2(w,s)
25(s)
3(w,s)
24(s)
MW-23D
MW-23B
MW-25B
6(w)
16
ASPHALT PLANT ROAD
10(w)
1(w,s)
26(w,s)
MW-26B
RW-5
7(w)
9(w)
17(w)
MW-27D
LOADING DOCK
MW-8B
MW-8D
MW-8A
8(w)
RW-6
18(w)
LOADING DOCK
2P-7
19(w)
ASPHALT PLANT ROAD
20
MAIN PLANT BUILDING
LEGEND
1(w,s) Both Groundwater and Soil Samples Collected
4(w) Only Groundwater Samples Collected
21(s) Only Soil Samples Collected
Locations not Sampled (Eliminated through Field Screening)
60 0 60
SCALE IN FEET
AS SHOWN
Radian Engineering Inc.
TSH
09OCT00
Figure 4-1. Soil Groundwater Sampling Abbott Labs, Laurinb
804454.01
SAM

Table 3-1

Static Water-Level Measurements
Abbott Laboratories, Laurinburg, North Carolina
October 24, 2000

Well ID	Top of Casing Elevation (feet above msl)	Depth to Water (feet)	Water Level Elevation (feet above msl)
MW-2B	231.56	7.55	223.91
MW-6B	230.27	5.39	224.88
MW-8B	231.88	8.10	223.78
MW-8D	232.64	13.23	219.41
MW-10B	229.06	7.12	221.94
MW-10D	228.65	9.81	218.84
MW-13B	230.28	8.13	222.15
MW-16B	227.85	6.87	220.98
MW-16D	228.90	9.82	219.08
MW-18B	228.68	7.98	220.70
MW-18D	228.69	10.10	218.59
MW-19B	228.67	6.55	222.12
MW-19D	228.66	10.45	218.21
MW-20B	227.94	6.54	221.40
MW-20D	228.06	9.22	218.84
MW-21B	227.02	4.26	222.76
MW-22B	235.04	16.19	218.85
MW-22D	235.08	16.80	218.28
MW-23B	229.94	5.62	224.32
MW-23D	229.94	10.55	219.39
MW-24B	229.63	6.78	222.85
MW-25B	229.63	6.40	223.23
MW-26B	231.16	7.60	223.56
MW-27D	231.06	12.13	218.93

msl = Mean sea level

Table 4-1

Soil Sampling Matrix, Supplemental Investigation, Abbott Laboratories, Laurinburg, North Carolina

Sample Location Number	Sample Depth (ft)				
	2	5	15	25	35
1		X[1]	X[1]	X	X[2]
2	X	X[1]	X[1]	X	X[2]
3		X	X	X	
14		X[2]	X[2]		X[2]
21	X	X	X	X	X
22	X				
23	X	X	X	X	
24	X				
25		X	X	X	
26		X	X	X	

X = Sample analyzed for volatile organic compounds
X[1] = Sample analyzed for volatile organic compounds and total heterotropic plate count
X[2] = Sample analyzed for total heterotropic plate count

Table 5-1

Summary of Volatile Organic Compounds in Soil[1], 2–3 Feet Below Ground Surface Supplemental Investigation Abbott Laboratories, Laurinburg, North Carolina

RGPPB	Analyte	Sample Location Number				
		2	21	22	23	24
4400,000	2-Butanone (MEK)	ND (1.32)	ND (3.43)	ND (18.6)	61.4 J	ND (10.8)
220	Chloroform	ND (0.601)	ND (0.585)	ND(0.604)	ND (0.613)	ND (0.590)
880	1,2-Dichloroethane	ND (0.546)	ND (0.762)	ND(0.787)	ND (0.799)	ND (0.769)
21,000	1,1-Dichloroethene	ND (0.869)	0.691 J	ND (0.858)	ND (0.875)	0.297 J
8,1000	cis-1,2-Dichloroethene	10.9	5.84	19.3	8.81 J	3.33 J
13,800	trans-1,2-Dichloroethene	0.650 J	0.176 J	0.500 J	ND (0.720)	ND (0.702)
9,100	Methylene Chloride	ND (1.10)	ND (44.4)	ND(51.3)	ND (27.7)	ND (26.3)
480	Tetrachloroethene	0.480 J	0.925 J	1.38 J	ND (0.904)	0.282 J
400,000	1,1,1-Trichloroethane	ND (0.705)	0.376 J	0.200 J	ND (0.710)	0.126 J
53	Trichloroethene	ND (2.86)	28.9	46.2	19.9	ND (8.29)
782,000	1,2,4-Trimethylbenzene	ND (1.07)	ND (1.03)	ND (1.07)	ND (1.07)	0.319 J

[1]Only results with detected analytes have been summarized.
All values reported in micrograms per kilogram (µg/kg).
J = Indicates an estimated value
ND = Not detected above associated reporting limit in parentheses

none above Stds

Table 5-2

Summary of Volatile Organic Compounds in Soil[1], 5-6 Feet Below Ground Surface Supplemental Investigation Abbott Laboratories, Laurinburg, North Carolina

Analyte	ug/kg RG 1HSB	Sample Location Number 1	2	3	21
Acetone	2,800,000	ND (2.03)	196	ND (2.04)	1070 J
Benzene	4,400	ND (0.442)	ND (0.909)	ND (0.443)	4.00 J
2-Butanone	4,400,000	ND (1.32)	796 ✓	ND (1.32)	5170 J
* n-Butylbenzene	156,000	ND (1.35)	ND (2.78)	ND (1.35)	5.01 J
* sec-Butylbenzene	"	ND (1.11)	ND (2.29)	ND (1.11)	5.27 J
* tert-Butylbenzene	"	ND (1.20)	ND (2.48)	ND (1.21)	3.28 J
Chloroform	220	ND (0.600)	ND (1.63)	ND (0.601)	17.0
1,1-Dichloroethane	102,000	ND (0.544)	ND (1.12)	ND (0.545)	10.5
1,2-Dichloroethane	280	ND (0.782)	ND (1.61)	ND (0.783)	24.6
1,1-Dichloroethene	24,000	ND (0.867)	1.39 J	ND (0.868)	55.1
cis-1,2-Dichloroethene	8,600	ND (0.640)	120	ND (0.641)	4900 ✓
trans-1,2-Dichloroethene	13,800	ND (0.714)	7.14 J	ND (0.714)	34.7
Ethylbenzene	380,000	ND (0.600)	5.95 J	ND (0.601)	44.4
* 2-Hexanone	625,000	ND (0.732)	ND (1.51)	ND (0.733)	1.50 J
Cumene * Isopropylbenzene	1,564,000	ND (0.692)	ND (1.42)	ND (0.693)	8.76
4-Isopropyltoluene	N/S	ND (1.25)	75	ND (1.25)	31.6
4-Methyl-2-pentanone	1,060,000	ND (4.69)	ND (9.65)	ND (4.70)	28.1 J
Methylene chloride	9,100	ND (1.59)	ND (1.43)	ND (1.55)	ND (26.3)
Naphthalene	11,200	ND (0.563)	ND (1.16)	ND (0.563)	12.4
n-Propylbenzene	156,000	ND (1.28)	ND (2.64)	ND (1.29)	3.31 J
Tetrachloroethene	480	ND (0.896)	4.29 J	ND (0.896)	150 ✓
+ Tetrahydrofuran	9,400	ND (1.17)	2.63 J	ND (1.17	ND (1.21)
Toluene	132,000	ND (0.590)	77.7	ND (0.590)	1980 ✓
1,1,1-Trichloroethane	400,000	ND (0.704)	ND (1.45)	ND (0.704)	99.2
1,1,2-Trichloroethane	930	ND (0.546)	ND (1.12)	ND (0.546)	2.37 J
Trichloroethene	53	ND (0.493)	102	ND (0.494)	20200 ✓
1,1,2-Trichlorotrifluoroethane	N/S	ND (1.12)	26.2	ND (1.13)	1040 J
* 1,2,4-Trimethylbenzene	782,000	ND (1.06)	ND (2.19)	ND (1.06)	23.1
* 1,3,5-Trimethylbenzene	"	ND (1.11)	ND (2.28)	ND (1.11)	7.88
Vinyl chloride	29	ND (0.995)	10.3 J	ND (0.995)	ND (1.03)
total Xylene 54,000 p-Xylene/m-Xylene	54,000	ND (1.73)	ND (3.55)	ND (1.73)	153
o-Xylene		ND (0.565)	1.00 J	ND (0.565)	42.4

[1]Only results with detected analytes have been summarized.
All values reported in micrograms per kilogram (µg/kg).
J = Indicates an estimated value
ND = Not detected above associated reporting limit in parentheses

+ Reg 9 Res #

* MSCCs (UST) Residential #

N/S = No Std

Table 5-2 (Continued)

Summary of Volatile Organic Compounds in Soil[1], 5-6 Feet Below Ground Surface Supplemental Investigation Abbott Laboratories, Laurinburg, North Carolina

Analyte	Sample Location Number		
	23	25	26
Acetone	85	ND (2.11)	77.9
Benzene	ND (0.803)	ND (0.458)	ND (0.455)
2-Butanone (MEK)	71.7 J	ND (5.58)	76.8 J
n-Butylbenzene	ND (1.36)	ND (1.40)	ND (1.40)
sec-Butylbenzene	ND (1.11)	ND (1.15)	ND (1.15)
tert-Butylbenzene	ND (1.21)	ND (1.25)	ND (1.24)
Chloroform 220	ND (0.602)	ND (0.819)	ND (0.618)
1,1-Dichloroethane	4.38 J	1.11 J	ND (0.563)
1,2-Dichloroethane 250	ND (0.784)	4.84 J	2.31 J
1,1-Dichloroethene	10.3	0.518 J	0.494 J
cis-1,2-Dichloroethene	5540	43.2	39.2 J
trans-1,2-Dichloroethene	23.1	0.402 J	ND (0.738)
Ethylbenzene	5.38 J	ND (0.622)	ND (0.620)
2-Hexanone	ND (0.734)	ND (0.768)	ND (0.756)
Isopropylbenzene	1.90 J	ND (0.718)	ND (0.715)
4-Isopropyltoluene	8.74	ND (1.30)	ND (1.29)
4-Methyl-2-pentanone	3.96 J	ND (4.92)	ND (4.85)
Methylene chloride	ND (9.27)	186 J	237 J
Naphthalene	ND (1.01)	ND (0.583)	ND (0.581)
n-Propylbenzene	ND (1.29)	ND (1.33)	ND (1.33)
Tetrachloroethene 480	2.84 J	ND (0.928)	ND (0.926)
Tetrahydrofuran	1.10 J	0.982 J)	ND (1.20)
Toluene	152)	ND (2.02)	ND (2.49)
1,1,1-Trichloroethane	ND (0.705)	1.57 J	1.92 J
1,1,2-Trichloroethane	ND (0.547)	ND (0.566)	ND (0.562)
Trichloroethene 53	ND (10.1)	49.0 J	116 J
1,1,2-Trichlorotrifluoroethane	29.7	ND (1.17)	ND (1.16)
1,2,4-Trimethylbenzene	3.24 J	ND (1.10)	ND (1.09)
1,3,5-Trimethylbenzene	1.22 J	ND (1.15)	ND (1.14)
Vinyl chloride 79	68.5	ND (1.03)	ND (1.02)
p-Xylene/m-Xylene	16.8	ND (1.79)	ND (1.79)
o-Xylene	4.99 J	ND (0.586)	ND (0.584)

[1]Only results with detected analytes have been summarized.
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ND = Not detected above associated reporting limit in parentheses