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NAB LITTLE CREEK
5090.3a

LETTER TRANSMITTING DIRECT-PUSH GROUNDWATER SAMPLING AND SANITARY
SEWER SAMPLING EVENTS FOR SITE 11 AND IDENTIFYING PROPOSED LOCATIONS
FOR ADDITIONAL MONITORING WELLS NAB LITTLE CREEK VA

3/17/1999
CH2MHILL

March 17, 1999

142506.DE.DM
99-

Commander
LANTNAVFACENGCOM
Mr. Bob Schirmer
Lafayette Annex, Building A
6500 Hampton Boulevard
Norfolk, VA 23511-6287

Subject: Draft Sanitary Sewer Sampling Results and Proposed Well Locations
Site 11 NAB Little Creek
Contract N62470-95-D-6007
Navy CLEAN II Program
Contract Task Order 0054

Dear Mr. Schirmer:

This letter presents the results of the recent (January-February 1999) direct-push groundwater sampling and sanitary sewer sampling events at Site 11 and identifies proposed monitoring well locations. Figure 1-1 shows the sewer segments, the sampling locations along those segments, previous groundwater sampling locations and results, and the proposed locations for the six new wells. As shown in Figure 1-2, potentiometric contours indicate that groundwater in the southern half of the site appears to flow toward the southeast near manhole 10 (MH10), while groundwater in the northern half of the site flows to the northwest toward well LS11-MW06D. To further understand hydrogeology at this site, a sanitary sewer investigation was conducted to determine if groundwater was infiltrating the pipes, and if so, to sample the sewer lines for Site 11 contaminants.

In February 1999, three segments of the sewer lines were isolated to measure the groundwater infiltration rate into the pipes. While infiltration was detected in all three segments, the most significant flow was found in the 30" concrete pipe running east to west from MH10 to MH9. Infiltration was measured in this segment at a rate of 10 gallons per minute (gpm), whereas infiltration rates in the pipe segments from MH91 to MH89 and from MH89 and MH100 to MH10 were less than 1 gpm. The results of the flow measurements are presented in Table 1.

After completing the flow measurements, each sewer segment was then sampled at locations shown on Figure 1-1 and labeled as:

- SA09E-99A – Collected at MH9 from segment MH10 to MH9
- SA10N-99A – Collected at MH10 from segment MH89 and MH100 to MH10

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- SA89NW-99A – Collected at MH89 from segment MH91 to MH89

Site groundwater contaminants were detected in each of the sewer segments, most notably TCE which was detected in all three. Note that two chemicals, methylene chloride and carbon disulfide, were detected in the trip blank. Although each segment was isolated prior to sampling, it is possible that the contaminants (particularly PCE) found in the segment from MH10 to MH9 may be related to Site 12, which discharges PCE-contaminated groundwater into the sanitary sewer upstream of Site 11. Table 2 presents the analytical results for these samples.

Two phases of Geoprobe groundwater investigations have already been conducted at Site 11, and the results are presented in Table 3 and Figure 1-1. The first phase was conducted in June and July, 1998 and was used as a screening tool to define the extent of chlorinated VOC contamination at the site. Based on the results of the 17 Geoprobe samples collected, eight (8) permanent monitoring wells were installed at strategic locations within and surrounding the plume. These wells were sampled in September, 1998 and the detections of chlorinated VOCs are presented in Table 4 and the groundwater elevations are shown in Table 5. Since these monitoring wells failed to define the lateral extent of the plume, a second phase of Geoprobe groundwater sampling was conducted in January, 1999. Based on these results, we propose to install six new monitoring wells in the locations indicated in Figure 1-1. The proposed wells shall be screened across the bottom 5 feet of the water table aquifer (from approximately 15 to 20 feet below ground surface) because all previous sampling results have indicated that VOC contamination is present almost solely in the bottom of the aquifer. Additional data from these previous investigations are presented in Figures 1-3 through 1-5 for your reference.

We would like to get your comments and agreement on these locations before March 29, 1999 so that we may schedule our subcontractors and confirm the scope of drilling and well construction. We hope to install the wells beginning on April 12, 1999. Please review the enclosed sewer sampling results and proposed monitoring well locations and direct comments or questions to me at (703) 471-6405, extension 4332.

Sincerely,

CH2M HILL

Scott J. MacEwen, P.E.
Activity Manager

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c: Mr. Robert Weld/VDEQ
Mr. Bruce Beach/EPA Region III
Ms. Kelly Greaser/NAB Little Creek
Ms. Angie Errett/CH2M HILL
Mr. Doug Dronfield/CH2M HILL

**TABLE 1. SITE 11 SEWER SAMPLE RESULTS
PHASE II SRI SITE 11
NAB LITTLE CREEK, VIRGINIA BEACH, VA**

Site	Upstream manhole	Downstream manhole	Pipe Diameter (inches)	Date	Time	Flow greater than (gpd)	Flow less than (gpd)	Flow Closer to (gpd)	Flow greater than (gpm)	Flow less than (gpm)	Flow Closer to (gpm)	Flow (gpm)
11	91	90 - 89	24	2/5/99	12:43 AM	57	115	57	0.04	0.08	0.04	0.50
				2/5/99	12:45 AM	57	115	57	0.04	0.08	0.04	
				2/5/99	12:47 AM	57	115	57	0.04	0.08	0.04	

Site	Upstream manhole	Downstream manhole	Pipe Diameter (inches)	Date	Time	Flow greater than (gpd)	Flow less than (gpd)	Flow Closer to (gpd)	Flow greater than (gpm)	Flow less than (gpm)	Flow Closer to (gpm)	Flow (gpm)
11	89, 100	10	24	2/5/99	3:41 AM	57	115	115	0.04	0.08	0.08	0.2
				2/5/99	3:43 AM	260	464	260	0.18	0.32	0.18	
				2/5/99	3:45 AM	260	464	260	0.18	0.32	0.18	
				2/5/99	3:47 AM	260	464	260	0.18	0.32	0.18	

Site	Upstream manhole	Downstream manhole	Pipe Diameter (inches)	Date	Time	Flow greater than (gpd)	Flow less than (gpd)	Flow Closer to (gpd)	Flow greater than (gpm)	Flow less than (gpm)	Flow Closer to (gpm)	Flow (gpm)
11	10	9	30	2/5/99	6:22 AM	1,064	1,458	1,458	0.7	1.0	1.0	10
				2/5/99	6:25 AM	6,076	7,456	7,456	4.2	5.2	5.2	
				2/5/99	6:27 AM	11,030	14,380	14,380	7.7	10.0	10.0	
				2/5/99	6:28 AM	11,030	14,380	14,380	7.7	10.0	10.0	

**TABLE 2. SITE 11 SEWER SAMPLE RESULTS
PHASE II SRI SITE 11
NAB LITTLE CREEK, VIRGINIA BEACH, VA**

Chemical	Sample No. units in ug/kg			
	SA09E-99A	SA10N-99A	SA89NW-99A	TB 2/5/99
1,1-DICHLOROETHENE	0.6000 J	2.0000	1.0 U	1.0 U
METHYLENE CHLORIDE	9.5000	1.2000 J	9.3000	0.9000 J
CARBON DISULFIDE	0.5000 J	0.5000 J	0.5000 J	0.4000 J
CHLOROFORM	1.2000	2.0000	5.4000	1.0 U
BENZENE	1.0 U	1.0 U	0.4000 J	1.0 U
TRICHLOROETHENE	3.0000	7.2000	8.2000	1.0 U
BROMODICHLOROMETHANE	1.0 U	1.0 U	0.7000 J	1.0 U
TOLUENE	0.8000 J	0.7000 J	3.8000	1.0 U
TETRACHLOROETHENE	8.1000	1.0 U	0.5000 J	1.0 U
ETHYLBENZENE	1.0 U	1.0 U	0.4000 J	1.0 U
XYLENES (TOTAL)	1.0 U	0.5000 J	0.6000 J	1.0 U
1,2,4-TRICHLOROBENZENE	0.7000 J	1.1000	1.6000	1.0 U
Flow Rate (gpm)	10	0.2	0.5	
Notes: J - compound detected, estimated value U - compound not detected TB - Trip Blank				

Table 3. Site 11 Onsite Geoprobe Groundwater Sampling Results - Chlorinated VOCs
PHASE II SRI SITE 11
NAB LITTLE CREEK, VIRGINIA BEACH, VA

Sample Location and Sample Number	Screen Depth (ft bgs)	Chlorinated VOCs (ug/l)							
		1,1-DCA	1,1-DCE	<i>trans</i> -1,2-DCE	<i>cis</i> -1,2-DCE	1,1,1-TCA	TCE	PCE	Total Cl VOCs
PHASE I									
LC11-GP201-10	17-21	NA	82.8 E	ND	5.7	NA	591 E	ND	679.5
LC11-GP202-05	10-14	NA	ND	ND	ND	NA	0.46	ND	0.46
LC11-GP202-10	17-21	NA	ND	12.3	ND	NA	13.6 E	ND	25.9
LC11-GP203-05	8-11	NA	ND	ND	ND	NA	ND	ND	ND
LC11-GP203-10	18-21	NA	52.9 E	ND	ND	NA	184 E	ND	236.9
LC11-GP204-05	8-12	NA	3.83	ND	ND	NA	ND	ND	3.83
LC11-GP204-10	17-21	NA	406 E	ND	ND	NA	1621 E	ND	2027
LC11-GP205-05	8-12	NA	ND	ND	ND	NA	ND	ND	ND
LC11-GP205-10	17-21	NA	113 E	ND	8.76	NA	1877 E	0.93	1999.69
LC11-GP206-10	17-21	NA	357 E	ND	ND	NA	1610 E	1.77	1968.77
LC11-GP207-05	8-12	NA	ND	ND	ND	NA	ND	ND	ND
LC11-GP207-10	17-21	NA	9.75	ND	ND	NA	25.9	ND	35.65
LC11-GP208-10	17-21	NA	ND	ND	ND	NA	0.5	ND	0.5
LC11-GP209-10	17-21	NA	8.4	ND	ND	NA	9.87 E	ND	18.27
LC11-GP210-10	17-21	NA	6.05	ND	2.54	NA	ND	ND	8.59
LC11-GP211-05	8-12	NA	ND	ND	ND	NA	ND	ND	ND
LC11-GP211-10	17-21	NA	24.9 E	ND	ND	NA	28.3 E	ND	53.2
LC11-GP212-05	8-12	NA	ND	ND	ND	NA	0.68	ND	0.68
LC11-GP212-10	17-21	NA	14.5	ND	ND	NA	20.3 E	ND	34.8
LC11-GP213-05	8-12	NA	ND	ND	ND	NA	ND	ND	ND
LC11-GP213-10	17-21	NA	ND	ND	83.1 E	NA	48.9 E	ND	132
LC11-GP214-05	8-12	NA	ND	ND	ND	NA	ND	ND	ND
LC11-GP214-10	17-21	NA	ND	ND	ND	NA	ND	ND	ND
LC11-GP215-10	17-21	NA	ND	ND	ND	NA	ND	0.1	0.1
LC11-GP216-10	17-21	NA	ND	ND	ND	NA	12.5 E	0.37	12.87
LC11-GP217-10	17-21	NA	62.2 E	ND	ND	NA	68.9 E	ND	131.1
PHASE II									
LS11-DP301-17	17-20	ND	ND	ND	2.1 J	ND	48	ND	50.1 J
LS11-DP302-17	17-20	ND	ND	ND	ND	ND	ND	ND	ND
LS11-DP303-17	17-20	2.1 J	ND	ND	ND	ND	ND	ND	2.1 J
LS11-DP304-17	17-20	ND	ND	ND	ND	ND	ND	ND	ND
LS11-DP305-17	17-20	ND	ND	ND	ND	ND	ND	ND	ND
LS11-DP306-17	17-20	ND	ND	ND	ND	ND	ND	ND	ND
LS11-DP307-17	17-20	ND	ND	ND	ND	ND	ND	ND	ND
LS11-DP308-17	17-20	1.5 J	ND	ND	ND	ND	ND	ND	1.5 J
LS11-DP309-17	17-20	ND	ND	ND	ND	ND	ND	ND	ND
LS11-DP310-17	17-20	ND	ND	ND	0.9 J	ND	20	ND	20.9 J
LS11-DP311-17	17-20	ND	ND	ND	ND	ND	4.1	ND	4.1

E - quantified value exceeded linear calibration range and true value may be higher
NA - not analyzed
ND - not detected above quantitation limit
J - estimated concentration

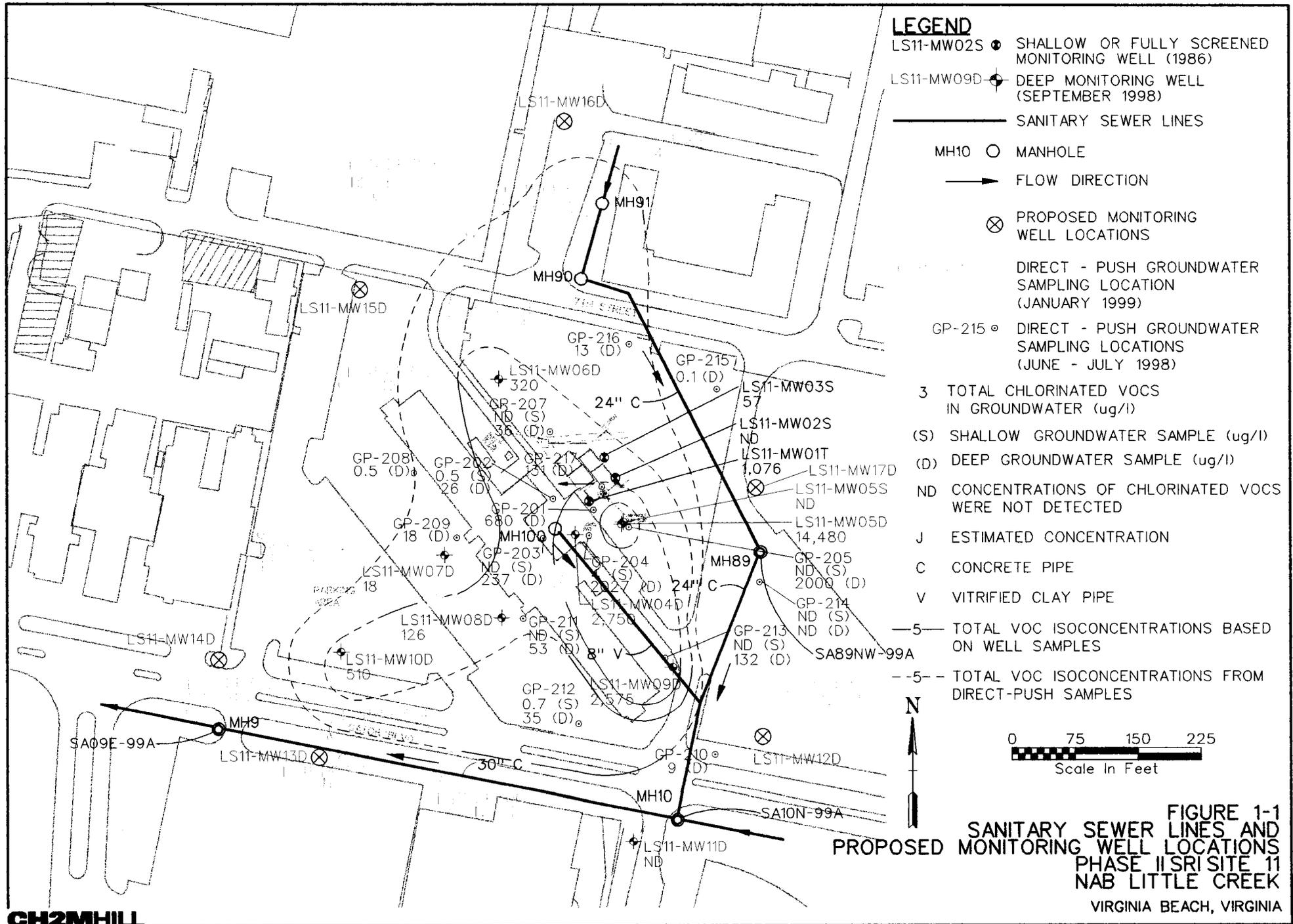
**TABLE 4. CHLORINATED VOCs DETECTED IN MONITORING WELLS
PHASE II SRI SITE 11
NAB LITTLE CREEK, VIRGINIA BEACH, VA**

Sample Locations	Screen Depth (ft. bgs)	Chlorinated VOCs (ug/l)									Total Cl- VOCs
		1,1-DCA	1,1-DCE	cis-1,2-DCE	trans-1,2-DCE	PCE	1,1,1-TCA	TCE	Vinyl chloride		
LS11-MW01T	8-18'	160	66	25 U	25 U	25 U	25 U	850	25 U	1,076	
LS11-MW02S	4-14	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	ND	
LW11-MW03T	9-19	4	1.5	1 U	1 U	1 U	6.4	45	1 U	57	
LS11-MW04D	15-20	150	400	75 U	75 U	75 U	75 U	2,200	75 U	2,750	
LS11-MW04DD	15-20	150	370	75 U	75 U	75 U	75 U	2,000	75 U	2,520	
LS11-MW05S	7-12	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	ND	
LS11-MW05D	15-20	680	300 U	300 U	300 U	300 U	2,800	11,000	300 U	14,480	
LS11-MW05DD	15-20	580	300 U	300 U	300 U	300 U	2,500	11,000	300 U	14,080	
LS11-MW06D	15-20	9 U	9 U	9 U	9 U	9 U	9 U	320	9 U	320	
LS11-MW07D	15-20	1 U	1 J	1 U	1 U	1 U	1 U	19	1 U	20 J	
LS11-MW08D	15-20	4 U	16	4 U	4 U	4 U	4 U	110	4 U	126	
LS11-MW09D	15-20	85	390	50 U	50 U	50 U	50 U	2,100	50 U	2,575	
LS11-MW10D	15-20	10 U	100	10 U	10 U	10 U	10 U	410	10 U	510	
LS11-MW11D	15-20	1 U	1 U	1 U	1 U	1 U	1 U	1 U	1 U	ND	

U = compound not detected
 ND = non-detectable concentrations
 J = estimated concentration

**TABLE 5. SITE 11 GROUNDWATER ELEVATIONS
PHASE II SRI SITE 11
NAB LITTLE CREEK, VIRGINIA BEACH, VA**

MONITORING WELLS	SCREEN DEPTHS (FT BGS)	TOP OF CASING ELEVATION (FT AMSL)	9/24/98		11/17/98	
			DTW (FEET)	GROUNDWATER ELEVATIONS (FT AMSL)	DTW (FEET)	GROUNDWATER ELEVATIONS (FT AMSL)
COLUMBIA AQUIFER WELLS						
LS11-MW01T	8-18'	8.07	5.91	2.16	6.17	1.90
LS11-MW02S	4-14'	6.92	4.78	2.14	4.99	1.93
LS11-MW03T	8-18'	6.39	4.22	2.17	4.45	1.94
LS11-MW04D	15-20'	9.2	6.97	2.23	7.24	1.96
LS11-MW05S	7-12'	8.03	5.79	2.24	6.04	1.99
LS11-MW05D	15-20'	8.36	6.14	2.22	6.37	1.99
LS11-MW06D	15-20'	6.76	4.81	1.95	4.79	1.97
LS11-MW07D	15-20'	8.86	6.60	2.26	6.92	1.94
LS11-MW08D	15-20'	9.06	6.85	2.21	7.11	1.95
LS11-MW09D	15-20'	8.88	6.88	2	7.06	1.82
LS11-MW10D	15-20'	8.19	5.9	2.29	6.21	1.98
LS11-MW11D	15-20'	9.89	7.8	2.09	7.98	1.91



LEGEND

- LS11-MW02S ● SHALLOW OR FULLY SCREENED MONITORING WELL (1986)
- LS11-MW09D ● DEEP MONITORING WELL (SEPTEMBER 1998)
- SANITARY SEWER LINES
- MH10 ○ MANHOLE
- FLOW DIRECTION
- ⊗ PROPOSED MONITORING WELL LOCATIONS
- DIRECT - PUSH GROUNDWATER SAMPLING LOCATION (JANUARY 1999)
- GP-215 ○ DIRECT - PUSH GROUNDWATER SAMPLING LOCATIONS (JUNE - JULY 1998)
- 3 TOTAL CHLORINATED VOCS IN GROUNDWATER (ug/l)
- (S) SHALLOW GROUNDWATER SAMPLE (ug/l)
- (D) DEEP GROUNDWATER SAMPLE (ug/l)
- ND CONCENTRATIONS OF CHLORINATED VOCS WERE NOT DETECTED
- J ESTIMATED CONCENTRATION
- C CONCRETE PIPE
- V VITRIFIED CLAY PIPE
- 5— TOTAL VOC ISOCONCENTRATIONS BASED ON WELL SAMPLES
- -5 - - TOTAL VOC ISOCONCENTRATIONS FROM DIRECT-PUSH SAMPLES

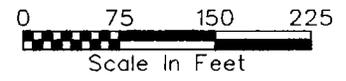


FIGURE 1-1
SANITARY SEWER LINES AND
PROPOSED MONITORING WELL LOCATIONS
PHASE II SRI SITE 11
NAB LITTLE CREEK
 VIRGINIA BEACH, VIRGINIA

LEGEND

● FULLY SCREENED MONITORING WELL
LS11-MW01T

● SHALLOW MONITORING WELL
LS11-MW02S

--- STORM SEWER LINES

⊙ SHALLOW MONITORING WELL (CH2M HILL, September 1998)

⊙ DEEP MONITORING WELL (CH2M HILL, September 1998)

3 CHLORINATED VOCS (PCE, TCE, DCE, ETC.) IN GROUNDWATER (ug/l) (September 1998)

ND CONCENTRATIONS OF CHLORINATED VOCS WERE NOT DETECTED

NOTES:

1. MANHOLE, PIPING AND SURROUNDING SOIL HAVE BEEN REMOVED, AND THE SITE HAS BEEN RESTORED.

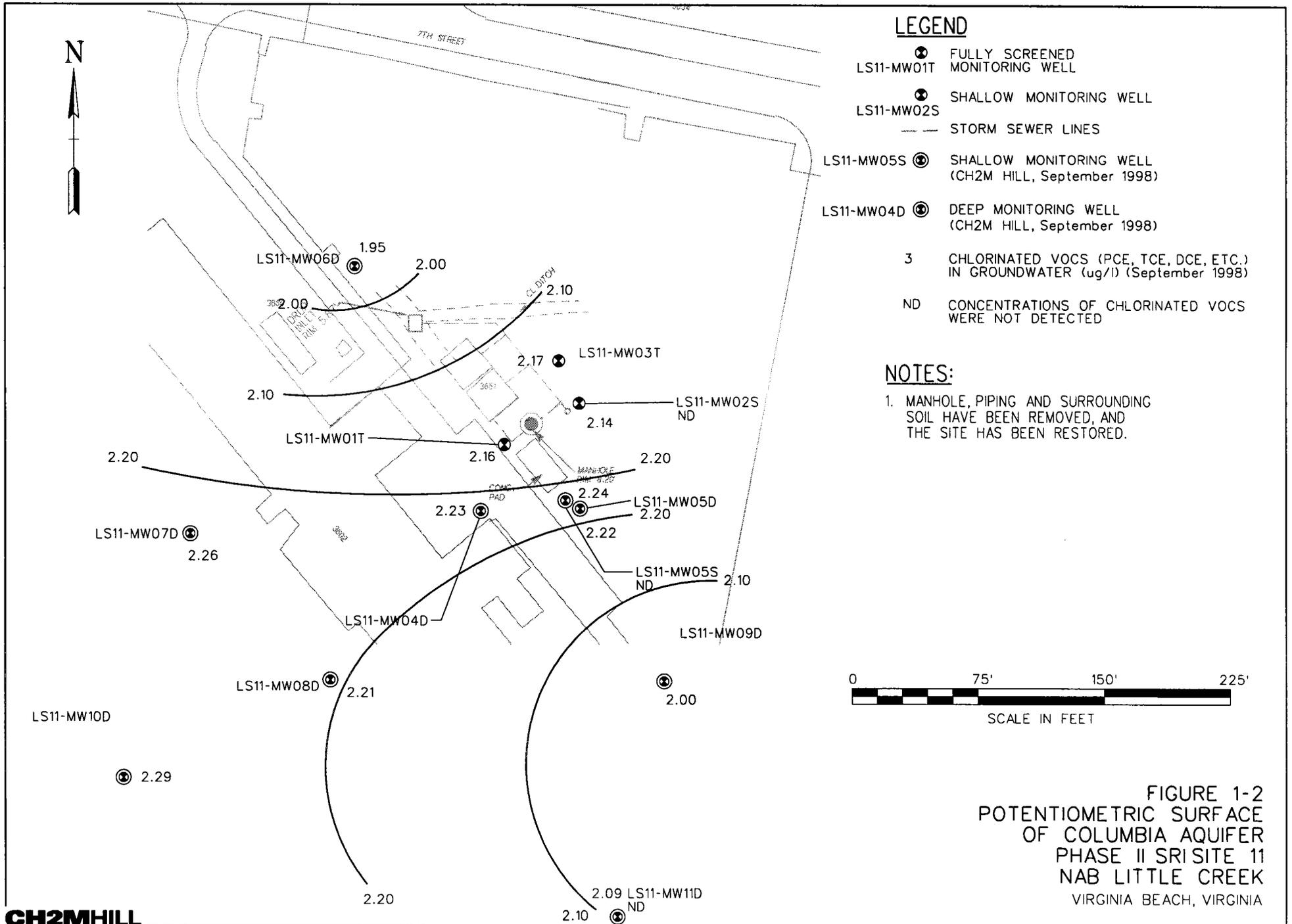
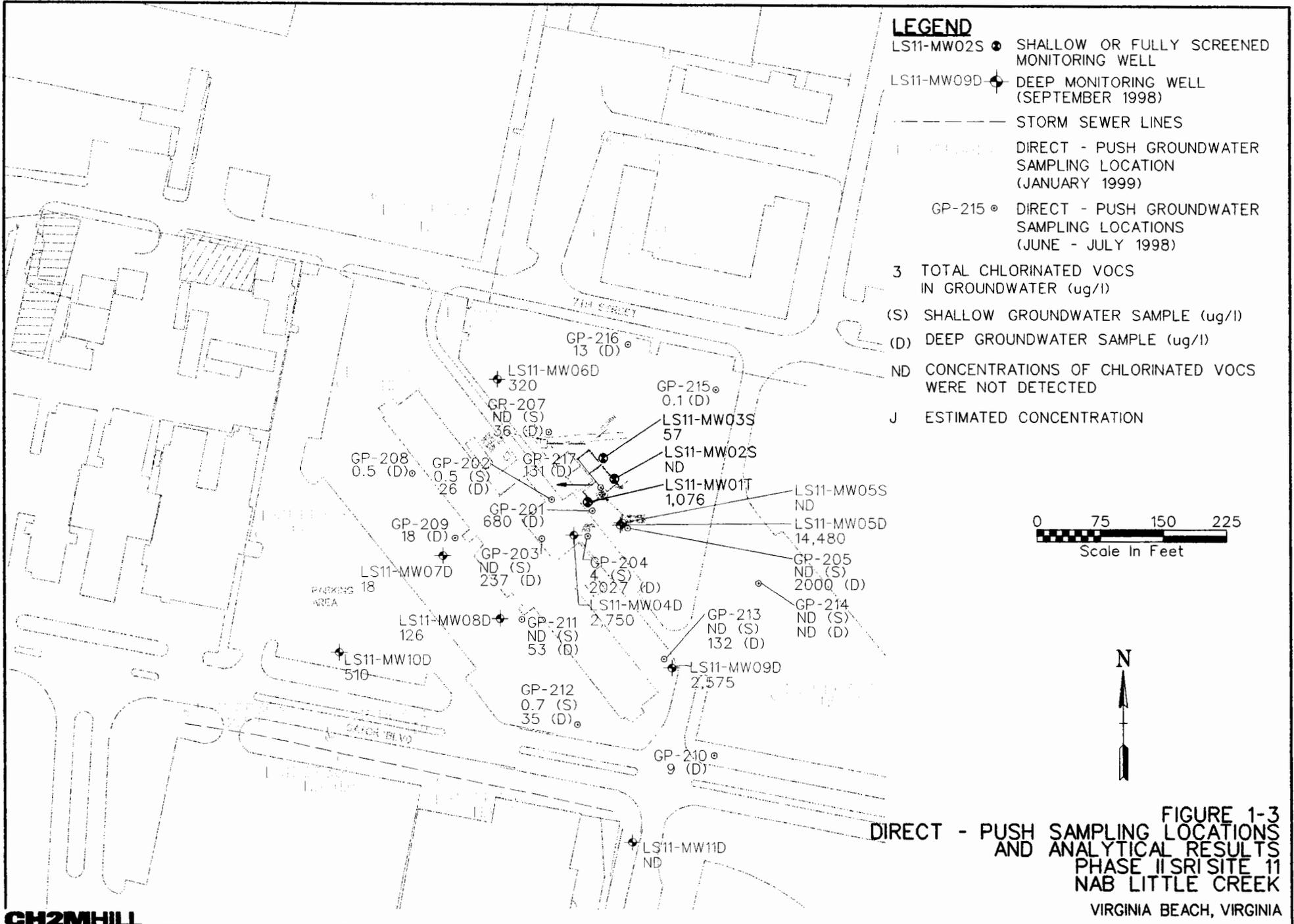


FIGURE 1-2
POTENTIOMETRIC SURFACE
OF COLUMBIA AQUIFER
PHASE II SR SITE 11
NAB LITTLE CREEK
VIRGINIA BEACH, VIRGINIA



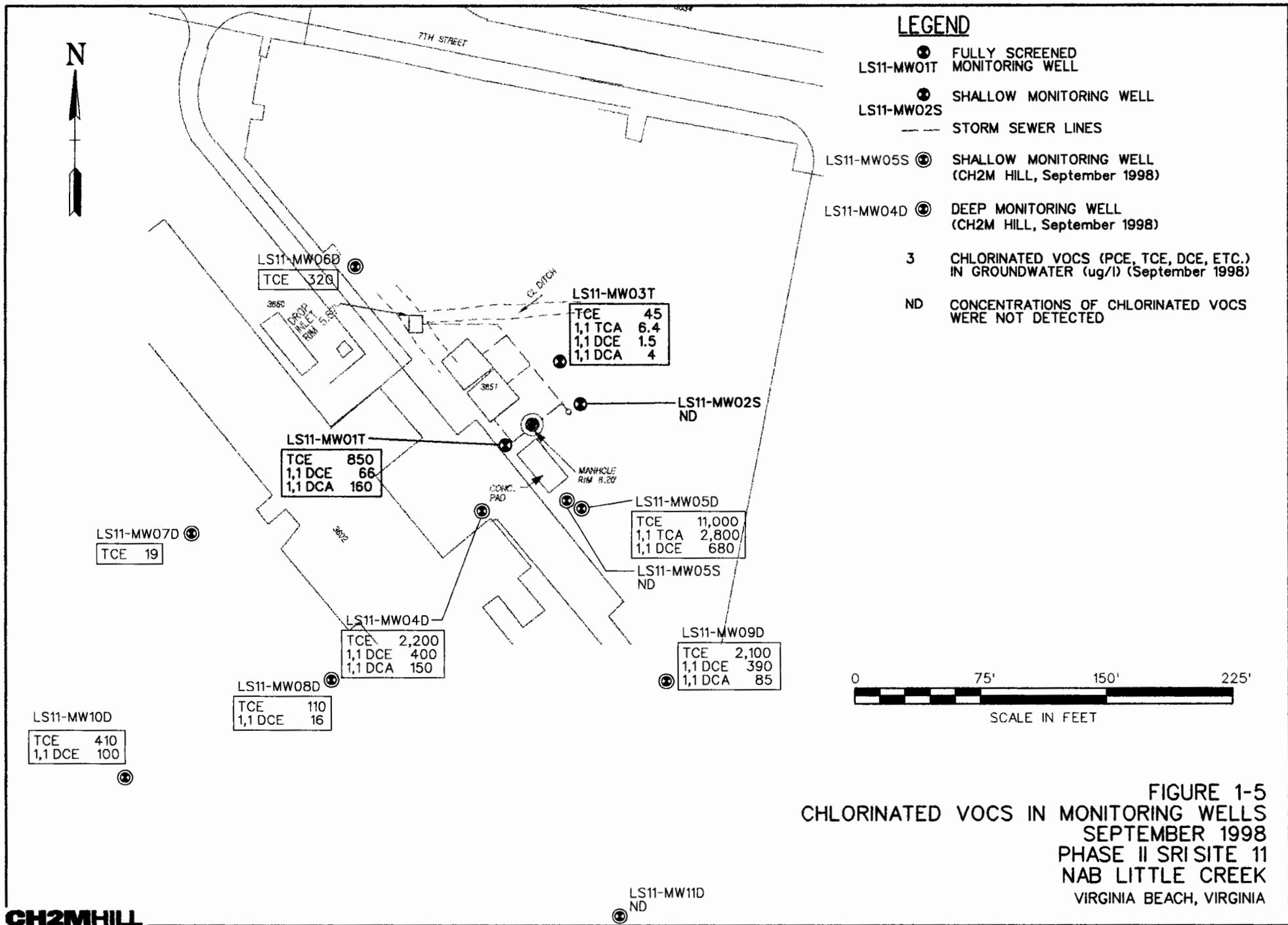


FIGURE 1-5
 CHLORINATED VOCS IN MONITORING WELLS
 SEPTEMBER 1998
 PHASE II SRI SITE 11
 NAB LITTLE CREEK
 VIRGINIA BEACH, VIRGINIA