to NYTEST for confirmation analysis by EPA Method SW-846 8021. The field GC analytical data are summarized in Table 4.4 and the NYTEST laboratory data are summarized in Table 4.5

The field GC analytical data generally indicated that, VOCs were not detected at significant levels in the DW boring samples. With the exception of the DW-SB-01 (24'-26') boring sample, only low concentrations of 1,1-dichloroethene/ 1,1,1-trichloroethane (these compounds coelute on the field GC) and sporadic detections of low concentrations of trichloroethene, cis-1,2-dichloroethene, toluene and benzene were detected in the dry well boring samples. Field GC data indicated that the DW-SB-01 (24'-26') sample exhibited a 1,1-DCE/1,1,1-TCA concentration of 1,430 µg/kg which exceeds the NYSDEC RSCO (1,1-DCE, 400 µg/kg; 1,1,1-TCA, 800 µg/kg). However, the next sample from this boring (26'-26.7') exhibited a 1,1-DCE/1,1,1-TCA concentration of only 40.5 µg/kg. This data, in conjunction with data from the other borings, indicates that the high concentrations reported in the DW-SB-01 (24'-26') sample is an isolated occurrence. Additionally, the high 1,1-DCE/1,1,1-TCA concentration in the DW-SB-01 (22'-24') sample was not detected in the laboratory confirmation sample.

The DW-SB-05A (4'-6') sample was submitted to NYTEST for analysis by EPA Method SW-846 8021 and the DW-SB-01 (24'-26') was submitted for analysis by EPA Method SW-846 8240, to determine the presence/absence of 1,1-dichloroethene or 1,1,1-trichloroethane. The field GC analysis of these samples indicated that 1,1-DCE/1,1,1-TCA was potentially present at a concentration that exceeded the NYSDEC RSCOs for these two compounds; 1,1-dichloroethene and 1,1,1-trichloroethane coelute on the field GC. The DW-SB-05A(4'-6') and DW-SB-01(24'-26') laboratory data indicated that neither 1,1-dichloroethene nor 1,1,1-trichloroethane were present in the samples at elevated concentrations. 1,1,1-trichloroethane was detected in the DW-SB-01 (24'-26') sample at an estimated concentration of 3 µg/kg. The laboratory EPA Method SW-846 8021 chromatogram for sample DW-SB-05A(4'-6') indicated the presence of an unidentified compound. It is possible that this compound coeluted with the 1,1-dichloroethene/1,1,1-trichloroethane resulting in a false high positive value.

In summary, the field GC and laboratory dry well soil boring analytical data indicate that the soil in the vicinity of the borings do not represent a significant source of volatile organic hydrocarbons. The laboratory data, supplemented with the field GC data, indicated that none of the boring samples contained high VOC concentrations.

4.4 TEST PIT INVESTIGATION

During the installation of SB-24 as part of the UST subsurface soil investigation program, electrical refuse debris was encountered and a viscous oily material was observed between approximately 2.5 feet and 4.5 feet, at which point the boring was terminated. Two samples were collected from the boring, one from 2'-4' and a second from 4'-4.5' and submitted to NYTEST for PCB analysis. The PCB analytical data indicated that the PCBs were detected in both the 2'-4' sample and the 4'-4.5' sample at concentrations of 2.8 mg/kg and 120 mg/kg, respectively. Based on the PCB results, a test pit program was implemented to evaluate the extent of PCB impacted soil in this area. The SB-24 boring PCB data and the test pit sample PCB data are summarized in Table 4.6

Table 4.4
Field GC Data - Dry Well Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
December 6 through 12, 1995

Location:	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01	DW-SB-01
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'	26-26.7'
Compound														
Vinyl Chloride	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-DCE/1,1,1-TCA	**5.2 J**	**5.4 J**	**26.3**	**8.0 J**	< 25	< 25	< 25	**5.2 J**	**8.5 J**	**251**	**272**	**466**	**1,430**	**40.5**
trans-1,2-DCE	< 5	< 5	**5.4**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-DCE	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	**6.8**	< 5
Benzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	**6.9**	**31.7**	< 5
Tetrachloroethylene	< 25	< 25	< 25	< 25	< 25	< 25	< 25	**5.4**	< 5	**7.5**	< 5	< 5	< 5	< 5
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 25	< 25	< 25	< 25	< 25	< 25	< 25
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***5.4***	***0***	***7.5***	***0***	***0***	***0***	***0***

Location:	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02	DW-SB-02
Depth:	1-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'	26-28'
Compound														
Vinyl Chloride	< 5	< 5	< 5	< 5	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
1,1-DCE/1,1,1-TCA	**75.3**	**6.0 J**	**7.8 J**	< 25	**11.0 J**	**30.8**	**19.2 J**	N/A	**33.3**	**9.0 J**	**27.5**	**134**	**32.2**	**22.2 J**
trans-1,2-DCE	< 5	< 5	< 5	**4.3 J**	**7.5**	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-DCE	< 5	< 5	< 5	< 5	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	**17.7**
Benzene	**27.3**	< 5	< 5	< 5	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	**34.7**
Toluene	**34.7**	< 5	< 5	< 5	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethylene	< 25	< 25	< 25	< 25	< 25	< 25	< 25	N/A	< 25	< 25	< 25	< 25	< 25	< 25
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	**52.6**	< 5	< 5	< 5	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	**35.9**	< 5	< 5	< 5	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	***150.5***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).
N/A indicates Not Analyzed.
J indicates that the result reported is below the laboratory reporting limit and is considered estimated.

Table 4.4
Field GC Data - Dry Well Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
December 6 through 12, 1995

Location:	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03	DW-SB-03
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'	26-27.1'
Compound														
Vinyl Chloride	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-DCE/1,1,1-TCA	N/A	< 25	< 25	< 25	< 25	**17.9 J**	**16.2 J**	**28.8**	**69.8**	**27.5**	**35.8**	**49.3**	**84**	**71.6**
trans-1,2-DCE	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-DCE	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Benzene	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	N/A	**14.6**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethylene	N/A	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Ethylbenzene	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	***0***	***14.6***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

Location:	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04	DW-SB-04
Depth:	1-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'	26-26.1'
Compound														
Vinyl Chloride	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-DCE/1,1,1-TCA	**6.0 J**	**7.0 J**	**8.5 J**	**< 25**	**21.3 J**	**23.3 J**	**7.7 J**	**7.1 J**	**22.3 J**	**135**	**91.9**	**120**	**11.7 J**	**10.5 J**
trans-1,2-DCE	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-DCE	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	**15.1**	**6.5**	< 5
Benzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	**30.0**	**12.0**
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethylene	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).
N/A indicates Not Analyzed.
J indicates that the result reported is below the laboratory reporting limit and is considered estimated.

Table 4.4
Field GC Data - Dry Well Soil Boring Program
Orange & Rockland Utilities, Inc.
West Nyack, New York
December 6 through 12, 1995

Location:	DW-SB-05	DW-SB-05	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A	DW-SB-05A
Depth:	0-2'	2-4'	4-6'	4-6' R	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-24.4'
Compound														
Vinyl Chloride	< 5	< 5	**14.2**	**6.8**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-DCE/1,1,1-TCA	**9.8 J**	**113**	**530**	**220**	< 25	< 25	**8.2 J**	< 25	< 25	**10.3 J**	**11.6 J**	**133**	**42.0**	**20.7 J**
trans-1,2-DCE	< 5	**44.6**	**54.6**	**24.5**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-DCE	< 5	**20.6**	**50.2**	**31.0**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Benzene	< 5	< 5	**55.6**	**26.2**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Toluene	< 5	**5.0**	**10.6**	**5.3**	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethylene	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	***0***	***0***	***66.2***	***31.5***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

Location:	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06	DW-SB-06
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'	26-28'	28-28.4'
Compound															
Vinyl Chloride	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-DCE/1,1,1-TCA	< 25	**15.5 J**	**8.1 J**	< 25	**5.7 J**	< 25	< 25	< 25	< 25	< 25	**13.6 J**	**6.2 J**	< 25	**7.6 J**	**10.9**
trans-1,2-DCE	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-DCE	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	**8.9**	**6.8**
Benzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	**13.3**	**10.9**
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethylene	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).
N/A indicates Not Analyzed.
J indicates that the result reported is below the laboratory reporting limit and is considered estimated.

Table 4.5
Volatile Analytical Data (Method 8021) - Soil (Dry Well)
Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: December 6, 7, 8, 11 and 12, 1995

Sample ID / Depth / Compound	DW-SB-01 (24-26')	DW-SB-01 (26-26.7')	DW-SB-02 (26-26.4')	DW-SB-03 (26-27.1')	DW-SB-04 (26-26.5')	DW-SB-05A (4-6')	DW-SB-05A (24-24.4')	DW-SB-06 (28-28.4')
Benzene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Bromobenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Bromochloromethane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Bromodichloromethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Bromoform	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Bromomethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
sec-Butylbenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
tert-Butylbenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Carbon Tetrachloride	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Chlorobenzene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Chloroethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Chloroform	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Chloromethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
2-Chlorotoluene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
4-Chlorotoluene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Dibromochloromethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2-Dibromo-3-Chloropropane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2-Dibromoethane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Dibromomethane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2-Dichlorobenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,3-Dichlorobenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,4-Dichlorobenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Dichlorodifluoromethane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,1-Dichloroethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,3,5-Trimethylbenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2,4-Trimethylbenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
n-Butylbenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Naphthalene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2-Dichloroethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,1-Dichloroethene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2-Dichloroethene (total)	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2-Dichloropropane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U

Table 4.5
Volatile Analytical Data (Method 8021) - Soil (Dry Well)
Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: December 6, 7, 8, 11 and 12, 1995

Sample ID / Depth / Compound	DW-SB-01 (24-26')	DW-SB-01 (26-26.7')	DW-SB-02 (26-26.4')	DW-SB-03 (26-27.1')	DW-SB-04 (26-26.5')	DW-SB-05A (4-6')	DW-SB-05A (24-24.4')	DW-SB-06 (28-28.4')
1,3-Dichloropropane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
2,2-Dichloropropane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,1-Dichloropropene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Ethylbenzene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Hexachlorobutadiene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Isopropylbenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Methylene Chloride	12 U	8.5 U	5.0 U	10.0 U	4.6 U	3.1 U	3.9 U	6.4 U
n-Propylbenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Styrene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,1,1,2-Tetrachloroethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,1,2,2-Tetrachloroethane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Tetrachloroethene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Toluene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Xylene (total)	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,1,1-Trichloroethane	3 J	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,1,2-Trichloroethane	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Trichloroethene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Trichlorofluoromethane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2,3-Trichloropropane	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
Vinyl Chloride	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
p-Isopropyltoluene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2,4-Trichlorobenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
1,2,3-Trichlorobenzene	N/A	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
cis-1,3-Dichloropropene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U
trans-1,3-Dichloropropene	11 U	1.1 U	1.1 U	1.1 U	1.1 U	1.1 U	1.2 U	1.1 U

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.
Sample DW-SB-01 (24-26') was analyzed be EPA Method 8240. "N/A" indicates that the compound was not analyzed for.

TABLE 4.5 Continued
Volatile Analytical Data (Method 8240) - Soil (Dry Well)

Orange & Rockland Utilities
West Nyack, New York

Sampling Date: December 6, 1995

Sample ID / Depth / Compound	DW-SB-01 (24-26')
Chloromethane	11 U
Bromomethane	11 U
Vinyl Chloride	11 U
Chloroethane	11 U
Methylene Chloride	12 U
Acetone	11 U
Carbon Disulfide	11 U
1,1-Dichloroethene	11 U
1,1-Dichloroethane	11 U
1,2-Dichloroethene (total)	11 U
Chloroform	11 U
1,2-Dichloroethane	11 U
2-Butanone	11 U
1,1,1-Trichloroethane	**3 J**
Carbon Tetrachloride	11 U
Bromodichloromethane	11 U
1,2-Dichloropropane	11 U
cis-1,3-Dichloropropene	11 U
Trichloroethene	11 U
Dibromochloromethane	11 U
1,1,2-Trichloroethane	11 U
Benzene	11 U
trans-1,3-Dichloropropene	11 U
Bromoform	11 U
4-Methyl-2-Pentanone	11 U
2-Hexanone	11 U
Tetrachloroethene	11 U
1,1,2,2-Tetrachloroethane	11 U
Toluene	11 U
Chlorobenzene	11 U
Ethylbenzene	11 U
Styrene	11 U
Xylene (total)	11 U
Vinyl Acetate	11 U

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.

Table 4.6
Test Pits and Soil Boring 24 - PCB Analytical Data

Orange & Rockland Utilities
West Nyack, New York

Sampling Date, Soil Boring 24: November 30, 1995
Sampling Date, Test Pits: January 11, 1996

Sample ID Depth (if applicable) Compound	UST-SB-24 (2-4')	UST-SB-24 (4-4.5')	TP96-1	TP96-2	TP96-3	TP96-4
Aroclor-1016	92 U	110 U	140 U	97 U	39 U	86 U
Aroclor-1221	92 U	110 U	280 U	200 U	80 U	170 U
Aroclor-1232	92 U	110 U	140 U	97 U	39 U	86 U
Aroclor-1242	92 U	110 U	140 U	97 U	39 U	86 U
Aroclor-1248	92 U	110 U	140 U	97 U	39 U	86 U
Aroclor-1254	**2,800**	**120,000**	**1400**	**840**	39 U	**2000 D**
Aroclor-1260	92 U	110 U	140 U	97 U	39 U	86 U

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.
The NYSDEC Recommended Soil Cleanup Objectives for total PCBs (i.e., the sum of the Aroclors reported) from TAGM 4046 (HWR-94-4046, January 24, 1994 REVISED) is 1,000 ug/Kg for surficial soils and 10,000 ug/Kg for sub-surface soils.

Three test pits were completed to a depth of six to eight feet below grade. Test pit TP-96-3 was completed beginning just south of and adjacent to the SB-24 location and proceeded south approximately 13 feet. Test pit TP-96-1 began ten feet north of SB-24 and ended 18 feet further north. Test pit TP-96-2 began ten feet north of SB-24 and proceeded 24 feet east. A total of 18 subsurface soil/debris samples were collected, screened with an HNU 101 PID instrument for VOCs and geologically logged. Test pit logs are presented in Appendix C.

Based on visual examination, four samples were submitted to NYTEST for PCB analysis; samples exhibiting visual indication of oil-like staining were submitted for analysis. Sample TP-96-1 was collected at the south wall of test pit TP-96-1 at a depth of 4'-5'; sample TP-96-2 was collected ten feet east of the western end of test pit TP-96-2; sample TP-96-3 was collected at the southern wall of test pit TP-96-03; and sample TP-96-4 was collected ten feet north of the southern end of test pit TP-96-01.

The PCB analytical data from the four test pits indicated that the high PCBs reported in the SB-24, 4'-4.5' sample was an isolated occurrence. PCB concentrations in the four test pit samples ranged from non-detect at 0.039 mg/kg (TP-96-3) to 2 mg/kg (TP-96-4); the TP-96-1 and TP-96-2 PCB concentrations were 1.4 mg/kg and 0.84 mg/kg, respectively. All concentrations were less than the USEPA, PCB soil spill cleanup concentration of 25 mg/kg (40 CFR Part 761). The NYSDEC RSCO for subsurface PCBs is 10 mg/kg and all the test pit values were well below this level. NYSDEC has recently proposed cleanup to 25 mg/kg at a site in upstate New York.

In summary, the test pit sample analytical data indicate that the high PCBs reported in the SB-24, 4'-4.5' sample is an isolated occurrence. The extent of subsurface soil impacted by PCBs at concentrations greater than 25 ppm is limited to the area in the immediate vicinity of SB-24.

4.5 SUSPECTED DISPOSAL AREA SOIL/DEBRIS INVESTIGATION

Two soil borings were drilled in an area where it has been reported that transformer/electrical refuse debris was potentially buried. The boring locations have been depicted on Figure 3.0 and Drawing 2. The intent of the boring program was to determine if this potential disposal area represented a possible source of PCBs or VOCs. Methodology for boring installation and sample collection have been presented in Section 2.4.4.1. A total of 32 subsurface soil samples were collected from the two borings. All samples were analyzed for selected VOCs using the field GC and were visually inspected and logged. Based on the visual inspection and the field GC data, three samples, SDA-SB-01 (4'-6'), SDA-SB-01 (12'-14') and SDA-SB-02 (12'-14') were submitted to NYTEST for analysis. Samples SDA-SB-01 (4'-6') and SDA-SB-02 (12'-14') were analyzed for PCBs by EPA Method SW-846 8080 and Samples SDA-SB-01 (12'-14') and SDA-SB-02 (12'-14') were analyzed for VOCs by EPA Method SW-846 8240 and PCBs by EPA Method SW-846 8080. A summary of the field GC VOC data, the laboratory VOC data and the laboratory PCB data are summarized in Tables, 4.7, 4.8 and 4.9, respectively.

TABLE 4.7

Field GC Data - Suspected Disposal Area Soil Boring Program

Orange & Rockland Utilities, Inc.

West Nyack, New York

December 12 and 13, 1995

Location:	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01	SDA-SB-01
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'	26-28'	28-30'	30-30.9'
Compound																
Vinyl Chloride	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-DCE/1,1,1-TCA	< 25	**8.5 J**	**23.6 J**	N/A	< 25	< 25	< 25	< 25	**5.1 J**	< 25	< 25	< 25	< 25	< 25	< 25	< 25
trans-1,2-DCE	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-DCE	< 5	< 5	< 5	N/A	< 5	**7.7**	**18.4**	**13.0**	**20.3**	< 5	< 5	**6.8**	< 5	< 5	< 5	< 5
Benzene	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	N/A	< 5	**9.3**	**74.1**	**38.3**	**61.7**	< 5	< 5	**16.2**	< 5	**7.2**	**14.0**	**17.7**
Toluene	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethylene	< 25	< 25	< 25	N/A	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Ethylbenzene	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	**15.2**	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	N/A	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	***0***	***0***	***15.2***		***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

Location:	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02	SDA-SB-02
Depth:	0-2'	2-4'	4-6'	6-8'	8-10'	10-12'	12-14'	14-16'	16-18'	18-20'	20-22'	22-24'	24-26'	26-28'	28-30'	30-31.4'
Compound																
Vinyl Chloride	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
1,1-DCE/1,1,1-TCA	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
trans-1,2-DCE	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
cis-1,2-DCE	< 5	< 5	< 5	< 5	< 5	**7.3**	**15.9**	**9.5**	< 5	< 5	< 5	< 5	< 5	**6.4**	**5.8**	< 5
Benzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Trichloroethene	< 5	< 5	< 5	< 5	< 5	< 5	**44.5**	**28.2**	**5.7**	**5.0**	< 5	**5.4**	< 5	**16.6**	**17.7**	**13.5**
Toluene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Tetrachloroethylene	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25	< 25
Ethylbenzene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
m&p-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
o-Xylene	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5	< 5
Total BTEX	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***	***0***

All results expressed in ug/Kg wet weight (ppb, uncorrected for percent solids).
N/A indicates Not Analyzed.
J indicates that the result reported is below the laboratory reporting limit and is considered estimated.

Table 4.8
Laboratory Volatile Analytical Data - Soil (Suspected Disposal Area)
Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: December 12 and 13, 1995

Sample ID / Depth / Compound	SDA-SB-01 (12-14')	SDA-SB-02 (12-14')
Chloromethane	13 U	13 U
Bromomethane	13 U	13 U
Vinyl Chloride	13 U	13 U
Chloroethane	13 U	13 U
Methylene Chloride	13 U	18 U
Acetone	13 U	13 U
Carbon Disulfide	13 U	13 U
1,1-Dichloroethene	13 U	13 U
1,1-Dichloroethane	13 U	13 U
1,2-Dichloroethene (total)	13 U	13 U
Chloroform	13 U	13 U
1,2-Dichloroethane	13 U	13 U
2-Butanone	13 U	13 U
1,1,1-Trichloroethane	13 U	13 U
Carbon Tetrachloride	13 U	13 U
Bromodichloromethane	13 U	13 U
1,2-Dichloropropane	13 U	13 U
cis-1,3-Dichloropropene	13 U	13 U
Trichloroethene	13 U	**3 J**
Dibromochloromethane	13 U	13 U
1,1,2-Trichloroethane	13 U	13 U
Benzene	13 U	13 U
trans-1,3-Dichloropropene	13 U	13 U
Bromoform	13 U	13 U
4-Methyl-2-Pentanone	13 U	13 U
2-Hexanone	13 U	13 U
Tetrachloroethene	13 U	13 U
1,1,2,2-Tetrachloroethane	13 U	13 U
Toluene	13 U	13 U
Chlorobenzene	13 U	13 U
Ethylbenzene	13 U	13 U
Styrene	13 U	13 U
Xylene (total)	13 U	13 U
Vinyl Acetate	13 U	13 U

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.
The NYSDEC Recommended Soil Cleanup Objective for trichloroethene from TAGM 4046 (HWR-94-4046, January 24, 1994 REVISED) is 700 ug/Kg.

Table 4.9
PCB Analytical Data - Soil (Suspected Disposal Area)

Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: December 12 and 13, 1995

Sample ID / Depth / Compound	SDA-SB-01 (4-6')	SDA-SB-02 (12-14')
Aroclor-1016	110 U	100 U
Aroclor-1221	110 U	100 U
Aroclor-1232	110 U	100 U
Aroclor-1242	110 U	100 U
Aroclor-1248	110 U	100 U
Aroclor-1254	**1,700**	100 U
Aroclor-1260	110 U	100 U

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.
The NYSDEC Recommended Soil Cleanup Objectives for total PCBs (i.e., the sum of the Aroclors reported) fromTAGM 4046 (HWR-94-4046, January 24, 1994 REVISED) is 1,000 ug/Kg for surficial soils and 10,000 ug/Kg for sub-surface soils.

The field GC analysis of all 32 soil boring samples indicated that with the exception of low concentrations of TCE (range 5.0 µg/kg to 74.1 µg/kg), cis-1,2-DCE (range 5.8 µg/kg to 20.3 µg/kg) and 1,1-DCE/1,1,1,-TCA (range 8.5 u/kg to 23.6 µg/kg) no VOCs were detected in any of the samples. The reported TCE, 1,1-DCE/1,1,1-TCA and the cis-1,2-DCE concentrations were well below the NYSDEC RSCO concentrations; TCE 700 µg/kg, 1,2-DCE 300 µg/kg, 1,1-DCE 400 µg/kg and 1,1,1-TCA 800 µg/kg. The laboratory VOC analytical results for the SDA-SB-01 and the SDA-SB-02 samples confirm the field GC data. With the exception of the detection of TCE at a low estimated concentration of 3 µg/kg in sample SDA-SB-02 (12'-14), no VOCs were detected. The field GC and laboratory VOC analytical data indicate that this area does not represent a source of VOCs and that subsurface soil in this area have not been significantly impacted with respect to VOCs.

The PCB analytical data indicated that with the exception of 1.7 mg/kg of Aroclor 1254 in sample SDA-SB-01 (4'-6') no PCBs were detected in the two samples submitted for analysis. The 1.7 mg/kg of Aroclor 1254 is well below both the NYSDEC RSCO of 10 mg/kg and the USEPA subsurface soil cleanup value of 25 mg/kg. Data indicate that this area does not represent a source of PCBs and that subsurface soil in this area have not been significantly impacted with respect to PCBs.

To reiterate, the subsurface soil field GC VOC data and the laboratory VOC and PCB data indicate that the suspected disposal area does not represent a source of VOCs or PCBs. The analytical data indicate that subsurface soil in this area have not been significantly impacted with respect to VOCs or PCBs.

4.6 SURFACE WATER INVESTIGATION

As part of this RI one round of surface water samples was collected from three locations on the Hackensack River on December 27, 1995. One sample was collected upstream of the Site, one near the Nyack Water Company intake and one downstream of the Site. Sample locations are depicted in Figure 3 and Drawing 2. Samples were submitted to NYTEST for PCB analysis by NYSDEC, ASP, CLP Method 91-3. The intent of the surface water sampling program was to confirm previous PCB surface water analytical data and evaluate current conditions.

4.6.1 Historical Surface Water Data

As part of previous site investigations, surface water samples were collected upstream of the Site at the railroad bridge intersection with the Hackensack River and downstream of the Site where the Route 59 bridge crosses the River. Samples collected at these two locations in June 1981, August 1981, October 1981 and February 1990 were analyzed for PCBs, in October 1981 both total matrix and filtered samples were analyzed for PCBs. In October of 1991 surface water samples were collected from seven locations as part of the Phase II investigation performed by Lawler, Matusky & Skelly Engineers for ORU. These samples were analyzed for PCBs and VOCs. The October 1991 surface water sample locations are depicted on Figure 3-6 of the Phase II report.

The 1981 and the February 1990 analytical data were summarized in Table 4.7 of the Phase II report. The analytical results indicated that in August 1991 total PCB concentrations in the upstream and the downstream samples were 0.4 µg/l and 0.83 µg/l, respectively. In October 1981 total PCB

concentrations in the unfiltered upstream and downstream samples were 0.46 µg/l and 0.14 µg/l, respectively. The filtered sample upstream and downstream concentrations were 0.19 µg/l and 0.10 µg/l respectively. The October 1981 filtered data indicate that PCBs are potentially sorbed to suspended solids in the water column. No PCBs were detected in the June 1981 or the February 1990 surface water samples.

The October 1991 surface water VOC analytical data revealed that with the exception of an estimated concentration of methylene chloride (1 µg/l) in sample SW-2 and an estimated and tentative identification of freon 113 in sample SW-1 (7.4 µg/l), no VOCs were detected in any of the surface water samples. As indicated by LMS, the reported methylene chloride and freon are most likely related to laboratory contamination. Neither the reported methylene chloride or the Freon are considered site related. The October 1991 surface water data indicate that the Site had not had an impact on the Hackensack surface water quality with respect to VOCs as of October 1991. However, groundwater flow rates (discussed in Section 3.2.3) indicate that BTEX VOCs may not have migrated as far as the Hackensack River by 1991. The leaking UST was discovered in 1989. BTEX concentrations in groundwater samples from monitoring wells MW-3 and MW-4 generally increased from 1989 to 1991, which indicates that the bulk of a plume had not reached monitoring well MW-3 by 1989. The estimated groundwater travel time from MW-3 to the Hackensack River is 2.8 to 4.7 years. If the BTEX detected in the 1989 MW-3 grondwater samples reflect the leading edge of a contaminant plume, these travel times indicate that VOCs associated with the UST may not have reached the Hackensack River by October 1991. A summary of historical surface water PCB analytical results is presented below. No PCBs were detected in the October 1991 surface water samples.

DATE	UPSTREAM AT RAILROAD BRIDGE	DOWNSTREAM AT ROUTE 59 BRIDGE	NYSDEC HUMAN HEALTH SURFACE WATER STANDARD	NYSDEC AQUATIC AND WILDLIFE BASED STANDARD
June 1981	<0.1	<0.1	0.01	0.001
August 1981	0.4	0.83	0.01	0.001
October 1981	0.46 unfiltered 0.19 filtered	0.14 unfiltered 0.10 filtered	0.01	0.001
February 1990	<0.25	<0.25	0.01	0.001
October 1991	<1.0	<1.0 (all seven locations)	0.01	0.001

Note: All results expressed in µg/l

The historical PCB analytical data indicates that in August and October 1991, both the upstream and the downstream surface water samples exceeded the NYSDEC surface water standards. The October 1991 upstream value was higher than the downstream value. The historical surface water data indicate that the Site has not had an impact on surface water quality with respect to PCBs. The October 1991 surface water VOC analytical data indicate that VOCs were not a concern in Hackensack River surface water in 1991.

4.6.2 December 1995 Surface Water Data

Based on the historical surface water analytical data, three surface water samples were collected during the RI. Samples were submitted to NYTEST for PCB analysis by NYSDEC ASP, CLP Method 91-3. Analytical results were validated and the validation report is presented in Appendix L. The December 1995 surface water PCB analytical results indicated that no PCBs were detected in any of the samples (reporting limit of 1 µg/l except for Aroclor 1221 which had a reporting limit of 2 µg/l).

In summary, the RI surface water analytical data in conjunction with the historical surface water analytical data indicate that the Site has not had an impact on surface water quality with respect to PCBs. The Historical surface water analytic data indicate that the Site has not had an impact on surface water quality with respect to VOCs.

4.7 SEDIMENT INVESTIGATION

A total of eighteen sediment samples were collected from the Hackensack River during the RI. Samples were collected on December 28, 1995 and submitted to NYTEST for analysis of PCBs by NYSDEC, ASP, CLP Method 91-3. Sample locations are depicted on Figure 3 and Drawing 2. The sediment samples were collected to evaluate potential impacts to the Hackensack River with respect to PCBs and confirm historical river sediment analytical results. Historical analytical sediment data and the data collected during the RI are discussed in the following sections.

4.7.1 Historical Hackensack Sediment Data

During previous investigations, sediment samples were collected from the Hackensack River at several locations. In June 1980, four sediment samples were collected from the Hackensack River; samples AB-1 and AB-2 were collected just upstream of the Conrail railroad bridge and just downstream of the railroad bridge, respectively, and samples AB-3 and AB-4 were collected at the center and west abutment, respectively, of the small dam located upstream of the Route 59 overpass. In June, August and October 1981 and in February 1990, sediment samples were collected upstream of the Site at the ConRail railroad bridge intersection with the Hackensack River and downstream of the Site where the Route 59 bridge crosses the River. The June and August 1991 samples at these locations consisted of a single grab sample. The October sample consisted of three separate grab samples at each location. In August 1991 two samples were also collected at the small dam just upstream of the Route 59 overpass. The June 1980, the June, August and October 1981 and the February 1990 samples were analyzed for PCBs. In October 1991, LMS collected seven sediment samples from the Hackensack River during the Phase II Site investigation. The seven samples were analyzed for VOCs and PCBs. The seven sampling locations are depicted in Figure 3-6 of the Phase II investigation. The historical sediment PCB analytical data are summarized in Table 4.10

The historical analytical data indicated that sediments collected adjacent to or downstream of the Site have exhibited PCB concentrations that were elevated with respect to upstream concentrations. Concentrations have exceeded the NYSDEC sediment criteria (Technical Guidance for Screening Contaminated Sediments, NYSDEC, November 1993) values for protection of human health with respect to bioaccumulation (0.024 µg/kg) and protection of piscivourous wildlife with respect to bioaccumulation (42 µg/kg).

TABLE 4.10
Summary of Historical
Hackensack River Sediment
PCB Analytical Data

Date	Upstream Railroad Bridge (SD-1, A-1)	Downstream Side of Railroad Bridge (SD-2, A-2)	Upstream of Nyack Water Intake SD-3	SD-4	SD-5	Small Dam (SD-6, A-3, A-4)	Route 59 Bridge (SD-7)
June 1980	0.02	0.0003				0.012/0.12*	
June 1981	<0.2						0.1
August 1981	<0.1					<0.1/0.2**	0.6
October 1981	<0.1/<0.31/<0.1***						0.54/6.3/<0.1***
February 1990	<0.1						0.15
October 1991	<0.87	<0.46	<0.20	4.9	<1.8	0.67	<0.81

All values expressed in mg/kg
* Indicates sample A3/A4
** Indicates two samples, one at dam center one at west abuttment
*** Indicates results from three seperate samples collected at this location
NYSDEC Sediment Criteria Screening value for Human Health with Respect to Bioaccumulation 0.000024 mg/kg assuming 3% Organic Carbon
NYSDEC Sediment Criteria Screening value For Protection of Wildlife with Respect to Bioaccumulation 0.042 mg/kg assuming 3% Organic Carbon

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The October 1991 sediment samples were analyzed for VOCs. With the exception of methylene chloride, no VOCs were detected in the sediment samples. Methylene chloride is a common laboratory contaminant, and as reported by LMS, the detection of this compound is considered laboratory derived and not related to the Site. As discussed in Section 4.6.1 it is possible that BTEX compounds may not have reached the Hackensack River by 1991.

4.7.2 December 1995 Sediment Analytical Results

Based on the historical Site analytical data and the historical Hackensack River sediment and surface water analytical data, the RI included collection of eighteen sediment samples from the River. The sediment samples were collected on December 28, 1995 and submitted to NYTEST for PCB analysis by NYSDEC, ASP, CLP Method 91-3. Samples were collected to confirm historical data and further evaluate current River sediment PCB concentrations adjacent to and downstream of the Site. Analytical results are summarized in Table 4.11 and sampling locations are depicted on Figure 3 and Drawing 2.

Analytical results indicated that PCBs were detected in samples SED-1, SED-6, SED-7, SED-11, SED-15 and SED-18. Sample SED-1 is a background sample that was collected upstream of the Conrail railroad bridge; Aroclor 1254 was detected in the SED-1 sample at a concentration of 71 µg/kg. Aroclor 1254 was also detected in samples SED-6, SED-7, SED-15 and SED-18 at concentrations of 100 µg/kg, 230 µg/kg, 62 µg/kg and 60 µg/kg, respectively. The downstream sediment sample Aroclor 1254 concentrations were not significantly elevated with respect to the upgradient value. Aroclor 1254 has been detected in on-site surface soil samples and the Site potentially contributes to the Aroclor 1254 loading in the Hackensack River sediments, however, the data indicates that a significant portion of the Aroclor 1254 loading is most likely attributable to sources upstream of the Site.

Aroclor 1260 was detected in sediment sample SED-11 at a concentration of 3,000 µg/kg.

The SED-11 sample was collected on the north/east side of Hackensack River on the side opposite the Site, approximately 270 feet downstream of the Nyack Water Company intake. Aroclor 1260 has been detected in onsite soil samples at concentrations as high as 33,000 µg/kg.

Both the upstream and downstream Aroclor 1254 concentrations and the SED-11 Aroclor 1260 concentration exceed the NYSDEC total PCB sediment criteria for protection of human health and wildlife with respect to bioaccumulation (Human Health 0.024 µg/kg, Wildlife 42 µg/kg); the sediment criteria values were calculated assuming an organic matter content of 3 percent. These sediment criteria values are based on the potential for PCBs to bioaccumulate.

To summarize, review of all the available Hackensack River sediment PCB analytical data, indicate that concentrations significantly greater than upstream values are limited to three isolated areas: the October 1991 SD-4 and/or December 1995 SED-11 sample locations (approximately 300 feet downstream of the Nyack Water Company intake), the small dam located near the southeastern boundary of the Site and the Route 59 Bridge.

Table 4.11
PCB Analytical Data - Sediment
Orange & Rockland Utilities
West Nyack, New York

Sampling Date: December 28, 1995

Sample ID / Compound	SED-1	SED-2	SED-3	SED-4	SED-5	SED-6	SED-7	SED-8	SED-9	SED-10
Aroclor-1016	42 U	46 U	48 U	52 U	73 U	73 U	42 U	41 U	45 U	69 U
Aroclor-1221	86 U	94 U	97 U	110 U	150 U	150 U	86 U	84 U	91 U	140 U
Aroclor-1232	42 U	46 U	48 U	52 U	73 U	73 U	42 U	41 U	45 U	69 U
Aroclor-1242	42 U	46 U	48 U	52 U	73 U	73 U	42 U	41 U	45 U	69 U
Aroclor-1248	42 U	46 U	48 U	52 U	73 U	73 U	42 U	41 U	45 U	69 U
Aroclor-1254	**71**	46 U	48 U	52 U	73 U	**100**	**230**	41 U	45 U	69 U
Aroclor-1260	42 U	46 U	48 U	52 U	73 U	73 U	42 U	41 U	45 U	69 U

Sample ID / Compound	SED-11	SED-12	X-3	SED-13	SED-14	SED-15	SED-16	SED-17	SED-18
Aroclor-1016	46 UV	38 UV	37 U	70 UV	56 UV	54 UV	130 U	52 UV	41 UV
Aroclor-1221	94 UV	77 UV	76 U	140 UV	110 UV	110 UV	260 U	110 UV	84 UV
Aroclor-1232	46 UV	38 UV	37 U	70 UV	56 UV	54 UV	130 U	52 UV	41 UV
Aroclor-1242	46 UV	38 UV	37 U	70 UV	56 UV	54 UV	130 U	52 UV	41 UV
Aroclor-1248	46 UV	38 UV	37 U	70 UV	56 UV	54 UV	130 U	52 UV	41 UV
Aroclor-1254	46 UV	38 UV	37 U	70 UV	56 UV	**62 V**	130 U	52 UV	**60 PVN**
Aroclor-1260	**3000 DV**	38 UV	37 U	70 UV	56 UV	54 UV	130 U	52 UV	41 UV

All results expressed in ug/Kg.
Standard Organic Data Qualifiers have been used.
Sample X-3 is a blind field duplicate of sample SED-12.
NYSDEC Sediment Critera Screening Value For PCBs is 0.042 mg/kg based on 3% organic carbon

4.8 GROUNDWATER INVESTIGATION

The RI groundwater sampling task consisted of the collection of one round of groundwater samples from all existing monitoring wells and the three new monitoring wells (MW-5B, MW-8S and MW-9B). Groundwater from all monitoring wells except EXW-1, MW-2, MW-3 and MW-4 were collected on December 26-27, 1995. Samples EXW-1, MW-2, MW-3 and MW-4 were collected on January 12, 1996. All samples were submitted to NYTEST for VOC and PCB analysis by NYSDEC, ASP, CLP, Methods 91-1 and 91-3, respectively.

4.8.1 Historical Groundwater Data

Drawings 3 and 4 summarize the historical (and the most recent December 1995/January 1996) analytical data for compounds that have been detected in the groundwater monitoring well samples collected at the Site. Overburden groundwater analytical results are presented on Drawing 3 and bedrock interface well data are presented on Drawing 4.

Four rounds of groundwater samples were collected from overburden monitoring well MW-3 (November 1989, January 1990, July 1991 and October 1991) and three rounds from monitoring wells MW-1 and MW-2 (November 1989, January 1990, July 1991), EXW-1, EXW-4, EXW-5 and MW-5 (January 1990, July 1991 and October 1991). All samples were analyzed for BTEX compounds. The February 1990 and the October 1991 samples from monitoring wells MW-3, EXW-1, EXW-4 and EXW-5 as wells as the October 1991 samples from monitoring wells MW-4 and MW-5 were analyzed for chlorinated VOCs.

The historical overburden groundwater analytical data indicates that groundwater from monitoring wells MW-1, MW-2, MW-3 and MW-4 have exhibited BTEX concentrations that have exceeded the NYSDEC groundwater standards (benzene 0.7 µg/l, toluene, ethylbenzene and xylene 5.0 µg/l). Of the six monitoring wells with historical chlorinated VOC data, the groundwater samples from monitoring wells MW-3, EXW-1, EXW-4 and EXW-5 exhibited the presence of chlorinated VOCs.

The MW-1 groundwater analytical data indicate that the benzene, ethylbenzene and toluene concentrations have been relatively consistent and that the xylene concentrations decreased from the high in January 1990 of 550 µg/l to the low in July 1991 of 89 µg/l.

The MW-2 July 1991 BTEX concentrations decreased from the January 1990 concentrations which were generally the highest reported of the three monitoring events. However, the July 1991 concentrations remained elevated with respect to the NYSDEC groundwater standard.

The MW-3 BTEX concentrations increased from November 1989 to October 1991. Although benzene was detected in four of the historical monitoring events at concentrations that exceeded the NYSDEC groundwater standard for benzene (0.7 µg/l), toluene, ethylbenzene and xylene were not detected until the October 1991 monitoring event. The October 1991 toluene, ethylbenzene and xylene concentrations exceeded the NYSDEC groundwater standard (5 µg/l). A significantly greater number of VOCs were detected in the October 1991 groundwater sample from MW-3 than in the February 1990 groundwater sample. The concentration of 1,2-DCE was higher in the February 1990 sample (76 µg/l) than in the October 1991 sample (34 µg/l).

The July and October 1991 toluene, ethylbenzene and xylene concentrations for MW-4 were significantly higher than the November 1989 and the February 1990 values and significantly exceed the NYSDEC groundwater standard. The October 1991 benzene concentration (260 µg/l), although significantly elevated with respect to the NYSDEC groundwater standard, is lower than the previous three groundwater sample concentrations.

The historical groundwater analytical data from monitoring wells EXW-1, EXW-4 and EXW-5 indicate that BTEX compounds have not been detected at concentrations above the groundwater standard in the samples collected from these monitoring wells. With the exception of low concentrations of toluene in the July 1991 EXW-4 and EXW-5 samples, no BTEX compounds have been detected in these wells. This data indicates that petroleum constituents related to the UST area had not reached the Site boundary in the vicinity of monitoring wells EXW-1, EXW-4 and EXW-5 by October 1991. Historical groundwater data from monitoring well EXW-1 indicates that one chlorinated compound, 1,2-DCE was detected in the January 1990 sample at a concentration below the current groundwater standard. 1,2-DCE was not detected in the October 1991 groundwater sample from EXW-1.

Several chlorinated VOCs, 1,1-DCA, 1,2-DCE, tetrachlorethene (PCE), 1,1,1-TCA, TCE and vinyl chloride (VC), were detected in the January 1990 groundwater sample from EXW-4. The January 1990 1,2-DCE, 1,1,1-TCA and the TCE concentrations exceeded the NYSDEC groundwater standards (5 µg/l). The October 1991 groundwater sample indicate that with the exception of vinyl chloride, the same chlorinated compounds were detected as in January 1990. The October 1991 chlorinated VOC concentrations from EXW-4 were generally of the same magnitude as in January 1990, with the 1,2-DCA, 1,2-DCE, 1,1,1-TCA and TCE concentrations exceeding the NYSDEC groundwater standard.

Three chlorinated VOCs, 1,2-DCE, 1,1,1-TCA and TCE were detected in the January 1990 sample from EXW-5. The TCE and 1,2-DCE concentrations exceeded the NYSDEC groundwater standards. In October 1991, 1,2-DCE, 1,1,1-TCA, TCE and VOC were detected in the EXW-5 groundwater sample; the 1,2-DCE, TCE and VC concentrations exceeded the NYSDEC groundwater standards. The chlorinated VOC concentrations were generally lower than the values reported in the EXW-4 groundwater sample.

The October 1991 groundwater analytical data from weathered bedrock interface monitoring wells MW-6 and MW-8, located in the northeastern and central eastern area of the Site have exhibited elevated concentrations of the same VOCs reported in the MW-3, EXW-4 and EXW-5 monitoring well samples. The MW-8 and MW-6, 1,2-DCE, 1,1,1-TCA and TCE concentrations and the MW-8, 1,1-DCA concentration exceeded the NYSDEC groundwater standards. The 1,1,1-TCA concentration from MW-8 was higher than the MW-6 values, However, the TCE and 1,2-DCE concentrations from MW-6 were higher than the MW-8 values. No chlorinated VOCs were detected in the MW-7 weathered bedrock interface groundwater sample, which is consistent with the direction of groundwater flow in the weathered bedrock. MW-7 is located in the central section of the Site along the western boundary.

In summary, the historical groundwater analytical data indicates that groundwater from monitoring wells MW-1, MW-2, MW-3 and MW-4 have exhibited petroleum related (BTEX) VOCs that have exceeded the NYSDEC groundwater standards. Historically, groundwater from monitoring wells

MW-2 and MW-4 have exhibited the highest concentrations, with comparable xylene concentrations in the MW-1 groundwater samples. The BTEX concentrations from MW-4 generally increased from 1989 to July/October 1991. Chlorinated VOCs have been detected in the MW-3 groundwater samples at concentrations that exceeded the NYSDEC groundwater standards. The groundwater samples from EXW-1, EXW-4 and EXW-5 indicate that groundwater in the vicinity of these wells has not been impacted by petroleum related VOCs (BTEX). However, chlorinated VOCs have been consistently detected in the EXW-4 and EXW-5 samples at concentrations which have exceeded the NYSDEC groundwater standards. Groundwater from the weathered bedrock interface wells MW-8 and MW-6 exhibited chlorinated volatile compounds at concentrations that have exceeded the NYSDEC groundwater standard, the compounds detected are the same as identified in the overburden MW-3, EXW-4 and EXW-5 monitoring well samples.

4.8.2 December 1995/January 1996 Groundwater Data

The RI groundwater sampling task consisted of the collection of one round of groundwater samples from all existing monitoring wells and the three new monitoring wells (MW-5B, MW-8S and MW-9B). Groundwater from all monitoring wells except EXW-1, MW-2, MW-3 and MW-4 were collected on December 26-27, 1995. Samples from EXW-1, MW-2, MW-3 and MW-4 were collected on January 12, 1996. All samples were submitted to NYTEST for VOC and PCB analysis by NYSDEC, ASP, CLP, Methods 91-1 and 91-3, respectively.

4.8.2.1 Overburden Groundwater Data

Volatile Organic Compounds

The December 1995/January 1996 overburden groundwater VOC analytical data are summarized on Drawing 3 and in Table 4.12. Groundwater from monitoring wells MW-1, MW-2, MW-3 and MW-4, continue to exhibit petroleum related compounds that exceed the NYSDEC groundwater standard. However, the MW-1, MW-3 and MW-4 BTEX concentrations were significantly lower than historical concentrations. Only benzene in the MW-3 and MW-4 and xylene in the MW-1 sample exceeded groundwater standards. Data indicates that, between removal of the leaking UST in 1989 and collection/analysis of the most recent round of groundwater samples (December 1995/January 1996), that BTEX concentrations have attenuated. However, BTEX concentrations in the January 1996 groundwater sample from monitoring well MW-2 have increased with respect to historical concentrations.

The BTEX analytical results from monitoring wells EXW-1, EXW-4, EXW-5 and the recently installed MW-8S monitoring well, indicate that BTEX contaminants associated with the UST area have not migrated to the Site boundary in the vicinity of these monitoring wells. Monitoring wells EXW-4 and EXW-5 are located downgradient of the UST area. With the exception of a low estimated concentration of xylene in the EXW-1 groundwater sample, no BTEX compounds were detected in the groundwater samples from these monitoring wells. However, as discussed in Section 3.2.3, estimated groundwater travel times from the UST area to EXW-4 range from 6.2 to 10.3 years. If the UST began leaking in 1989 or shortly prior to 1989, it is possible that BTEX compounds had not reached EXW-4 and EXW-5 by December 1995. No BTEX compounds were detected in the groundwater sample from monitoring well MW-5, which is located upgradient of the UST area along the Site's southwestern boundary.

Table 4.12
Overburden Groundwater - Volatile Organic Analytical Data

Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: December 26 and 27, 1995 and January 12, 1996

Sample ID / Compound	EXW-1	EXW-4	EXW-5	MW-1	MW-2	MW-3	MW-4	MW-5	MW-8S	X-1 (MW-8S)	NYSDEC Groundwater Standard/GV
Chloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
Bromomethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	2
Vinyl Chloride	10 U	4 J	4 J	10 U	4 J	10 U	36	10 U	10 U	10 U	5
Chloroethane	10 U	10 U	10 U	10 U	7 J	5 J	10 U	10 U	10 U	10 U	
Methylene Chloride	14 UV	10 UV	15 UV	10 UV	12 UV	10 UV	10 UV	10 UV	10 UV	10 UV	50 (GV)
Acetone	10 U	10 UV	11 SV	10 UV	10 U	10 U	10 U	10 UV	10 UV	10 UV	5
Carbon Disulfide	10 U	10 UV	10 UV	10 UV	10 U	10 U	2 J	10 UV	10 UV	10 UV	5
1,1-Dichloroethene	10 U	2 J	10 U	10 U	24	650 D	10	10 U	49	51	5
1,1-Dichloroethane	10 U	2 J	10 U	10 U	23	28	19	10 U	7 J	7 J	5
1,2-Dichloroethene (total)	10 U	130	13	10 U	12	220	110	10 U	120	120	5
Chloroform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10	10 U	10 U	5
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
2-Butanone	10 UV	10 UV	10 UV	10 U	10 UV	10 UV	10 UV	10 U	10 U	10 U	
[redacted]richloroethane	10 U	8 J	10 U	1 J	58	1900 D	15	10 U	310 D	310 D	5
Carbon Tetrachloride	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	3 J	10 U	10 U	50 (GV)
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
[redacted]richloroethene	10 U	170	14	10 U	18	430 D	70	10 U	190	200 D	5
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	3 J	10 U	10 U	10 U	10 U	10 U	5
Benzene	10 U	10 U	10 U	10 U	1200 D	14	42	10 U	10 U	10 U	0.7
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
Bromoform	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
2-Hexanone	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
Tetrachloroethene	10 U	4 J	10 U	10 UV	10 U	5 J	10 U	10 UV	3 JV	3 JV	5
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
Toluene	10 U	10 U	10 U	2 J	160	10 U	2 J	10 U	10 U	10 U	5
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
Ethylbenzene	10 U	10 U	10 U	9 J	100	10 U	2 J	10 U	10 U	10 U	5
Styrene	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	
Xylene (total)	3 J	10 U	10 U	28	310	10 U	10 U	10 U	10 U	10 U	5

All results expressed in ug/L.
Standard Organic Data Qualifiers have been used.
Sample X-1 is a blind field duplicate of sample MW-8S.
NYSDEC Groundwater Standards/Guidance Values have been provided for those compounds which were detected. "GV" designates guidance value rather than a standard.

Groundwater from monitoring wells MW-2, MW-3, MW-4, MW-8S, EXW-4 and EXW-5 exhibited chlorinated VOC concentrations that were elevated with respect to the groundwater standard. Generally the compounds detected in the groundwater samples from these wells were consistent with historical data from monitoring wells MW-3, EXW-4 and EXW-5. The exception is the chloroethane, chloromethane and 1,1,2- TCA detected in the MW-2 groundwater sample, which have not been previously detected in any groundwater samples collected at the Site. These compounds were only detected in the MW-2 sample and are insignificant when compared to the concentrations of the more prevalent chlorinated compounds detected in the MW-2 sample and detected in the most recent and historical groundwater samples from the other Site monitoring wells. Chloroethane is a degradation product of 1,1-DCA, which has been detected in the MW-2 groundwater samples.

Chlorinated VOCs were not detected in the MW-5 or MW-1 samples at levels which exceeded the groundwater standard. With the exception of a low, estimated concentration of 1,1,1-TCA (1 µg/l) in the MW-1 sample, no historical Site related chlorinated VOCs were detected in the MW-1 and MW-5 groundwater samples. Chloroform and bromodichloromethane were detected in the MW-5 sample; with only the chloroform (10 µg/l) concentration exceeding the NYSDEC groundwater standard (7 µg/l). Both chloroform and bromodichloromethane are trihalomethane compounds which are frequently found in municipal water supplies. Trihalomethanes are formed from the reaction of chlorine, commonly used as a disinfectant in municipal water treatment, with organic matter in water. The municipal water line is located in close proximity to the MW-5 monitoring well and represents a probable source of these two compounds. Neither chloroform nor bromodichloromethane have been previously detected in groundwater samples collected at the Site. The detection of these two compounds is not considered Site related.

Chlorinated VOCs were not detected in the groundwater sample from monitoring well EXW-1. Data indicate that overburden groundwater in the vicinity of the southeastern section of the Site has not been impacted by chlorinated VOCs.

Groundwater from monitoring well MW-2 has not been previously analyzed for chlorinated VOCs. TCE, 1,1,1-TCA, 1,1-DCE, 1,2-DCE, 1,1-DCA, VC, chloromethane and chloroethane were detected in the MW-2 groundwater sample at concentrations which exceeded the NYSDEC groundwater standards. Data indicate that the groundwater quality in the vicinity of MW-2 has been impacted with respect to the chlorinated compounds that have historically been reported in Site groundwater samples. The MW-2 chlorinated concentrations were significantly lower than the values reported in the groundwater sample from monitoring well MW-3.

The chlorinated VOC (TCE, 1,1,1-TCA, PCE, 1,2-DCE, 1,1-DCE and 1,1-DCA) concentrations detected in the MW-3 groundwater sample were significantly higher than the historical concentrations. The MW-3 concentrations were also the highest detected in any of the overburden groundwater monitoring well samples.

The MW-4 groundwater sample analytical results revealed that TCE, 1,1,1-TCA, 1,1-DCE, 1,1-DCA, 1,2-DCE and VC were detected at concentrations that exceeded the groundwater standard. These compounds were not detected in the October 1991 sample from this monitoring well, the only other sampling event in which analysis of chlorinated VOCs was performed.

The EXW-4 groundwater analytical data indicated that the TCE, 1,2-DCE, VC and 1,1,1-TCA concentrations exceeded the NYSDEC groundwater standards. The TCE, 1,2-DCE and VC values were higher than historical levels. The TCE, 1,2-DCE and 1,1,1-TCA concentrations from EXW-4 were significantly lower than the concentrations of these compounds reported in the MW-3 groundwater sample. The December 1995 analytical data indicate that groundwater in the vicinity of monitoring well EXW-4 continues to exhibit elevated concentrations of chlorinated VOCs.

Groundwater analytical data from monitoring well EXW-5 demonstrated that groundwater in the vicinity of this well continues to exhibit elevated concentrations of chlorinated VOCs. The concentrations of TCE, VC and 1,2-DCE detected in the December 1995 sample were elevated with respect to the groundwater standard. The reported concentrations were consistent with, although slightly lower than the October 1991 levels but remain elevated with respect to the reported January 1990 concentrations.

Groundwater analytical results from monitoring well MW-8S, indicate that groundwater quality in the vicinity of this well has been impacted with respect to chlorinated VOCs. The December 1995 analytical results showed that 1,1-DCA, 1,1-DCE, 1,2-DCE, 1,1,1-TCA and TCE concentrations were elevated with respect to the groundwater standard. The MW-8S concentrations were lower than the MW-3 concentrations.

The overburden groundwater chlorinated VOC analytical data indicate a potential source of chlorinated VOCs located upgradient of the MW-2/ MW-3/MW-4 area or potentially upgradient of the Site. However, the MW-5 and MW-1 overburden data indicate that the overburden groundwater upgradient of these wells has not been impacted with respect to chlorinated VOCs. If there was an overburden source of chlorinated VOCs upgradient of the Site, then elevated concentrations of chlorinated VOCs would be expected in overburden monitoring wells MW-5 and MW-1.

However, hydrogeolgical data discussed in Section 3.2 indicate that an upward gradient exists from the weathered bedrock interface to the overburden in the northern section of the Site and that this upward gradient most likely increases as you get closer to the Hackensack River. Therefore, the TCE and 1,2-DCE detected in the MW-2, MW-3, MW-4, EXW-4 and EXW-5 monitoring wells may potentially be related to an off-site source and not Site derived. This is supported by the HA-4 and HA-5 shallow boring data which indicated that chlorinated VOCs were not present in the unsaturated zone subsurface soil samples.

The analytical data from the shallow soil boring samples HA-4 and HA-5, indicate that shallow soil (1' to 4') in the vicinity of the former and existing UST area do not represent a source of chlorinated VOCs. Boring samples HA-4 and HA-5 were collected upgradient of the MW-2, MW-3 and MW-4 monitoring wells; the HA-4 and HA-5 samples were collected on the west side of the former UST and the east side of the active UST, respectively. Locations have been depicted on Drawing 2.

The overburden groundwater analytical data reveal that generally all VOC concentrations are less than 1% of the solubility. Concentrations in groundwater samples greater than 1% to 5% of the aqueous solubility are indicative of the possible presence of a non-aqueous phase product in the vicinity of the sample location. All overburden monitoring well VOC concentrations were less than 1% of the aqueous solubility. Data indicate that there most likely is not a source of non-aqueous phase liquid at the Site.

PCBs

Groundwater samples collected from the overburden monitoring wells were analyzed for PCBs by NYSDEC, ASP, CLP Method 91-3. Analytical results are summarized in Table 4.13. With the exception of the groundwater samples from monitoring wells MW-2 and MW-3, no PCBs were detected in any of the overburden monitoring well samples. Aroclor 1254 was detected in the MW-2 and MW-3 groundwater samples at concentrations of 1 µg/l and 0.4 µg/l, respectively, which exceeded the NYSDEC groundwater standard of 0.1 µg/l.

With the exception of analysis of a filtered sample that was collected in February 1990, no groundwater samples from monitoring well MW-2 have been analyzed for PCBs. No PCBs were detected in the February 1990 filtered sample at the reporting limit of 0.5 µg/l.

The MW-3 December 1995 PCB concentration is consistent with the October 1991 concentration of 0.63 µg/l. The only other sample collected from MW-3 that was analyzed for PCBs was a filtered sample collected in February 1990 in which no PCBs were detected at the reporting limit of 0.5 µg/l.

PCBs were detected in the August 1981 and October 1981 total matrix (unfiltered) groundwater samples from monitoring wells EXW-1, EXW-2, EXW-3, EXW-4 and EXW-5 at concentrations which exceeded the groundwater standard. Analysis of a filtered sample collected concurrently with the October 1981 total matrix samples indicated that PCBs were not detected in the filtered samples from these monitoring wells. The current analytical data revealed that PCBs were not present in the total matrix samples from monitoring wells EXW-1, EXW-4 and EXW-5.

PCBs were also not detected in the December 1995 groundwater samples from monitoring wells MW-1, MW-4 and MW-5. The December 1995 MW-4 and MW-5 data are consistent with the November 1991 data from these monitoring wells. Samples have not historically been collected from monitoring well MW-1 for PCB analysis.

The December 1995 PCB analytical data indicate that the overburden groundwater has not been significantly impacted by PCBs. Elevated concentrations were limited to monitoring wells MW-2 and MW-3. PCBs were not detected at the downgradient perimeter monitoring wells during either of the past two monitoring events (December 1995 and November 1991).

To review, the overburden groundwater analytical data indicate that groundwater monitoring well BTEX concentrations have generally decreased overtime, indicating attenuation of groundwater BTEX concentrations. The one exception is the BTEX concentrations in MW-2 which are higher in the December 1995 sample. The EXW-1, EXW-4, EXW-5 and the MW-8S groundwater BTEX analytical data indicate that VOC petroleum contaminants associated with the UST area have not migrated to the Site boundary.

The chlorinated VOC analytical data indicate that groundwater concentrations in the vicinity of monitoring wells MW-3 and MW-4, and to a lesser extent EXW-4 have increased. The EXW-5 chlorinated VOC concentrations were consistent with historical values. Elevated concentrations of chlorinated VOCs were also detected in the MW-2 and the MW-8S overburden monitoring wells. Existing overburden groundwater and weathered bedrock flow data indicate that the TCE and 1,2-

Table 4.13
Overburden Groundwater - PCB Analytical Data

Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: December 26 and 27, 1995 and January 12, 1996

Sample ID / Compound	EXW-1	EXW-4	EXW-5	MW-1	MW-2	MW-3	MW-4	MW-5	MW-8S	X-1 (MW-8S)
Aroclor-1016	1 UV	1 UV	1 U	1 UV	1 UV	1 U	1 U	1 U	1 U	1 UV
Aroclor-1221	2 UV	2 UV	2 U	2 UV	2 UV	2 U	2 U	2 U	2 U	2 UV
Aroclor-1232	1 UV	1 UV	1 U	1 UV	1 UV	1 U	1 U	1 U	1 U	1 UV
Aroclor-1242	1 UV	1 UV	1 U	1 UV	1 UV	1 U	1 U	1 U	1 U	1 UV
Aroclor-1248	1 UV	1 UV	1 U	1 UV	1 UV	1 U	1 U	1 U	1 U	1 UV
Aroclor-1254	1 UV	1 UV	1 U	1 UV	**1 V**	**0.40 J**	1 U	1 U	1 U	1 UV
Aroclor-1260	1 UV	1 UV	1 U	1 UV	1 UV	1 U	1 U	1 U	1 U	1 UV

All results expressed in ug/L.
Standard Organic Data Qualifiers have been used.
Sample X-1 is a blind field duplicate of sample MW-8S.
The NYSDEC Groundwater Standard for total PCBs (i.e., the sum of the individual Aroclors reported) is 0.1 ug/L.

DCE detected in the MW-2, MW-3, MW-4, EXW-4 and EXW-5 and MW-8S samples may potentially be related to an off-site source.

4.8.2.2 Weathered Bedrock Interface Monitoring Wells

In December 1995, groundwater samples were collected from weathered bedrock interface monitoring wells MW-5B, MW-6, MW-7, MW-8 and MW-9B. Samples were analyzed for VOCs and PCBs following NYSDEC, ASP, CLP Methods 91-1 and 91-3, respectively. The VOC data are summarized in Table 4.14. The VOC data are presented on Drawing 4.

Volatile Organic Compounds

The weathered bedrock interface analytical data indicated BTEX compounds were not detected in any of the weathered bedrock interface monitoring well samples. This is consistent with the November 1991 groundwater analytical data collected during the Phase II investigation.

Chlorinated VOCs were detected at concentrations exceeding NYSDEC groundwater standards in all weathered bedrock interface monitoring well samples (except well MW-7), including upgradient wells MW-5B and MW-9B. No VOCs were detected in the MW-7 groundwater sample at concentrations that exceeded NYSDEC groundwater standards; TCE was detected at a low, estimated concentration (2 µg/l) that was below the NYSDEC groundwater standard of 5 µg/l.

Monitoring well MW-9B is located on the east side of the ORU building and approximately 40 feet north of Old Nyack Turnpike. The monitoring well location is considered to be representative of Site background (upgradient conditions). The MW-9B groundwater VOC analytical data indicated TCE (350 µg/l), PCE (5 µg/l) and 1,2-DCE (87 µg/l) were significantly elevated with respect to the NYSDEC groundwater standard (5 µg/l). Upgradient/background monitoring well MW-5B is located in the southwest corner of the Site, approximately 60 feet west of the building. The groundwater VOC analytical data indicated that the TCE (35 µg/l) and 1,2-DCE (24 µg/l) concentrations from MW-5B were elevated with respect to the NYSDEC groundwater standard.

The TCE and 1,2-DCE concentrations detected in the MW-9B and MW-5B background groundwater samples appear to be associated with an off-site upgradient source, potentially the Grant Hardware site. The NYSDEC has listed the former Grant Hardware property as a Class 2 inactive hazardous waste site (Site ID 3-44-031) based on TCE contamination of soil and groundwater. PCE was also detected in soil and groundwater at this site. The Grant Hardware Site is located approximately 500 feet south of the ORU Site. The ORU Site overburden and weathered bedrock interface groundwater contour maps (Section 3.2, Figures 4 and 5, respectively), indicate that the Grant Hardware site is located upgradient of the ORU Site. The TCE and 1,2-DCE concentrations reported in the MW-9B upgradient sample were consistent with concentrations detected in downgradient weathered bedrock interface monitoring well MW-6 and MW-8 samples. Weathered bedrock interface flow data indicate that the TCE and 1,2-DCE reported in the weathered bedrock MW-6 and MW-8 appears to be related to an off-site source.

Downgradient weathered bedrock interface monitoring wells MW-6 and MW-8 also exhibited 1,1-DCE and 1,1,1-TCA concentrations that exceeded the NYSDEC groundwater standards (5 µg/l). Neither of these compounds were detected in the MW-9B nor MW-5B groundwater samples at elevated concentrations. Both 1,1-DCE and 1,1,1-TCA were detected at concentrations exceeding

Table 4.14
Bedrock/Overburden Interface Groundwater - Volatile Organic Analytical Data
Orange & Rockland Utilities
West Nyack, New York

Sampling Dates: December 26 and 27, 1995

Sample ID / Compound	MW-5B	MW-6	MW-7	MW-8	MW-9B	NYSDEC Groundwater Standard/GV
Chloromethane	10 U	10 U	10 U	10 U	10 U	
Bromomethane	10 U	10 U	10 U	10 U	10 U	
Vinyl Chloride	10 U	10 U	10 U	10 U	10 U	
Chloroethane	10 U	10 U	10 U	10 U	10 U	
Methylene Chloride	10 UV	16 UV	10 UV	10 UV	10 UV	
Acetone	10 UV	**6 JSV**	10 UV	10 UV	10 UV	50 (GV)
Carbon Disulfide	10 UV	10 UV	10 UV	10 UV	10 UV	
1,1-Dichloroethene	10 U	**57**	10 U	**9 J**	10 U	5
1,1-Dichloroethane	10 U	**3 J**	10 U	10 U	10 U	5
1,2-Dichloroethene (total)	**24**	**180**	10 U	**160**	**87**	5
Chloroform	10 U	10 U	10 U	10 U	10 U	
1,2-Dichloroethane	10 U	10 U	10 U	10 U	10 U	
2-Butanone	10 UV	10 UV	10 U	10 U	10 U	
1,1,1-Trichloroethane	**2 J**	**150**	10 U	**44**	**2 J**	5
Carbon Tetrachloride	10 U	10 U	10 U	10 U	10 U	
Bromodichloromethane	10 U	10 U	10 U	10 U	10 U	
1,2-Dichloropropane	10 U	10 U	10 U	10 U	10 U	
cis-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	
Trichloroethene	**35**	**360 D**	**2 J**	**310 D**	**350 D**	5
Dibromochloromethane	10 U	10 U	10 U	10 U	10 U	
1,1,2-Trichloroethane	10 U	10 U	10 U	10 U	10 U	
Benzene	10 U	10 U	10 U	10 U	10 U	
trans-1,3-Dichloropropene	10 U	10 U	10 U	10 U	10 U	
Bromoform	10 U	10 U	10 U	10 U	10 U	
4-Methyl-2-Pentanone	10 U	10 U	10 U	10 U	10 U	
2-Hexanone	10 U	10 U	10 U	10 U	10 U	
Tetrachloroethene	**3 J**	**4 J**	10 UV	**4 JV**	**5 JV**	5
1,1,2,2-Tetrachloroethane	10 U	10 U	10 U	10 U	10 U	
Toluene	10 U	10 U	10 U	10 U	10 U	
Chlorobenzene	10 U	10 U	10 U	10 U	10 U	
Ethylbenzene	10 U	10 U	10 U	10 U	10 U	
Styrene	10 U	10 U	10 U	10 U	10 U	
Xylene (total)	10 U	10 U	10 U	10 U	10 U	

All results expressed in ug/L.

Standard Organic Data Qualifiers have been used.

NYSDEC Groundwater Standards/Guidance Values have been provided for those compounds which were detected. "GV" designates guidance value rather than a standard.

the groundwater sample in the downgradient overburden monitoring wells. Data indicate that the weathered bedrock interface 1,1-DCE and 1,1,1-TCA concentrations are most likely related to the Site.

In summary, the TCE and 1,2-DCE detected in upgradient, background weathered bedrock interface wells MW-5B and MW-9B groundwater samples appears to be related to an off-site source. The weathered bedrock flow data indicates that the TCE and 1,2-DCE detected in the weathered bedrock well MW-6 and MW-8 groundwater samples appears to be related to an off-site source. The 1,1,1-TCA and 1,1-DCE detected in the downgradient MW-6 and MW-8 weathered bedrock interface monitoring well samples appears to be Site related.

PCBs

The weathered bedrock interface groundwater samples collected during the RI were analyzed for PCBs following NYSDEC, ASP, CLP Method 91-3. Analytical results indicated that no PCBs were detected in any of the weathered bedrock interface groundwater monitoring well samples. Data indicate that the Site has not had an impact on the weathered bedrock interface groundwater regime with respect to PCBs.

4.9 SUMMARY

Shallow Subsurface Soil

The shallow subsurface soil analytical data from the five borings completed during the RI indicate that the subsurface soil at depths greater than two feet in the vicinity of borings HA-4 and HA-5 are impacted by BTEX. Shallow subsurface soil (1' to 4') in the western section of the Site (borings HA-1, HA-2 and HA-3) have not been impacted by petroleum related VOCs. Omichron field test kit data indicate that soil in the immediate vicinity of borings HA-1, HA-2, HA-3, HA-4 and HA-5 have not been impacted by PCBs.

UST Area

Field GC and laboratory analytical data indicated that the extent of impacted subsurface soil, north, west and south of the UST area have been delineated. North of the USTs, subsurface impacted soil do not extend beyond SB-9A, SB-13A or SB-14A, to the west soil at SB-6 and SB-7 are not impacted and to the south soil at SB-22 and SB-19 are not impacted. SB-18 marks the approximate limit of impacted soil south-southeast of the UST area. To the east and southeast the limit of impacted soil lies between SB-16/SB-17 and SB-5/SB-5A. Northeast of the UST area, the horizontal limit of impacted soil lies between SB-25 and SB-SDA-SB-02. The depth of impacted soil ranges from 1 foot to 14 feet. Using 12 feet as an average depth of impacted soil and the areal extent as described above, there is potentially 6,000 cubic yards of soil impacted by petroleum related VOCs.

Suspected Dry Well Area

The field GC and laboratory dry well soil boring analytical data indicate that the soil in the vicinity of the borings do not represent a significant source of VOC hydrocarbons.

SB-24 Test Pit

The PCB sample analytical data from the test pits completed in the vicinity of UST SB-24, indicate that the high PCBs reported in the SB-24, 4'-4.5' sample is an isolated occurrence. The extent of subsurface soil impacted by PCBs at concentrations greater than 25 ppm is limited to the area in the immediate vicinity of SB-24.

Suspected Debris Disposal Area

The subsurface soil field GC VOC data and the laboratory VOC data from samples collected from the borings installed in the suspected debris disposal area and the PCB data indicate that the suspected disposal area does not represent a source of VOCs or PCBs. The analytical data indicate that subsurface soil in this area have not been significantly impacted by VOCs or PCBs.

Hackensack River Surface Water

The RI surface water analytical data in conjunction with the historical surface water analytical data indicate that the Site has not had an impact on surface water quality with respect to PCBs. Furthermore, the historical surface water analytical data also indicates that the Site has not had an impact on Hackensack River surface water quality with respect to VOCs. However, BTEX compounds may not have reached the Hackensack River by the 1991 sampling event. Since VOCs were not detected during previous investigations, VOCs were not samples during this RI.

Hackensack River Sediment

Review of all the available Hackensack River sediment PCB analytical data, indicate that concentrations significantly greater than upstream values are limited to three isolated areas. The October 1991 SD-4 and the December 1995 SED-11 sample locations (approximately 300 feet downstream of the Nyack Water Company intake), and the small dam located near the southeastern boundary of the Site and the Route 59 Bridge. The October 1991 sediment analytical data indicate that the Hackensack River sediment quality has not been impacted by VOCs. However, BTEX compounds may not have reached the Hackensack River by 1991.

Groundwater

The historical groundwater analytical data indicates that groundwater from monitoring wells MW-1, MW-2, MW-3 and MW-4 have exhibited BTEX compounds that have exceeded the NYSDEC groundwater standards. Historically, groundwater from monitoring wells MW-2 and MW-4 have exhibited the highest concentrations, with comparable xylene concentrations in the MW-1 groundwater samples. The BTEX concentrations in MW-4 generally increased from July 1989 to October 1991. Chlorinated VOCs have been detected in the MW-3 groundwater samples at concentrations that exceeded the NYSDEC groundwater standards. The groundwater samples from EXW-1, EXW-4 and EXW-5 indicate that groundwater in the vicinity of these wells has not been impacted by BTEX. However, chlorinated VOCs have been consistently detected in the EXW-4 and EXW-5 samples at concentrations which have exceeded the NYSDEC groundwater standards. Groundwater from weathered bedrock interface wells MW-8 and MW-6 exhibited chlorinated volatile compounds at concentrations that have exceeded the NYSDEC groundwater standard, the

compounds detected are the same as identified in the overburden MW-3, EXW-4 and EXW-5 monitoring well samples.

The overburden groundwater analytical data indicate that BTEX concentrations have generally decreased overtime. The one exception is the BTEX concentrations in MW-2 which are higher in the December 1995 sample than in previous samples. The EXW-1, EXW-4, EXW-5 and the MW-8S groundwater BTEX data indicate that VOC petroleum contaminants associated with the UST area have not migrated to the Site boundary. However, estimated groundwater flow rates indicate that BTEX compounds potentially had not reached the EXW-4 and EXW-5 locations by December 1995.

The chlorinated VOC analytical data indicate that groundwater concentrations in the vicinity of monitoring wells MW-3 and MW-4, and to a lesser extent EXW-4 have increased. The EXW-5 chlorinated VOC concentrations were consistent with historical values. Elevated concentrations of chlorinated VOCs were also detected in the MW-2 and the MW-8S overburden monitoring wells. Existing overburden groundwater and weathered bedrock flow data indicate that the TCE and 1,2-DCE detected in the MW-2, MW-3, MW-4, EXW-4 and EXW-5 and MW-8S samples may potentially be related to an off-site source.

The December 1995 PCB analytical data indicate that the overburden groundwater has not been significantly impacted by PCBs. Elevated concentrations were limited to monitoring wells MW-2 and MW-3. PCBs were not detected in the downgradient Site perimeter monitoring wells during either of the past two monitoring events (December 1995 and November 1991).

The TCE and 1.2-DCE detected in upgradient, background weathered bedrock interface wells MW-5B and MW-9B groundwater samples appears to be related to an off-site source. The available weathered bedrock flow data indicates that the TCE and 1,2-DCE detected in the weathered bedrock MW-6 and MW-8 groundwater samples is to some extent related to an off-site source. The 1,1,1-TCA and 1,1-DCE detected in the downgradient MW-6 and MW-8 weathered bedrock interface monitoring well samples appears to be Site related.

No PCBs were detected in the weathered bedrock interface groundwater monitoring well samples. Data indicates that the Site has not had an impact on weathered bedrock groundwater quality with respect to PCBs.

5.0 FATE AND TRANSPORT

This section provides a discussion of the environmental fate of the chemicals of concern and the potential transport mechanisms and transport routes via which chemicals detected at the Site could potentially migrate to off-site media. The fate and transport of chemical compounds is a function of both the physical and chemical properties of the chemicals of concern and the surface and sub-surface physical characteristics of the Site. Compounds detected in Site media at concentrations above applicable standards have been discussed in Section 4.0. A description of the Site and surrounding environs was presented in Section 1.0 A description of the Site geology and hydrogeology was provided in Section 3.0.

A summary of the chemical compounds of potential concern and the associated media are detailed below;

COMPOUND	MEDIA
Benzene	Soils, Groundwater
1,1-Dichloroethane	Groundwater
1,1-Dichloroethene	Groundwater
1,2-Dichloroethene	Groundwater
Ethylbenzene	Soils, Groundwater
Tetrachloroethene	Groundwater
Toluene	Soils, Groundwater
1,1,1-Trichloroethane	Groundwater
Trichloroethene	Groundwater
Xylenes	Soils, Groundwater
PCBs	Soils, Groundwater, Surface Water, Sediments

The following sections describe the possible environmental fate of the chemical compounds of concern, transport/migration routes and a description of the environmental media which have been effected by Site related chemicals.

5.1 TRANSPORT

Analytical data generated during the Phase II investigation and the RI revealed that subsurface soil above and below the water table exhibit elevated concentrations of VOCs. A limited number of shallow soil samples in the 0-2' foot depth have exhibited PCB concentration that have exceeded NYSDEC RSCOs and a limited number of subsurface samples have exhibited PCB concentrations that have exceeded NYSDEC RSCOs. Groundwater samples have exhibited concentrations of VOCs and to a lesser extent PCBs that have exceeded NYSDEC groundwater standards.

Potential migration routes for the compounds of concern from the Site include the following:

- Migration of PCBs and VOCs to the Hackensack River surface water and sediment via erosion of surface soil with PCBs and/or VOCs sorbed to the organic fraction of the soil,

- Leaching of VOCs and possibly PCBs from soil to groundwater,

- Discharge of groundwater with elevated concentrations of VOCs and PCBs to the Hackensack River; and,

- Transport of Site related compounds of concern from the Site via groundwater movement to off-site areas such as the shallow or deep bedrock.

The Site topography is detailed in Drawing 1 and Figure 2. The topographic map indicates that although the Site is relatively flat, it very gently slopes from an elevation of approximately 66 feet above msl in the south to 54 feet above msl along the northern and eastern boundaries of the Site adjacent to the Hackensack River. There is a potential for impacted surface soil to migrate to the Hackensack River.

As discussed in Section 3.2, groundwater flow in the both the overburden and weathered bedrock is generally to the northeast. Historical information and the December 1995/January 1996 groundwater analytical data have indicated that Site overburden and weathered bedrock groundwater monitoring well samples have exhibited concentrations of VOCs, and overburden wells MW-2 and MW-3 PCBs, that have been elevated with respect to NYSDEC groundwater standards. The Site hydrogeolgical and chemical data indicate that there is a potential transport route for VOCs and PCBs off-site via groundwater, to the Hackensack River.

Analytical data from the Hackensack River surface water and sediment samples collected in October 1991, indicated that no site-related VOCs were detected even though the potential migration pathway exists. Although, as discussed in Section 4.6.1, it is possible that BTEX compounds had not reached the Hackensack River by October 1991. However, the physical and chemical properties of BTEX indicate that sorption to sediments will be insignificant and volatilization from surface waters will be a major factor in removing BTEX from Hackensack River surface water.

Although there is a potential migration route from the Site to the Hackensack River, surface water PCB samples collected from the Hackensack River have indicated that the Site has not impacted surface water quality with respect to PCBs. PCB analytical data from samples collected in August and October 1991, indicated that both the upstream and the downstream surface water samples exceeded the NYSDEC surface water standards. The October 1991 upstream value was higher than the downstream value. Furthermore, PCBs were not detected in the samples collected in December 1995.

Both the historical data and the December 1995 sediment PCB analytical results have indicated that PCB concentrations adjacent to and downstream of the Site, have been elevated with respect to upstream concentrations and the NYSDEC sediment criteria. Data indicates that PCBs have most likely migrated from the Site to Hackensack River sediments. However, the available Hackensack River sediment PCB analytical data indicates that concentrations greater than upstream values are limited to three isolated areas: the October 1991 SD-4 and the December 1995 SED-11 sample locations (approximately 300 feet downstream of the Nyack Water Company intake), the small dam located near the southeastern boundary of the Site and the Route 59 Bridge. No data is available downstream of the Route 59 Bridge. However, there is a major wetland complex beginning approximately 700 feet downstream of the Route 59 bridge. The wetland areas represent major depositional zones. Assuming that Site surface soils are eliminated as a potential source of PCBs (i.e., possibly through encapsulation of soil via pavement) and that sources upstream of the Site were

eliminated, any PCBs that have migrated to the wetlands would over time become isolated from surface sediments and the biologically active zone via deposition. The biologically active zone is considered to be the top 5 cm of the sediment.

In review, the physical characteristics of the Site and surrounding area and the Site chemical data indicate that transport mechanisms through which site-related chemicals of concern could migrate include groundwater movement away from the Site, and erosion of soil and discharge of groundwater to the Hackensack River. Groundwater at the Site exhibits VOC and PCB concentrations which exceed NYSDEC groundwater standards. No elevated VOC chemicals of concern associated with the Site were detected in the October 1991 Hackensack River surface water and sediment samples. Although groundwater flow rates indicate that BTEX compounds may not have reached the Hackensack River by 1991, physical and chemical properties indicate VOCs are most likely not a concern. PCBs have not been detected in the Hackensack River surface water samples at concentrations elevated with respect to upstream concentrations indicating that groundwater discharge to the River and erosion of soil is not a pathway of concern with respect to impacts to Hackensack River surface water quality.

PCBs have been detected in Hackensack River sediment samples at concentrations which have exceeded upstream concentrations and NYSDEC sediment criteria. Available data indicate that impacts are limited to three areas: the October 1991 SD-4 and the December 1995 SED-11 sample locations (approximately 300 feet downstream of the Nyack Water Company intake), and the small dam located near the southeastern boundary of the Site and the Route 59 Bridge. No data is available downstream of the Route 59 Bridge. Assuming elimination of both upstream and Site related PCB sources, over time sediments impacted by PCBs would become covered by deposition and removed from the biologically active zone (top 5 cm of sediment). Deposition would be greatest in the wetlands located downstream of the Site, thereby eliminating further transport of PCBs in the Hackensack River.

5.2 CHEMICAL FATE

The physical and chemical properties of a compound along with environmental factors, predetermine its environmental fate. The solubility, density, partition coefficient and vapor pressure determine the environmental mobility of a compound. The octanol/water partition coefficient and a calculated/derived bioconcentration factor indicate the propensity for a compound to bioaccumulate. Table 5.1 summarizes pertinent physical and chemical information on the chemical compounds detected at the Site at significant concentrations. The following text provides a discussion of the environmental fate of these compounds.

Water solubility is the maximum concentration of a chemical that dissolves in pure water at a specific temperature and pH. The solubility of a chemical is important in determining the mobility of a chemical. Highly soluble compounds are more likely to move with groundwater and surface water and less likely to vaporize from surface water and less likely to sorb to the organic fraction of soil and sediments.

TABLE 5.1
Physical Properties of Selected VOC's
Detected at The ORU West Nyack Site

Compound	Solubility mg/l	Density g/cm^3 at 20 deg C.	Vapor Pressure mm Hg	Henry's Law Constant atm-m3/mol	Partition Coefficient (Koc) ml/g	Log Octanol/water Partition Coeficient (Kow)	Mobility Class	Bio. Conc. Factor (Fish)
Benzene	1,750	0.88	95.2	0.00559	83	2.12	High	5.2
1,1-Dichloroethane	5,550	1.17	182	0.00431	30	1.79	High	
1,1-Dichloroethene	2,250	1.21	600	0.034	65	1.84	High	5.6
1,2-Dichloroethene (Cis)	3,500	1.28	3,500	0.00758	49	0.7	High	5-23
Ethylbenzene	152	0.867	7	0.00643	1,100	3.15	Low	37.5
PCBs	0.031		0.000077	0.00107	53,000	6.04	Low	100,000
Tetrachlorethene	150	1.62	17.8	0.0259	364	2.6	Moderate	31
Toluene	535	0.87	28.1	0.00637	300	2.73	Moderate	10.7
1,1,1-Trichloroethane	1,500	1.34	123	0.0144	152	2.5	Moderate	5-9
Trichloroethene	1,100	1.46	57.9	0.0091	126	2.38	Moderate	10-17
Vinyl chloride	2,670	0.91	2,660	0.0819	57	1.38	High	1.17
Xylene	198	0.87	10	0.00704	240	3.26	Low-Mod	45-105

Vapor pressure is the pressure of the gas in equilibrium with the liquid or solid at a given temperature. Vapor pressure partially determines the propensity for a chemical to vaporize from surface water and soil. Chemicals with low vapor pressures, high solubilities and high adsorptivity to soil are less likely to vaporize from surface water and soils/sediments.

Density is the mass to volume ratio of a compound as compared to water. Non-aqueous compounds with a density greater than one are heavier than water and will tend to sink in an aquifer system and compounds with a density less than one will tend to float on the water table.

The organic carbon partition coefficient (Koc) is a measure of the tendency of a compound to sorb to soil and or sediment. Compounds with high Koc values will tend to sorb to soil/sediment and therefore be less mobile in an aqueous environment.

The Henry's Law Constant provides a measure of the propensity for a chemical to volatilize from water. The constant can be used to calculate the rate of evaporation of dissolved organics from water. The higher the Henry's Law constant the greater the propensity for a chemical dissolved in water to volatilize to the air.

The octanol/water partition coefficient provides an indication of the proclivity for a chemical to biomagnify in the environment. The octanol/water coefficient is the ratio of the equilibrium concentration of a dissolved substance between octanol and water. A direct relationship between the octanol/water coefficient and biomagnification has been documented. Bioconcentration factors (BCF) provide an indication of the ability of a chemical to biomagnify in the food chain. Generally BCFs less than 20 indicate little or no tendency to bioaccumulate, BCFs between 20-100 indicate biomagnification is generally not a concern. BCFs between 100 and 1,000 or indicative of moderate biomagnification.

Volatile Organic Compounds

With the exception of xylene and ethylbenzene, the VOCs detected in the Site groundwater samples are relatively highly soluble with low Koc values. The data indicates that the VOCs will exhibit moderate to high mobility in groundwater. Benzene, 1,1-DCA, 1,1-DCE, 1,2-DCE, toluene, 1,1,1-TCA, TCE, VC and to a lesser extent PCE are expected to exhibit moderate to high mobility in a groundwater system. Xylene and ethylbenzene will be slightly less mobile than the other VOCs detected in soil and groundwater at the Site and will exhibit a slightly greater tendency to sorb to soil.

The solubility data and the maximum concentrations detected in the groundwater samples from the Site indicate that the VOCs detected in groundwater exist in the dissolved phase and that there does not appear to be a any significant source of non-aqueous phase liquids. Compound concentrations in groundwater samples greater than 1% to 5% of the aqueous solubility are indicative of the possible presence of a non-aqueous phase in the vicinity of the sample location. All groundwater VOC concentrations were less than 1% of the aqueous solubility, indicating that there is most likely not a source of non-aqueous phase liquid at the Site. Therefore the groundwater transport of the chlorinated hydrocarbons is most likely controlled by the groundwater flow directions and not bedrock contours. Dense non-aqueous phase liquids can migrate via gravity along bedrock/fractures and contours against groundwater flow directions.

Physical data indicate volatilization from surface waters would be significant for all the VOCs detected at the Site. The relatively high vapor pressures and Henry's Law constant values support this observation. Therefore, the VOCs detected in Site groundwater and soil do not represent a significant threat to the Hackensack River surface water quality. Historical data indicate that VOCs were not detected in the Hackensack River surface water samples. The high vapor pressures also indicate that volatilization from surface soil would be significant.

The octanol/water partition coefficients and the BCFs for the VOCs detected at the Site indicate that biomagnification is not a concern. Although the BCF range for xylenes is slightly higher than the other VOCs, this compound is rapidly oxidized/metabolized in humans, fish and wildlife and therefore does not biomagnify to any significant extent.

Natural degradation of the VOCs detected at the Site has, and is expected to continue to occur. The degreasing agent known to have been used at the Site is 1,1,1-TCA and the agent used at the upgradient Grant Hardware Site was reportedly TCE. However, 1,1-DCA, 1,1-DCE, 1,2-DCE and VC have been detected in groundwater from the Site.

Under anaerobic conditions, typically present in the subsurface saturated zone, TCE and 1,1,1-TCA will biologically degrade to 1,2-DCE (primarily the cis isomer of 1,2-DCE). 1,1,1-TCA will also degrade to 1,1-DCE primarily by abiotic processes and 1,1-DCA by biological processes. 1,1-DCE will degrade to VC as will cis-1,2-DCE although by an indirect secondary route. VC will degrade to chloroethane. 1,1-DCA will degrade to chloroethane via anaerobic biological processes. It has been well documented that benzene and toluene will also readily degrade in soil and shallow groundwater. Several bacterial species have been shown to degrade toluene, including the genus Pseudomonas and Achromobacter. Toluene degrades to benzoic acid followed by metabolic cleavage of the aromatic ring with ultimate degradation to carbon dioxide. Research has shown that xylenes are also subject to both aerobic and anaerobic degradation.

PCBs

PCBs exhibit low solubilities, low vapor pressure, and low Henry's Law Constants. Therefore, PCBs will tend to sorb to sediments and will not significantly partition to groundwater/surface water. Because of the high affinity for sorbtion to the organic carbon fraction of soils/sediments, PCB mobility via groundwater is extremely retarded. The very limited detection of PCBs in the Site groundwater samples and Hackensack River surface water is directly attributed to this phenomenon. Because of the low vapor pressure, the Henry's Law Constant is low which indicates that PCB volatilization from surface water will generally not be significant. The octanol/water partition coefficient and BCF for PCBs are high, indicating that PCBs will significantly biomagnify in the environment.

Although PCBs will biomagnify and PCBs were detected in the Hackensack River sediment samples at concentrations which exceeded NYSDEC sediment criteria guidelines, available data indicates that the areal extent of significantly impacted sediments appears to be limited.

6.0 ECOLOGICAL ASSESSMENT/FISH AND WILDLIFE IMPACT ANALYSIS

This section presents the findings of the Fish and Wildlife Impact Analysis (FWIA) performed at the Site. The FWIA was performed following NYSDEC FWIA procedures presented in the NYSDEC, Division of Fish and Wildlife, "Fish and Wildlife Impact Analysis for Inactive Hazardous Waste Sites" (dated June 18, 1991). Step I (Site Description) and the pathway analysis and criteria-specific analysis sections of Step II (Contaminant-Specific Impact Analysis) of the FWIA were performed.

The objective of the Site Description is to identify the fish and wildlife resources, land-use and habitat types that exist in the vicinity of the Site. In addition, fish and wildlife species that may utilize habitats that could potentially be impacted by site-related contaminants are identified. This information is necessary to allow identification of potential pathways of contaminant migration that could impact fish and wildlife resources.

The objective of the pathway and criteria-specific analyses portion of the FWIA process is to determine the impacts, if any, of site-related contaminants on fish and wildlife resources. The pathway analysis evaluates and identifies potential contaminants of concern, sources of contaminants, potential pathways of contaminant migration and potential for fish and wildlife resources to be impacted by site-related contaminants. The criteria-specific analysis determines if reported concentrations represent a potential threat to aquatic life and wildlife.

6.1 SITE DESCRIPTION

The Site is located in a developed commercial and residential area of West Nyack, Rockland County, New York. The Site is approximately three acres in size and is situated immediately north of Route 59 and the Old Nyack Turnpike, and seven-tenths of a mile west of the intersection of Routes 59 and 303. The Site is bordered on the west by the Conrail train tracks, and on the north and east by the Hackensack River.

6.1.1 Site Topography and Drainage

The Site topography is detailed in Drawing 1 and Figure 2. The topographic map indicates that although the Site is relatively flat, it very gently slopes from an elevation of approximately 66 feet above msl in the south to 54 feet above msl along the northern and eastern boundaries of the Site adjacent to the Hackensack River. Drainage is toward the Hackensack River.

6.1.2 Land Use/Major Vegetative Communities within One-half Mile of the Site

A cover type map detailing the major land use/vegetative communities within a one-half mile radius of the Site are presented on Drawing 5. The cover type map was prepared based on interpretation and evaluation of aerial photographs, topographic maps, NYSDEC wetland maps and U.S. Fish and Wildlife Service (USFWS) National Wetland Inventory Maps. Field checking was performed to verify the accuracy of the cover type map. The base map for the cover type map was prepared from aerial photographs taken in 1987. The cover types within a half mile of the Site were classified using a combination of the New York Heritage Program Classification System (NHPCS, Reschke, 1990) and the U.S. Geological Survey Classification System (Anderson, 1976).

Where access was possible during the field check of the cover type map, the dominant vegetation in each cover type was identified for areas classified as terrestrial natural (TN) and palustrine (P). The areas not numbered were either not accessible or were similar in nature to the other areas. The numbers in each area correspond to the numbers and descriptions of dominant vegetation for each area as presented in Table 6.1. The cover type boundary lines are approximate and have not been surveyed. The determination of dominance was qualitative, based on visual estimates. Vegetative plots and transects were not used in determining dominance. These methods are beyond the scope of a Step I analysis.

There are no natural habitats located within the boundaries of the Site. The Site consists of buildings and hardpacked driveway, parking and open space. The majority of the land use within a half mile of the Site is a mixture of commercial and residential. However, there are several large wetland ecotypes located within one-half mile of the Site. These wetlands are part of the Hackensack River drainage system and are located along the Hackensack River. There are also several small isolated areas of upland habitat located within a one-half mile radius of the Site.

The wetland habitats located within a one-half mile radius of the Site include both emergent and deciduous forested habitat. Three of the wetlands located within a one-half mile radius of the Site are NYSDEC Regulated wetlands.

The emergent wetland (P1 #1) located immediately upstream of the Site along the Hackensack River is NYSDEC regulated wetland NA-11 and is classified as a Class I wetland. The dominant vegetation in this wetland consists primarily of common cattail (Typha latifolia) and reed canary grass (Phalaris arundinacea). There is an area of deciduous forested wetland habitat (P2 #6) located along the eastern edge of wetland NA-11, which is dominated by green ash (Fraxinus pennsylvanica), pin oak (Quercus palustris), spicebush (Lindera benzoin) and silky dogwood (Cornus amomum).

North of wetland NA-11, on the north side of Interstate 287 and approximately 2,200 feet north west of the Site on the west side of the railroad tracks, there is an area of mixed deciduous forested wetland and upland habitat and an area of deciduous forested wetland habitat.

NYSDEC regulated wetland NA-4 is located approximately 1,000 feet southeast of the Site and is classified as a Class I wetland. This wetland is a mixture of emergent and deciduous shrub/forest (P1/P2 #4). The primary emergent vegetation is canary reed grass, cattail (Typha latifolia) and purple loosestrife (Lythrum salicaria). The principle tree and shrub vegetation is green ash, american elm (Ulmus americana), red maple (Acer rubrum), pin oak and silky dogwood. This wetland is associated with the Hackensack River and associated tributaries, and is located downstream of the Site. The Hackensack River runs through the northwestern section of the wetland.

NYSDEC regulated wetland NA-5 is located approximately 2,200 feet southwest of, and downstream of the Site along the Hackensack River. The Hackensack River runs through the southern central section of the wetland. This wetland is primarily a deciduous forested wetland, however, there is emergent habitat located along the Hackensack River. The principle tree and shrub species observed were red maple, American elm and spice bush.

Table 6.1
ORU West Nyack Site
Dominant Vegetation in Natural Areas
Within a One-Half Mile Radius Of The Site

#1 P1: **Emergent Marsh**

Reed canary grass (Phalaris arundinacea), Phragmities (Phragmities communis), common cattail (Typha latifolia)

#2 P2: **Deciduous Forested Wetland**

Red maple (Acer rubrum), American elm (Ulmus americana), Spicebush (Lindera benzoin)

#3 TN2D: **Upland Deciduous Forest**

Red oak (Quercus rubra), Ground pine (Lycopodium obscurum)

#4 P1/P2: **Emergent/Deciduous Forested Wetland**

Purple loosestrife (Lythrum salicaria), Canary reed grass, Common cattail, Green ash (Fraxinus pennsylvanica), American elm, Red maple, Pin oak (Quercus palustris), Silky dogwood (Cornus amomum)

#5 TN2D: **Deciduous Forested Upland**

Pin oak, American beech (Fagus grandifolia), White ash (Fraxinus americana)

#6 P2: **Deciduous Forested Wetland**

Pin oak, Green ash, Spicebush, Silky dogwood

#7 TN2D: **Deciduous Forested Upland**

Red oak, White Oak, Red maple, Honeysuckle species (Lonicera species)

#8 P1/P2: **Emergent/Deciduous Forested Wetland**

Purple loosestrife, Red-oiser dogwood (Cornus stolonifera)

There are several small isolated areas of upland deciduous forest located within a one-half mile radius of the Site. One area TN2D#5 is located approximately 2,600 feet north and northeast of the Site. The dominant vegetation observed in this area was pin oak, white ash and american beech (Fagus grandifolia). There is a narrow band (100 to 300 feet wide) of upland deciduous forest (TN2D #7) that begins immediately north of the Site and extends northward. The primary vegetation observed in this forested area was red oak (Quercus rubra), white oak (Quercus alba), red maple and honeysuckle species (Lonicera Species). South of the Site approximately 2,600 feet adjacent to and east of NYSDEC wetland NA-5 is an isolated area of upland deciduous forest. This area is dominated by red oak and ground pine (Lycopodium obscurum).

The Hackensack River is the primary aquatic habitat located within a one-half mile radius of the Site. There is also a small pond located approximately 1,300 feet northwest of the Site, adjacent to the Hackensack River. The Site is located adjacent to the Hackensack River, which flows along the north and east boundaries of the Site.

6.1.3 Wetlands Within One-half and Two Miles of the Site

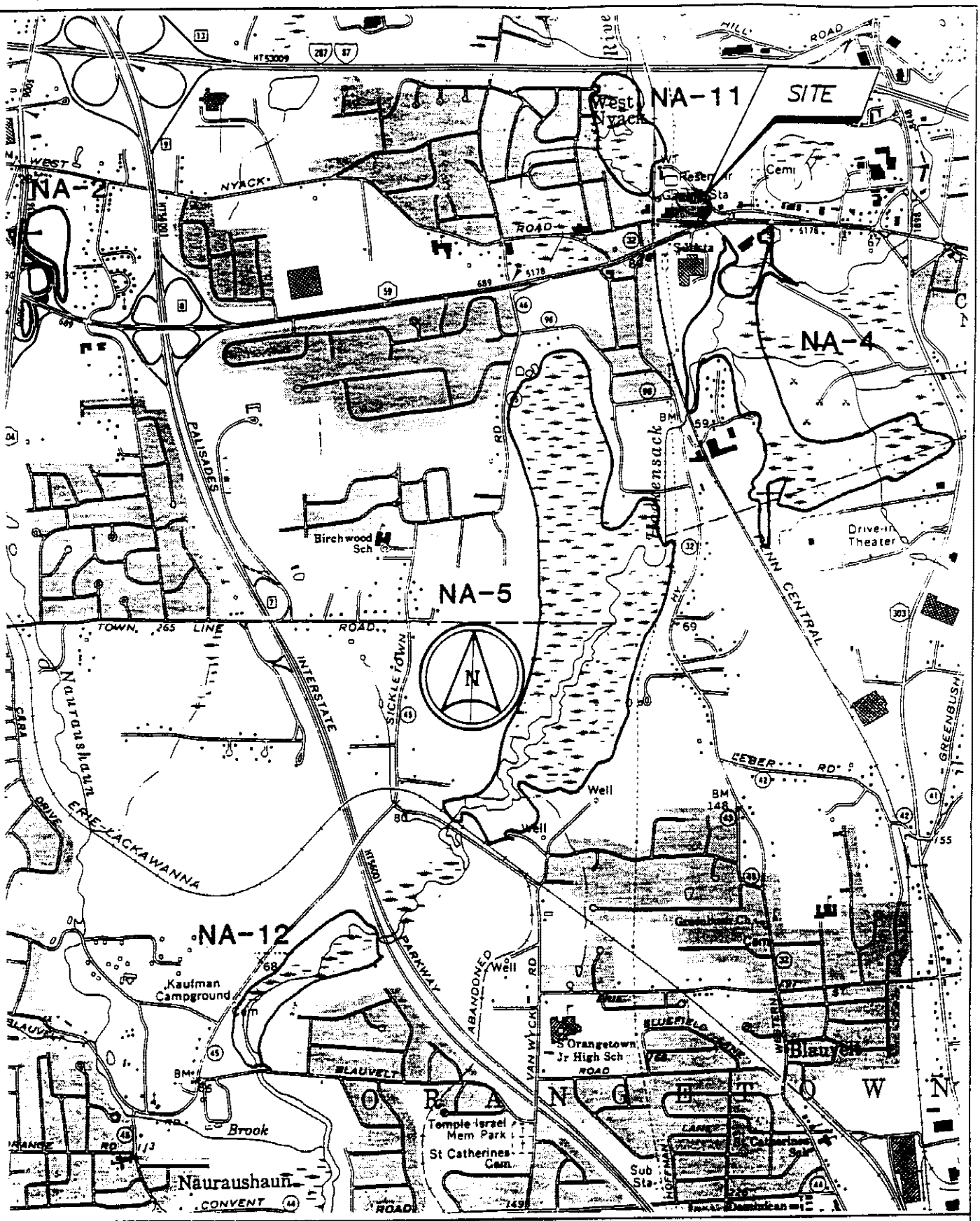
There are three NYSDEC regulated wetlands located within a one half mile radius of the Site, these are wetlands NA-11, NA-4 and NA-5. Wetland NA-11 is primarily an emergent wetland with a fringe of deciduous forested wetland, NA-5 is primarily a deciduous forested wetland and wetland NA-4 is a mixture of emergent and deciduous shrub/forest wetland. These areas have been further described in the preceding section. All three wetlands are classified as Class I wetlands. Class I wetlands represent the most valuable wetland habitat of the four classes used by NYSDEC to classify wetlands. A wetland is considered Class I if it exhibits at least one of seven characteristics detailed in the Freshwater Wetlands Maps and Classification Regulations (6NYCRR Part 664), which are summarized below:

1. Is a classic kettlehole bog;
2. Resident habitat of an endangered or threatened animal Species;
3. Contains an endangered or threatened plant Species;
4. Supports an animal species in abundance or diversity unusual for the state or the region;
5. Provides significant flood control benefits for a substantially developed area;
6. Adjacent of contiguous to an aquifer or reservoir used for public water supply; and,
7. Contains four or more Class II wetland characteristics.

There are two additional NYSDEC regulated wetlands located within a two-mile radius of the Site; wetland NA-2 and wetland NA-12. Wetland NA-2 and NA-12 are NYSDEC Class II and Class I wetlands, respectively. Wetland locations are presented in Figure 8.

6.1.4 Streams and Related Surface Water Bodies Within One-Half Mile and Two Miles of the Site

The Hackensack River is the primary aquatic habitat located within a one-half mile radius of the Site. The Hackensack River is Classified by NYSDEC as a Class A stream from Lake DeForest (located approximately 4,500 feet upstream of the Site) to the New York/New Jersey border.



RUST ENVIRONMENT & INFRASTRUCTURE

NYSDEC WETLAND LOCATIONS
ORANGE & ROCKLAND UTILITIES INC.

PROJECT No. 38301.300	DATE 3/25/96	DWG. No. 38301-09	SCALE	FIGURE No. 8

DRAWIN .O. 38301-09

There are several tributaries of the Hackensack River located in a one-half mile radius of the Site. Two of these, tributary NJ-1-9 and NJ-1-9A are located downstream of the Site and are classified as Class A streams where they discharge to the Hackensack River. There are three tributaries of the Hackensack River located upstream of the Site, NJ-1-9b, NJ-1-10 and NJ-1-10a, which are classified as Class A, Class A(t) and Class A, respectively, where they discharge into the Hackensack River.

Within a two mile radius of the Site there are several additional tributaries of the Hackensack River located downstream of the Site (NJ-1-8, -7b, -7a, -7, -6 and -5b). Where these tributaries discharge to the Hackensack River they are classified as either Class A or Class A(t). The tributaries and their classifications are listed below.

NJ-1-8	Class A
NJ-1-7b	Class A
NJ-1-7a	Class A
NJ-1-7	Class A (t)
NJ-1-6	Class A (t)
NJ-1-5b	Class A

The best usage of Class A waters is as a source of water supply for drinking, culinary or food processing, following to any necessary treatment. The waters are suitable for primary and secondary contact recreation and fishing. The waters shall be suitable for fish propagation and survival. A "t" designation indicates that the waters shall be of suitable quality for trout propagation and survival.

6.2 RESOURCE CHARACTERIZATION WITHIN ONE-HALF AND TWO MILES OF THE SITE

Resource characterization consists of determining the wildlife species that may potentially utilize, or have been determined to utilize, the habitats identified in the previous sections as existing within one-half mile of the Site. Also, any known species of concern (i.e., endangered, threatened, etc.) or significant habitats that may exist within two miles of the Site are identified. Additionally, the general quality of the habitats that are located within one-half mile of the Site and their ability to provide for the needs of the species that may utilize the habitats is discussed. Areas of observed vegetative stress, leachate seeps, documented evidence of fish and/or wildlife mortality and any known population impacts related to site-related contaminants are presented.

6.2.1 Endangered, Threatened or Special Concern Fish and Wildlife or Plant Species or Significant Habitats

The United States Fish and Wildlife Service (USFWS), the NYSDEC Wildlife Resources Center and the NYSDEC Region 3 Office were contacted regarding the known occurrence of endangered, threatened, or special concern species or habitats located within a two mile radius of the Site. The USFWS indicated that there are no known occurrences of federal endangered or threatened wildlife or plant species located within a two mile radius of the Site.

A review of the New York State Natural Heritage Program files by the New York State Department of Environmental Conservation, Wildlife Resources Center, indicated that there had been a historic siting of the bog turtle (Clemmys muhlenbergii), north of, and within two miles of the Site. The

historic siting was in 1965 and the accuracy of the location of the siting was a 1.5 mile radius (one minute) of the given latitude and longitude of the siting.

The bog turtle is a New York State listed endangered Species. The endangered classification indicates that there are either, fewer than 1,000 individuals in the State, the species is restricted to fewer than four U.S.G.S. 7.5 minute quadrangle maps or is listed as endangered by the U.S. Department of Interior, USFWS. The U.S. Department of interior has considered the bog turtle may be appropriate for listing as either endangered or threatened but more data are needed. Globally, the species is ranked as G3, indicating that it is either rare and local throughout its range, or found locally in restricted ranges, or is vulnerable to extinction throughout its range because of other factors.

The bog turtle is a semi-aquatic Species, which prefers cool, shallow, slow moving water, deep soft muck soil and tussock-forming vegetation. The bog turtle prefers open early successional habit types such as wet meadows and open bogs.. The open areas in wet meadows and bogs allow a high degree of solar penetration; these areas are used as basking sites by the bog turtle. The NYSDEC Endangered species Unit has been working on identifying the habit requirements and distribution of the bog turtle in New York State. It has been determined that wet meadows and open bog habitat containing sedge tussocks, low juncus, sweet flag (Acorus calamus), shrubby cinquefoil (potentilla fruiticosa) and joe-pye weed (Eupatorium Species) are utilized by bog turtles. Suitable bog turtle habitat also contain muck substrates at least eight inches thick in depth and shallow slow moving rivulets, usually less than four inches in depth. The home range of the bog turtle is primarily confined to the wet meadow and open bog habitat and does not significantly utilize surrounding upland habitat.

The habitats associated with the Hackensack River adjacent to and immediately downstream of the Site do not represent bog turtle habitat; there are no wet meadows or open bogs associated with the Hackensack River in this area. No wet meadows or open bogs were observed in the wetland habitats located along the Hackensack River within a one half mile radius of the Site. However, this does not mean that they do not or could not necessarily exist; a detailed in-depth delineation/evaluation of the wetland areas was not performed and is beyond the scope of this assessment. However, suitable habitat for the bog turtle could potentially exist within NYSDEC regulated wetlands NA-11, NA-4 and NA-5 where the Hackensack River and associated tributaries meander through these wetland areas.

6.2.2 Fish and Wildlife Species Potentially Using Habitats Within a One-Half Mile Radius of the Site

Mammals, amphibians and reptiles, fish, and bird species that could potentially utilize the habitats within a one-half mile radius of the Site, for at least a portion of their life cycle, are listed in Tables 6.2, 6.3 and 6.4, respectively. These lists are not meant to indicate that these species can always be found, or that all will be present at one time within one-half mile of the Site. These lists were prepared following a limited field evaluation of the habitats and review of available literature. These lists are not the result of a site-specific population survey. Actual population surveys are complex and time intensive and are beyond the scope of a Step I baseline evaluation.

Many wildlife species are mobile and generally require a range of habitat types to meet their life cycle requirements. In addition, many species will only use the area within one-half mile of the Site for a

portion of their life requisites. Thus, all the species identified on these lists were not actually observed within a one-half mile radius of the Site.

During the field checking of the cover type map on December 6, 1995, the species listed below were observed on or within one-half mile of the Site.

- Black-capped Chickadee
- Cardinal
- Common Crow
- Red-tailed Hawk
- Great Blue Heron
- Blue-jay
- Canada Goose
- Mallard Duck
- White-tailed Deer

With the exception of the black-capped Chickadee, none of these species were observed on the Site. The Canada geese and the mallard ducks were observed on the Hackensack River adjacent to the Site. The remaining species were observed in the undeveloped areas located north and south of the Site.

6.3 GENERAL HABITAT QUALITY WITHIN ONE-HALF MILE OF THE SITE

The quality of the undeveloped terrestrial natural habitats located within a one-half mile radius of the Site vary from poor to moderate quality wildlife habitats. The quality of the aquatic habitat located within a one-half mile radius of the Site vary from moderate to high quality habitats. The quality of the palustrine wetland habitats varies from moderate to high quality habitat.

The undeveloped deciduous forested habitats located north of the Site represent poor to moderate quality wildlife habitat, due to the relatively small size of the areas and there juxtaposition with respect to the developed areas. The small size of the forested areas and the close proximity to the developed residential and commercial areas to the east, southeast and southwest, limit the value of these habitats to wildlife.

Table 6-2
ORU West Nyack Site
Mammal/Amphibian/Reptile Species That Could Potentially Utilize Habitats Within One-Half Mile of the Site

COMMON NAME	GENUS AND SPECIES
Mammals	
Big Brown Bat	Eptesicus fuscus
Beaver	Custor canadensis
Eastern Cottontail	Sylvilagus floridanus
White-tailed Deer	Odocoileus virginiana
Ermine	Mustella erminea
Red Fox	Vulpes vulpes
Mink	Mustella vison
Hairy-tailed Mole	Parascalops brewri
Star-nosed Mole	Condylura cristata
Deer Mouse	Peromyscus maniculatus
House Mouse	Mus musculus
Meadow Jumping Mouse	Zapus hudsonius
Woodland Jumping Mouse	Napaeozapus insignis
Muskrat	Ondatra zibethica
Keen's Myotis	Myotis keenii
Little Brown Myotis	Myotis lucifugus
Virginia Opossum	Didelphis virginiana
Raccoon	Procyon lotor
Norway Rat	Rattus norvegicus
Northern Short-tailed Shrew	Blarina brevicauda
Striped Skunk	Mephitis mephitis
Gray Squirrel	Sciurus carolinensis
Meadow Vole	Microtus pennsylvanicus
Southern Red-backed Vole	Clethrionomys gapperi
Woodland Vole	Microtus pinetroum
Long-tailed Weasel	Mustella frenata
Woodchuck	Marmota monax

Table 6-2
ORU West Nyack Site
Mammal/Amphibian/Reptile Species That Could Potentially Utilize Habitats Within One-Half Mile of the Site

COMMON NAME	GENUS AND SPECIES
Amphibians/Reptiles	
Bull Frog	Rana catesbeiana
Green Frog	Rana clamitans
Pickerel Frog	Rana palustris
Wood Frog	Rana sylvatica
Eastern Newt	Notophthalmus viridescens
Spring Peeper	Hyla crucifer
Four-Toed Salamander	Ambystoma mulculatum
Brown Snake	Storeria dekayi
Eastern Ribbon Snake	Thammophis sauritus
Northern Water Snake	Nerodia sipedon
Redbelly Snake	Storeria occipitmaculata
Bog Turtle	Clemmys muhlenbergi
Painted Turtle	Chrysemys picta
Snapping Turtle	Chetydra serapentina
Spotted Turtle	Clemmys guttata

Table 6-3
ORU West Nyack Site
Fish Species That Could Potentially Utilize Habitats Within One-Half Mile of the Site

COMMON NAME	GENUS AND SPECIES
Rock Bass	Ambloplites rupestris
Largemouth Bass	Micropterus salmoides
Smallmouth Bass	Micropterus dolomieui
Bluegill	Lepomis macrochirus
Brown Bullhead	Ictalurus nebulosus
Creek Chub	Semotilus astromaculatus
Pearl Dace	Semotilus margarita
Blacknose Dace	Rhinichthys atratulus
Longnose Dace	Rhinichtys cataractae
Fantail Darter	Etheostoma flabellare
Greenside Darter	Etheostoma blennioides
Nothern Hogsucker	Hypentelium nigricans
Banded Killfish	Fundulus diaphanus
Bluntnose Minnow	Pimephales notatus
Fathead Minnow	Pimephales promelas
Yellow Perch	Perca flavescens
Chain Pickerel	Esox niger
Pumpkinseed	Lepomis gibbosus
Blacknose Shiner	Notropis heterolepis
Golden Shiner	Notemigonus crysoleucas
Spottail Shiner	Notropis hudsonius
Common Shiner	Notropis cornutus
Brook Stickleback	Culaea inconstans
White Sucker	Catostomus commersoni
Brown Trout	Salmo trutta

Table 6-4
ORU West Nyack Site
Bird Species
That Could Potentially Utilize Habitats Within One-Half Mile of the Site

COMMON NAME	GENUS AND SPECIES
Red-winged Blackbird	Agelaius phoneniceus
Northern Cardinal	Cardinalis cardinalis
Black-capped Chickadee	Parus atricapillus
Brown-headed Cowbird	Molothrus ater
American Crow	Corvus brachyrhynchos
Mourning Dove	Zenaida macroura
Rock Dove	Columba livia
American Black Duck	Anas rubripes
American Goldfinch	Carduelis trustis
Canada Goose	Branta canadensis
Common Grackle	Quiscalus guiscula
Ruffed Grouse	Bonasa umbellus
Red-tailed Hawk	Buteo jamaicensis
Copper's Hawk	Accipiter cooperii
Ruby-throated Hummingbird	Archilochus colubris
Blue Jay	Cyanocitta cristata
American Kestrel	Falco sparverius
Killdeer	Charadrius vociferus
Mallard	Anas platyrhynchos
Common Nighthawk	Chordeiles minor
White-breasted Nuthatch	Sitta carolinensis
Screech Owl	Otus asio
Common Barn Owl	Tyto alba
Great-horned Owl	Dubo virginianus
Eastern Phoebe	Sayonis phoebe
American Robin	Turdus migratorius
Spotted Sandpiper	Actitis macularia
Song Sparrow	Melospiza melodia
House Sparrow	Passer domesticus
European Starling	Stumus vulgaris
Barn Swallow	Hirudo rustica
Rough-winged Swallow	Stelgidoptery ruficollis
Chimney Swift	Chaetura pelagica
Blue-winged Teal	Anas discors
Wild Turkey	Meleagris gallopavo
Yellow Warbler	Dendroica petechia
Cedar Waxwing	Bronbycila cedrorum
Downy Woodpecker	Picoides pubescens
House Wren	Troglodytes aedon
Common Yellowthroat	Geothypis trichas

The wetland habitats located south of the Site and to a lesser extent the areas located north of the Site represent moderate to high quality habitats. There are several habitat types located in these wetlands, including open water, emergent marsh and deciduous forest wetland. This variety of plant communities represents a diversity of habitat types available to wildlife. These areas are also of sufficient size to represent high quality habitats. It is a common ecological tenant that large blocks of undisturbed areas can support a greater number of species than smaller areas. This is partially related to the fact that larger areas will typically contain a wider variety of habitat types. Areas with a wide variety of habitat types are more likely to contain the range of resources necessary to support a given species life cycle requirements. The greater number of habitat types the wider the diversity of plant communities. Animal species are ultimately dependent upon plants for their survival, either directly in the case of herbivores, or indirectly in the case of animal species that use plants for shelter or feed on herbivores.

The Hackensack River and its tributaries located within a two mile radius of the Site represent high quality habitats. The river and its associated wetland communities provide habitat for waterfowl. The wetlands provide habitat for waterfowl and terrestrial Species. Many of the tributaries of the Hackensack River are classified by NYSDEC as supporting the propagation and survival of trout fish Species, which is indicative of a high quality aquatic habitat.

6.4 APPLICABLE FISH AND WILDLIFE REGULATORY CRITERIA

The appropriate Site Specific Criteria (SSC) that may potentially be applicable to the Site are detailed below:

- Clean Water Act, 233 U.S.C. 1261 et seq. Sec. 404 regulates the discharge of pollutants into wetlands and other water bodies, including dredged or fill materials;

- The Freshwater Wetlands Act (Article 24 of the Environmental Conservation Law) and the Freshwater Wetlands Implementing Regulations (6NYCRR Parts 663 and 664) are designed to protect wetlands. Only wetlands that have been mapped by the State of New York are regulated;

- Executive Order 11990, Protection of Wetlands. This order recognized the value of wetlands and directed federal agencies to minimize the degradation, destruction and loss of wetlands;

- Endangered Species Act (87 Stat. 884, as amended; 16 U.S.C. 1531 et seq.);

- Fish and Wildlife Coordination Act;

- NYSDEC, Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values, October 1993;

- NYSDEC, Water Quality Regulations for Surface Waters and Groundwaters, 6NYCRR Parts 700-705; and

- NYSDEC, Technical Guidance for Screening Contaminated Sediments, November 1993; and,

- USEPA, Interim Sediment Criteria Values For Nonpolar Hydrophytic Organic Chemicals (May 1988). Also Periodic Updates.

6.5 CONTAMINANT-SPECIFIC IMPACT ANALYSIS (STEP II)

This section evaluates pathways through which wildlife could potentially be exposed to site related contaminants. This evaluation includes the identification of habitats that could potentially be impacted by site contaminants, the possible food chain contamination pathways, and impact to fish/wildlife, if any.

6.5.1 Pathway Analysis

In order for fish and wildlife to be affected by chemical constituents from a site, two conditions must exist. There first must be an avenue by which fish and wildlife can be exposed to chemical constituents, referred to as a completed exposure pathway. In addition, the chemical concentrations within the completed exposure pathway must be of sufficient magnitude to cause an impact.

Potential fish and wildlife exposure pathways include ingestion of plants, animals or water, or direct contact with water, soil or sediments. Wildlife could also be potentially impacted by inhalation of compounds in air or sorbed to respirable particulates. This section evaluates potential exposure pathways. Section 6.5.2 evaluates the chemical concentrations in each exposure pathway with respect to fish and wildlife toxicity information.

The environmental media in which samples have been collected and analyzed as part of the Site investigation include, surface soils, subsurface soils, groundwater, and surface water and sediments from the Hackensack River. The principle exposure pathway via which wildlife could potentially be exposed to site related contaminants is via direct contact or ingestion of waters and sediments from the Hackensack River or ingestion of plants and aquatic life from the river, assuming that site related contaminants have reached the Hackensack River. Wildlife use of the Site itself is extremely limited considering the developed nature and limited size of the Site. Therefore, wildlife exposure to contaminants at the Site via contact/ingestion of groundwater, surface soils, subsurface soil and or plants, is considered to be negligible and insignificant and will not be further evaluated.

With the exception of potential groundwater discharge points to the Hackensack River, fish and wildlife will not be exposed to groundwater. The only potential groundwater discharge point downgradient of the Site is the Hackensack River, from which surface water and sediment samples have been collected. Since fish and wildlife will not be exposed to groundwater, with the exception of indirect contact via surface water of the Hackensack River, there is no completed exposure pathway and groundwater data will not be evaluated.

The only complete exposure pathways through which aquatic life could potentially be exposed to site related chemicals, if present, is through ingestion/direct contact with water and or sediments or ingestion of impacted aquatic life from the Hackensack River. The only complete exposure pathway for terrestrial life is through ingestion/direct contact with Hackensack River water and or sediments or ingestion of aquatic life. Therefore, these are the only exposure pathways that will be evaluated. Surface water and sediment samples have been collected from the Hackensack River, upstream and downstream from the Site. Analytical data from these samples is evaluated in the following section.

6.5.2 Criteria-Specific Analysis

This section compares available analytical data from media which represent potential fish and wildlife exposure pathways to available regulatory guidelines and available fish and wildlife toxicity data. The pathway analysis in the preceding section indicated that the only significant fish and wildlife exposure pathway is through direct contact/ingestion of Hackensack River surface water and sediments and indirectly via ingestion of aquatic/wildlife which utilize the habitats associated with the River. The analytical data presented in Section 4 indicate that PCBs were the only site-related compound detected in Hackensack River surface water or sediments. Although groundwater flow data indicated that BTEX compounds may not have reached the Hackensack River by October 1991 when samples were collected and analyzed for VOCs, the BTEX compounds' physical and chemical properties indicate that these chemicals most likely would not be a concern in Hackensack River surface water and sediments. Therefore, VOCs were not evaluated as chemicals of concern.

The Hackensack River surface water data from samples collected adjacent to and downstream of the site indicated that PCBs were not detected at concentrations above upstream values. Therefore PCBs in sediments are the compound and media evaluated.

The octanol/water partition coefficient for PCBs (6.04) and the BCF (100,000) indicate that PCBs will significantly biomagnify in the environment. The NYSDEC has established sediment criteria guidelines for protection of piscivorous wildlife from consuming fish or other aquatic life from a water body over sediments containing PCBs. The sediment criteria is based on the USEPA, Equilibrium Partitioning Model (EPM). The fundamental assumption of the EPM is that the toxicity of a contaminant in sediment is attributable to the fraction on the contaminant that dissolves in the sediment interstitial pore space and is therefore biologically available. This concentration is predicted based on the concentration of the contaminant in the sediment, the concentration of organic carbon in the sediment and the affinity of the contaminant for organic carbon.

Assuming 3 percent organic carbon in the sediments, the sediment criterion guideline is 42 µg/kg of PCBs. This value is based on the potential for PCBs to biomagnify in through the food chain and result in concentrations in fish and other aquatic prey species that would be toxic to a predator Species. Sediment concentrations below the 42 µg/kg level would not pose a risk to piscivorous wildlife.

The sediment screening criteria value is not intended to represent a mandatory cleanup level. The objective of the screening value is to provide an initial assessment of the potential adverse impacts. The need for actual sediment remediation would be based on the extent of contamination, the potential for widespread impacts within the ecosystem of concern and the potential for transport by natural processes to other areas.

Comparison of the Hackensack River PCB sediment analytical data from the RI and previous investigations indicates that PCB concentrations exceeding the sediment criteria screening value of 42 µg/kg have been detected in sediments adjacent to and downgradient of the Site. However, data from the most recent sampling event (December 1995) indicate that of the samples collected from 18 separate locations, only six, one of which was the upstream background sample, exhibited concentrations that were greater than either the laboratory reporting limit or the 42 µg/kg sediment screening value. The sample collected upstream of the ORU Site exhibited an Aroclor 1254

concentration of 72 µg/kg, which is elevated with respect to the sediment screening criteria value (42 µg/kg).

The available Hackensack River sediment PCB analytical data, indicate that concentrations significantly greater than upstream values are limited to three isolated areas. The October 1991 SD-4 and/or December 1995 SED-11 sample locations (approximately 300 feet downstream of the Nyack Water Company intake) and the small dam located near the southeastern boundary of the Site and the Route 59 Bridge. Considering the limited areal extent of sediments which exceed the sediment screening value and the detection of background levels above the screening level, excavation of sediments in the Hackensack River is not considered appropriate. Data indicates that additional investigations associated with Tasks III and IV or the FWIA are not required.

7.0 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY

7.1.1 Nature and Extent of Contamination

Shallow Subsurface Borings

The shallow subsurface soil analytical data from the five borings completed during the RI indicate that the subsurface soil at depths greater than two feet in the vicinity of borings HA-4 and HA-5 are impacted by BTEX. Shallow subsurface soil (1' to 4') in the western section of the Site (borings HA-1, HA-2 and HA-3) have not been impacted by petroleum related VOCs. Omichron field test kit data indicate that soil in the immediate vicinity of borings HA-1, HA-2, HA-3, HA-4 and HA-5 have not been impacted by PCBs.

UST Area

Field GC and laboratory analytical data indicated that the extent of impacted subsurface soils, north, west and south of the UST area have been delineated. North of the USTs subsurface impacted soil do not extend beyond SB-9A, SB-13A or SB-14A, to the west soil at SB-6 and SB-7 are not impacted and to the south soil at SB-22 and SB-19 are not impacted. SB-18 marks the approximate limit of impacted soil south southeast of the UST area. To the east and southeast the extent of impacted soil lies between SB-16/SB-17 and SB-5/SB-5A. Northeast of the UST area the horizontal extent of impacted soil lies between SB-25 and SDA-SB-02. The depth of impacted soil ranges from 1 foot to 14 feet. Using 12 feet as an average depth of impacted soil and the areal extent as described above, there is potentially 6,000 cubic yards of soil impacted by petroleum related VOCs.

Suspected Dry Well Area

The field GC and laboratory dry well soil boring analytical data indicate that the soil in the vicinity of the borings do not represent a significant source of VOC hydrocarbons.

SB-24 Test Pit

The PCB sample analytical data from the test pits completed in the vicinity of UST SB-24, indicate that the high PCBs reported in the SB-24, 4'-4.5' sample is an isolated occurrence. The extent of subsurface soil impacted by PCBs at concentrations greater than 25 ppm is limited to the area in the immediate vicinity of SB-24.

Suspected Debris Disposal Area

The subsurface soil field GC VOC data and the laboratory VOC data from samples collected from the borings installed in the suspected debris disposal area and the PCB data indicate that the suspected disposal area does not represent a source of VOCs or PCBs. The analytical data indicate that subsurface soil in this area have not been significantly impacted by VOCs or PCBs.

Hackensack River Surface Water

The RI surface water analytical data in conjunction with the historical surface water analytical data indicate that the Site has not had an impact on surface water quality with respect to PCBs. The Historical surface water analytic data indicate that the Site has not had an impact on Hackensack River surface water quality with respect to VOCs. However, BTEX compounds may not have reached the Hackensack River by 1991.

Hackensack River Sediment

Review of all the available Hackensack River sediment PCB analytical data, indicate that concentrations significantly greater than upstream values are limited to three isolated areas. The October 1991 SD-4 and/or December 1995 SED-11 sample locations (approximately 300 feet downstream of the Nyack Water Company intake) and the small dam located near the southeastern boundary of the Site and the Route 59 Bridge. The October 1991 sediment analytical data indicate that the Hackensack River sediment quality has not been impacted by VOCs. However, BTEX compounds may not have reached the Hackensack River by 1991.

Groundwater

The historical groundwater analytical data indicates that groundwater from monitoring wells MW-1, MW-2, MW-3 and MW-4 have exhibited BTEX that have exceeded the NYSDEC groundwater standards. Historically, groundwater from monitoring wells MW-2 and MW-4 have exhibited the highest concentrations, with comparable xylene concentrations in the MW-1 groundwater samples. The BTEX concentrations in MW-4 generally increased from July 1989 to October 1991. Chlorinated VOCs have been detected in the MW-3 groundwater samples at concentrations that exceeded the NYSDEC groundwater standards. The groundwater samples from EXW-1, EXW-4 and EXW-5 indicate that groundwater in the vicinity of these wells has not been impacted by BTEX. However, chlorinated VOCs have been consistently detected in the EXW-4 and EXW-5 samples at concentrations which have exceeded the NYSDEC groundwater standards. Groundwater from weathered bedrock interface wells MW-8 and MW-6 exhibited chlorinated volatile compounds at concentrations that have exceeded the NYSDEC groundwater standard, the compounds detected are the same as identified in the overburden MW-3, EXW-4 and EXW-5 monitoring well samples.

The overburden groundwater analytical data indicate that BTEX concentrations have generally decreased overtime. The one exception is the BTEX concentrations in MW-2 which are higher in the December 1995 sample. The EXW-1, EXW-4, EXW-5 and the MW-8S groundwater BTEX data indicate that VOC petroleum contaminants associated with the UST area have not migrated to the Site boundary. However, estimated groundwater flow rates indicate that BTEX compounds potentially may not have reached the EXW-4 and EXW-5 locations by December 1995.

The chlorinated VOC analytical data indicate that groundwater concentrations in the vicinity of monitoring wells MW-3 and MW-4, and to a lesser extent EXW-4 have increased. The EXW-5 chlorinated VOC concentrations were consistent with historical values. Elevated concentrations of chlorinated VOCs were also detected in the MW-2 and the MW-8S overburden monitoring wells. Existing overburden groundwater and weathered bedrock flow data indicate that the TCE and 1,2-

DCE detected in the MW-2, MW-3, MW-4, EXW-4 and EXW-5 and MW-8S samples may potentially related to an off- site source.

The December 1995 PCB analytical data indicate that the overburden groundwater has not been significantly impacted by PCBs. Elevated concentrations were limited to monitoring wells MW-2 and MW-3. PCBs were not detected in the downgradient Site perimeter monitoring wells during either of the past two monitoring events (December 1995 and November 1991).

The TCE and 1.2-DCE detected in upgradient, background weathered bedrock interface wells MW-5B and MW-9B groundwater samples appears to be related to an off-site source. The available weathered bedrock flow data indicates that the TCE and 1,2-DCE detected in the weathered bedrock MW-6 and MW-8 groundwater samples is to some extent related to an off-site source. The 1,1,1-TCA and 1,1-DCE detected in the downgradient MW-6 and MW-8 weathered bedrock interface monitoring well samples appears to be Site related.

No PCBs were detected in the weathered bedrock interface groundwater monitoring well samples, indicating that the Site has not had an impact on weathered bedrock groundwater quality with respect to PCBs.

7.1.2 Fate and Transport

The physical characteristics of the Site and surrounding area and the Site chemical data indicate that transport mechanisms through which site related chemicals of concern could migrate from the Site include groundwater movement away from the Site, and erosion of Site soil and discharge of groundwater to the Hackensack River. Groundwater at the Site exhibits VOC and PCB concentrations which exceed NYSDEC groundwater standards. No elevated VOC chemicals of concern have been detected in the Hackensack River surface water and sediment samples, indicating that this is not a pathway of concern with respect to VOCs. PCBs have not been detected in the Hackensack River surface water samples at concentrations elevated with respect to upstream concentrations indicating that groundwater discharge to the River and erosion of Site soil is not a pathway of concern with respect to impacts to Hackensack River surface water quality.

PCBs have been detected in Hackensack River sediment samples at concentrations which have exceeded upstream concentrations and NYSDEC sediment criteria. Available data indicate that impacts are limited to three areas: the October 1991 SD-4 and/or December 1995 SED-11 sample locations (approximately 300 feet downstream of the Nyack Water Company intake), the small dam located near the southeastern boundary of the Site and the Route 59 Bridge. No data is available downstream of the Route 59 Bridge. Assuming elimination of both upstream and Site related PCB sources, overtime sediments impacted by PCBs would become covered via deposition and removed from the biological active zone (top 5 cm of sediment). Deposition would be greatest in the wetlands located downstream of the Site, thereby eliminating further transport of PCBs via the Hackensack River.

The physical and chemical properties of the VOCs indicate that partitioning to, and migration vis groundwater would be significant. However, volatilization from surface waters is a significant process, which significantly reduces any impacts to Hackensack River surface water quality. Historical VOC data indicate that no VOCs have been detected in Hackensack River surface water

samples. The octanol/water partition coefficients and the BCF factors of the VOC detected in Site groundwater samples are low, indicating biomagnification is not a concern. PCBs will tend to sorb to soil/sediment organic matter and will not readily partition to groundwater/surface water. PCBs will biomagnify in the food chain as evidenced by the high octanol/water partition coefficient and BCF.

7.1.3 Fish and Wildlife Impact Analysis

The available Hackensack River sediment PCB analytical data, indicate that concentrations significantly greater than upstream values are limited to three isolated areas: the October 1991 SD-4 and/or December 1995 SED-11 sample locations (approximately 300 feet downstream of the Nyack Water Company intake), the small dam located near the southeastern boundary of the Site and the Route 59 Bridge. Considering the limited areal extent of sediments which exceed the sediment screening value and the detection of background levels above the screening level, excavation of sediments in the Hackensack River is not considered appropriate. Data indicate that additional investigations associated with Tasks III and IV or the FWIA are not required.

7.2 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the Remedial Investigation, the following conclusions have been reached:

7.2.1 Conclusions

- Subsurface soil in the vicinity of the UST area exhibit BTEX concentrations that are elevated with respect to the NYSDEC RSCO's. There is an estimated 6,000 cubic yards of impacted soils;

- Subsurface soil in the area of the suspected dry well does not represent a significant source of chlorinated VOCs;

- PCB impacted soil in the vicinity of UST SB-24 is limited to the immediate vicinity of the boring;

- No evidence of subsurface soil contamination exists in the debris disposal area located in the northeast section of the Site;

- Hackensack River surface water analytical data indicates that the Site has not had an impact on surface water quality with respect to PCBs;

- Hackensack River sediment data indicate that the Site has not had an impact on sediment quality with respect to PCBs. Sediments exhibiting concentrations significantly elevated with respect to upgradient background is limited in extent;

- The October 1991 Hackensack River surface water and sediment data indicated that VOCs were not detected. However, groundwater flow data indicate that BTEX compounds may not have reached the River by October 1991.

- Groundwater flow in both the overburden and bedrock interface regimes is to the northeast;

- It is expected that an upward gradient from the bedrock to the overburden exists across the entire northern half of the Site, due to influences posed by the Hackensack River.

- Upgradient background groundwater data indicate that the TCE and to a significant extent the 1,2-DCE is related to an off-site source;

- Overburden groundwater monitoring wells, except MW-1 and MW-5, exhibit elevated concentrations of chlorinated VOCs. Chlorinated volatile concentrations in groundwater from MW-3 have increased;

- Overburden groundwater impacted by petroleum constituents is limited to the three wells, MW-2, MW-3 and MW-4, located immediately downgradient of the UST area. MW-3 and MW-4 concentrations have decreased. Groundwater from monitoring wells EXW-4 and EXW-5 at the downgradient Site boundary has not been impacted by BTEX. However, groundwater flow rates indicate that BTEX compounds may not have reached these locations;

- Bedrock interface groundwater monitoring wells at the upgradient Site boundary and the eastern and central section of the Site exhibit elevated concentrations of chlorinated VOCs. The 1,1,1-TCA and associated degradation products appear Site related; and

- The fish and wildlife criteria specific analysis indicates that Hackensack River sediment concentrations, at a limited number of locations, exhibit concentrations that exceed the sediment criteria screening value of 0.042 mg/kg. However, the available data indicate that the areal extent of impacted sediments is limited and therefore excavation/remediation of the sediments is not warranted.

7.2.2 Recommendations

- A complete round of groundwater elevations should be collected from both the overburden and bedrock monitoring wells during low water level conditions. This data is needed to evaluate the weathered bedrock groundwater flow directions to provide more definitive data on the possible source of TCE in the Site overburden monitoring wells and weathered bedrock wells MW-6 and MW-8.

- Collect and analyze surface water and sediment samples from the Hackensack River for volatile organics to confirm that VOCs are not a concern.

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APPENDIX A

Water-Level Data

APPENDIX B

Soil Boring Logs

APPENDIX C

Test Pit Logs

APPENDIX D

Monitoring Well Network Inspection

APPENDIX E

Well Construction Logs

APPENDIX F

Core Log

APPENDIX G

Well Development Logs

APPENDIX H

Groundwater Sampling Logs

APPENDIX I

In-Situ Hydraulic Conductivity Data

I.1 Overburden Monitoring Wells
I.2 Bedrock Interface Monitoring Wells

APPENDIX J

Field Test Kit PCB Data

APPENDIX K

Laboratory Reporting Sheets

APPENDIX L

Data Validation Reports

APPENDIX M

Report Addendum