REMEDIAL INVESTIGATION FEASIBILITY STUDY REPORT

VOLUME 1: REMEDIAL INVESTIGATION TEXT

SWEDEN-3 CHAPMAN SITE

NYS SITE NUMBER 8-28-040A

TOWN OF SWEDEN, MONROE COUNTY

NEW YORK STATE

Prepared for:
Division of Hazardous Waste Remediation
New York State
Department of Environmental Conservation
50 Wolf Road
Albany, New York 12233-7010

Prepared by:
Dunn Geoscience Engineering Company, P.C.
Albany, New York

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SWEDEN-3 CHAPMAN SITE

TOWN OF SWEDEN
COUNTY OF MONROE, NEW YORK

SITE NO. 8-28-040A

PREPARED UNDER STATE SUPERFUND
WORK ASSIGNMENT NO. D002520-14

Prepared for:

NEW YORK STATE
DEPARTMENT OF ENVIRONMENTAL CONSERVATION
50 Wolf Road
Albany, New York 12233-7010

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December 1993

REMEDIAL INVESTIGATION/FEASIBILITY STUDY REPORT

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1.0 INTRODUCTION

1.1 Overview

This Remedial Investigation (RI) Report for the Sweden-3 Chapman Site (New York State Site No. 8-28-040A) has been prepared by Dunn Geoscience Engineering Company, P.C. (DUNN) under the State Superfund Standby Contract (Work Assignment No. D002520-14) with the New York State Department of Environmental Conservation (NYSDEC). This report has been prepared to summarize the recently completed RI program as specified in the Work Plan. The report describes the project site, the investigative activities completed, and the findings and conclusions resulting from the RI program.

1.2 Site Location

The Sweden-3 Chapman Site (Site) is located north of Beadle Road and east of Redman Road in the Town of Sweden, Monroe County. The Site is approximately two acres in size, and is located in a predominantly rural area. Refer to Figure 1.1A and 1.1B for the location of the Site and Satellite Sites.

Five satellite sites in the vicinity of the Sweden-3 Chapman Site were also investigated during the Phase I RI and are described in detail in Section 2.2. The Sweden-3 Chapman Site and Satellite Sites will be referred to throughout this Report as the Sweden-3 Chapman Study Area.

1.3 Purpose of Investigation

In December of 1991, DUNN was assigned by the NYSDEC under the State Superfund Standby Program Contract to conduct a Remedial Investigation/Feasibility Study (RI/FS) for the Sweden-3 Chapman Site. The purpose of the RI is to characterize and identify the nature, extent and migration of contaminants in various environmental media into an adjacent wetland and the underlying aquifer.

In order to thoroughly investigate the Site, a phased approach was adopted. The RI was divided into three separate phases of work. The Phase I investigation preliminarily investigated the nature and extent of contamination on Site. Based on the results of the Phase I RI, a Phase II RI was conducted to further investigate the nature and extent of contamination off-site and to fill data gaps identified by the Phase I investigation. The Phase III RI was conducted to further define the downgradient extent of the groundwater contaminant plume and confirm the occurrence of two separate and distinct groundwater plumes.

1.4 Purpose of Report

The purpose of this report is to present the methods and findings of the Phase I and II investigations and characterize the nature and extent of Site contamination. An Air Pathway Analysis Study, Health Risk Assessment Study, Fish and Wildlife Step I Impact Study, and a Lead Contamination Study are also included with this report.

The Final RI/FS Report includes the results and findings of Phase I, Phase II, Phase III modifications that result from NYSDEC comments, and the Feasibility Study.

2.0 SITE BACKGROUND

2.1 Site History

In the early 1970's, the Site was allegedly utilized by Mr. Webster Chapman (then owner of the property) for the disposal of construction and demolition debris associated with his wrecking company.

In February of 1986, a preliminary investigation Phase I Report was prepared for the Site and submitted to the NYSDEC by Engineering Science, Inc. The report documented the presence of approximately sixty-five 55-gallon drums on the surface of the Site. Several of the drums were labelled "Trichloroethylene" and "Cyanide Waste". Based on observations made during the preliminary investigation, it was suspected that a thousand or more drums could be potentially buried within the debris of the main fill area of the Site.

During October of 1987, and March of 1989, the NYSDEC collected several surface soil samples and drum samples at the Site. The analytical results of this sampling program indicated the presence of acetone, trichloroethylene, tetrachlorethene, 4, 4-DDT, chromium, silver and zinc.

Based on this information, the NYSDEC concluded that hazardous waste detected at the Site could potentially contaminate an adjacent wetland and the underlying aquifer. Residential homes in the vicinity of the Site utilize the underlying aquifer as their primary source of drinking water. Sampling of the residential wells was performed in October, 1989 by the New York State Department of Health (NYSDOH), however, no evidence of groundwater contamination was detected.

During July of 1989, the Site was reclassified from a Class 2a to a Class 2 site. This classification defines the Site as significant threat to the public health or the environment and requires action.

During March of 1990, the NYSDEC authorized the development and implementation of an Interim Remedial Measures (IRM) project for the Sweden-3 Chapman Site by utilizing the Environmental Quality Bond Act. The need to perform an IRM action was based upon the imminent threat to public health and the surrounding environment posed by the possible spread of contaminants into an adjacent wetland and the underlying aquifer.

On March 8, 1991, the NYSDEC contracted with Tricil Environmental Response, Inc. to remove and dispose of the apparent source of contamination at the Site (i.e., drums, grossly contaminated soil and debris). All remedial activities required under the IRM contract were completed by May, 1992. The IRM resulted in the removal and disposal of 2,383 drums, 2,400 tons of hazardous soil and debris, 1,710 tons of non-hazardous soil and debris and 486 bottles containing laboratory materials. Refer to Figure 2.1 for the Sweden-3 Chapman Site Map.

There is approximately 2,000 cubic yards (2,424 tons) of contaminated soil/debris staged on-Site. There is 1,835 cubic yards (2,224 tons) of soil staged on a 50 feet by 200 feet concrete pad and 165 cubic yards (200 tons) staged on an adjacent 60 feet by 60 feet concrete pad. The composition of soil consists of three types of material; soil, construction and demolition debris, and household debris. The staged contaminated soils are presently covered with a 40 mil heavy duty polyethene liner. Any water leaching from the pile is collected in a sump constructed within the concrete pad. Periodic inspections occur to check the integrity of the liner material and sump water depth.

2.2 Satellite Site Locations and History

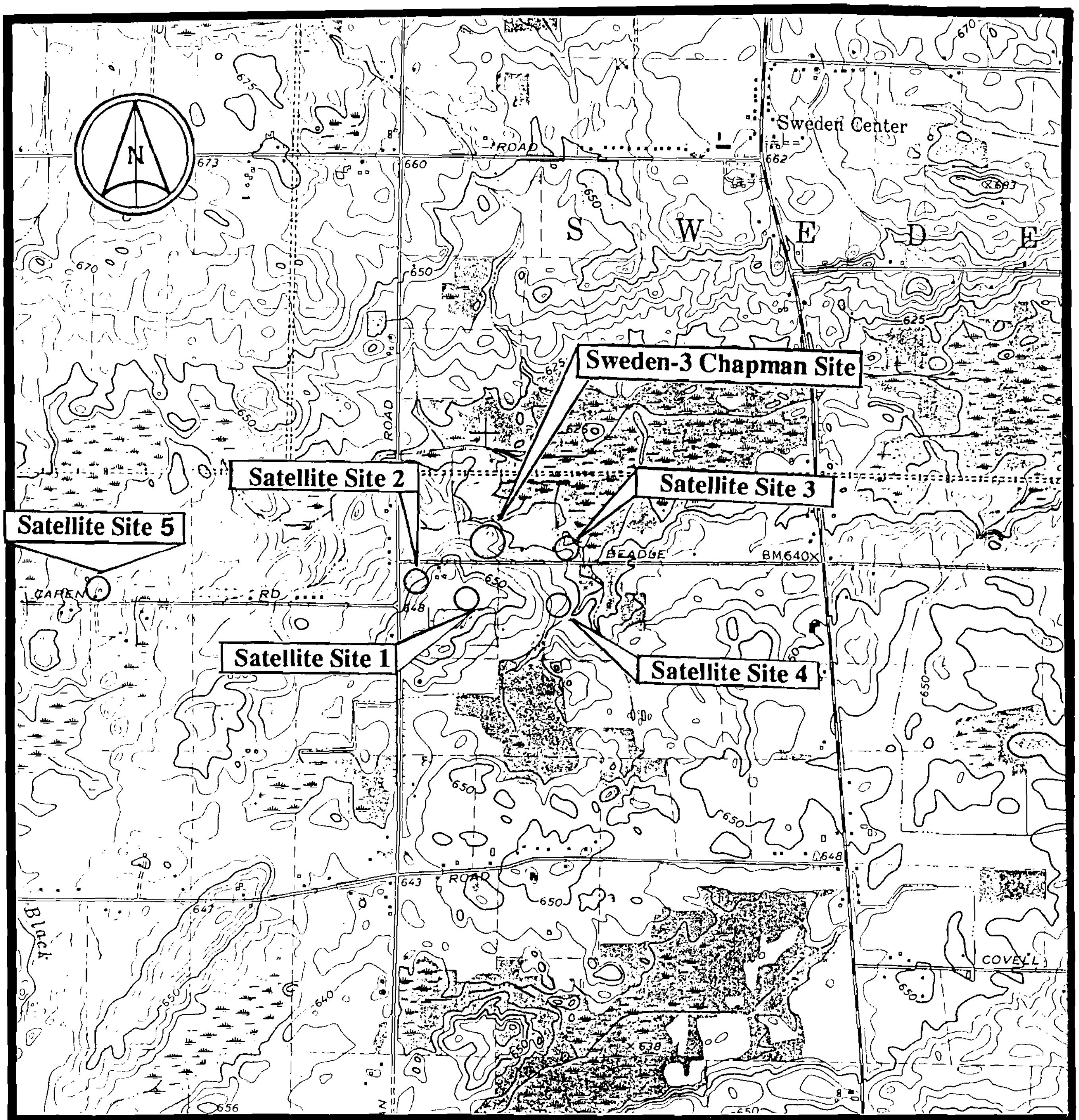
Satellite Site 1 is located south of the Site across Beadle Road in the residential backyard of the RES-W3 residence at 1411 Beadle Road. This Satellite Site consists of a hedgerow comprised of surficial household debris, construction and demolition debris and 55 gallon drums covering an area of approximately 300 feet by 100 feet. The observed 55 gallon drums and surrounding soil required investigation and was added to the RI. Refer to Figure 1.1a for the location of Satellite Site 1. Refer to Figure 2.2 for Satellite Site 1 Site Map.

Satellite Site 2 is located south of the Site across Beadle Road in the residential backyard of RES-W2 residence at 1437 Beadle Road. This Satellite Site was an area utilized by Mr. Chapman as his construction storage yard for his construction and landfill businesses. Aerial photograph interpretations raised suspicion that buried drums were possibly located on this Satellite Site and, therefore, required investigation. Refer to Figure 1.1a for the location of Satellite Site 2. Refer to Figure 2.3 for Satellite Site 2 Site Map.

Satellite Site 3 is located approximately one-half mile east of the Site at the Sweden-4 Beadle Road Site that is presently a NYSDEC Delisted Inactive Hazardous Waste Disposal Site. This Satellite Site was utilized in the 1950s and 1960s as a construction and demolition debris landfill. However, through aerial photograph interpretation and residential interviewing, this Satellite Site was confirmed to be an active landfill during the 1970s. This is the same span of time when drums were dumped at the Sweden-3 Chapman Site, therefore this site was added to the RI. Refer to Figure 1.1a for the location of Satellite Site 3. Refer to Figure 2.4 for Satellite Site 3 Site Map.

Satellite Site 4 is located approximately one-half mile southeast of the Site in the backyard of a residence at 1345 Beadle Road. This Satellite Site was utilized in the 1970s as a construction and demolition debris landfill during active drum dumping at the Sweden-3 Chapman Site. Since this landfill (of an approximate size of 100 feet by 100 feet) was active during the drum dumping operations at the Sweden-3 Chapman Site, it was added to the RI. Refer to Figure 1.1a for the location of Satellite Site 4.

Satellite Site 5 is located approximately one-half mile southwest of the Site in the backyard of a residence at 152 Capen Road. This Satellite Site was utilized in the 1970s as a surface drum disposal site for a short time period. According to residential interviews, approximately 5 to 6 drums were removed and disposed of shortly after the dumping incident without any accidental spillage. Refer to Figure 1.1a for the location of Satellite Site 5.



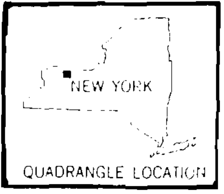


FIGURE 1.1 A

SITE AND SATELLITE SITES LOCATION MAP

BROCKPORT QUADRANGLE
NEW YORK
7.5 MINUTE SERIES (TOPOGRAPHIC)

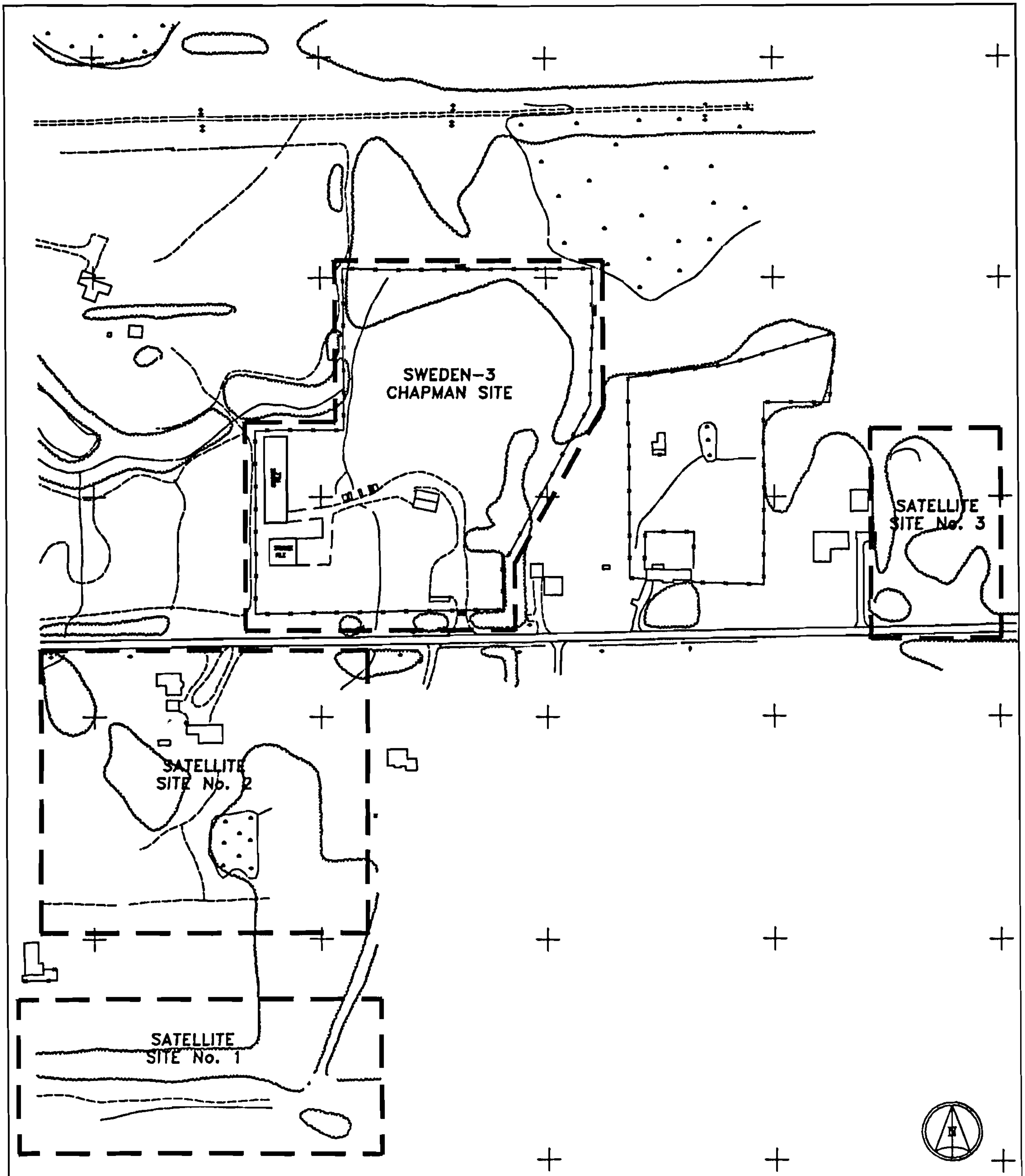
SCALE 1:24 000

1 ½ 0 1 MILE

1000 0 1000 2000 3000 4000 5000 6000 7000 FEET

1 .5 0 1 KILOMETER

CONTOUR INTERVAL 5 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929



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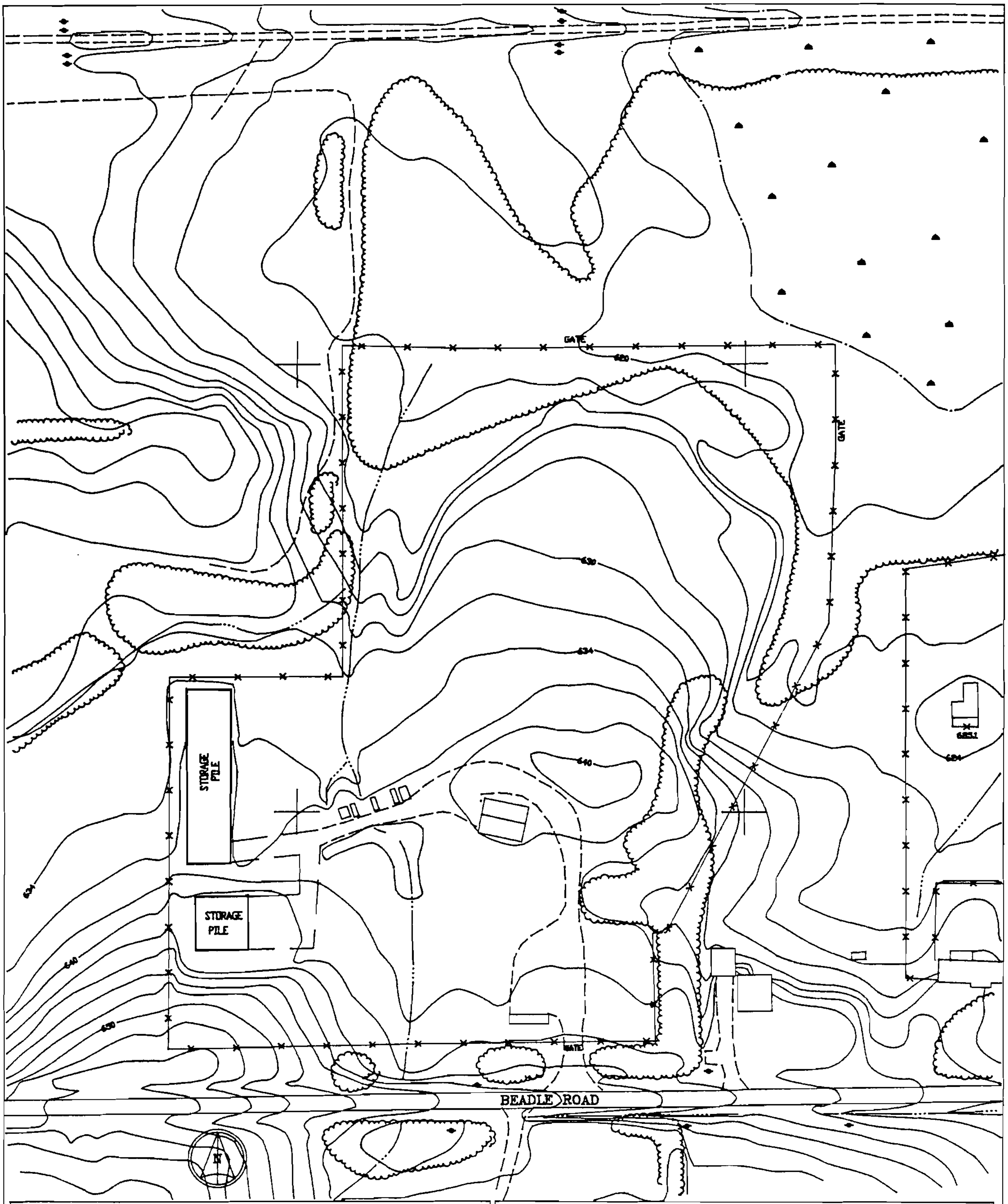
SITE LOCATION MAP

SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-00150	DATE Dec., 1992	DWG. NO. A9182_1	SCALE 1"=300'	FIGURE NO. 1.1B



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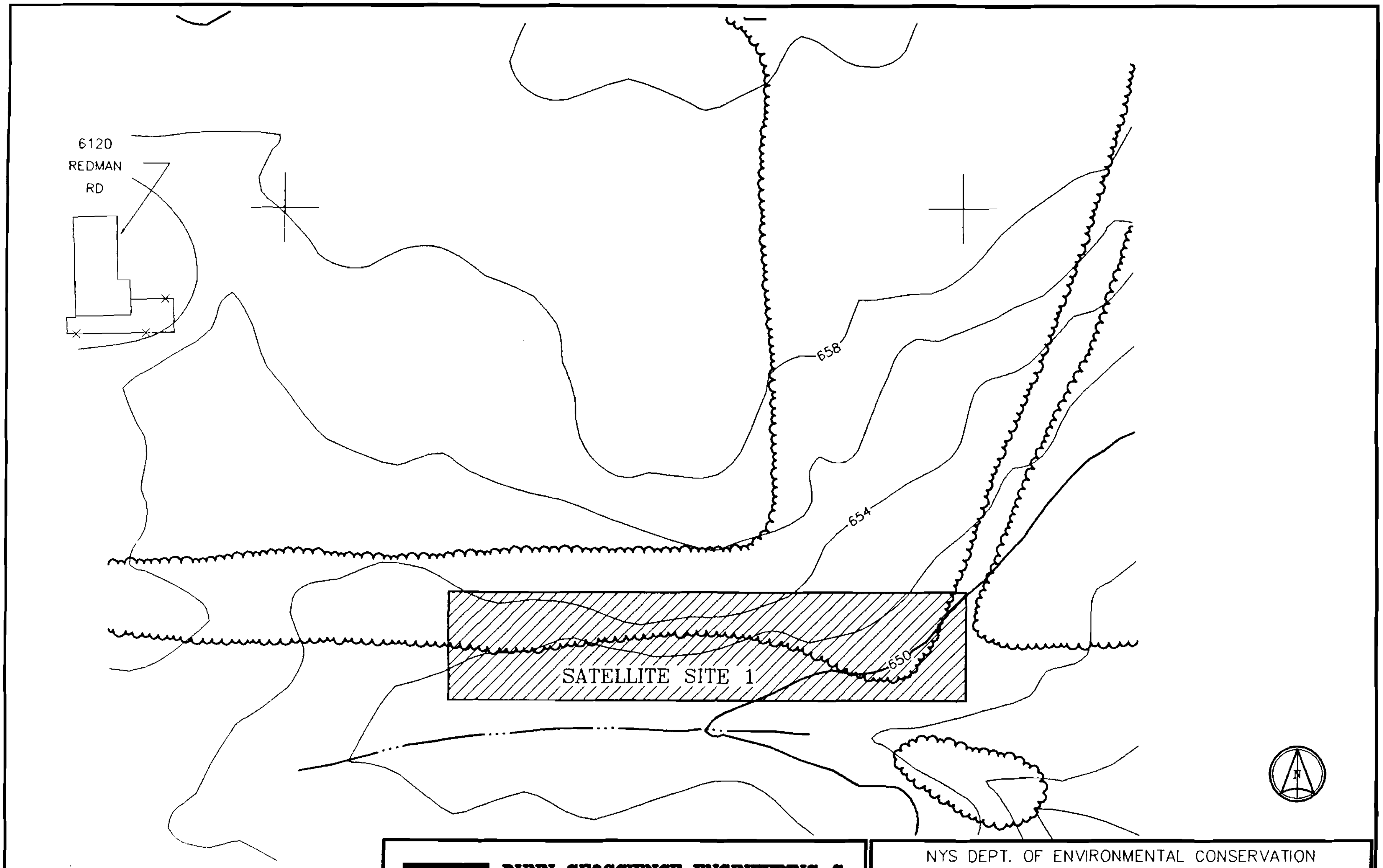
SITE MAP

SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE Dec.,1992	DWG. NO. R9182_9	SCALE 1"=150'	FIGURE NO. 2.1



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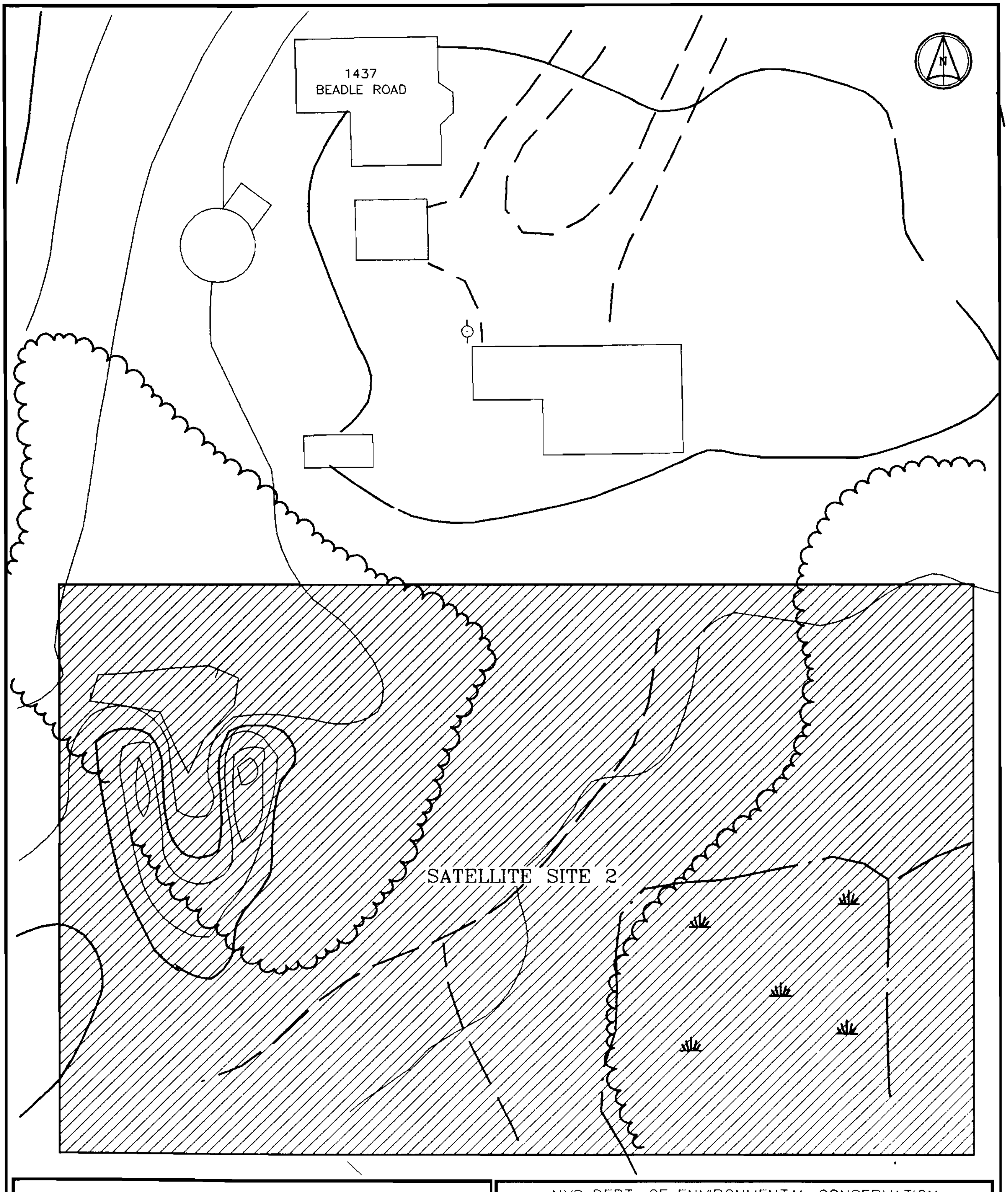
SATELLITE SITE 1

SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 37647	DATE Dec. ,1993	DWG. NO. 4A0073SR	SCALE 1"=100'	FIGURE NO. 2.2



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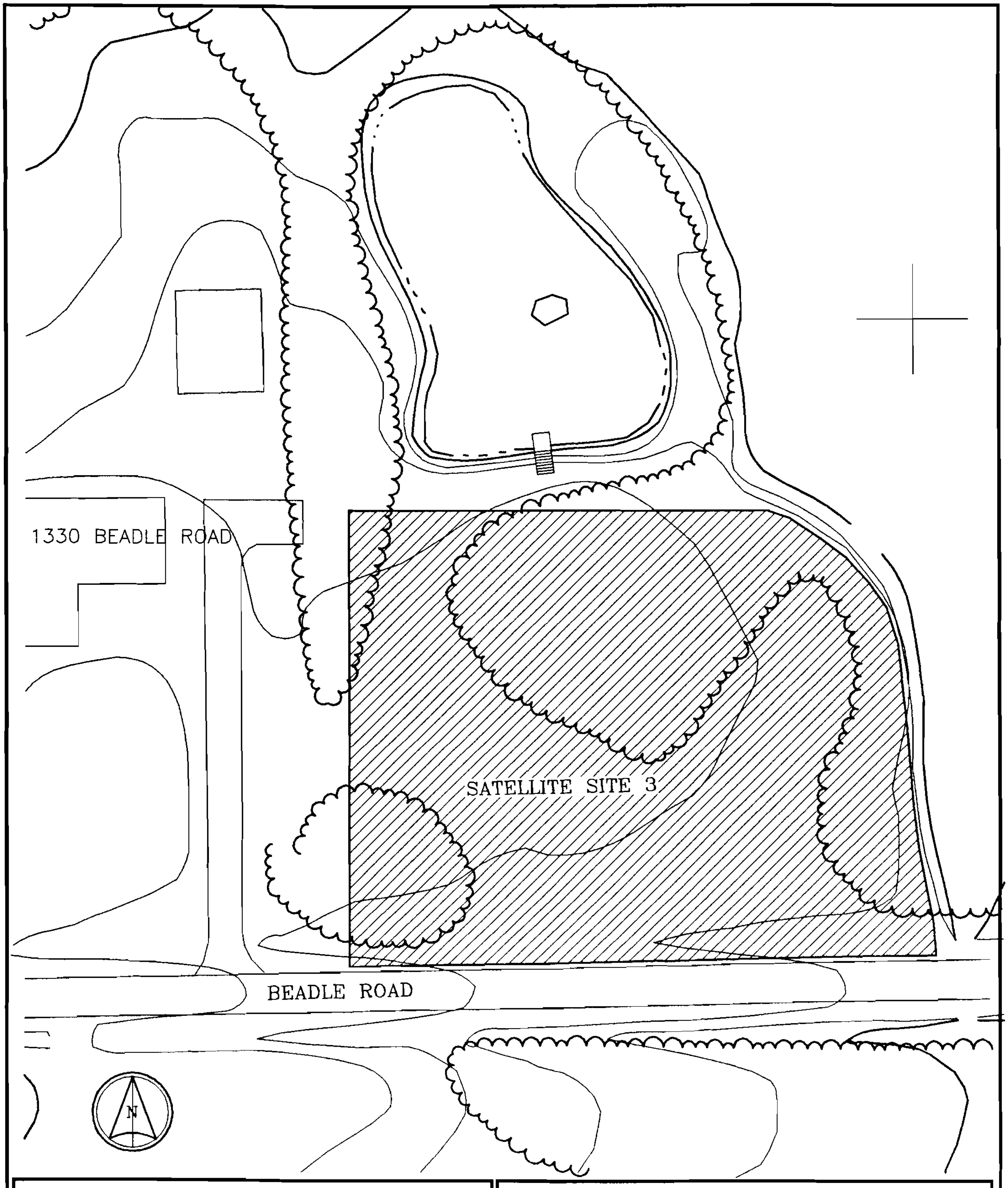
SATELLITE SITE 2
SITE MAP
SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 37647	DATE Dec, 1993	DWG. NO 4A0074SR	SCALE 1"=50'	FIGURE NO. 2.3



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SATELLITE SITE 3

SWEDEN-3 - CHAMPAN SITE

PROJECT NO. 37647	DATE Dec., 1993	DWG. NO. 4A0075SR	SCALE 1"=60'	FIGURE NO. 2.4

3.0 SITE DESCRIPTION

3.1 Demography

The Sweden-3 Chapman Site is located in the Town of Sweden in Monroe County, New York. The Town of Sweden has a population of approximately 14,181 (1990 census). Additional townships and population centers in close proximity of the Site (less than 5 miles) include the following: (1980 census)

- Town of Bergen, Genesee County - 2,568
- Town of Ogden, Monroe County - 14,693
- Town of Clarkson, Monroe County - 4,016
- Town of Clarendon, Orleans County - 2,148

The closest major population center to the project site is the Village of Brockport. The Village of Brockport is located approximately three miles due north of the Site, and has a population of 8,649 (1990 census).

3.2 Land Use

The existing land use at the Sweden-3 Chapman study area and the surrounding vicinity can be considered a mixed residential - agricultural area.

The Sweden-3 Chapman Site is bordered by a wooded wetland area along its entire northern boundary. Single family residences border the east and west boundaries of the Sweden-3 Chapman Site. The closest single family residence is approximately 100 ft from the southeast corner of the Sweden-3 Chapman Site. The southern boundary of the Sweden-3 Chapman Site is bounded by Beadle Road. Situated along Beadle Road, across from the Sweden Site are single family residences.

Satellite Site 1 is presently undeveloped and vacant. However, in the past, the site was probably utilized for agricultural purposes (i.e. farming and/or grazing).

Satellite Site 2 and 3 are situated within an area currently being utilized for residential usage.

The zoning map of the Town of Sweden (refer to Figure 3.1) indicates that the entire study area is incorporated within the R1-2 residential district classification.

3.3 Physiography

The study area is located in the Erie-Ontario lake plain physiographic province. The Erie-Ontario plain has little significant relief which is consistent with a former lake bed. In general, the project site is situated within an area that consists of end moraines, till plains, and drumlins. Intermingled in these areas are small lakebeds and alluvial flood plains. The slope range associated with these different physical features varies from nearly level to steep.

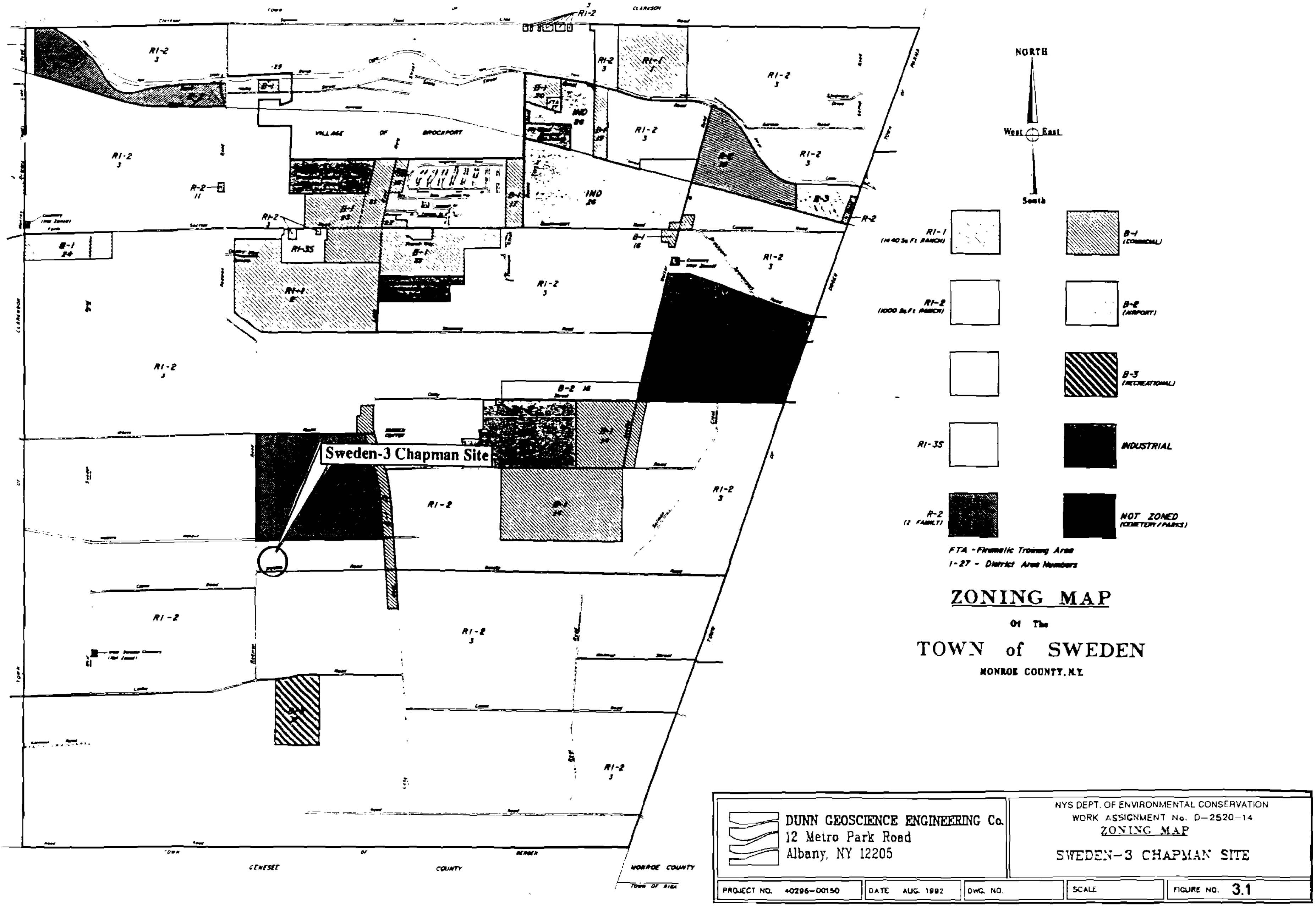
3.4 Climatology

The climate of the Monroe County region is classified as a humid continental. In general, the climate can be characterized as having moderate annual precipitation and marked differences between summer and winter temperatures. Atmospheric flow and weather systems in Monroe County come predominantly from continental sources. Periodically, well-developed weather systems off the mid- or north-Atlantic Coast bring airflow and precipitation from maritime sources into the county. Total annual precipitation in Rochester, NY, is 30.9 inches, including an average seasonal snowfall of 80 inches (source: USDA Soil Conservation Service - Soil Survey of Monroe County, NY). The averaged recorded daily maximum and minimum temperatures for Rochester, NY is 57^{o}F and 39^{o}F, respectively.

3.5 Topography - Surface Water Drainage

The topography of the Sweden-3 Chapman study area is shown on Figure 1.1B. The Sweden-3 Chapman Site slopes gently towards the north and northeast. Elevations range from over 654 ft mean sea level (MSL) at the southwest corner of the site, near Beadle Road, to approximately 620 ft MSL along the northern fence line. North of the fence line, the topography is relatively flat with little to no relief.

A review of the 7.5 minute topographic map (Brockport, NY, photo revised 1978) indicates surface water drainage flow within the study area to be in a north to northeast direction towards a large east to west trending wetland area. Several unnamed intermittent tributaries collect and channel surface water runoff from the study area. The tributaries flow in a north to northeast direction and discharge into the wetland area. Surface water within the wetland area appears to be somewhat channelized into small flowing streams. These streams appear to flow in an eastern direction and ultimately discharge into Salmon Creek.



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ZONING MAP

SWEDEN-3 CHAPMAN SITE

PROJECT NO. 40296-00150	DATE AUG. 1992	DWG. NO.	SCALE	FIGURE NO. 3.1

were steriographic black and white images taken during the years of 1941, 1951, 1958, 1961, 1967, 1970, 1973, 1975, 1980, 1988 and 1990. The intent of the review was to define possible dumping sites in the study area.

1941 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
This area is farm land and is not disturbed.

Satellite Site 2
This area surrounding the house is clean and there is no evidence of excavation.

Satellite Site 3
This area appears to be wet and undisturbed.

Satellite Site 4
This area is fully vegetated with no activity observed.

Satellite Site 5
This area is farmland with no surface dumping observed.

1951 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
Area currently identified as Luce's Pond is being excavated and is not yet completed. No other activity was observed at this location.

Satellite Site 1
No activity observed.

Satellite Site 2
A small disturbance of possible excavation is evident south of the house in the center of the lot.

Satellite Site 3
No activity observed.

Satellite Site 4
This area is fully vegetated with no activity observed

Satellite Site 5
This area is farmland with no surface dumping observed.

1958 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
Area currently identified as Luce's Pond is complete and full of water.
No other activity was observed at this location.

Satellite Site 1

No activity observed.

Satellite Site 2
The area surrounding the house is littered with debris; no other disturbance is observed.

Satellite Site 3
The area is being filled in from the road and to the north. The low area identified in the 1941 aerial photograph has been filled near level with the road for 50 feet. There are two access roads in and out of the site.

Satellite Site 4
The area is fully vegetated with no activity observed.

Satellite Site 5
The area is farmland with no surface dumping observed.

MAY 5, 1961 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
The present access road to the site does not exist or is not well defined.
There is a small pile of some type of material that exists approximately 300 feet north of Beadle Road and just east of the present access road.
The Polle residence does not exist.

Satellite Site 1
No activity observed.

Satellite Site 2
The present house and other buildings are evident. The area south of the buildings is littered with equipment and debris.
There is an access road leading southward to the back of the construction yard, however, it only extends as far back as the debris does. There is no evidence of any excavation on this side of the road, however, there is construction disturbance on the shoulder across the road.

Satellite Site 3
The area is nearly void of any vegetation and large objects are present on top of the fill area, eluding to possible dumping.
The remaining portions of Beadle Road looks natural and innocent.

Satellite Site 4
The area is fully vegetated with no activity observed.

Satellite Site 5
The area is farmland with no surface dumping observed.

1967 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
The Luce Pond is present. There are two objects that appear to be construction trailers on the east side of the access road. The present fill area is very small where dumping operations are taking place. There are paths north of the present fill area that run northwest to Redman Road, which are possible alternative access roads to the fill area.

Satellite Site 1
No activity observed.

Satellite Site 2
The area south of the house and surrounding buildings is littered with equipment and miscellaneous debris. The access road leading out to the debris is well defined as described in 1961. There is an area on the east side of the lot 400-500 feet south of Beadle Road that appears to have been excavated. This area is void of vegetation. There are two mounds (piles) on the west side of the lot, 400 feet south of Beadle Road. This area could possibly be an excavation area.

Satellite Site 3
A pond is present north of Beadle Road and the site is slightly vegetated.

Satellite Site 4
The area is fully vegetated with no activity observed.

Satellite Site 5
The area is farmland with no surface dumping observed.

APRIL 15, 1970 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
The present site is active. The fill is approximately the pre-IRM shape. There is evidence of dumping due to the soil carried on to Beadle Road from truck traffic and the poor vegetation on the fill.

Satellite Site 1
No activity observed.

Satellite Site 2
Same as 1967.

Satellite Site 3
This site is void of vegetation.
There are large objects on top of the fill and a pond to the north. It appears that dumping operations are taking place.

Satellite Site 4
The area is fully vegetated with no activity observed.

Satellite Site 5
The area is farmland with no surface dumping observed.

1973 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
The fill area is near its present shape and has little vegetation on it. Dumping appears evident.

Satellite Site 1
No activity on the Satellite site.

Satellite Site 2
Same as 1967, no change.

Satellite Site 3
A small amount of vegetation is present. The northern portion of the fill area is disturbed from active dumping operations. The pond still exists.

Satellite Site 4
The area is fully vegetated with no activity observed.

Satellite Site 5
The area is farmland with no surface dumping observed.

APRIL 22, 1975 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
The present site is very active with vehicles parked along Beadle Road and on the access road. There are many dark objects on the west and north side of the fill area that appears to be debris from active dumping operations. There appears to be one piece of equipment working the northwest corner of the fill area. The fill area is completely void of vegetation.

Satellite Site 1
No activity observed.

Satellite Site 2
The area east of the house and surrounding the garages is littered with equipment and debris. The road leading behind the buildings is well defined and has debris on both sides of it. There is a spot that is very dark on the west side of the access road, possibly a small pond.

Satellite Site 3
No activity on this site.
Vegetation has started to grow in the center of the fill area.

Satellite Site 4
Small clearing is evident.

Satellite Site 5
The area is farmland with no surface dumping observed.

1980 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
Vegetation has begun to grow on the fill area. There are two objects on-site that may be some type of equipment.
The fill area is at it's present size and shape.

Satellite Site 1
No activity observed.

Satellite Site 2
The area surrounding the Chapman house is cleaned up. The debris that was present in

earlier years has been removed.
There is now some debris (equipment) on the RES-W3 property approximately 300 feet north of Beadle Road.

Satellite Site 3
Low vegetation has begun to grow and it appears that dumping was discontinued.

Satellite Site 4
Small clearing is evident.

Satellite Site 5
The area is farmland with no surface dumping observed.

1988 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
No activity observed. Vegetation growth on fill area becoming dense.

Satellite Site 1
The hedge row now has debris just south of it scattered about in a miscellaneous fashion which is approximately 800 feet east of Redman Road and approximately 1,100 feet south of Beadle Road.

Satellite Site 2
The area has been cleaned up as stated in 1980. There is a road from the RES-W3 property to the hedge row (Satellite Site). The debris at the RES-W3 property has been removed.

Satellite Site 3
The site is vegetated and has a few small trees on it.

Satellite Site 4
No activity; highly vegetated.

Satellite Site 5
The area is farmland with no surface dumping observed.

1990 AERIAL PHOTOGRAPH

Sweden-3 Chapman Site
No activity observed.

Satellite Site 1
The hedge row debris is scattered just to the south of the hedge row.

Satellite Site 2
Area is representable of its present state. A dark spot is visible south of the main house that appears to be a pond or depression. Soil berms appear to be mounded on the west side of the lot.

Satellite Site 3
No activity; highly vegetated.

Satellite Site 4
No activity; highly vegetated.

Satellite Site 5
The area is farmland with no surface dumping observed.

4.3 PRP Drum Analytical Results versus Site Analytical Results

Table 4.1 summarizes the organic chemical compounds detected in each PRP drum and correlates the results to the occurrence of organic chemical compounds detected in Sweden-3 Chapman Site soil, groundwater and surface water samples.

4.4 Pre-Landfill Ground Surface

During the IRM, exploratory trenches were excavated through the landfill on a 30 foot by 30 foot grid to explore fill materials for drums and hazardous wastes. Trenches were excavated four feet wide and to a depth where native soil was encountered. All trenches were stratigraphically logged and the top and bottom elevations of each trench section were surveyed. The pre-landfill ground surface was contoured from the elevation data as presented on Figure 4.1. An old stream channel is evident near the north-south centerline of the Site oriented in a northerly direction. This channel appears to be linked to the intermittent stream that presently channels around the northwestern section of the landfill. A rechanneling of the stream has possibly taken place after landfill operations backfilled the old stream channel resulting in rerouting stream waters to the present drainage pattern.

TABLE 4. 1: Page 1 of 7
CORRELATION OF ORGANIC CHEMICAL COMPOUNDS DETECTED IN PRP DRUMS VERSUS THE PRESENCE OF ORGANIC CONTAMINATION DETECTED IN ON-SITE SAMPLES

PRP Drum Identification Number	Grid Location of Analyzed PRP Drum	Drum Contents	Compounds Detected in PRP Drum Samples	Correlated Compounds Detected In Site Soil Samples *	Correlated Compounds Detected In Site Groundwater Samples **	Correlated Compounds Detected In Surface Samples***	Number of Similarly Labeled Drums in Landfill
1142 Agway Motor Oil	C-4	Liquid	Methylene Chloride	X	X		3
			Trichlorethene	X	X		
			4-Methyl-2-Pentanone	X			
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
			Benzyl Alcohol				
			2-Ethylhexylphthalate	X	X	X	
764 Alcan Corp.	B-5	Liquid/ Solid	Methylene Chloride	X	X		1
			1,1 Dichloroethane	X	X		
			1,1,1 Trichloroethane	X			
			Tetrachloroethene	X	X	X	
			Toluene	X	X		
			4-Methylphenol		X		
			Di-n-Butylphthalate	X	X		
			Butylbenzylphthalate	X			
			Delta-BHC				
554 Amchem Products	D-3	Liquid					4
1329 Amchem Products	C-4	Liquid	Methylene Chloride	X	X		
			1,2 Dichloroethene	X	X		
			Trichloroethene	X	X		
			Toluene	X	X		
1548 American Can Co.	F-4	Liquid	Acetone	X	X	X	1
			1,1,1 Trichloroethane	X			
783 Ameroid	B-5	Liquid	Methylene Chloride	X	X		1
			Acetone	X	X	X	
			Benzene		X		
			Pyridire				
			Phenol	X			
983 Anoi	C-4	Liquid	Methylene Chloride	X	X		1
			Trichlorethene	X	X		
			Toluene	X	X		
			Chlorobenzene		X		
			Ethylbenzene	X			
			Xylene	X			
296 B. Dodge Company	B-5	Solid	Methylene Chloride	X	X		1
			4-Methyl-2-Pentanone	X	X		
			Ethylbenzene	X			
			Xylene	X			
19 Bison Corporation	C-10	Liquid	Methylene Chloride	X	X		138
			Trichloroethene	X	X		
			1,1,2 Trichloroethane		X		
			Tetrachloroethene	X	X	X	
			4,4 DDD				
26 Bison Corporation	C-10	Liquid	Trichloroethene	X	X		
			Xylene	X			
256 Bison Corporation	B-5	Liquid	Trichloroethene	X	X		
			Heptachlor				
			Heptachlor Epoxide	X			

TABLE 4.1: Page 2 of 7
CORRELATION OF ORGANIC CHEMICAL COMPOUNDS DETECTED IN PRP DRUMS VERSUS THE PRESENCE OF ORGANIC CONTAMINATION DETECTED IN ON-SITE SAMPLES

PRP Drum Identification Number	Grid Location of Analyzed PRP Drum	Drum Contents	Compounds Detected in PRP Drum Samples	Correlated Compounds Detected In Site Soil Samples *	Correlated Compounds Detected In Site Groundwater Samples **	Correlated Compounds Detected In Surface Samples ***	Number of Similarly Labeled Drums in Landfill
539 Bison Corporation	D-3	Solid	Methylene Chloride	X	X	X	cont.
			Acetone	X	X		
			Trichloroethene	X	X		
1583 Bison Corporation	E-4	Liquid	Methylene Chloride	X	X	X	
			1,1,1 Trichloroethane	X			
			Trichloroethene	X	X		
			Tetrachloroethene	X	X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
1313 Calgon Corporation	C-4	Liquid	1,2 Dichloroethene	X	X		3
			Trichloroethene	X	X		
			Toluene	X	X		
			Ethylbenzene	X			
			Styrene				
579 Castrol	E-3	Liquid	Methylene Chloride	X	X		1
			Trichloroethene	X	X		
1533 Chevron	F-4	Liquid	N-Nitrosodiphenylamine				1
			Di-n-Butylphthalate	X	X		
487 Davis Howland Oil	C-5	Oil	1,1,1 Trichloroethane	X			3
			Trichloroethene	X	X		
			4-Methyl-2-Pentanone	X	X		
			2-Hexanone	X			
			Toluene	X	X		
			Aldrin				
			Heptachlor Epoxide	X			
731 Davis Howland Oil	B-5	Liquid	Methylene Chloride	X	X		
			Trichlorethene	X	X		
			Toluene	X	X		
1244 Delaware Plastic	C-4	Liquid	Methylene Chloride	X	X		1
207 Dow Corporation	B-8	Oil	Trichloroethene	X	X		8
			4-Methyl-2-Pentanone	X	X		
			Xylene	X			
818 Dow Corporation	B-5	Oil	Methylene Chloride	X	X		
			Trichloroethene	X	X		
			Benzene		X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xlyene	X			
			Naphthalene				
			2-Methylnaphthalene				
1524 Dow Corporation	F-4	Liquid	Methylene Chloride	X	X		
			Trichloroethene	X	X		
			Toluene	X	X		
			Xylene	X			
			Aldrin				
751 Dupont	B-5	Liquid	Methylene Chloride	X	X		10
			1,1 Dichloroethane	X	X		
			1,1,1 Trichloroethane	X			
			Trichloroethene	X	X		

TABLE 4.1: Page 3 of 7
CORRELATION OF ORGANIC CHEMICAL COMPOUNDS DETECTED IN PRP DRUMS VERSUS THE PRESENCE OF ORGANIC CONTAMINATION DETECTED IN ON-SITE SAMPLES

PRP Drum Identification Number	Grid Location of Analyzed PRP Drum	Drum Contents	Compounds Detected In PRP Drum Samples	Correlated Compounds Detected In Site Soil Samples *	Correlated Compounds Detected In Site Groundwater Samples **	Correlated Compounds Detected In Surface Samples ***	Number of Similarly Labeled Drums In Landfill
1323 Dupont	E-4	Solid	Methylene Chloride	X	X		cont.
			Trichloroethene	X	X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
1185 DuZinc	C-4	Liquid	Methylene Chloride	X	X		1
			Trichloroethene	X	X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
			Aroclor 1254	X			
1 Eastman Kodak	C-10	Solid	Trichloroethene	X	X		3
			Tetrachloroethene	X	X	X	
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
			Phenanthrene	X			
			Heptachlor Epoxide				
1616 Emblem Oil	E-4	Solid	2-Butanone	X	X		1
			Trichloroethene	X	X		
			Tetrachloroethene	X	X	X	
			Toluene	X	X		
			Ethybenzene	X			
			Xlyene	X			
			2-Methyl naphthalene				
			Aldrin				
1315 Erg & Stevens	C-4	Gel	2-Butanone	X	X	X	2
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
			Butylbenzylphthalate	X			
1103 FMC Corporation	C-5	Solid	Methylene Chloride	X	X		1
			Acetone	X	X	X	
			Trichloroethene	X	X		
			4-Methyl-2-Pentanone	X	X		
267 Franklin Maintenance Products	B-5	Liquid	Methylene Chloride	X	X		4
			2,4 Dimethylphenol				
			Aldrin				
			Endosulfan 1				
769 Garlock Inc.	B-5	Tar	1,2 Dichloroethene	X	X		1
			Trichloroethene	X	X		
			Tetrachloroethene	X	X	X	
			Di-n-Butylphthalate	X	X		
			2-Ethylhexylphthalate	X	X	X	
19 General Motors	C-10	Liquid	Methylene Chloride	X	X		2
			Trichloroethene	X	X		
			1,1,2 Trichloroethane		X		
			Tetrachloroethene	X	X	X	
			4,4 DDD				
1964 General Motors	D-4	Solid	Mehtylene Chloride	X	X		
			Trichloroethene	X	X		

TABLE 4.1: Page 4 of 7
CORRELATION OF ORGANIC CHEMICAL COMPOUNDS DETECTED IN PRP DRUMS VERSUS THE PRESENCE OF ORGANIC CONTAMINATION DETECTED IN ON-SITE SAMPLES

PRP Drum Identification Number	Grid Location of Analyzed PRP Drum	Drum Contents	Compounds Detected In PRP Drum Samples	Correlated Compounds Detected In Site Soil Samples *	Correlated Compounds Detected In Site Groundwater Samples **	Correlated Compounds Detected In Surface Samples ***	Number of Similarly Labeled Drums In Landfill
200 General Printing	B-8	Liquid	Methylene Chloride	X	X		5
			Ethylbenzene	X			
			Xylene	X			
696 General Printing	B-6	Liquid	Methylene Chloride	X	X		
			Benzene		X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
2095 General Printing	D-4	Liquid	Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
413 GPI Flemgraph	C-5	Resin	Trichloroethene	X	X		1
			Butylbenzylphthalate	X			
			2-Ethylhexylphthalate	X	X	X	
1302 Gran Cyanide	C-4	Solid	Methylene Chloride	X	X		5
			Trichloroethene	X	X		
2346 Gran Cyanide	D-4	Solid	Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
1964 Hangster Metal	D-4	Solid	Methylene Chloride	X	X		2
			Trichloroethene	X	X		
1248-W Hooker Chemical	C-4	Liquid	Trichloroethene	X	X		3
			Aldrin				
			Endosulfan 1				
1248-L Hooker Chemical	C-4	Liquid	Trichloroethene	X	X		
1679 Hooker Chemical	E-4	Solid	Methylene Chloride	X	X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
36 Inca Ink Incorporated	C-10	Liquid	Methylene Chloride	X	X		1
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
510 Jaysol	D-3	Solid	Trichloroethene	X	X		1
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
815 Kem Manufacturing	B-5	Liquid	Methylene Chloride	X	X		1
			Acetone	X	X	X	
			Chloroform		X		
937 Kendall Grease	E-8	Grease	Methylene Chloride	X	X		1
			Toluene	X	X		
			Aldrin				
			Heptachlor Epoxide	X			
78 McKesson Chemical	C-10	Solid	Methylene Chloride	X	X		3
			Acetone	X	X	X	
			2-Butanone	X	X	X	

TABLE 4.1: Page 5 of 7
CORRELATION OF ORGANIC CHEMICAL COMPOUNDS DETECTED IN PRP DRUMS VERSUS THE PRESENCE OF ORGANIC CONTAMINATION DETECTED IN ON-SITE SAMPLES

PRP Drum Identification Number	Grid Location of Analyzed PRP Drum	Drum Contents	Compounds Detected In PRP Drum Samples	Correlated Compounds Detected In Site Soil Samples *	Correlated Compounds Detected In Site Groundwater Samples **	Correlated Compounds Detected In Surface Samples ***	Number of Similarly Labeled Drums In Landfill
637 McKesson Chemical	B-7	Solid	Methylene Chloride	X	X		cont.
219 Mobil	B-8	Liquid	Methylene Chloride	X	X		3
			Trichloroethene	X	X		
			Xylene	X			
			Naphthalene				
			Heptachlor Epoxide	X			
2 Morrell Place	C-10	Liquid	Toluene	X	X		1
			Ethylbenzene	X			
			Xylene	X			
1548 M & T Chemicals	F-4	Liquid	Acetone	X	X	X	7
			1,1,1 Trichloroethane	X			
1594 M & T Chemicals	E-4	Solid	Methylene Chloride	X	X		
			Acetone	X	X	X	
			1,1,1 Trichloroethane	X			
			Trichloroethene	X	X		
			Toluene	X	X		
			Alpha-BHC				
			Beta-BHC				
			Heptachlor				
			Aldrin				
			Heptachlor Epoxide	X			
			Endosulfan 1				
			Endrin				
			4,4 DDD				
			4,4 DDT				
66 Oakite Rust Preventative	C-10	Liquid/ Solid	Methylene Chloride	X	X		3
2002 Oakite Rust Preventative	D-4	Liquid	1,1,1 Trichloroethane	X			
			Trichloroethene	X	X		
			Toluene	X	X		
			Xylene	X			
1679 Occidental Chemical	E-4	Solid	Methylene Chloride	X	X		1
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
502 PPG Industries	D-3	Solid	Methylene Chloride	X	X		9
			Trichloroethene	X	X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
2371 Pribro Cyanide	D-4	Solid	Toluene	X	X		1
55W Quaker Oats Company	C-10	Liquid	Acetone	X	X	X	2
			4-Methylphenol		X		
			2-Ethylhexylphthalate	X	X	X	

TABLE 4.1: Page 6 of 7
CORRELATION OF ORGANIC CHEMICAL COMPOUNDS DETECTED IN PRP DRUMS VERSUS THE PRESENCE OF ORGANIC CONTAMINATION DETECTED IN ON-SITE SAMPLES

PRP Drum Identification Number	Grid Location of Analyzed PRP Drum	Drum Contents	Compounds Detected In PRP Drum Samples	Correlated Compounds Detected In Site Soil Samples *	Correlated Compounds Detected In Site Groundwater Samples **	Correlated Compounds Detected In Surface Samples ***	Number of Similarly Labeled Drums In Landfill
55L Quaker Oats Company	C-10	Liquid	Methylene Chloride	X	X		cont.
647 Quaker Oats Company	B-7	Solid	Methylene Chloride	X	X		
			Trichloroethene	X	X		
			Toluene	X	X		
			Chlorobenzene		X		
282 Raelock Oil Company	B-5	Liquid/ Solid	Methylene Chloride	X	X		5
			Trichloroethene	X	X		
			Endosulfan 1				
304 Rochester Products	B-5	Liquid	Trichloroethene	X	X		15
1964 Rochester Products	D-4	Solid	Methylene Chloride	X	X		
			Trichloroethene	X	X		
19 Rochester Products	C-10	Liquid	Methylene Chloride	X	X		
			Trichloroethene	X	X		
			1,1,2 Trichloroethane		X		
			Tetrachloroethene	X	X	X	
			4,4 DDD				
696 Rochester Times Union	B-6	Liquid	Methylene Chloride	X	X		2
			Benzene		X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
40 Schenectady Chemical	C-10	Solid	Xylene	X			6
656 Shell	B-7	Liquid	Toluene	X	X		1
524 Sparkl	D-3	Liquid	Methylene Chloride	X	X		1
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
			4,4 DDT				
92-W Stauffer Chemical	B-8	Oil	Methylene Chloride	X	X		32
			Acetone	X	X	X	
			Trichloroethene	X	X		
			Toluene	X	X		
			Xylene	X			
			2,4 Dimethylphenol				
			Endosulfan 1				
92-L Stauffer Chemical	B-8	Liquid	Trichloroethene	X	X		
			Toluene	X	X		
			Xylene	X			
262 Stauffer Chemical	B-5	Liquid	1,2 Dichloroethene	X	X		
			Trichloroethene	X	X		

TABLE 4.1: Page 7 of 7
CORRELATION OF ORGANIC CHEMICAL COMPOUNDS DETECTED IN PRP DRUMS VERSUS THE PRESENCE OF ORGANIC CONTAMINATION DETECTED IN ON-SITE SAMPLES

PRP Drum Identification Number	Grid Location of Analyzed PRP Drum	Drum Contents	Compounds Detected in PRP Drum Samples	Correlated Compounds Detected In Site Soil Samples *	Correlated Compounds Detected In Site Groundwater Samples **	Correlated Compounds Detected In Surface Samples ***	Number of Similarly Labeled Drums In Landfill
2095 Sun Chemical	D-4	Liquid	Toluene	X	X		1
			Ethylbenzene	X			
			Xylene	X			
1960 West Chemical	D-4	Sludge	2-Butanone	X	X	X	2
			Trichloroethene	X	X		
			4-Methyl-2-Pentanone	X	X		
			Toluene	X	X		
			Ethylbenzene	X			
			Xylene	X			
			2-Ethylhexyphthalate	X		X	

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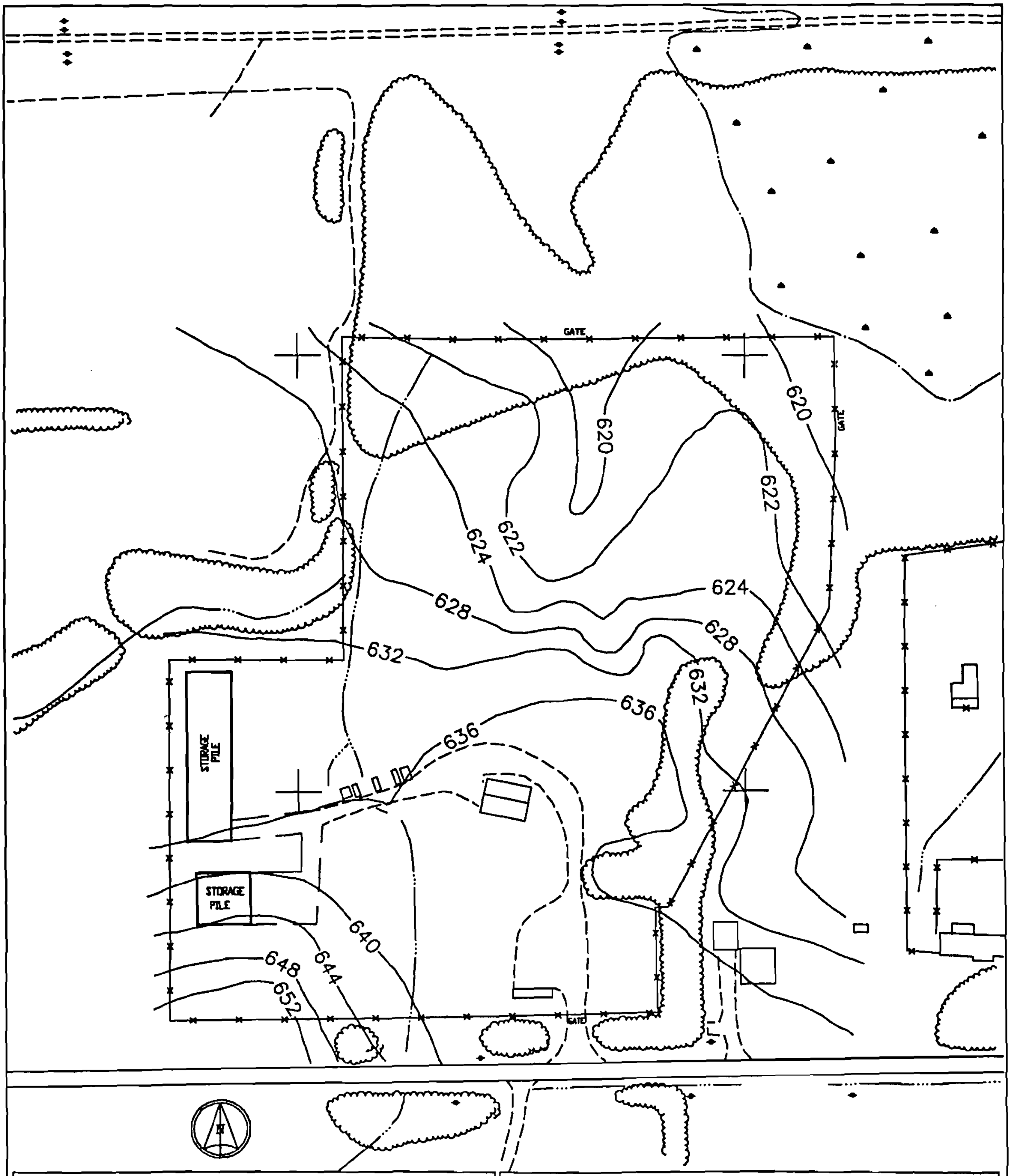
* Site soil samples consist of confirmatory test trench samples (SW-SS15 through SW-SS-22) and soil boring samples from the Phase I and Phase II RI.

** Site groundwater samples consist of groundwater samples obtained during the Phase I RI only (SWE-MW1I through SWE-MW8D).

*** Site surface water samples consist of surface water samples obtained during the Phase I and Phase II RI



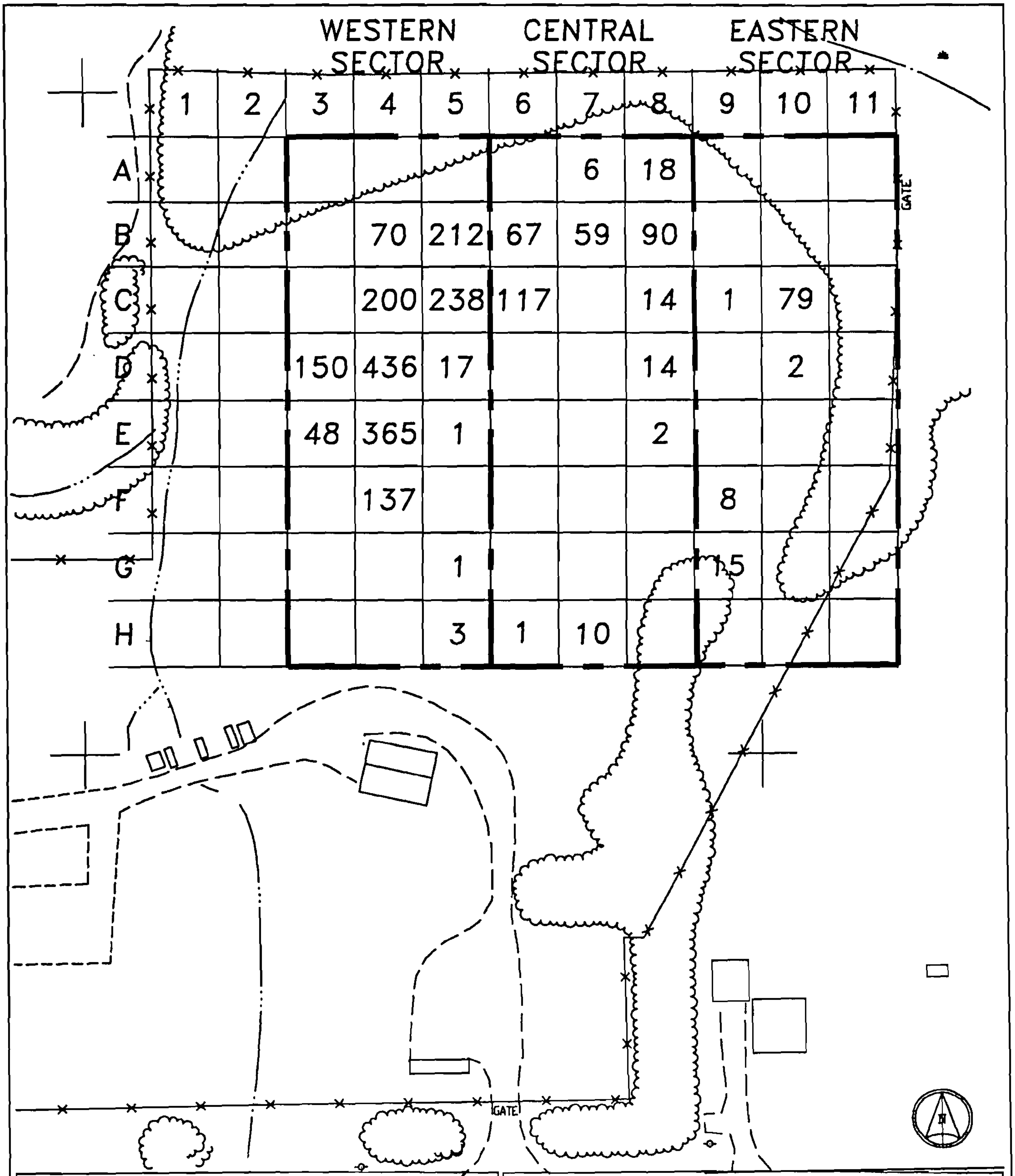
DUNN GEOSCIENCE ENGINEERING Co.
12 Metro Park Road
Albany, NY 12205

NYS DEPT. OF ENVIRONMENTAL CONSERVATION
WORK ASSIGNMENT No. D-2520-14

PRE-LANDFILL GROUND CONTOUR MAP

SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE Dec.,1992	DWG. NO. R9182_9	SCALE 1"=150'	FIGURE NO. 4.1



DUNN GEOSCIENCE ENGINEERING Co.
12 Metro Park Road
Albany, NY 12205

NYS DEPT. OF ENVIRONMENTAL CONVERSATION
WORK ASSIGNMENT No. D-2520-15

REMOVED DRUM LOCATION MAP

SWEDEN-3 – CHAPMAN STIE

PROJECT NO. 40296-00150	DATE Dec., 1992	DWG. NO. 9182_E	SCALE 1"=100'	FIGURE NO. 4.2

FIGURE 4.3 : Number of Drums Removed From Each Grid Location/Sector

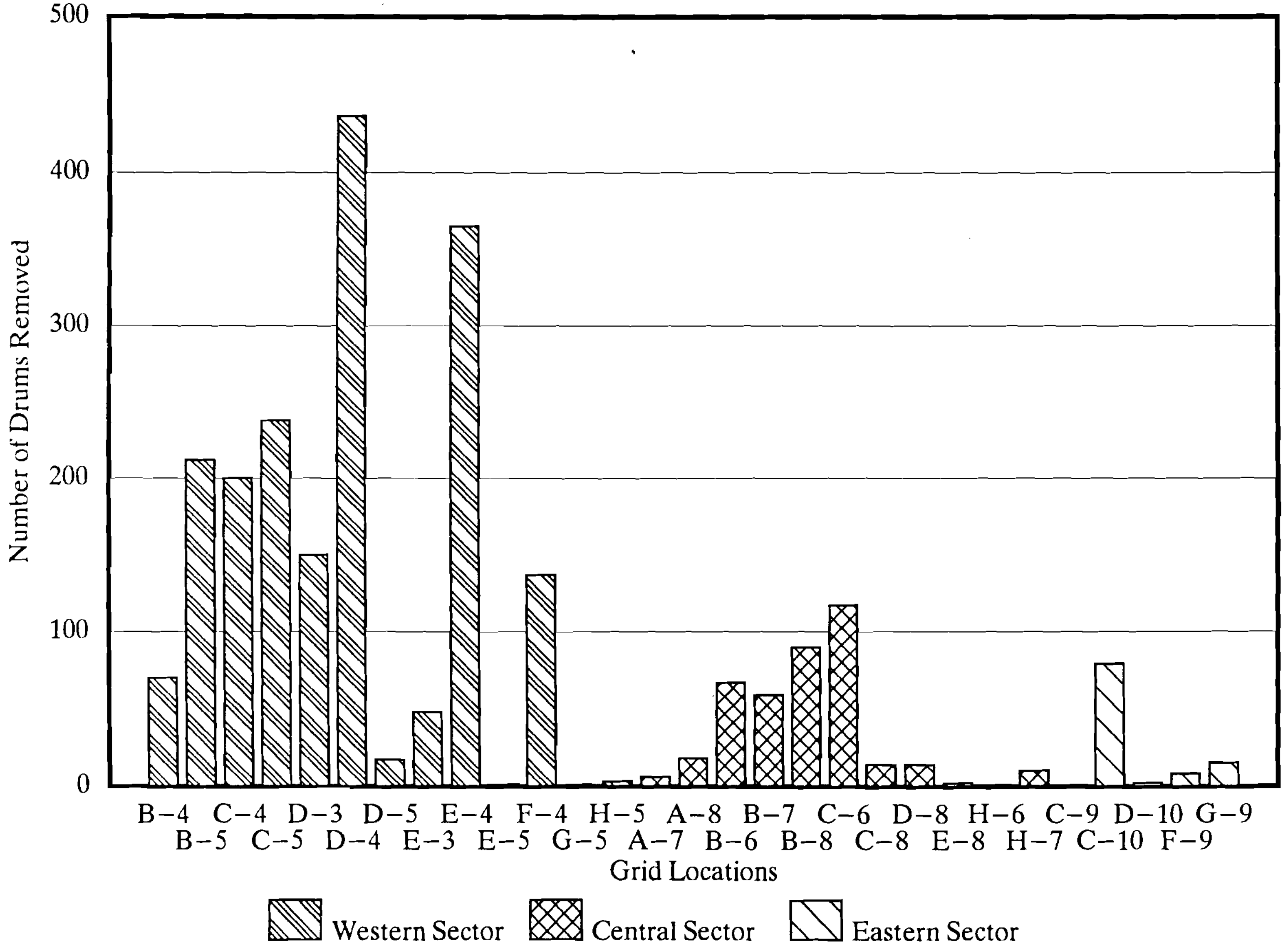
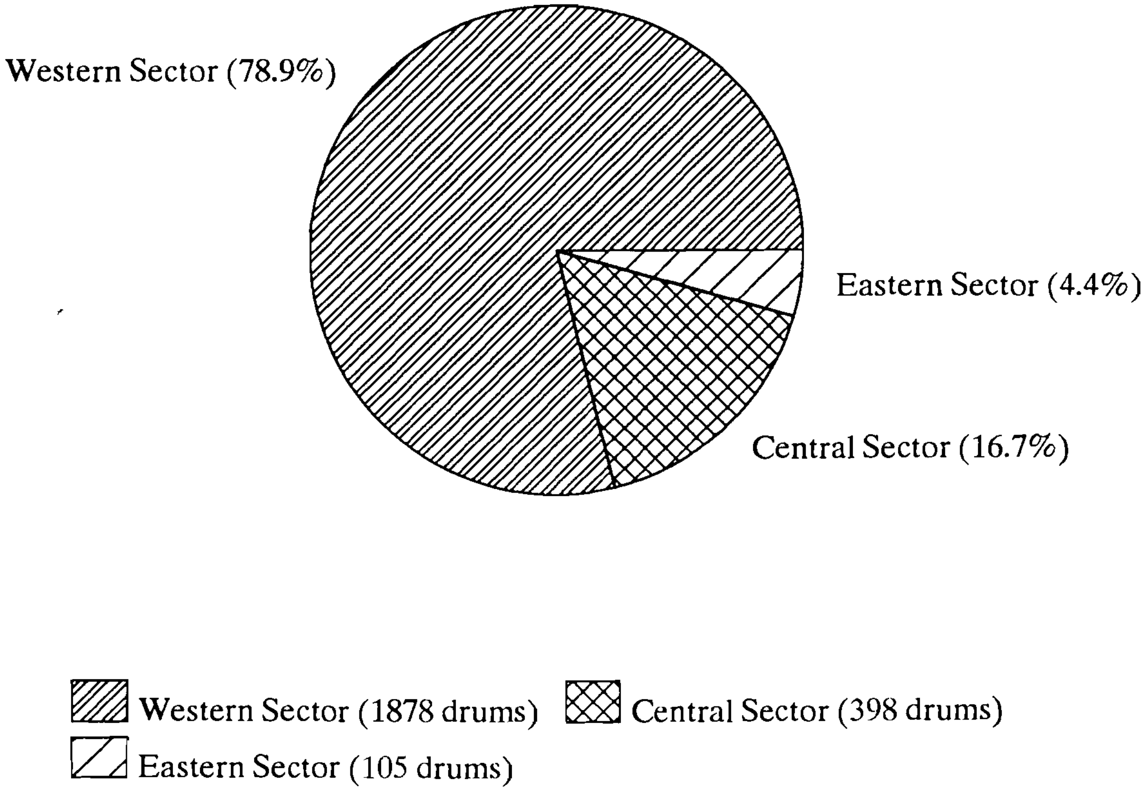


FIGURE 4.4 : Percentage of Drums Removed From Each Sector



5.0 INTERVIEWS/SURVEYS

5.1 General

Interviews have been conducted with local residents and former Chapman employees regarding past activities at both the Sweden-3 Chapman Site and its Satellite Sites. Residential interviews were responsible for providing information that raised suspicions about past activities conducted at Satellite Sites 1, 2, 3 and 4. Interviews of local residents and former Chapman employees are presented in Section 5.2.

In addition, a survey of private residential wells has been completed to determine construction well details (refer to Table 5.1). The residential wells selected for this survey are within close proximity of the Site and represent the same wells utilized for groundwater sampling.

5.2 Interviews of Local Residents and Former Chapman Employees

PERSON INTERVIEWED: Resident No. 1
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEWED BY: Jerry Jones, DUNN
DATE: 4/24/92
TIME: 9:00AM
LOCATION: Phone conversation

This interview took place as a follow-up to Dave Crosby's interview with Web Chapman Jr. to determine the location of Satellite Site 4. Resident No. 1 said that the two ponds on Resident No. 1's land were excavated for watering cattle. The resident was not sure when they were excavated. The McCracken farms use the land now since Resident No. 1 stopped farming in 1963.

PERSON INTERVIEWED: Resident No. 2
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEWED BY: Jerry Jones, DUNN
DATE: 3/3/92
TIME: AM
LOCATION: Interview

Resident No. 2 was interviewed to ascertain the history of the debris on Satellite Site 1 and if other dump sites exist in the area of Beadle Road. The interview is summarized below:

1. Resident No. 2 watches Mrs. Chapman's land on Redman Road for her and they have known one another for many years.

2. The Chapman's had most of the debris removed by a scrap company when the news about the Sweden-3 Chapman Site was made public in 1990 or 1991.

3. Resident No. 2 said to look on the delisted site (Satellite Site 3) because hospital waste and drums were dumped there. The owners of that land covered it as soon as news of the Sweden-3 Chapman Site was made public.

4. Resident No. 2 said the Chapmans allowed drums to be dumped at the Sweden-3 Chapman Site in return for construction work at General Electric, Dyana Color and local townships.

PERSON INTERVIEWED: Resident No. 3
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEW BY: Jerry Jones, DUNN
DATE: 1/92
TIME: PM
LOCATION: Phone conversation

Resident No. 3 was interviewed to determine the location of other dumping areas, if any, in the Beadle Road area. The interview is summarized below.

1. Resident No. 3 only recalls two dump sites in the Beadle Road area; the Sweden-3 Chapman Site and (Satellite Site 3) to the east of Sweden-3 Chapman Site.

2. Satellite Site 3 was filled from Beadle Road north with soil, trees, C & D material, and "this and that". Resident No. 3 would not define "this and that" but inferred you could always get a burn barrel off that site.

PERSON INTERVIEWED: RES W2
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEW BY: Jerry Jones, DUNN
DATE: 3/4/92
TIME: AM
LOCATION: Interview

RES-W2 was interviewed to ascertain the history of the debris at Satellite Site 1. Pertinent information from the interview is summarized below.

1. When RES-W2 was in the process of purchasing the Chapman house the surrounding land was covered with debris. RES-W2 wanted the debris removed prior to closing.

2. The debris was transferred from Chapman's backyard, now RES-W2's property, to RES-W3's property and finally to Satellite Site 1.

PERSON INTERVIEWED: RES-W3
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEW BY: Jerry Jones, DUNN
DATE: 3/3/92
TIME: AM
LOCATION: Interview

RES-W3 was interviewed to ascertain the history of the debris at Satellite Site 1. Pertinent information from the interview is summarized below:

1. The debris on Satellite Site 1 was on his land before he bought it and was moved to the location of Satellite Site 1 prior to purchase (1986).

2. The debris included an old crane and other construction equipment.

NOTE: Resident No. 4 and RES-W2 agree with this information.

PERSON INTERVIEWED: Employee No. 1
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEW BY: Jerry Jones, DUNN
DATE: 1/14/92
TIME: PM
LOCATION: Phone conversation

Employee No. 1 was interviewed to determine the location of dumping sites in the Beadle Road area, if any. The interview is summarized below:

1. Employee No. 1 worked full-time for Mr. Chapman from about 1956 to 1964 as an equipment operator.

2. Employee No. 1 does not remember any drums at the Sweden-3 Chapman Site when he operated a dozer there.

3. Employee No. 1 said everyone dumped at the delisted site (Satellite Site 3).

4. Employee No. 1 said Mr. Chapman Sr. got out of the business in about 1970.

5. Employee No. 1 said Chapman filled in a clean fill pit with C & D material on Holly Street in Brockport, NY.

PERSON INTERVIEWED: Resident No. 4
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEWED BY: Jerry Jones, DUNN
DATE: 2/28/92
TIME: PM
LOCATION: Phone conversation

Resident No. 4 was interviewed as a follow up on RES-W3's interview. Pertinent information is summarized below:

1. Resident No. 4 said his father moved the equipment from what is now the RES-W3 property to a location further back off Beadle Road with their bulldozer.
2. Resident No. 4 is not sure how far off the road the equipment was moved, but that an old crane was among the items moved.
3. When asked about other dump sites in the area, he knew of none.

PERSON INTERVIEWED: Resident No. 5
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEW BY: Jerry Jones, DUNN
DATE: 3/26/92
TIME: PM
LOCATION: Interview

Resident No. 5 has lived on Redman Road since 1964. He said there are two landfills in the area; the Sweden-3 Chapman Site and the delisted site (Satellite Site 3). Resident No. 5 said he saw open-ended drums on the delisted site along with household trash and brush.

PERSON INTERVIEWED: Edverti Chapman, Osprey, FL, 818/966-2738
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEW BY: Jerry Jones, DUNN
DATE: 3/13/92
TIME: 3:00PM
LOCATION: Phone conversation

Mrs. Chapman was asked if she knew of any locations on Beadle, Redman or Capen Roads in the Town of Sweden, New York where a dump site may exist. Her answer was that "she knew about nothing from up there". The question was reworded, but the answer was the same.

PERSON INTERVIEWED: Resident No. 6
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEW BY: Jerry Jones, DUNN
DATE: 3/23/92
TIME: PM
LOCATION: Phone conversation

Resident No. 6 was interviewed as a follow-up to a discussion between Dave Crosby and Resident No. 6. Resident No. 6 did not have any information on other dump sites but wanted to voice his concerns about the upcoming RI/FS work.

PERSON INTERVIEWED: Resident No. 7
PURPOSE OF INTERVIEW: Determine other dumping locations.
INTERVIEW BY: David Rowlinson, DUNN
DATE: 10/2/92
TIME: 10:00am
LOCATION: Phone conversation

Resident No. 7, a Capen Road property owner, was contacted to follow up interviews conducted with Resident No. 8 concerning a surface drum disposal site located at 150-152 Capen Road. Resident No. 7 stated that a tenant residing at 152 Capen Road allowed the dumping of approximately 6 drums on the northeast corner of the property. The tenant was immediately evicted when knowledge of this drum disposal was obtained. AC Delco or AC Rochester was labeled on the drums. The firm was contacted and arrived on-site the next day to remove the drums. According to Resident No. 7, all drums were removed intact with no accidental spills. No excavation was required since all drums were alleged to be located on the surface.

PERSON INTERVIEWED: Resident No. 8
PURPOSE OF INTERVIEW: Determine other dumping locations
INTERVIEW BY: Jerry Jones, David Rowlinson
DATE: 1/8/92, 10/3/92
TIME: PM
LOCATION: Phone conversation

Resident No. 8 said drums were dumped on Satellite Site 5 and thought the County had prior knowledge of this activity, Resident No. 8 thought approximately 30 drums were removed by Rochester Products. This person was interviewed again on October 3, 1992 to possibly confirm the person involved with the dumping of drums at Satellite Site 5. Resident No. 8 confirmed the accounts of Resident No. 7 describing tenant problems, however, could not recall the names of the person or people involved.

TABLE 5.1
RESIDENTIAL WELL SURVEY TABLE

Residence Name	Residence Address	Depth to Rock (feet)	Well Capacity (gpm)	Pump Capacity (gpm)	Total Depth (feet)	Well Diameter (inches)	Storage Tank Capacity (gallons)	Water Treatment	Well Age (years)
RES-W1	1388 Beadle Rd.	13	20-25	10	47	6	20-30	softener	12
RES-W2	1437 Beadle Rd.	*	*	*	65	6	none	softener	11
RES-W3	1411 Beadle Rd.	37	2	*	61	6	1500	softener	6
RES-W4	6053 Redman Rd.	*	*	10	25	6	none	none	18
RES-W5	1330 Beadle Rd.	*	*	*	34	6	none	iron	10
RES-W6	1360 Beadle Rd.	*	*	10	26	6	50	softener	16
RES-W7	6000 Beadle Rd.	23	50	10	40	6	none	none	9

NOTE: All well caps were for additional information concerning residential water well construction.
* Information is unknown.

6.0 GEOLOGY

6.1 Regional Geology

The most prominent geologic features associated with the Sweden, New York region are those related to the Ice Age or the Pleistocene Epoch. These features are the result of advances and retreats of glacial ice beginning approximately 300,000 years ago and ending approximately 10,000 years ago. The activity of the glaciers widened pre-existing valleys and deposited widespread accumulations of glacial till. The melting of ice produced large volumes of meltwater which shaped channels and formed lakes. The creation of these channels and lakes results in the deposition of thick stratified granular sediments. The Regional Surficial Geology Map is presented on Figure 6.1.

The bedrock groups associated with this region are Lockport and Clinton Groups that consist of dolostones underlaid by shales. The regional bedrock dip is trending to the south and dipping approximately 40 foot per mile (LaSala, 1968). One of the more pronounced geologic features in this area is an east-west trending rock escarpment ranging in height from 20 to 50 feet. The location of the escarpment is north of the Site approximately 3 to 5 miles. A stratigraphic column showing the various geological strata that underlie the Sweden region is presented on Figure 6.3. The Regional Bedrock Geology Map is presented on Figure 6.2. Geological cross sections and a site fence diagram are presented on Figure 6.8 through 6.9D.

The surface soils found at the Site have been classified by the United States Department of Agriculture (U.S.D.A.) Soil Conservation Service as belonging to the Lima-Honeoye-Ontario Association. This association is characterized by soil formed predominantly from glacial till and shallow limestone bedrock. In general, the Lima-Honeoye-Ontario Association can be characterized as well-drained to moderately well-drained soils that have a medium-texture to moderately fine-textured subsoil. Specific soil units found at the project site include:

- Honeoye Silt Loam (HnB);
- Lima Silt Loam (LnA); and
- Ovid and Appleton Silt Loam (Ow).

Subsurface investigations undertaken as part of the IRM and RI projects appear to confirm the findings of the Monroe County Soil Survey. Light brown to grey brown glacial till was encountered throughout the Site. Overlying the till in some areas of the Site is a lacustrine clay deposit. The lacustrine clays are overlain by oxidized surficial soils. Fill soils exist in some areas of the Site that were produced by present day (1970s) landfilling operations and IRM construction practices. The thickness of Site overburden soil is presented on Figure 6.4.

6.2 Site Geology

6.2.1 Overburden Stratigraphy

6.2.1.1 Fill

Fill is a surficial soil and debris deposited as a result of human activities. Landfill operations were active on Site during the time period of 1960 to 1975. The area that has been filled in is defined by the typical surface elevation rise characteristic of landfills. The fill is relatively permeable, heterogenous mix of soil, household debris, concrete, wood, rebar, tires and other construction related materials that range in depth from 0-15 feet thick, averaging approximately 8 feet. The landfill perimeter was excavated and backfilled during the NYSDEC administered IRM to remove buried drums, contaminated soil and debris. Backfill materials used during the IRM have been identified in soil borings (refer to Appendix D) as the common fill and clay cap units. The common fill consists of compacted light brown silts to clayey silts with some fine sub-rounded gravel that range in thickness from 0 to 10 feet. The clay cap consists of a dry compacted light grey silty clay that ranges in thickness from 1 to 2 feet. The clay cap lies between two layers of common fill as an impervious layer that limits surface water penetration to underlying contaminated soils. In some soil borings, a 10 mil plastic was observed and logged that defines the lowest IRM excavated surface.

6.2.1.2 Lacustrine

The lacustrine unit the first soil unit that underlies the surficial soils and fill, which consists of a brown red silty clay with interbedded fine silty sand lenses. The silty clay is characterized with numerous varves, fine lamina of alternating silty and clayey layers, which represent seasonal deposition in lacustrine environments. Horizontal fine silty sand lenses are frequent and discontinuous throughout the lacustrine units.

The unit varies in thickness from 1.4 to 7.0 feet and pinches out laterally near the north-south center line of the Site. The absence of the lacustrine clay in this area coincides with the old stream channel as described in Section 4.4 and presented on Figure 4.1. The lacustrine clay was possibly removed by stream erosional processes that would explain the lateral pinch out of the lacustine unit. The lacustrine thickness is presented on Figure 6.5.

6.2.1.3 Till

Glacial till directly underlies the lacustrine clay as a relatively flat lying soil unit. Two distinct layers, upper and lower till, are defined only by a difference in color. The color difference seems to be attributed to groundwater levels and the amount of time soils are left unsaturated and exposed to air to produce an oxidized soil. The upper till consists of a compacted light brown sandy silt with some angular fine gravel. The lower till consist of a compacted light grey sandy silt with some angular fine gravel. Boulders are more prevalent in upper section of the upper till and lower section of the lower till near the top of rock/till interface. Fine silty sand seams are occasionally present.

The till is relatively impervious and acts as a semi-confining layer due to the compact silts and reduced soil pore space. However, the fine silty sand seams are saturated and are capable of minor groundwater transport. The top surface of the till is presented on Figure 6.6.

6.2.2 Bedrock Stratigraphy

The bedrock encountered during core drilling operations is represented by the Lockport and

Clinton Group. These rock groups have been classified in ascending order into formations and members based on characteristic rock features. A stratigraphic column showing the various geological strata that underlie the Site is presented on Figure 6.3.

The Lockport Group is generally a dolomite-limestone, light brown-gray to dark gray in color with fine to medium granularity, argillacious partings, vugs, and poorly preserved fossils. Two formations of the Lockport Group lie beneath the Site that include: Gasport and Ancaster Formations. The Gasport Formation has two distinct members that include: Gothic Hill (lower member) and Pekin (upper member). The Goat Island Formation has also two distinct members that include: Niagara Falls (lower member) and Ancaster (upper member).

The Decew Formation, part of the Clinton Group, consists of dark grey fine grained massive dolostones that are finely laminated with no fossils. The Rock Quality Designation (RQD) ranges from 32-100, however, does not typify the general massive condition of this formation.

The Gothic Hill Member is the basal member of the Lockport Group, which consists of a dark grey, fine grained dolostone that includes interbedded crinoidal packstone lenses, rip-up clasts and shale partings. The basal contact with the underlying Decew Foundation of the Clinton Group represents a sharp erosional unconformity. The RQD ranges from 76-100, which indicates fairly massive conditions.

The upper contact of the Gothic Hill Member with the Pekin Member is sharp and conformable. The Pekin Member is a dark grey, fine grained dolostone that is slightly fossiferous with shale partings. The upper contact of the Pekin Member with the overlying Niagara Falls Member of the Goat Island Formation conformably grades into coarser grained dolostones. The RQD ranges from 78-96, which indicates fairly massive conditions.

The Niagara Falls Member is the basal member of the Goat Island Formation, which consists of blue-grey medium to coarse grained porous to vuggy dolostone that is abundantly fossiliferous with crindoids and cladoporids. The RQD ranges from 44-100 which defines a fractured rock.

The Niagara Falls Member is conformably overlain by the Ancaster Member, which consists of dark grey fine grained dolostone that is highly fossiliferous with favosidid coral. Irregular bedding and bioturbation was observed. The Ancaster Member represents the top of rock throughout most of the Site. The RQD ranges from 40-100 that defines a fractured rock.

6.2.3 Top of Rock

Fractures exist in all rock units, however, they are more prevalent in the Niagara Falls and Ancaster Members of the Goat Island Formation. Top of rock is more weathered and fractured on the eastern areas of the Site near monitoring well clusters MW-3, MW-8, MW-11, while the western side of the Site is more massive and less fractured.

The top of rock surface that has been contoured and presented on Figure 6.7 appears to be channeled into a lower lying area located to the northwest of the Site. This top of rock depression correlates well with the location of the largest number of drums removed from the Site (refer to Figures 4.2 through 4.4).

TABLE 6.1

Page 1 of 3

SUMMARY OF OVERBURDEN SOILS STRATIGRAPHY
MONITORING WELL BORINGS

			OVERBURDEN SOILS												
			Surficial Soils		Lacustrine			Upper Till			Lower Till				
														Top-of-Rock	
Boring	Ground Elevation	Total Depth	Depth Range	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth	Elevation
MW 1I	624.4'	27.5'	0-4.6'	4.6'	4.6-8.0'	619.8'	3.4'	8.0-10.3'	616.4'	2.3'	10.3-22.5'	614.1'	12.2'	22.5'	601.9'
MW 1D	624.9'	52.5'	0-4.0'	4.0'	4.0-7.0'	620.9'	3.0'	7.0-10.0'	617.9'	3.0'	10.0-22.5'	614.9'	12.5'	22.5'	602.4'
MW 2I	621.8'	20.0'	0-4.0'	4.0'				4.0-8.0'	617.8'	4.0'	8.0-15.1'	613.9'	7.1'	15.1'	606.7'
MW 2D	622.3'	45.2'	0-4.0'	4.0'				4.0-10.0'	618.3'	6.0'	10.0-15.2'	612.3'	5.2'	15.2'	607.1'
MW 3I	620.0'	17.2'	0-0.6'	0.6'	0.6-2.0'	619.4'	1.4'	2.0-8.0'	618.0'	6.0'	8.0-15.6'	612.0'	7.6'	15.6'	604.4'
MW 3D	620.6'	46.1'	0-4.0'	4.0'	4.0-6.0'	616.7'	2.0'	6.0-10.5'	614.6'	4.5'	10.5-16.0'	610.1'	5.5'	16.0'	604.6'
MW 4I	636.0'	27.7'	0-8.0'	8.0'				8.0-14.8'	628.0'	6.8'	14.8-27.1'	621.2'	12.3'	27.1'	608.9'
MW 5I	651.9'	41.8'	0-6.4'	6.4'				6.4-19.1'	645.5'	12.7'	19.1-36.8'	632.8'	17.7'	36.8'	615.1'
MW 5D	652.0'	67.5	0-6.0'	6.0'				6.0-19.0'	646.0'	13.0'	19.0-37.2'	633.0'	18.2'	37.2'	614.8'
MW 6S	622.6'	12.0'	0-2.0'	2.0'	2.0-6.5'	620.6'	4.5'	6.5-10.0'	616.1'	3.5'	10.0-12.0'	612.6'	2.0'		
MW 6I	623.0	22.0'	0-2.0'	2.0'	2.0-4.0	621.0'	2.0'	4.0-9.5'	619.0'	5.5'	9.5-20.5'	613.5'	11.0'	20.5'	602.5'
MW 7S	622.2'	13.1'	0-2.0'	2.0'				2.0-8.3'	620.2'	6.3'	8.3-13.1'	613.9'	4.8'		
MW 8S	623.1'	14.0'	0-2.1'	2.1'				2.1-9.0'	621.0'	6.9'	9.0-14.0'	614.1'	5.0'		
MW 8D	623.5'	46.0'	0-0.5'	0.5'	0.5-4.0'	623.0'	3.5'	4.0-9.0'	619.5'	5.0'	9.0-16.2'	614.5'	7.2'	16.2'	607.3'
MW 9I	621.2'	24.3'									8.5-22.3'	612.7'	13.8'	22.3'	598.9'
MW 9D	621.6'	50.0'	0-4.0'	4.0'				4.0-8.5'	617.6'	4.5'	8.5-20.0'	613.1'	11.5'	20.0'	601.6'
MW 10S	619.2'	12.5'	0-2.0'	2.0'	2.0-9.0'	617.2'	7.0'				9.0-12.5'	610.5'	3.5'		
MW 10I	618.9'	16.2'												14.0'	604.9'
MW 10D	619.0'	47.0'	0-2.0'	2.0'	2.0-7.5'	617.0'	5.5'				7.5-17.0'	611.5'	9.5'	17.0'	602.0'
MW 11I	619.2'	13.5'	0-1.5'	1.5'	1.5-6.0'	617.7'	4.5'	6.0-8.0'	613.2'	2.0'	8.0-11.5'	611.2'	3.5'	11.5'	607.7'
MW 11D	619.2'	39.0'												9.5'	609.7'
MW 12I	619.0'	21.0'												18.0'	601.0'
MW 12D	618.7'	47.5'	0-3.5'	3.5'	3.5-6.0'	615.2'	2.5'				6.0-17.5'	612.7'	11.5'	17.5'	601.2'
MW 13S	618.9'	14.5'													
MW 13I	618.9'	19.0'	0-1.5'	1.5'	1.5-8.0'	617.4'	6.5'				8.0-16.8'	610.9'	8.8'	16.8'	602.1'
MW 14I	619.5'	18.5'	0-2.0'	2.0'	2.0-2.5'	617.5'	0.5'	2.5-8.0'	617.0'	5.5'	8.0-16.5'	611.5'	8.5'	16.5'	603.0'

TABLE 6.1

Page 2 of 3

SUMMARY OF OVERBURDEN SOILS STRATIGRAPHY LANDFILL BORINGS

			OVERBURDEN SOILS											
			Common Fill			Clay Cap			Landfill			Surficial Soils		
Boring	Ground Elevation	Total Depth	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness
B-1	633.48'	22.5'	0.0-4.0'		4.0'							4.0-6.0'	629.48'	2.0'
B-2	630.21'	26.0'	0.0-2.0'		2.0'	2.0-4.0'	628.21'	2.0'	6.0-8.0'	624.21'	2.0'			
			4.0-6.0'	626.21'	2.0'									
B-3	632.35'	23.5'	0.0-2.0'		2.0'				2.0-8.0'	630.35'	6.0'			
B-4	628.91'	24.4'	0.0-2.0'		2.0'				2.0-8.0'	626.91'	6.0'	8-11.5'	620.91'	3.5'
B-5	630.54'	20.0'	0.0-2.0'		2.0'	2.0-2.5'	628.54'	0.5'						
			2.5-7.5'	628.04'	5.0'									
B-6	628.61'	24.2'	0.0-2.0'		2.0'	2.0-3.0'	626.61'	1.0'				7.5-10.0'	621.11'	2.5'
			3.0-7.5'	625.61'	4.5'									
B-7	627.47'	25.7'	0.0-1.0'		1.0'	1.0-2.8'	626.47'	1.8'						
			2.8-7.0'	624.67'	4.2'									
B-8	629.36'	25.1'	0.0-4.0'		4.0'				4.0-8.0'	625.36'	4.0'			
B-9	628.13'	25.6'	0.0-2.0'		2.0'	2.0-3.0'	626.13'	1.0'						
			3.0-7.5'	625.13'	4.5'									
B-10	626.95'	25.5'	0.0-2.0'		2.0'	2.0-3.0'	624.95'	1.0'						
			3.0-10.0'	623.95'	7.0'									
B-11	627.93'	25.4'	0.0-0.6'		0.6'	0.6-2.0'	627.33'	1.4'						
			2.0-8.5'	625.93'	6.5'									
B-12	625.77'	22.6'	0.0-8.0'		8.0'									
B-13	625.88'	21.0'	0.0-0.6'		0.6'	0.6-2.0'	625.28'	1.4'						
			2.0-5.5'	623.88'	3.5'									
B-14	626.96'	21.5'	0.0-0.5'		0.5'	0.5-2.0'	626.46'	1.5'						
			2.0-7.5'	624.96'	5.5'									
B-15	625.56'	22.5'	0.0-2.0'		2.0'				2.0-8.0'	623.56'	6.0'			
B-16	625.56'	23.0'	0.0-6.0'		6.0'									
B-17	626.70'	22.2'	0.0-6.0'		6.0'									
B-18	625.90'	10.0'	0.0-6.0'		6.0'									
B-19	628.37'	10.5'	0.0-0.5'		0.5'				0.5-6.0'	627.87'	5.5'	6.0-8.0'	622.37'	2.0'
B-20	630.31'	15.0'	0.0-4.0'		4.0'				4.0-6.0'	626.31'	2.0'			

TABLE 6.1

Page 3 of 3

SUMMARY OF OVERBURDEN SOILS STRATIGRAPHY
LANDFILL BORINGS

			OVERBURDEN SOILS										
			Lacustrine			Upper Till			Lower Till			Bedrock	
Boring	Ground Elevation	Total Depth	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Top-of-Bedrock Depth	Elevation
B-1	633.48'	22.5'				6.0-16.0'	627.48'	10.0'	16-22.5'	617.48'	6.5'	22.5'	610.98'
B-2	630.21'	26.0'	8.0-13.0'	622.21'	5.0'	13.0-20.0'	617.21'	7.0'	20.0-26.0'	610.21'	6.0'	26.0'	604.21'
B-3	632.35'	23.5'				8.0-16.3'	624.35'	8.3'	16.3-23.5'	616.05'	7.2'	23.5'	608.85'
B-4	628.91'	24.4'	11.5-16.0'	617.41'	4.5'	16.0-22.0'	612.91'	6.0'	22.0-24.4'	606.91'	2.4'	24.4'	604.51'
B-5	630.54'	20.0'	7.5-12.3'	623.04'	4.8'	12.3-17.0'	618.24'	4.7'	17.0-20.0'	613.54'	3.0'	20.0'	610.54'
B-6	628.61'	24.2'	10.0-16.0'	618.61'	6.0'	16.0-22.0'	612.61'	6.0'	22.0-24.2'	606.61'	2.2'	24.2'	604.41'
B-7	627.47'	25.7'	7.0-14.0'	620.47'	7.0'	14.0-22.0'	613.47'	8.0'	22.0-25.7'	605.47'	3.7'	25.7'	601.77'
B-8	629.36'	25.1'	8.0-14.5'	621.36'	6.5'	14.5-22.0'	614.86'	7.5'	22.0-25.1'	607.36'	3.1'	25.1'	604.26'
B-9	628.13'	25.6'	7.5-10.0'	620.63'	2.5'	10.0-16.0'	618.13'	6.0'	16.0-25.6'	612.13'	9.6'	25.6'	602.53'
B-10	626.95'	25.5'				10.0-20.0'	616.95'	10.0'	20.0-25.5'	606.95'	5.5'	25.5'	601.45'
B-11	627.93'	25.4'				8.5-14.0'	619.43'	5.5'	14.0-25.4'	613.93'	11.4'	25.4'	602.53'
B-12	625.77'	22.6'				8.0-16.0'	617.77'	8.0'	16.0-22.6'	609.77'	6.6'	22.6'	603.17'
B-13	625.88'	21.0'				5.5-14.0'	620.38'	8.5'	14.0-21.0'	611.88'	7.0'	21.0'	604.88'
B-14	626.96'	21.5'				7.5-12.0'	619.46'	4.5'	12.0-21.5'	614.96'	9.5'	21.5'	605.46'
B-15	625.56'	22.5'	8.0-10.0'	617.56'	2.0'	10.0-18.0'	615.56'	8.0'	18.0-22.5'	607.56'	4.5'	22.5'	603.06'
B-16	625.56'	23.0'	6.0-8.0'	619.56'	2.0'	8.0-16.0'	617.56'	8.0'	16.0-23.0	609.56'	7.0'	23.0'	602.56'
B-17	626.70'	22.2'	6.0-9.0'	620.70'	3.0'	9.0-?	No Recovery		?-?	No Recovery		22.2'	604.50'
B-18	625.90'	10.0'	6.0-8.0'	619.90'	2.0'	8.0-10.0'	617.90'	2.0'		Refusal			
B-19	628.37'	10.5'	8.0-10.5'	620.37'	2.5'		Refusal						
B-20	630.31'	15.0'	6.0-8.0'	624.31'	2.0'	8.0-15'	622.31'	5.0'		Refusal			

TABLE 6.2

Page 1 of 2

SUMMARY OF BEDROCK BORING STRATIGRAPHY

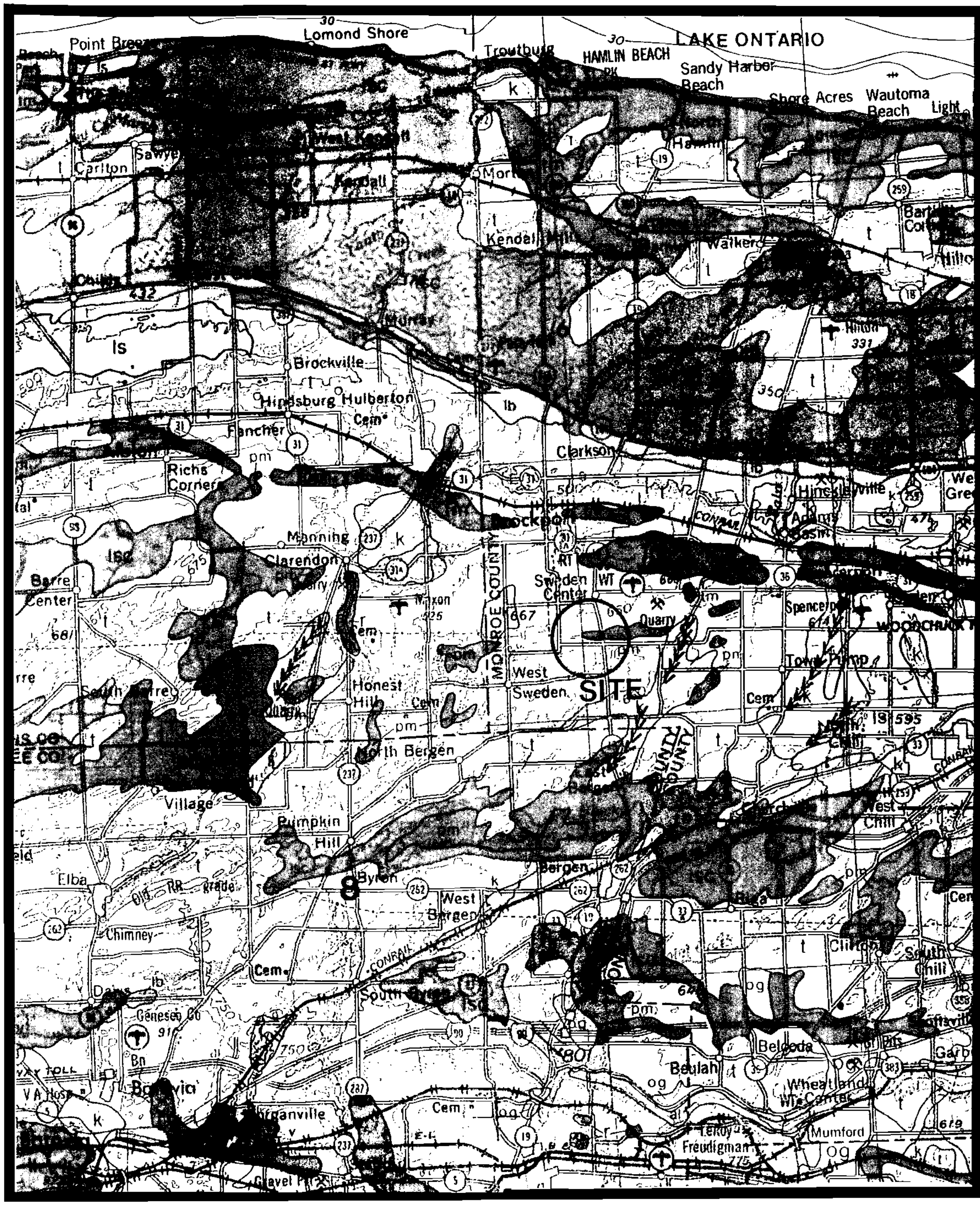
			LOCKPORT GROUP											
			Eramosa Formation			Goat Island Formation								
						Vinemount Member			Ancaster Member			Niagara Falls Member		
Boring	Ground Elevation	Total Depth	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness
MW 1 I	624.4'	27.5'												
MW 1D	624.9'	52.5'							22.5-26.5'	602.4'	4.0'	26.5-28.4'	598.4'	1.9'
MW 2 I	621.8'	20.0'												
MW 2 D	622.3'	45.2'							15.2-16.4'	607.1'	1.2'	16.4-26.7'	605.9'	10.3'
MW 3 I	620.0'	17.2'												
MW 3 D	620.6'	46.1'							16.0-19.5'	604.6'	3.5'	19.5-25.4'	601.1'	5.9'
MW 4 I	636.0'	27.7'												
MW 5 I	651.9'	41.8'												
MW 5 D	652.0'	67.5	37.2-43.0'	614.8'	5.8'	43.0-45.1'	609.0'	2.1'	45.1-57.0'	606.9'	11.9'	57.0-63.0'	595.0'	6.0'
MW 6 S	622.6'	12.0'												
MW 6 I	623.0'	22.0'							20.5-?	602.5'				
MW 7 S	622.2'	13.1'												
MW 8 S	623.1'	14.0'												
MW 8 D	623.5'	46.0'							16.2-22.3'	607.3'	6.1'	22.3-26.3'	601.2'	4.0'
MW 9 I	621.2'	24.3'										22.3-?	598.9'	
MW 9 D	621.6'	50.0'							20.0-22.0'	601.6'	2.0'	22.0-28.9'	599.6'	6.9'
MW 10 I	618.9'	16.2'										14.0-?	604.9'	
MW 10 D	619.0'	47.0'										17.0-20.3'	602.0'	3.3'
MW 11 I	619.2'	13.5'							11.5-?	607.7'				
MW 11 D	619.2'	39.0'							9.5-12.8'	609.7'	3.3'	12.8-24.0'	606.4'	11.2'
MW 12 I	619.0'	21.0'										18.0-19.0'	601.0'	1.0'
MW 12 D	618.7'	47.5'										17.5-18.5'	601.2'	1.0'

TABLE 6.2

Page 2 of 2

SUMMARY OF BEDROCK BORING STRATIGRAPHY

			LOCKPORT GROUP (continue)						CLINTON GROUP		
			Gasport Formation						Decew Formation		
			Pekin Member			Gothic Hill Member					
Boring	Ground Elevation	Total Depth	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness	Depth Range	Elevation of Top of Unit	Thickness
MW 1 I	624.4'	27.5'									
MW 1 D	624.9'	52.5'	28.4-41.4'	596.5'	13.0'	41.4-47.5'	583.5'	6.1'	47.5-52.5'	577.4'	5.0'
MW 2 I	621.8'	20.0'									
MW 2 D	622.3'	45.2'	26.7-35.1'	595.6'	8.4'	35.1-40.4'	587.2'	5.3'	40.4-45.2'	581.9'	4.8'
MW 3 I	620.0'	17.2'									
MW 3 D	620.6'	46.1'	25.4-35.5'	595.2'	10.1'	35.5-37.0'	585.1'	1.5'	37.0-46.1'	583.6	9.1'
MW 4 I	636.0'	27.7'									
MW 5 I	651.9'	41.8'									
MW 5 D	652.0'	67.5	63.0-67.5'	589.0'	4.5'						
MW 6 S	622.6'	12.0'									
MW 6 I	623.0'	22.0'									
MW 7 S	622.2'	13.1'									
MW 8 S	623.1'	14.0'									
MW 8 D	623.5'	46.0'	26.3'	597.2'							
MW 9 I	621.2'	24.3'									
MW 9 D	621.6'	50.0'	28.9-37.3'	592.7'	8.4'	37.3-42.8'	584.3'	5.5'	42.8-50.0'	578.8'	7.2'
MW 10 I	618.9'	16.2'									
MW 10 D	619.0'	47.0'	20.3-25.6'	598.7'	5.3'	25.6-34.0'	593.4'	8.4'	34.0-47.0'	585.0'	13.0'
MW 11 I	619.2'	13.5'									
MW 11 D	619.2'	39.0'	24.0-34.8	595.2'	10.8'	34.8-39.0'	584.4'	4.2'			
MW 12 I	619.0'	21.0'	19.0- ?	600.0'							
MW 12 D	618.7'	47.5'	18.5-28.0'	600.2'	9.5'	28.0-34.5'	590.7'	6.5'	34.5-47.5'	584.2'	13.5'



EXPLANATION

pm - Swamp deposits

lb - Lacustrine beach

lsc - Lacustrine silt and clay

ls - Lacustrine sand

og - Outwash sand and gravel

k - Kame deposits

tm - Till moraine

t - Till

r - Bedrock

Bedrock stipple overprint
Bedrock may be within 1-3 meters of surface

MAP SYMBOLS

Glacial meltwater channel

Esker

Cadwell,D.H. 1988. Surficial Geologic Map of New York, Niagara Sheet
Map and Chart Series Number 40: N.Y.S. Museum-Geologic Survey

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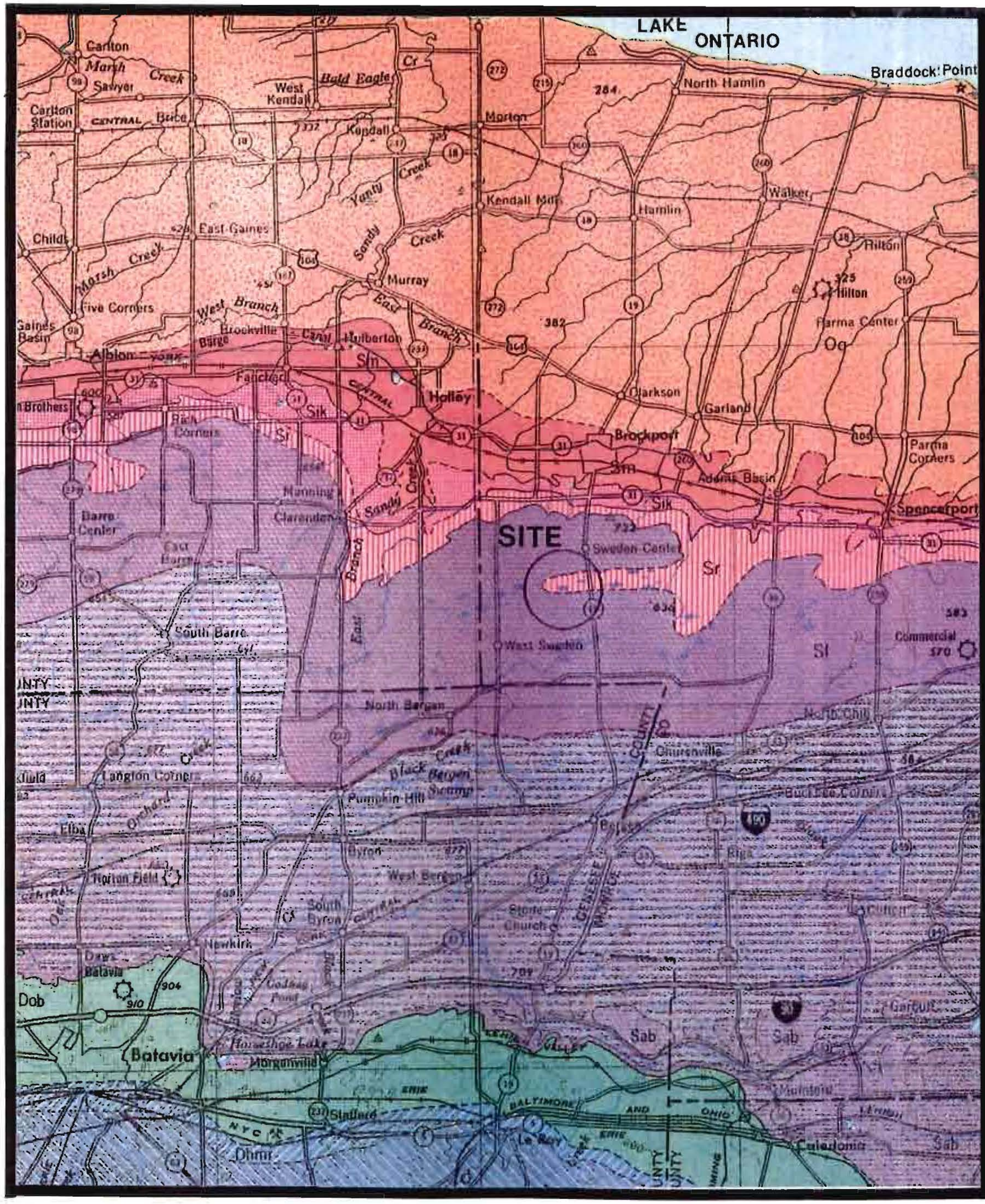
REGIONAL SURFICIAL GEOLOGY MAP
NYS DEPARTMENT OF
ENVIRONMENTAL CONSERVATION

PROJECT NO. 40296-00150

SCALE: 1:250000

August 1992

FIGURE NO. 6.1



LEGEND

HAMILTON GROUP
200-500 ft. (60-150 m.)

Dhmo	Moscow Formation—Windom and Kashong Shales, Menteth Limestone Members.
Dhld	Ludlowville Formation—Deep Run Shale, Tichenor Limestone, Wanakah and Ledyard Shales, Centerfield Limestone Members.
Dhsk	Skaneateles Formation—Levanna Shale, Stafford Limestone Members.
Dhmr	Marcellus Formation—Oatka Creek Shale Member.

ONONDAGA AND BOIS BLANC LIMESTONES
150 ft. (45 m.)

Dob	In New York: Onondaga Limestone—Seneca, Morehouse (cherty), and Clarence Limestone Members, Edgecliff cherty Limestone Member, local coral bioherms; Bois Blanc Limestone—sandy, thin, discontinuous.
Do	Oriskany Sandstone.

AKRON DOLOSTONE AND SALINA GROUP
400-700 ft. (120-210 m.)

Sab	Akron Dolostone; Bertie Formation—dolostone, shale.
Scv	Camillus, Syracuse, and Vernon Formations—shale, dolostone, salt, and gypsum.

LOCKPORT GROUP
150-200 ft. (45-60 m.)

Sl	Guelph, Oak Orchard, Eramosa, and Goat Island Dolostones; Gasport Limestone—local bioherms.

CLINTON GROUP
100-150 ft. (30-45 m.)

Scl	Decew Dolostone; Rochester Shale; Irondequoit and Merriton Limestones.
Sr	Decew Dolostone, Rochester Shale.
Sik	Irondequoit Limestone; Rockway Dolostone; Hickory Corners Limestone; Neahga Shale; Kodak Sandstone.

MEDINA GROUP AND QUEENSTON FORMATION
800 ft. (250 m.)

Sm	Thorold Sandstone; Grimsby Formation—sandstone, shale; Power Glen and Cabot Head Shales; Whirlpool Sandstone.
Oq	Queenston Shale.

Rickard, L.V.,Fisher, D.W. 1970. Geologic Map of New York, Niagara Sheet. Map and Chart Series Number 15: N.Y.S. Museum and Science Service

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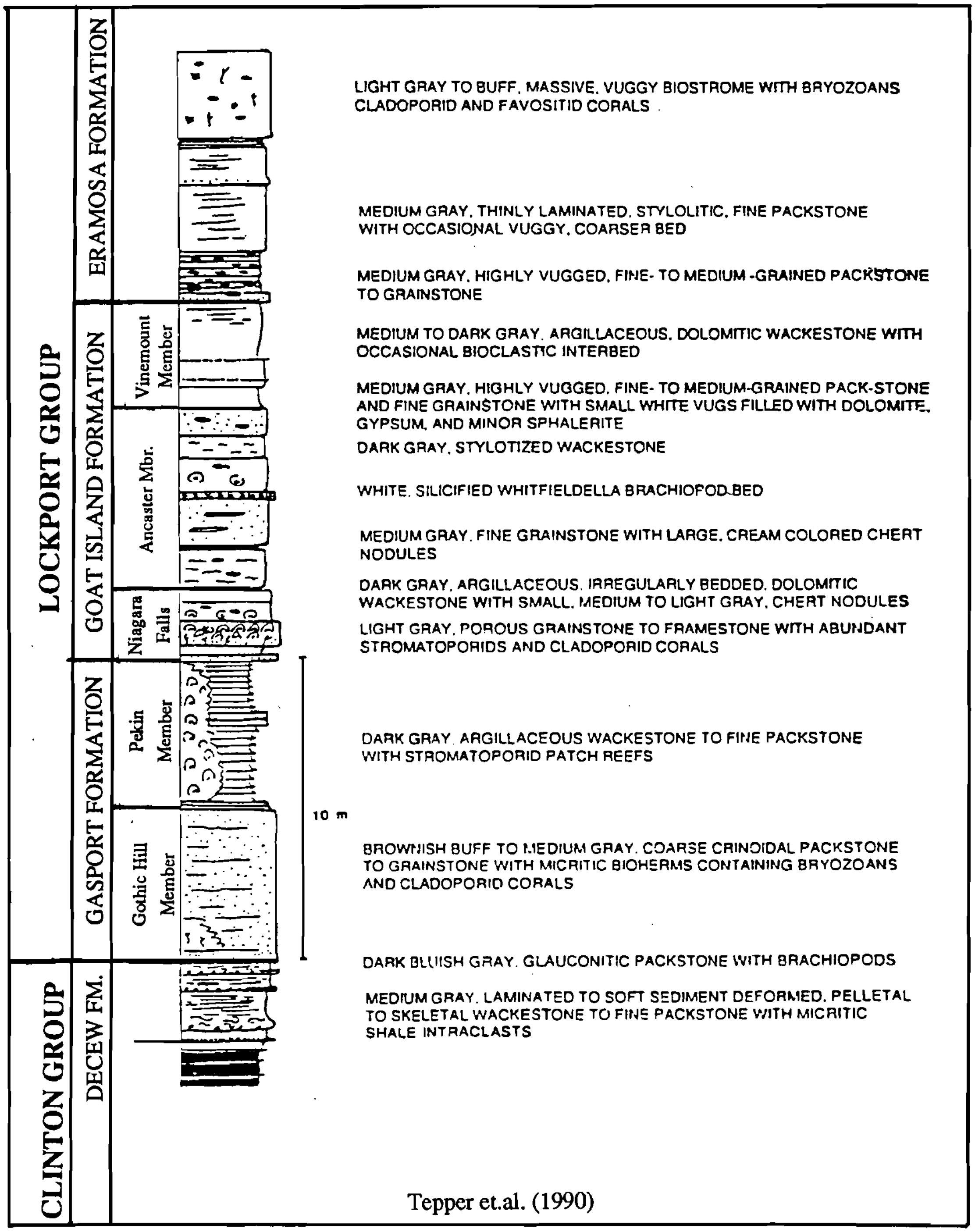
REGIONAL BEDROCK GEOLOGY MAP NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION

PROJECT NO. 40296-00150

SCALE: 1:250000 | August 1992 | FIGURE NO. 6.2



LIGHT GRAY TO BUFF, MASSIVE, VUGGY BIOSTROME WITH BRYOZOANS CLADOPORID AND FAVOSITID CORALS

MEDIUM GRAY, THINLY LAMINATED, STYLOLITIC, FINE PACKSTONE WITH OCCASIONAL VUGGY, COARSER BED

MEDIUM GRAY, HIGHLY VUGGED, FINE- TO MEDIUM -GRAINED PACKSTONE TO GRAINSTONE

MEDIUM TO DARK GRAY, ARGILLACEOUS, DOLOMITIC WACKESTONE WITH OCCASIONAL BIOCLASTIC INTERBED

MEDIUM GRAY, HIGHLY VUGGED, FINE- TO MEDIUM-GRAINED PACK-STONE AND FINE GRAINSTONE WITH SMALL WHITE VUGS FILLED WITH DOLOMITE, GYPSUM, AND MINOR SPHALERITE

DARK GRAY, STYLOTIZED WACKESTONE

WHITE, SILICIFIED WHITFIELDELLA BRACHIOPOD BED

MEDIUM GRAY, FINE GRAINSTONE WITH LARGE, CREAM COLORED CHERT NODULES

DARK GRAY, ARGILLACEOUS, IRREGULARLY BEDDED, DOLOMITIC WACKESTONE WITH SMALL, MEDIUM TO LIGHT GRAY, CHERT NODULES

LIGHT GRAY, POROUS GRAINSTONE TO FRAMESTONE WITH ABUNDANT STROMATOPORIDS AND CLADOPORID CORALS

DARK GRAY, ARGILLACEOUS WACKESTONE TO FINE PACKSTONE WITH STROMATOPORID PATCH REEFS

BROWNISH BUFF TO MEDIUM GRAY, COARSE CRINOIDAL PACKSTONE TO GRAINSTONE WITH MICRITIC BIOHERMS CONTAINING BRYOZOANS AND CLADOPORID CORALS

DARK BLUISH GRAY, GLAUCONITIC PACKSTONE WITH BRACHIOPODS

MEDIUM GRAY, LAMINATED TO SOFT SEDIMENT DEFORMED, PELLETAL TO SKELETAL WACKESTONE TO FINE PACKSTONE WITH MICRITIC SHALE INTRACLASTS

Tepper et.al. (1990)

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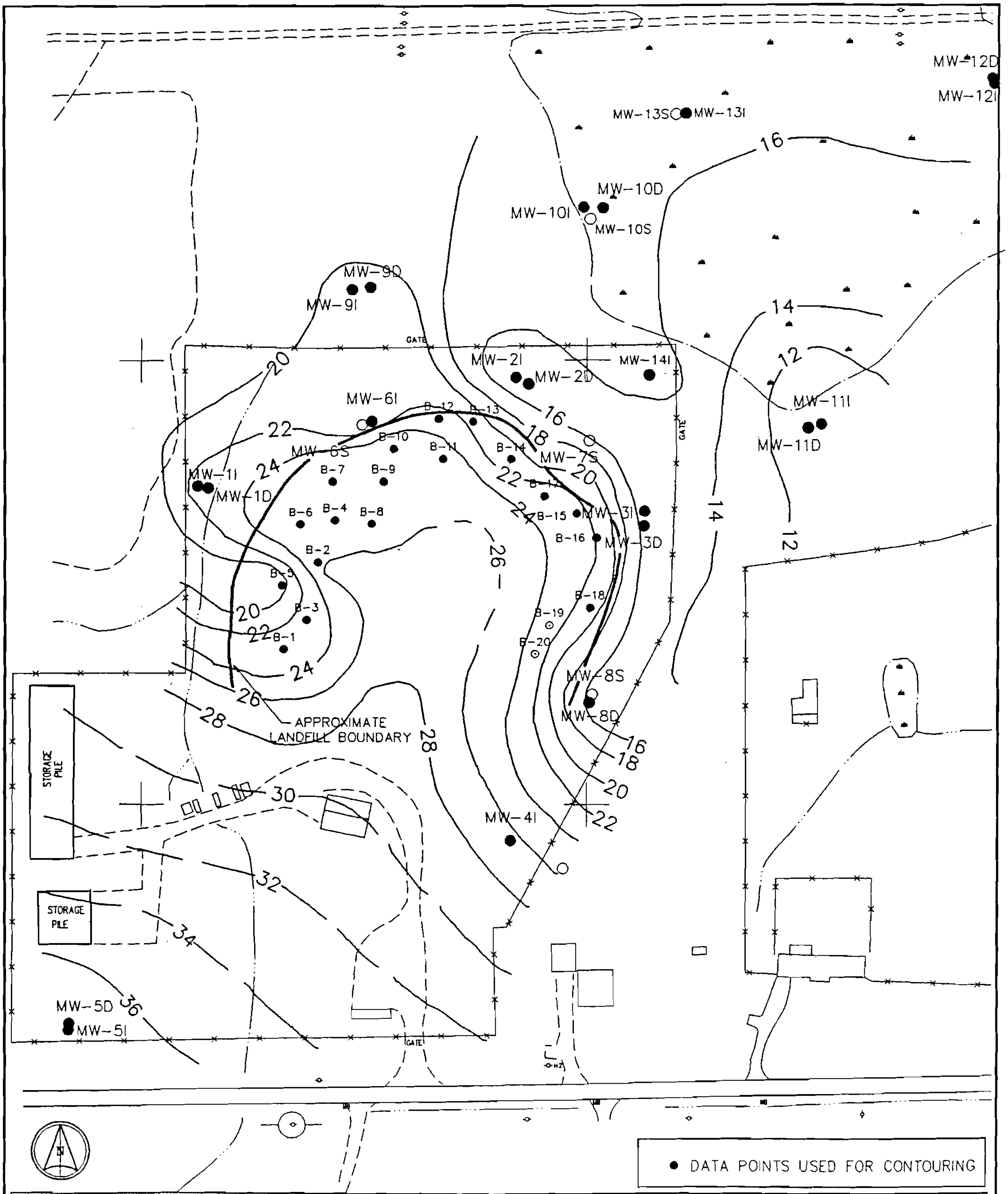
SITE STRATIGRAPHIC COLUMN
SWEDEN-3 CHAPMAN SITE

PROJECT NO. 40296-00150	DATE AUG. 1992	DWG. NO. 9186_R	SCALE	FIGURE NO. 6.3



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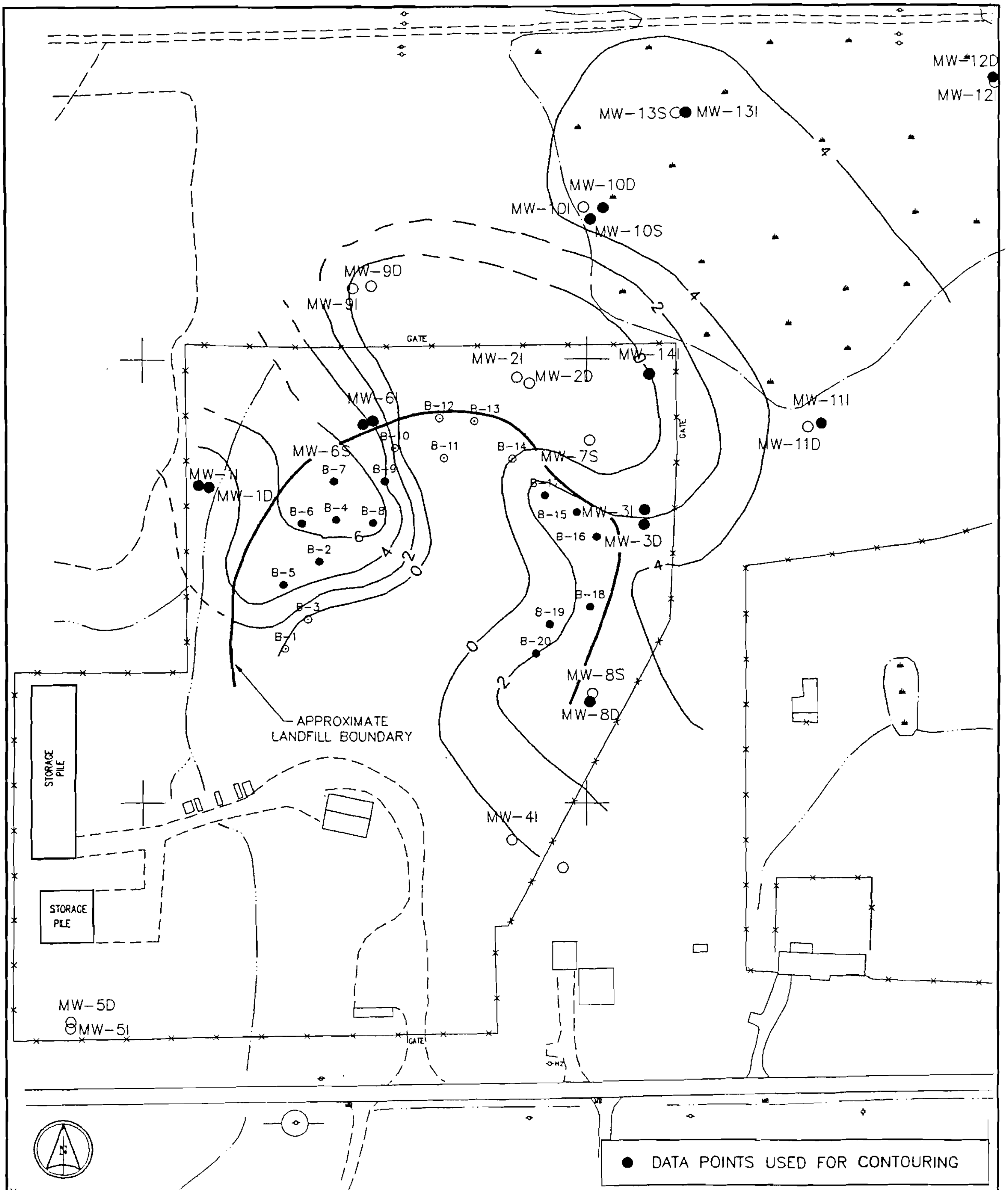
OVERBURDEN THICKNESS MAP

SWEDEN-3 – CHAPMAN SITE

PROJECT NO. 40296-150	DATE March, 1993	DWG. NO. R9182_9	SCALE 1"=150'	FIGURE NO. 6.4



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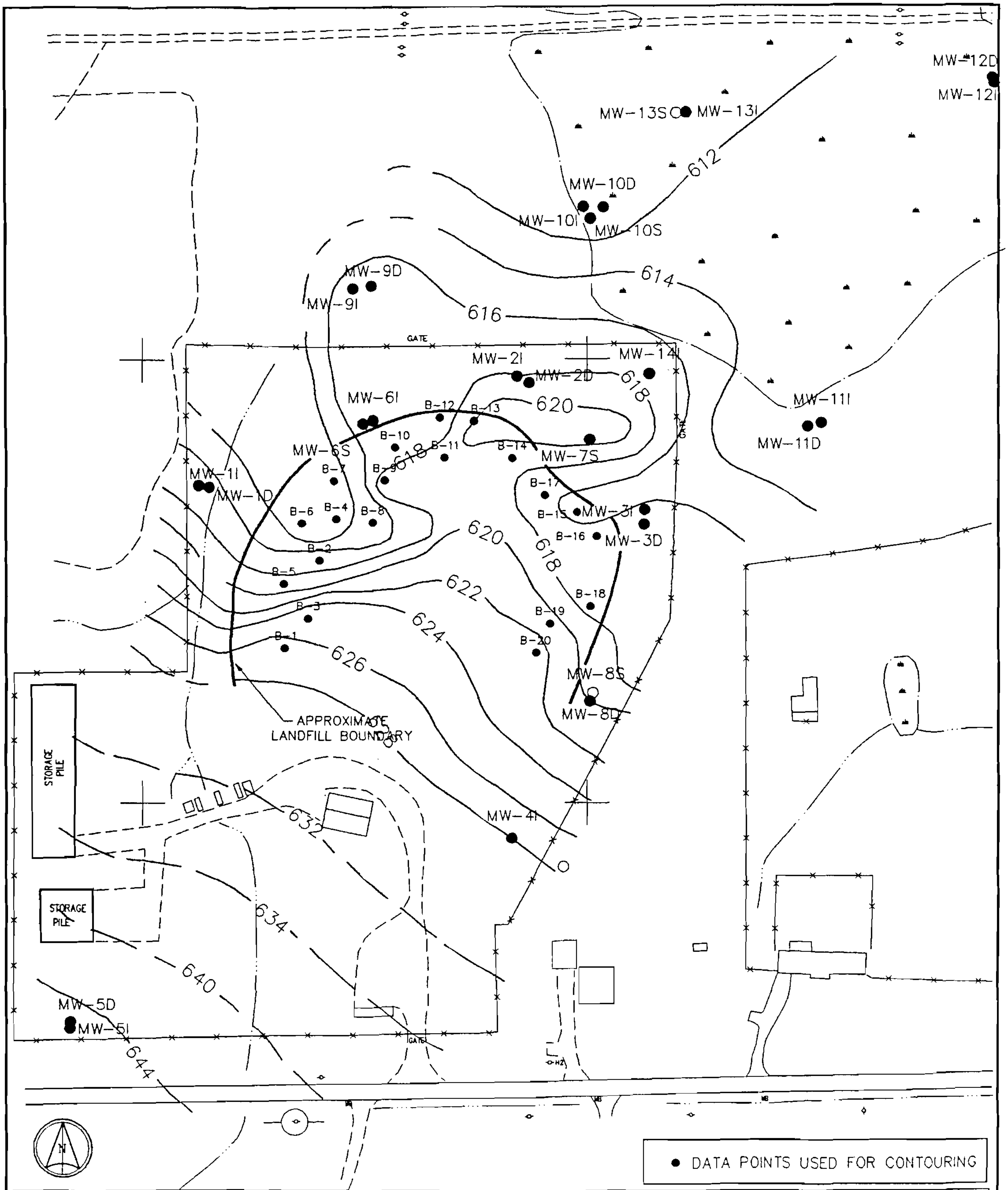
LACUSTRINE THICKNESS MAP

SWEDEN-3 – CHAPMAN SITE

PROJECT NO. 40296-150	DATE March, 1993	DWG. NO. R9182_9	SCALE 1"=150'	FIGURE NO **6.5**



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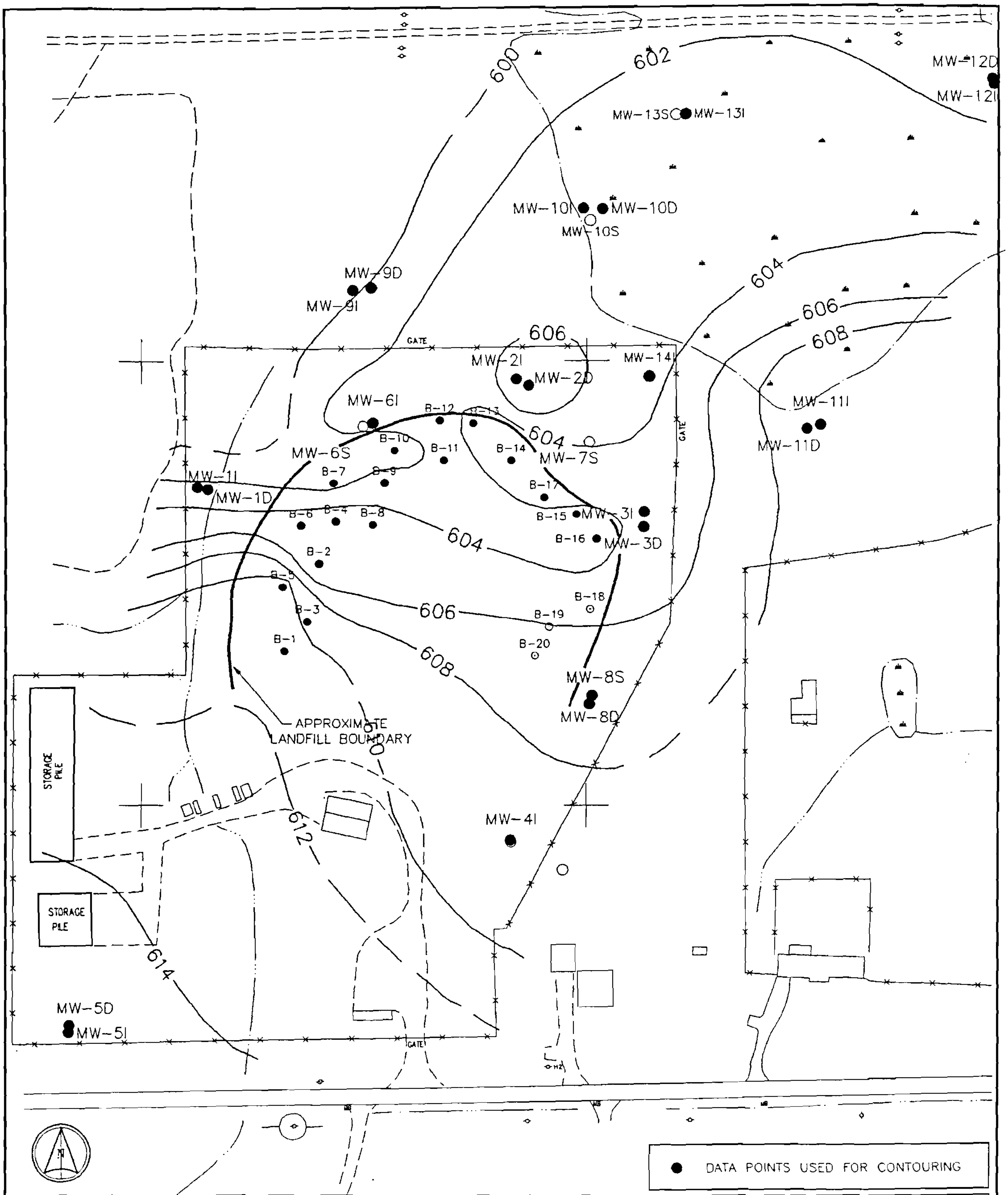
TOP OF TILL CONTOUR MAP

SWEDEN-3 – CHAPMAN SITE

PROJECT NO. 40296-150	DATE March, 1993	DWG. NO. R9182_9	SCALE 1"=150'	FIGURE NO. **6.6**



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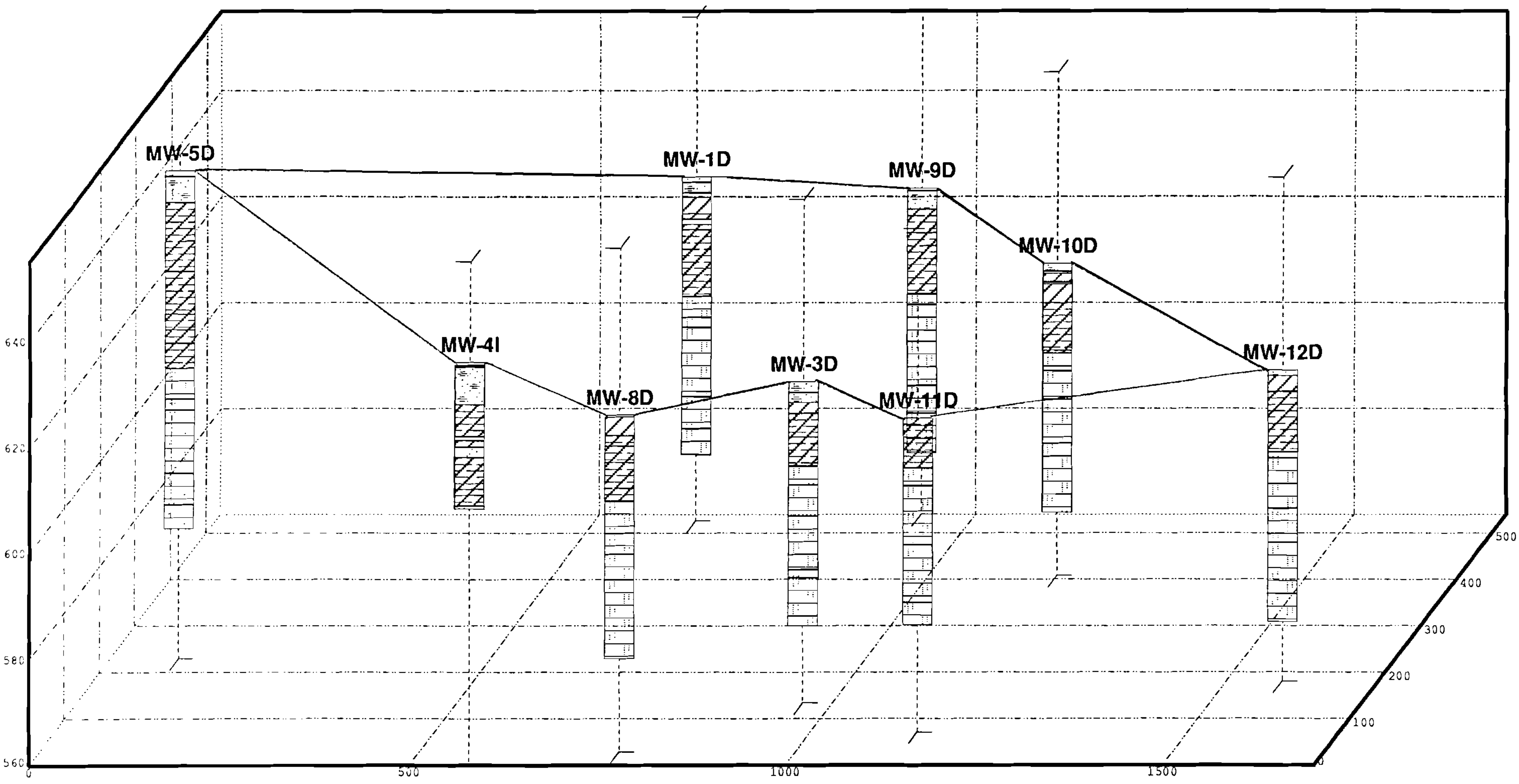
TOP OF BEDROCK CONTOUR MAP

SWEDEN-3 – CHAPMAN SITE

PROJECT NO. 40296-150	DATE March, 1992	DWG. NO R9182_9	SCALE 1"=150'	FIGURE NO **6.7**



SITE 3D FENCE DIAGRAM

SWEDEN-3 CHAPMAN SITE
NYS DEPT. of ENV. CONSERVATION

WK.ASSIGN.#	DATE	FIGURE
D002520-14	December 1992	6.8

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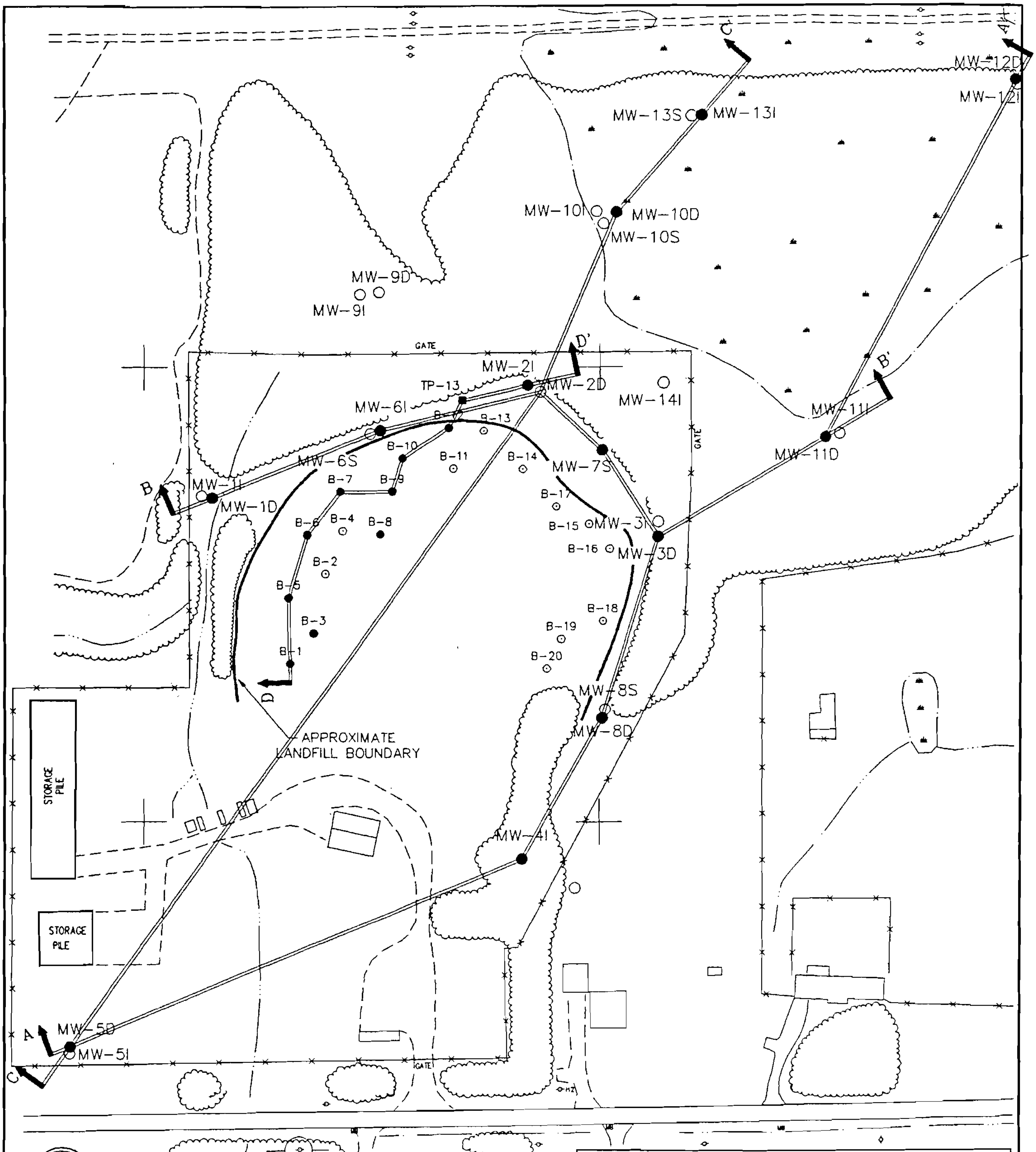
Scale

Vertical: Elevation MSL(feet)
Horizontal: Section Length(feet)



■ TEST PIT USED IN CROSS-SECTION
● SOIL BORING USED IN CROSS-SECTION
● MONITORING WELL USED IN CROSS-SECTION

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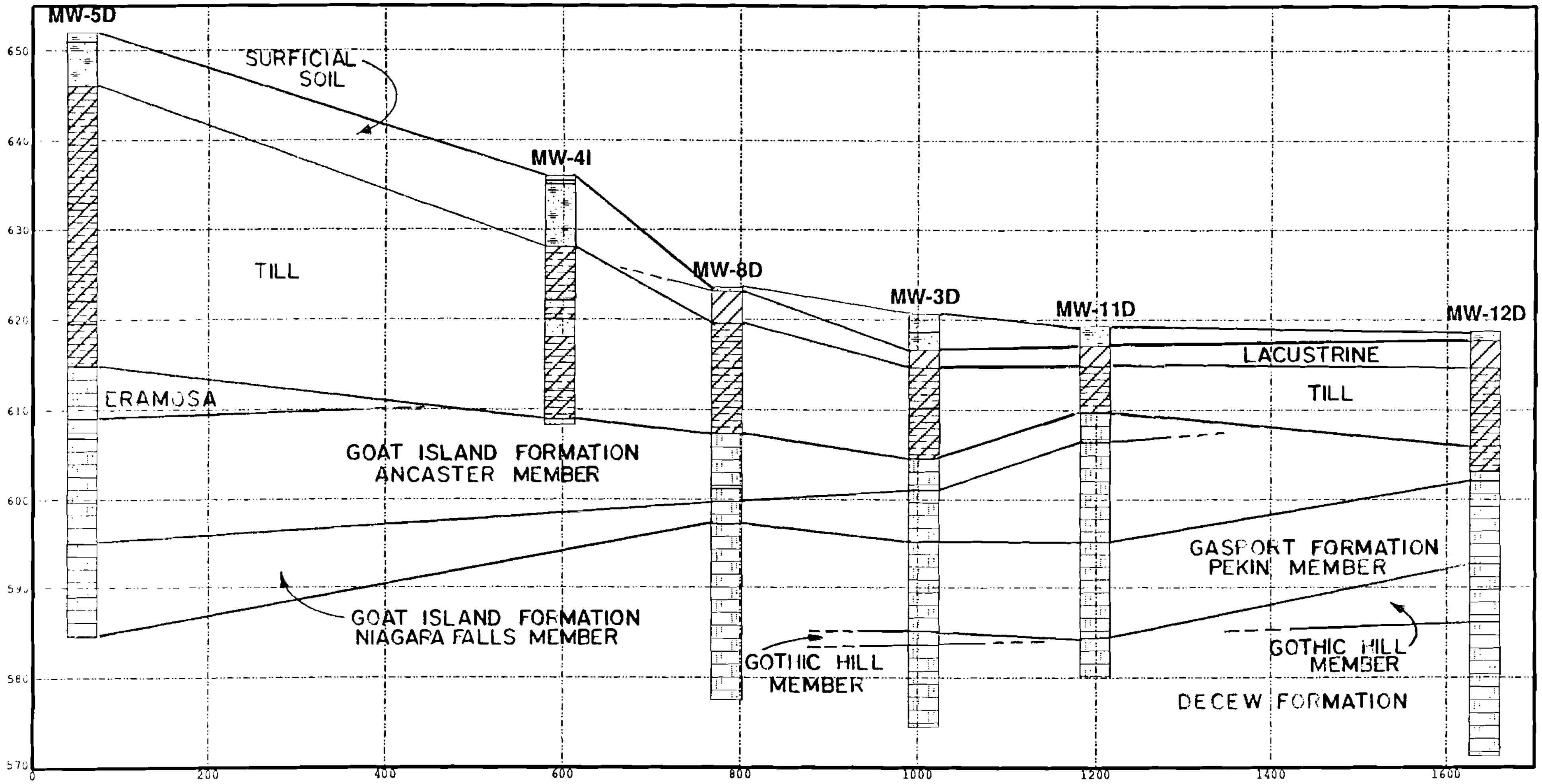
WORK ASSIGNMENT No. D-2520-14

GEOLOGIC SECTION LOCATION MAP

SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE March., 1992	DWG. NO. R9182_9	SCALE 1"=150'	FIGURE NO. **6.9**



CROSS SECTION A-A'

SWEDEN-3 CHAPMAN SITE
NYS DEPT. of ENV. CONSERVATION

WK.ASSIGN.#	DATE	FIGURE
D002520-14	December 1992	69A

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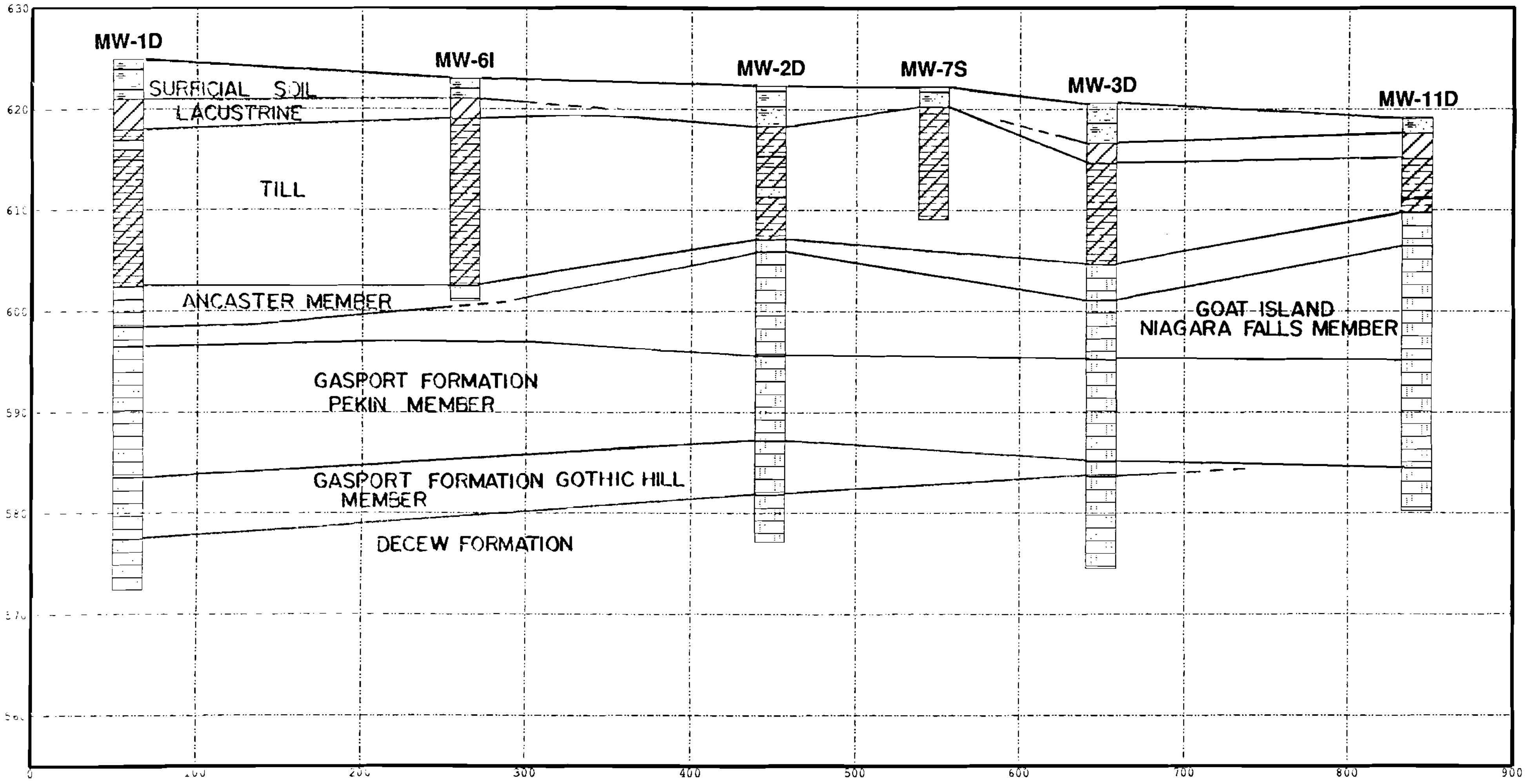
Scale

Vertical: Elevation MSL(feet)
Horizontal: Section Length(feet)



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Scale

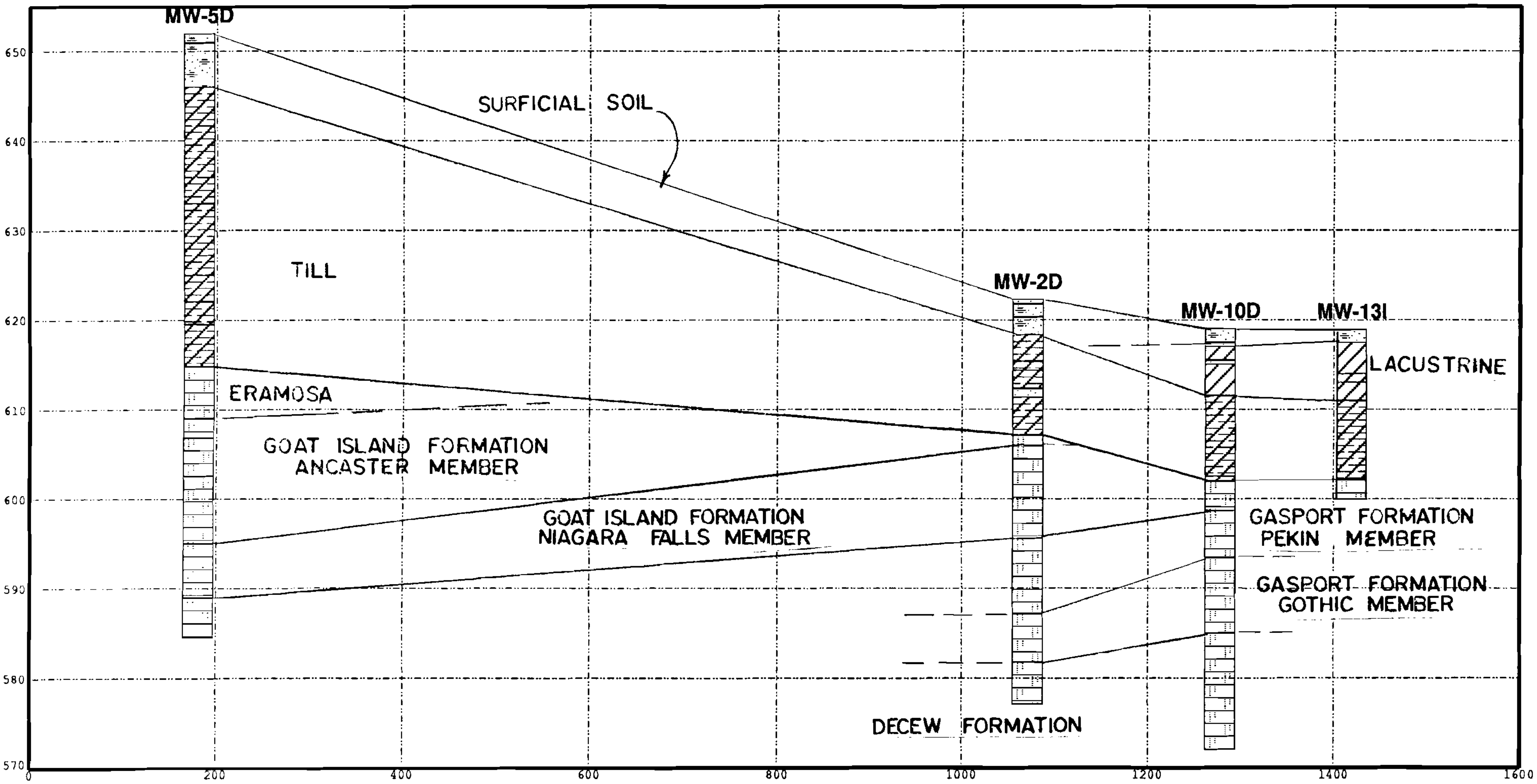
Vertical: Elevation MSL(feet)

Horizontal: Section Length(feet)

CROSS SECTION B-B'

SWEDEN-3 CHAPMAN SITE
NYS DEPT. of ENV. CONSERVATION

WK.ASSIGN.#	DATE	FIGURE
D002520-14	December 1992	6.9B



CROSS SECTION C-C'

SWEDEN-3 CHAPMAN SITE
NYS DEPT. of ENV. CONSERVATION

WK.ASSIGN.#	DATE	FIGURE
02483	March 1993	6.9C

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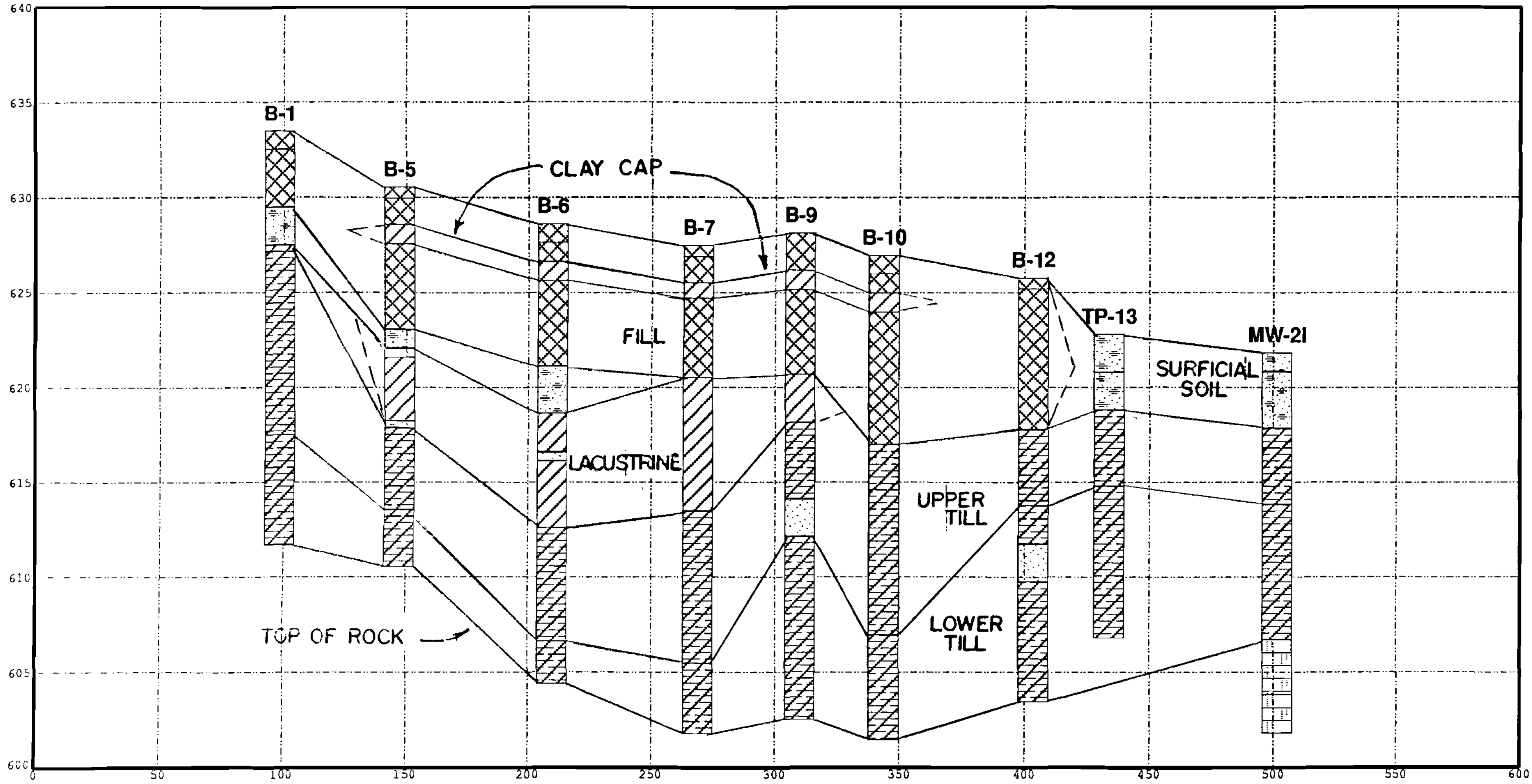
Scale
Vertical: Elevation Site Specific
Horizontal: Section Length(feet)



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Scale
Vertical: Elevation Site Specific
Horizontal: Section Length(feet)

CROSS SECTION D-D'

SWEDEN-3 CHAPMAN SITE
NYS DEPT. of ENV. CONSERVATION

WK.ASSIGN.#	DATE	FIGURE
02483	December 1992	6.9D

7.0 HYDROGEOLOGY

7.1 Regional Hydrogeology

The regional hydrogeology consists of unconsolidated, water-bearing glacial deposits overlying hydraulically pressurized, fractured carbonate bedrock of the Lockport Group. The relatively thin overburden zone and saturated horizons within the overburden are generally unconfined, possessing a "free floating" water-table surface. These relatively low permeability glacial deposits, which are comprised predominantly of till, partially confine the bedrock aquifer by limiting the hydraulic connection between the two units.

The primary water-bearing zones in the glacial overburden are higher permeability lacustrine and outwash deposits composed of silts, sands and gravel. These units are not commonly aerially extensive and rarely provide sufficient groundwater supplies for farms or residents in the area.

The primary aquifer in the area is the regionally extensive fractured dolostone bedrock. This aquifer is capable of providing significant groundwater supplies for municipalities and industry. The permeability of this aquifer is a function of the amount of secondary porosity occurring in the bedrock. A significant water-bearing zone is commonly encountered at the top of rock surface as a result of increased secondary porosity due to zones of bedrock weathering and increased fractures. The dominant water-bearing zones in the Lockport Group are along horizontal bedding planes and along regional joints and fractures.

The overburden glacial deposits are recharged directly by the infiltration of precipitation. Groundwater flow in the overburden unit is commonly controlled by local groundwater flow systems which discharge into local streams, lakes, and low-lands.

The semi-confined bedrock aquifer is primarily recharged by vertical leakage from the overlying glacial deposits. The regional groundwater flow in this area is to the north and is controlled by regional groundwater flow dynamics. Shallow groundwater in the bedrock aquifer will be controlled by local flow systems and will discharge into streams or along the face of the Lockport Escarpment which lies to the north. Deeper groundwater will be controlled by intermediate flow systems and will commonly discharge along the base of the escarpment or into the Erie Barge Canal, also located to the north. The canal is "keyed" into bedrock and receives considerable recharge from the bedrock aquifer. Deep groundwater is controlled by the deep regional flow system which discharges into Lake Ontario, the principal discharge zone of the region.

7.2 Site Hydrogeology

Based on groundwater elevation data obtained from the Phase I, II, and III Remedial Investigations, the hydrogeology encountered at the Site is consistent with the regional hydrogeology of the area. At the Site, unconfined glacial overburden deposits overlie a predominantly semi-confined fractured dolostone bedrock aquifer. Bedrock horizons in the eastern wetlands region of the site exhibit artesian hydraulic characteristics indicative of confined bedrock conditions. The artesian behavior of this anomalous zone will be discussed in Section 7.2.6.

Groundwater flow at the Site and its movement between water-bearing zones is controlled by local, and regional, recharge and discharge zones in the area. Local recharge and discharge zones control shallow groundwater movement at the Site whereas the deep groundwater flow is controlled by regional groundwater flow patterns.

The local recharge zone is characterized by the upland region south of the landfill and the local discharge zone is represented by the wetlands downgradient of the landfill.

Shallow groundwater flow in the overburden and upper bedrock zones is recharged by infiltration and vertical leakage. These zones subsequently discharge in the wetlands downgradient of the landfill. Groundwater occurring in the bedrock aquifer will also be recharged by vertical leakage, however, the flow in this zone will primarily be influenced by the regional groundwater flow pattern and corresponding recharge and discharge zones.

7.2.1 Occurrence and Movement of Groundwater

Groundwater at the Site generally occurs in three distinct water-bearing zones. These three groundwater-bearing zones comprise the following hydrostratigraphic units at the site: overburden glacial deposits; overburden/weathered bedrock interface; and fractured dolostone bedrock.

Overburden Unit:

Groundwater is first encountered in permeable horizons within the shallow overburden glacial deposits herein termed Overburden unit. These overburden deposits range in depths from 0.5 feet to 26.0 feet below surface and consist of lacustrine silty clay and silty, gravelly glacial till.

The primary water-bearing zones in the Overburden unit are the higher permeability silty and/or gravelly horizons in the till unit. Saturated, fine sand and silt lenses were encountered in the lacustrine and the till units, however, they were not aerially extensive or continuous and, therefore, do not support significant groundwater flows.

Groundwater flow in the Overburden unit will be controlled by the occurrence of local recharge and discharge zones at or near the Site. Recharge to this unit is primarily derived from infiltration of precipitation in the upgradient regions of the Site. Where downward gradients occur in the wetlands regions of the Site, the overburden deposits may also be recharged from the infiltration or wetland surface water.

Groundwater discharge in the Overburden unit, which is influenced by the predominant downward hydraulic gradient at the Site, will be primarily through vertical leakage into the underlying bedrock aquifer. However, based on the topographic slope, the presence of a local discharge zone downgradient of the landfill, and documented water-level elevations in the Overburden deposits, groundwater flow in this unit may also discharge directly into the wetlands during wet cycles of the year.

Interface Zone:

The second water-bearing zone is encountered at the overburden/weathered bedrock interface, herein termed Interface Zone. This hydrostratigraphic unit generally yields appreciable quantities of groundwater as a result of the higher relative permeabilities associated with this unit. The occurrence and preferential movement of groundwater along this more permeable zone is due to increased secondary porosity resulting from weathering and increased fracturing of the upper bedrock units. The thickness of this zone is variable and depends on the degree of weathering and the extent and density of fracturing. The maximum thickness of this interval encountered at the Site was approximately ten feet. The hydraulic connection of fracture zones in this weathered interval was observed during the drilling program over lateral distances of 10-15 feet (MW-3I/MW-3D).

Fairly massive, unfractured top of rock with a minor degree of weathering was encountered at monitoring well MW-1I and MW-1D. This does not typify the more permeable Interface Zone that was found throughout most of the Site.

Recharge to this zone generally occurs on a local scale and is derived from vertical leakage of the overlying Overburden units when influenced by a downward gradient. In the wetlands region, where upward hydraulic gradients have been observed, groundwater in this zone may discharge into the overlying Overburden unit and ultimately the wetlands.

Bedrock Aquifer:

The final and most extensive hydrostratigraphic unit at the Site is the fractured dolostone bedrock, herein termed Bedrock Aquifer. This unit is generally more competent than the weathered, top-of-rock zone as a result of a lower intrinsic permeability and fracture density. At the site, this unit, as defined by the length of the monitored zone, extends from 5-10 feet below top of rock surface to 30 feet below top-of-rock surface. The occurrence and movement of groundwater in this zone is generally controlled by regional structural features which include the regional fracture and joint patterns as well as the occurrence of horizontal bedding planes. These aspects are discussed in Section 7.1.

Recharge to this aquifer generally takes place on a regional scale and is derived from vertical leakage of the overlying glacial units and the weathered interface zone in situations in which downward gradients prevail. Consequently, the bedrock aquifer can be recharged by the Overburden deposits and Interface Zone upgradient of the landfill and over the landfill itself. This has important implications in regard to the possibility of contamination from the landfill infiltrating into the bedrock aquifer and migrating offsite.

Depending on the magnitude and direction of the vertical gradients, groundwater in this zone may discharge into the overlying Interface Zone and ultimately the wetlands. However, where downward gradients prevail, the groundwater in this zone will discharge at the regional discharge zones discussed in Section 7.1. Further discussions on the vertical hydraulic gradients at the site are presented in Section 7.2.3.

7.2.2 Groundwater Flow

Monthly groundwater elevation data (October, 1990 - March, 1993) obtained from monitoring wells installed at the Site were used to generate corresponding monthly groundwater contour maps. Table 7.1 presents a summary of the monthly groundwater elevations obtained from Site monitoring wells. The contour maps depict groundwater flow directions and associated hydraulic gradients for the Overburden unit, Interface Zone and the fractured Bedrock Aquifer and are presented in Appendix I-1, Appendix I-2, and I-3 respectively.

Monthly groundwater contour maps of the Overburden unit indicate groundwater flow generally mimics the surface topography and moves in a northeasterly direction, from the landfill towards the wetlands.

Interface groundwater contour maps indicate that groundwater flow in the Interface Zone is also in a northeasterly direction towards the wetlands. However, the Interface maps also indicate a subtle but consistent change in the flow direction downgradient of the landfill. In this region, the hydraulic gradients decrease and the groundwater flow changes to a more easterly direction. Upgradient of the landfill, where the hydraulic gradients are relatively steep due to the sloping topography, the groundwater flow is to the northeast.

Monthly groundwater contour maps of the bedrock aquifer indicate the overall groundwater flow is generally to the northeast. The potentiometric surface of the bedrock aquifer depicted in the contour maps generally mimics the top-of-bedrock surface (Figure 6.7) such that steeper hydraulic gradients correspond to steep slopes of the top-of-rock surfaces and groundwater highs correspond to bedrock highs. The maps also indicate a variation in the groundwater flow direction downgradient of the landfill. The change in flow direction occurs in the vicinity where the linear hydraulic gradients decrease in response to the decreasing slope of the top-of-bedrock surface. This characteristic is most apparent on the October 1992 and November 1992 groundwater maps which indicate groundwater north of the landfill flows predominantly east while groundwater northeast of the landfill flows in a more northerly direction. Upgradient of the landfill bedrock groundwater flow is consistent with the northeasterly direction of flow in the Interface Zone.

7.2.3 Hydraulic Gradients

Table 7.2 summarizes the monthly, average linear hydraulic gradients for the Overburden unit, Interface Zone and the Bedrock Aquifer. The more recent groundwater contour maps, which include the most complete well data, depict three distinct flow regions at the Site, with each region having a characteristic average linear hydraulic gradient. These flow regions, as summarized in Table 7.2 include; the upgradient area south of the landfill, the area over the landfill itself, and the wetlands area downgradient of the landfill.

The average linear hydraulic gradients in the upgradient area were determined along groundwater flow paths perpendicular to equipotential contour lines. In areas where the hydraulic gradients decrease and the number of contour lines becomes sparse, the hydraulic gradients were determined using the three-point method (Compton, 1962).

The linear hydraulic gradients observed in each region of the Site correspond directly with changes in the topographic slope and top-of-bedrock surface.

Upgradient of the landfill the hydraulic gradients of the Interface Zone and Bedrock Aquifer are much steeper than over the landfill or wetlands regions as a result of the moderately steep topographic slope and top-of-rock surface. The mean linear hydraulic gradient for the Interface Zone and the Bedrock Aquifer upgradient of the landfill is 0.023 ft/ft (2.3%).

In the landfill region of the site, the hydraulic gradient of both units decreases markedly. The mean hydraulic gradient of the Interface groundwater flow decreases to 0.011 ft/ft (1.1%) while the bedrock flow gradients decrease more severely to 0.003 ft/ft (0.3%). The hydraulic gradient of the Overburden unit in this region averages 0.010 ft/ft (1.0%).

The downgradient, wetlands region of the Site shows a further decrease in the Interface Zone hydraulic gradient to 0.002 ft/ft (0.2%). The Bedrock Aquifer in the wetlands area shows a modest increase in the mean hydraulic gradient to 0.007 (0.7%) in response to the bedrock high encountered northeast of the landfill at the monitoring well MW-11 Cluster (Figure 6.7). Overall, the linear hydraulic gradients do not vary temporally, remaining relatively consistent throughout the year.

Table 7.3 summarizes the monthly vertical hydraulic head differentials between stratified water-bearing zones at each cluster. The monthly vertical head differences were calculated by subtracting water-level elevations of wells screened in the highest water bearing zone at each cluster from water-level elevations of wells screened in the deepest water bearing zone at the same cluster. Therefore, vertical head differences were determined by subtracting interface water-level elevations from bedrock water-level elevations and overburden water-level elevations from interface water-level elevations.

The vertical hydraulic head differentials presented in Table 7.3 indicate the vertical direction of groundwater flow between the two water-bearing zones and the relative magnitude of the vertical gradients at each well cluster.

Negative head differentials indicate a downward hydraulic gradient, which in most clusters, is from the Interface water-bearing zone to the Bedrock Aquifer. Positive head differentials indicate an upward hydraulic gradient from the Bedrock Aquifer to the Overburden deposits. The presence of a vertical gradient indicates a potential for vertical flow between units, however, the actual amount of flow from one unit to another is dependent on the vertical hydraulic conductivity of the units. Zero head differentials indicate the absence of vertical communication between water bearing zones.

The head differential data summarized in Table 7.3 was used to generate monthly hydraulic head difference maps for the Site. These are presented in Appendix I-4. The contours on the maps indicate lines of equal vertical head differentials and show the areal distribution of head differences across the Site. In addition, the head difference contours and associated values indicate which regions have downward gradients and which regions have upward gradients.

Based on the maps, the majority of the Site is shown to have a downward gradient, indicating that groundwater flows from the Overburden and Interface water-bearing zones to the Bedrock Aquifer. However, a region showing temporally consistent positive head differentials is identified northeast and east of the landfill. This is represented on the maps by the shaded area. In this region the positive head differentials indicate an upward hydraulic gradient with groundwater flow from the Bedrock Aquifer to the Interface Zone. The region characterized by the positive head differentials corresponds directly with the bedrock high located northeast of the landfill. Refer to the Top-of-Bedrock Contour Map (Figure 6.7). The hydraulic relations between the Interface Zone and the Bedrock Aquifer in this region indicate that potentially contaminated Overburden or Interface groundwater will not infiltrate into the Bedrock Aquifer in this region of the Site. The upward hydraulic gradients in this area create a hydraulic barrier to the downward movement of groundwater.

7.2.4 Horizontal Hydraulic Conductivities

Selected groundwater monitoring wells were subjected to in-situ permeability testing to determine the saturated, horizontal hydraulic conductivities of the respective water-bearing units. The field methodologies and procedures used to implement the testing are discussed in Section 8.6.

Table 7.4 summarizes the horizontal hydraulic conductivities of the screened interval for each monitoring well tested in addition to the mean conductivity of each of the three hydrostratigraphic unit described in Section 7.2.1. The monitoring wells in Table 7.4 are arranged by hydrostratigraphic units and in decreasing order of hydraulic conductivity. The mean conductivity of each hydrostratigraphic unit was determined using the geometric mean of all the conductivities in the respective unit.

The Bedrock Aquifer possesses the highest mean conductivity (1.20 x 10^{-3} cm/sec) with ranges between 1.31 x 10^{-2} cm/sec to 7.97 x 10^{-5} cm/sec.

The Interface Zone had an intermediate mean conductivity of 1.08 x 10^{-3} cm/sec with ranges between 2.52 x 10^{-2} and 2.35 x 10^{-5} cm/sec. As is common in glaciated regions, the till Overburden unit had the lowest mean conductivity (5.34 x 10^{-5} cm/sec) with ranges between 1.07 x 10^{-4} cm/sec and 7.57 x 10^{-6} cm/sec. The highest conductivity was observed at MW-13I (2.52 x 10^{-2} cm/sec) while the lowest conductivity was observed at MW-8S (7.57 x 10^{-6} cm/sec). The conductivities determined for these units are consistent with field observations of the hydrogeology encountered at the Site and published ranges of representative hydraulic conductivities (Freeze and Cherry, 1979).

7.2.5 Groundwater Flow Velocities

The average linear groundwater flow velocities (horizontal seepage velocities) were calculated for each water-bearing unit in each distinct flow region at the Site using Darcy's Law. The horizontal seepage velocity is determined by dividing the Darcy velocity by the effective porosity of the medium of transport. The seepage velocities for each hydrostratigraphic unit at each region of the Site are summarized in Table 7.5. The calculations are presented in Appendix I-5.

Parameters used in the calculation of the flow velocities include the mean horizontal hydraulic gradient, the mean horizontal hydraulic conductivity and the characteristic effective porosity of each water-bearing zone. The hydraulic gradients and the hydraulic conductivities of each unit are presented in Section 7.2.3 and 7.2.4, respectively.

As presented in Table 7.5, there is a range of effective porosities for each unit encountered at the Site. The ranges for the Interface Zone and Bedrock Aquifer represent the variations in the degree of weathering and secondary porosity of the dolostone bedrock. As a result, there is a corresponding range in the horizontal seepage velocity for each zone. Based on field observations during the investigation, a characteristic effective porosity and a corresponding flow velocity were determined for each unit in each region of the Site.

A site characteristic effective porosity of 20% for the Overburden unit yields a seepage velocity of 2.8 ft/yr in the landfill region of the Site. The characteristic effective porosities of the Interface Zone and Bedrock Aquifer were determined to be 20% and 15%, respectively. These porosities yield an Interface flow velocity of 61 ft/yr and a Bedrock flow velocity of 25 ft/yr in the landfill region. These horizontal seepage velocities were used to estimate the extent of the plume migration in each waterbearing zone. The results are discussed and presented in Section 9.9 (Contamination Fate and Transport).

7.2.6 Groundwater Levels and Seasonal Fluctuations

Groundwater levels in monitoring wells at the Site can vary significantly from the upgradient regions to the downgradient regions of the Site. The variations result from the change in slope of the water table and potentiometric surface and the presence of the local recharge and discharge zones at the Site. The variation in water-levels from upgradient to downgradient is commonly 13 feet for the Interface Zone and 16 feet for the Bedrock Aquifer wells. Water-levels in the upgradient Interface wells are approximately 15 feet below ground surface versus water levels at or near the ground surface in the wetlands region of the Site. Upgradient Bedrock Aquifer water-levels are approximately 18 feet below ground surface and commonly less than 2 feet below grade downgradient of the landfill.

In the wetlands portion of the Site, east and northeast of the landfill, water levels have been recorded above ground surface at a number of monitoring wells. This artesian behavior has been documented in one or more well in each of the wetland region well clusters (MW-3, MW-9, MW-10, MW-11, MW-12, MW-13, and MW-14). The greatest artesian effects are encountered at monitoring well MW-11D where water levels have been measured approximately two feet above ground surface. Table 7.1 summarizes the monthly water-level data for monitoring wells installed at the site.

Seasonal fluctuations in water levels have been documented in on-site monitoring wells in response to seasonal fluctuations in recharge. Monthly water-level data presented in Table 7.1 was used to generate water-level hydrographs for selected monitoring wells. The hydrographs, which are presented in Appendix I-6, illustrate the monthly variation of water-levels in selected monitoring wells relative to water levels in other wells.

The Interface Well Hydrograph illustrates the relation of water-level fluctuations relative to other Interface wells installed across the Site. The figure also reveals the variation in water levels of upgradient wells versus downgradient wells in response to seasonal fluctuations. As depicted in the plot, the upgradient wells respond greater to seasonal variations in recharge relative to downgradient Interface wells. The downgradient water-levels are shown to be relatively consistent throughout the year with only subtle changes in water levels during recharge cycles. This implies that groundwater levels in the wetlands remain relatively constant throughout the year and are recharged by groundwater flowing from the upgradient portions of the site.

The Bedrock Well Hydrograph shows a similar response to seasonal fluctuations. Downgradient Bedrock wells show only subtle changes in water levels in response to recharge cycles with water levels remaining relatively constant throughout the year. The upgradient Bedrock well is shown to be more sensitive to seasonal fluctuations in recharge.

Well hydrographs were also generated for each well cluster exclusively. These figures illustrate the vertical gradients existing at each cluster and the response of each water-bearing zone relative to the other. These hydrographs are also presented in Appendix I-6.

TABLE 7.1

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Groundwater Elevation Data Summary Table

Monitoring Well	Ground Elevation (Feet)	Reference Elevation Top of Casing (Feet)	Groundwater Elevations (Feet)								
			Date of Measurement								
			10/10/90	4/23/91	8/12/91	12/10/91	1/13/92	2/12/92	3/12/92	4/13/92	5/18/92
SWE-MW1I	624.40	626.28	615.67	623.58	615.07	616.96	620.99	622.05	623.13	623.10	623.08
SWE-MW2I	621.82	623.38	616.25	620.17	611.58	616.97	619.46	619.49	620.03	619.80	619.68
SWE-MW3I	620.00	621.82	613.27	620.31	611.18	615.74	619.24	619.66	620.28	620.04	620.12
SWE-MW4I	636.00	637.93	622.83	632.48	621.33	626.20	629.82	630.71	631.93	628.78	631.03
SWE-MW5I	651.90	653.93	631.36	639.35	627.88	629.21	633.39	635.59	637.93	638.83	637.60
SWE-MW6I	623.00	625.39	—	—	—	—	—	—	—	—	—
SWE-MW6S	622.60	624.45	—	—	—	—	—	—	—	—	—
SWE-MW7S	622.20	624.35	—	—	—	—	—	—	—	—	—
SWE-MW8S	623.10	625.12	—	—	—	—	—	—	—	—	—
SWE-MW1D	624.90	627.26	—	—	—	—	—	—	—	—	—
SWE-MW2D	622.30	624.41	—	—	—	—	—	—	—	—	—
SWE-MW3D	620.60	622.78	—	—	—	—	—	—	—	—	—
SWE-MW5D	652.00	654.08	—	—	—	—	—	—	—	—	—
SWE-MW8D	623.50	625.23	—	—	—	—	—	—	—	—	—
BEST(Kennel)	660.70	661.59	—	—	—	—	—	—	—	—	—
SWE-MW9I	621.20	622.84	—	—	—	—	—	—	—	—	—
SWE-MW9D	621.60	624.08	—	—	—	—	—	—	—	—	—
SWE-MW10S	619.20	621.03	—	—	—	—	—	—	—	—	—
SWE-MW10I	618.90	621.29	—	—	—	—	—	—	—	—	—
SWE-MW10D	619.00	620.88	—	—	—	—	—	—	—	—	—
SWE-MW11I	619.20	621.49	—	—	—	—	—	—	—	—	—
SWE-MW11D	619.20	621.57	—	—	—	—	—	—	—	—	—
SWE-MW12I	619.00	621.39	—	—	—	—	—	—	—	—	—
SWE-MW12D	618.70	622.10	—	—	—	—	—	—	—	—	—
SWE-MW13S	618.90	620.95	—	—	—	—	—	—	—	—	—
SWE-MW13I	618.90	621.07	—	—	—	—	—	—	—	—	—
SWE-MW14I	619.50	621.45	—	—	—	—	—	—	—	—	—

TABLE 7.1
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Groundwater Elevation Data Summary Table

Monitoring Well	Ground Elevation (Feet)	Reference Elevation Top of Casing (Feet)	Groundwater Elevations (Feet)									
			Date of Measurement									
			6/22/92	7/14/92	8/12/92	9/15/92	10/19/92	11/19/92	12/18/92	1/18/93	2/26/93	3/18/93
SWE-MW1I	624.40	626.28	621.53	622.09	623.11	622.40	622.96	623.40	623.73	623.34	623.18	623.46
SWE-MW2I	621.82	623.38	619.16	619.69	620.21	619.70	620.26	620.66	620.98	620.47	620.48	620.82
SWE-MW3I	620.00	621.82	619.21	620.00	620.35	619.77	620.46	620.72	621.08	*	*	620.52
SWE-MW4I	636.00	637.93	629.19	629.74	630.98	629.57	630.83	632.01	632.68	631.85	631.38	632.13
SWE-MW5I	651.90	653.93	635.42	634.59	638.02	636.56	637.71	637.70	637.89	638.75	637.95	638.63
SWE-MW6I	623.00	625.39	—	—	—	—	621.13	621.51	621.99	621.51	621.59	621.73
SWE-MW6S	622.60	624.45	620.02	621.86	621.84	620.64	621.87	622.09	622.30	622.13	622.1	621.77
SWE-MW7S	622.20	624.35	618.54	619.26	620.12	618.93	619.71	620.84	621.64	*	*	621.31
SWE-MW8S	623.10	625.12	620.76	621.30	622.36	621.68	622.23	622.71	622.87	622.66	622.52	622.76
SWE-MW1D	624.90	627.26	620.46	620.89	621.51	620.90	621.28	621.72	622.01	621.65	621.56	621.92
SWE-MW2D	622.30	624.41	619.42	620.30	620.38	619.94	620.40	620.82	621.11	620.57	620.56	621.95
SWE-MW3D	620.60	622.78	619.78	620.16	620.81	620.46	620.81	621.23	621.54	*	*	621.13
SWE-MW5D	652.00	654.08	633.13	632.81	634.94	633.77	634.81	635.80	635.87	635.58	634.83	635.55
SWE-MW8D	623.50	625.23	619.94	620.20	620.88	620.56	620.93	621.32	621.98	621.13	621.13	*
BEST(Kennel)	660.70	661.59	635.34	635.15	637.99	636.43	637.79	638.65	639.59	638.73	639.59	*
SWE-MW9I	621.20	622.84	—	—	—	—	620.91	621.18	621.69	*	*	621.46
SWE-MW9D	621.60	624.08	—	—	—	—	620.78	621.23	621.51	621.05	621.03	621.34
SWE-MW10S	619.20	621.03	—	—	—	—	—	—	—	—	—	618.59
SWE-MW10I	618.90	621.29	—	—	—	—	619.95	620.32	620.64	620.35	*	620.06
SWE-MW10D	619.00	620.88	—	—	—	—	618.50	619.23	619.73	619.32	*	619.64
SWE-MW11I	619.20	621.49	—	—	—	—	619.39	619.65	619.91	619.57	*	619.61
SWE-MW11D	619.20	621.57	—	—	—	—	620.75	621.15	621.57	*	*	621.41
SWE-MW12I	619.00	621.39	—	—	—	—	619.09	619.43	619.97	619.55	*	619.45
SWE-MW12D	618.70	622.10	—	—	—	—	618.44	619.14	620.28	620.64	*	619.60
SWE-MW13S	618.90	620.95	—	—	—	—	—	—	—	—	—	618.97
SWE-MW13I	618.90	621.07	—	—	—	—	—	—	—	—	—	619.45
SWE-MW14I	619.50	621.45	—	—	—	—	—	—	—	—	—	620.55

* Indicates that well was frozen and an accurate measurement could not be obtained.

TABLE 7.2
MONTHLY SUMMARY OF AVERAGE LINEAR HYDRAULIC GRADIENTS (feet/feet)

Site Region	Stratigraphic Unit	Date of Groundwater Level Measurement																			Arithmetic Mean
		10/10/90	4/23/91	8/12/91	12/10/91	1/13/92	2/12/92	3/12/92	4/13/92	5/18/92	6/22/92	7/14/92	8/12/92	9/15/92	10/19/92	11/19/92	12/18/92	1/18/93	2/26/93	3/18/93	
South of Landfill (upgradient)	Overburden								(No Overburden wells completed in this Region)												
	Interface	0.018	0.025	0.021	0.021	0.022	0.023	0.025	0.026	0.022	0.023	0.020	0.018	0.029	0.027	0.030	0.024	0.021	0.021	0.025	0.023
	Bedrock										0.021	0.022	0.021	0.023	0.022	0.025	0.027	0.025	0.026	0.021	0.023
Landfill	Overburden												0.010	0.012	0.010	0.010	0.006	*	*	0.013	0.010
	Interface	0.009	0.011	0.015	0.011	0.011	0.011	0.010	0.016	0.019	0.010	0.017	0.010	0.008	0.009	0.008	0.008	0.011	0.016	0.008	0.011
	Bedrock										0.003	0.001	0.003	0.003	0.003	0.003	0.004	0.003	0.004	0.004	0.003
Wetlands (down-gradient)	Overburden																			0.015	0.015
	Interface														0.002	0.002	0.002	0.003	*	0.002	0.002
	Bedrock														0.008	0.007	0.005	0.007	*	0.006	0.007

Note: The average linear hydraulic gradients were calculated from the corresponding monthly groundwater contour maps.

* : Indicates groundwater within the well casing was frozen, therefore, the hydraulic gradient could not be calculated.

TABLE 7.3: MONTHLY VERTICAL HYDRAULIC HEAD DIFFERENCE SUMMARY

Well Cluster	Vertical Hydraulic Head Differences									
	6/22/92	7/14/92	8/12/92	9/15/92	10/19/92	11/19/92	12/18/92	1/18/93	2/26/93	3/18/93
MW 1 (I,D)	-1.07'	-1.20'	-1.60'	-1.50'	-1.68'	-1.68'	-1.72'	-1.69'	-1.62'	-1.54'
MW 2 (I,D)	+0.26'	+0.61'	+0.17'	+0.24'	+0.14'	+0.16'	+0.13'	+0.10'	+0.08'	+1.13'
MW 3 (I,D)	+0.57'	+0.16'	+0.46'	+0.69'	+0.35'	+0.51'	+0.46'	*	*	+0.61'
MW 5 (I,D)	-2.29'	-1.78'	-3.08'	-2.79'	-2.90'	-1.90'	-2.02'	-3.17'	-3.12'	-3.08'
MW 6 (S,I)					-0.74'	-0.58'	-0.31'	-0.62'	-0.51'	-0.04'
MW 8 (S,D)	-0.82'	-1.10'	-1.48'	-1.12'	-1.30'	-1.39'	-0.89'	-1.53	-1.39'	*
MW 9 (I,D)					-0.13'	+0.05'	-0.18'	*	*	-0.12'
MW10 (S,I)										+1.47'
MW 10 (I.D)					-1.45'	-1.09'	-0.91'	-1.03'	*	-0.42'
MW 11 (I,D)					+1.36'	+1.50'	+1.66'	*	*	+1.80'
MW 12 (I,D)					-0.65'	-0.29'	+0.31'	+1.09'	*	+0.15'
MW13 (S,I)										+0.48'

Note: Negative hydraulic head differentials indicate a downward hydraulic gradient; from the overburden/interface deposits into bedrock.

Note: Positive hydraulic head differentials indicate an upward hydraulic gradient; from the bedrock into the overburden deposits.

* Indicates well water was frozen and an accurate water level measurement could not be obtained.

TABLE 7.4: HORIZONTAL SATURATED HYDRAULIC CONDUCTIVITY SUMMARY

Hydrostratigraphic Unit	Monitoring Well	Unit Screened	Horizontal Saturated Hydraulic Conductivity	Geometric mean Conductivity
Overburden	MW 7S	Till	1.07x10-4	5.34x10-5
	MW13 S	Lacustrine/Till	9.00x10-5	
	MW 6 S	Lacustrine/Till	8.11x10-5	
	MW10 S	Lacustrine/Till	7.37x10-5	
	MW 8 S	Till	7.57x10-6	
Overburden/ Bedrock Interface	MW13I	Till/Bedrock	2.52x10-2	1.08x10-3
	MW 11 I	Till/Bedrock	1.09x10-2	
	MW 12 I	Till/Bedrock	6.42x10-3	
	MW 3 I	Till/Bedrock	3.83x10-3	
	MW 2 I	Till/Bedrock	2.05x10-3	
	MW 6 I	Till/Bedrock	1.82x10-3	
	MW14 I	Till/Bedrock	7.70x10-4	
	MW 4 I	Till/Bedrock	2.96x10-4	
	MW 10 I	Till/Bedrock	1.71x10-4	
	MW 9 I	Till/Bedrock	1.02x10-4	
	MW 1 I	Till/Bedrock	2.35x10-5	
Bedrock Aquifer	MW 11 D	Bedrock	1.31x10-2	1.20x10-3
	MW 8 D	Bedrock	1.01x10-2	
	MW 3 D	Bedrock	9.97x10-3	
	MW 2 D	Bedrock	1.92x10-3	
	MW 9 D	Bedrock	3.72x10-3	
	MW 1 D	Bedrock	2.52x10-4	
	MW 12 D	Bedrock	2.33x10-4	
	MW 10 D	Bedrock	7.97x10-5	

Note: All conductivities were calculated using the Bouwer and Rice Method (Bower and Rice, 1976).

TABLE 7.5 HORIZONTAL SEEPAGE VELOCITY SUMMARY

Site Region	Stratigraphic Unit	Representative Range of Effective Porosities	Representative Range of Seepage Velocities (ft/yr)	Estimated Site Characteristic Effective Porosity	Site Characteristic Seepage Velocity (ft/yr)
South of landfill (upgradient)	Overburden	(No Overburden Wells Completed in this Region)			
	Interface	10-25%	102-255	20%	128
	Bedrock	5-20%	142-569	15%	190
Landfill	Overburden	15-25%	2.2-3.7	20%	2.8
	Interface	10-25%	49-122	20%	61
	Bedrock	5-20%	19-74	15%	25
Wetlands (downgradient)	Overburden	15-20%	3.3-5.5	20%	4.1
	Interface	10-25%	9-22	20%	11
	Bedrock	5-20%	43-173	15%	58

8.0 FIELD INVESTIGATION

The Remedial Investigation conducted for the Sweden-3 Chapman Study Area consisted of three separate field investigations. The Phase I Remedial Investigation was conducted from April 29, 1992 to June 26, 1992. The purpose of this phase of the investigation was to determine the absence or presence of contamination at Satellite Sites 1, 2, 3 and 4 and to define the nature and extent of contamination at the Sweden-3 Chapman Site. The Phase II Remedial Investigation was conducted from September 21, 1992 to November 6, 1992. The purpose of this second phase was to determine the nature, and the extent of residual contamination in the soils underlying the landfill at the Sweden-3 Chapman Site as well as determine the extent of groundwater contamination downgradient of the landfill in the wetlands to the north. The Phase III Remedial Investigation was conducted during March, 1993. The purpose of this third phase was to determine possible vertical upward hydraulic gradients between the Overburden Unit and the Interface Zone. In addition, several data gaps existed at the close of Phase II resulting in further study. The Phase III RI was conducted from March 1, 1993 to March 18, 1993 to determine the downgradient extent of the groundwater plume, confirm the existence of the district groundwater plumes and further define the vertical hydraulic gradients in the wetlands portion of the Site.

8.1 Geophysical Investigations

Prior to initiating test pit programs at Satellite Sites 2 and 3, geophysical magnetic surveys were performed as part of the Phase I RI. The purpose of these surveys was to delineate areas within the sites which may contain buried drums. The magnetic surveys were performed utilizing an EG&G Geometrics Model G-856 Proton Precession Magnetometer. The magnetometer measures the intensity of the earth's magnetic field and will detect variations in this field caused by a single drum buried as deep as 20 feet below grade. Magnetometers respond to ferrous metals (iron or steel) only.

The Work Plan originally called for ground penetrating radar (GPR) to be used in conjunction with the magnetic survey. However, site conditions were not conducive to the use of the GPR due to the presence of standing surface water and abundance of surficial clay soils. The depth of radar penetration under these site conditions would be less than three feet.

In order to facilitate completion of the magnetic surveys, grids were laid out on each site with 20 foot spacings. The grids covered areas suspected to contain buried drums as identified through aerial photograph interpretations and interviews with local residents. The grids on Satellite Sites 2 & 3 measured 260 feet x 340 feet and 160 feet x 240 feet, respectively.

Prior to initiating the magnetic surveys, a base station was established outside the respective gridded survey areas to obtain background field intensity readings and to document fluctuations in the earth's magnetic field. The magnetometer was then used to measure and record readings of the magnetic field intensity at each grid station. A background value was established at each site and the magnetic field values which were greater or less than the respective background values were considered anomalous. The magnetometer readings presented in Tables 8.1 and 8.2 represent these anomalous measurements. Computer generated contour maps were completed utilizing this data and are presented in Figures 8.1 and 8.2, respectively.

8.1.1 Satellite Site 2

A review of Figure 8.1 reveals that there are few anomalous areas within the survey area. The minor anomalies detected can be attributed to surficial metal debris (i.e., scrap metal, cans, old appliances). The geophysical data suggests that there are no buried drums located on Satellite Site 2. Test pits were excavated to confirm these findings (refer to Section 8.2.2 of this report).

It should be noted that the mounded area located in the northwestern portion of the property was not included in the magnetic survey due to the high terrain and surface metallic debris.

8.1.2 Satellite Site 3

A review of Figure 8.2 indicates the presence of numerous anomalies within the survey area. The anomalous features trend in an east-west direction and may indicate the presence of filled-in trenches. In addition, several isolated anomalies were detected in the eastern portion of the site. Test pits were excavated within each of the anomalous areas to determine the type of buried metal debris present (refer to Section 8.2.3 of this report).

8.2 Test Pitting and Soil Sampling

Test pitting activities were conducted in both phases of the Remedial Investigation. Phase I test pits were excavated at Satellite Sites 1, 2, and 3. Phase II test pits were excavated at the Sweden-3 Chapman Site. The intrusive investigations were conducted at each site to obtain subsurface soil samples for chemical analysis. A backhoe was used to excavate the test pits and location-dedicated sampling equipment was used to obtain all soil samples. A subsurface investigation was not conducted at Satellite Site 4, however, surface soil samples were obtained for chemical analysis. Refer to the test pit logs and the soil sampling logs presented in Appendix E and Appendix C-3, respectively, for specific information describing the subsurface geology at each test pit location and the sampling details.

As part of the Remedial Investigation, surface soil samples were also obtained from each site and analyzed for the presence or absence of surficial contamination. An extensive surface sampling program, consisting of surface sediment samples and surface water samples was conducted in Phase I and Phase II at the Sweden-3 Chapman Site. These specific surface sampling activities are discussed in Section 8.5.

Test pitting and soil sampling activities conducted at each site are discussed in further detail in the following subsections.

8.2.1 Satellite Site 1 & IRM

The Phase I field investigation at Satellite Site 1 consisted of excavating surface debris along a hedgerow approximately 300 feet long. This surface debris was comprised of metal, construction and demolition debris, household rubbish and several 55-gallon drums. A total of seven 55-gallon drums were encountered along the hedgerow, however, only two drums contained waste. These drums were subsequently overpacked, staged at the Sweden-3 Chapman Site and sampled for Full CLP Analysis, TCLP and RCRA Waste Characteristics. Analytical test results are presented on Table 9.5A and B. Drum sample SWE-DS1 was a solid green resin and registered 50 ppm on the PID organic vapor analyzer. Drum sample SWE-DS2 was a tan, oily fluid with an elevated PID reading of 5 ppm.

Also, during Phase I, two shallow test pits (SAT1-TP1 and SAT1-TP2) were excavated to a depth of approximately four feet at the locations in which the two drums were encountered. A subsurface soil sample was obtained at each test pit location to determine if the contents of the drums had leaked into the surrounding soils. The samples were analyzed for Full CLP constituents which include the following parameters: volatile organics, semi-volatile organics, pesticides/PCBs, Target Analyte List (TAL) metals, and cyanide. Two surface soil samples (SAT1-SS1 and SAT1-SS2) also were obtained at Satellite Site 1 to document the absence or presence of surface contamination. The surface soil samples were obtained at locations of obvious surface staining and analyzed for Full CLP constituents. Refer to Figure 8.3 for the location of test pits and soil samples. The soil analytical results are presented in Section 9.2 and the test pit and soil sampling logs are presented in Appendix E and Appendix C-3 respectively.

Based on the analytical results of surface soil sample SAT-SS1 (low level PCBs), an Interim Remedial Measure (IRM) was implemented at Satellite Site 1 during the Phase II RI. The ground surface also showed evidence of stressed vegetation and was stained with a black oily substance. The IRM at this location consisted of excavating visually stained soil and placing the soil in clean 55-gallon drums. Five drums were filled with soil and staged at the Sweden-3 Chapman Site. A waste soil sample (IRM-WASTE) was obtained for waste characterization and two confirmatory soil samples SAT1-IRM and DUP1-IRM, were obtained from the bottom of the excavation to document that all the contaminated soil had been removed. The analytical results are presented on Table 9.1C. However, as requested by the NYSDEC, additional confirmatory samples will be taken and analyzed for semi-volatiles as a result of holding-time violations.

8.2.2 Satellite Site 2

A total of ten test pits (TP-1 through TP-10) were excavated at Satellite Site 2 at the locations shown on Figure 8.4. Four of the test pits, TP-1 through TP-4, were located in the mounded area in the northwest portion of the property. The remainder of the test pits were located to confirm the findings of the geophysics survey, which did not indicate the presence of any significant anomalies. Test Pit Logs, prepared for each test pit, are presented in Appendix E.

Investigation of the mounded fill area did not indicate the presence of any buried drums or other debris. The fill material consisted primarily of topsoil, visually classified as a brown clayey silt with varying amounts of gravel. There were no odors or soil discoloration noted and there were no PID readings recorded above background levels. Native soil consisting of tan-brown sandy silt was encountered beneath the mounded area at depths ranging from 4 to 8 feet.

Fill material was encountered at three other locations across the site (TP-6, 7 & 8) at depths ranging from 0.5 to 2.0 feet below ground surface. As with the mounded area, the fill consisted primarily of topsoil. Rebar and a piece of steel fence post were discovered in test pits TP-8 and TP-7, respectively, which explained the minor magnetic anomalies detected at these locations. There was no fill encountered in test pits TP-9 or TP-10, which verifies the results of the geophysics survey.

A total of three subsurface soil samples were collected from discrete intervals within selected test pits for subsequent chemical analysis. In addition, two surface soil samples were collected and analyzed (refer to Figure 8.4 for sampling locations). Field Sampling Logs describing the collection of each sample are presented in Appendix C-3. The analytical results are summarized in Section 9.2 and presented on Tables 9.2A and B.

8.2.3 Satellite Site 3

A total of five test pits (TP-1 through TP-5) were excavated on Satellite Site 3 at the locations shown on Figure 8.5. The test pits were located within anomalous areas as defined by the geophysics (magnetometer) survey. Test Pit Logs, prepared for each test pit, are presented in Appendix E.

Fill material was encountered at each test pit location to a minimum depth of seven feet below ground surface. The fill material consisted predominantly of silt with varying amounts of wood, concrete, glass, household refuse, bricks, metal debris and rock fragments. The presence of buried metal debris (i.e. wire mesh, steel piping rebar) is most likely the cause of the magnetic anomalies delineated in the magnetometer survey. There were no drums encountered, odors noted or elevated PID readings recorded at any test pit location. Native soil was encountered at two test pit locations, TP-1 and TP-3, at depths of 8.5 and 7.0 feet, respectively. The native soil consisted of a silty clay lacustrine deposit.

A total of two subsurface soil samples were collected from discrete intervals within selected test pits for subsequent chemical analysis. In addition, two surface soil samples were collected and analyzed (refer to Figure 8.5 for sampling locations). Field Sampling Logs describing the collection of each sample are presented in Appendix C-3. The analytical results are summarized in Section 9.2 and presented on Tables 9.3A and B.

8.2.4 Satellite Site 4

Field investigations at Satellite Site 4 were conducted during the Phase I RI to determine the absence or presence of contamination due to the alleged disposal of waste at the site. One surface soil sample (SAT4-SS1) was obtained adjacent to a rubbish pile of steel cans, broken glass and miscellaneous debris and analyzed for Full CLP. The analytical results are discussed in Section 9.2 and presented on Tables 9.4A and B. The soil sampling log is presented in Appendix C-3.

8.2.5 Sweden-3 Chapman Site

A total of fourteen test pits (TP-1 through TP-14) were excavated on the Sweden-3 Site during the Phase II RI along the periphery of the landfill at the locations shown on Figure 8.9. The majority of the test pits were located in the areas adjacent to monitoring wells MW-3 and MW-6, where subsurface contamination was previously encountered. The purpose of the test pit program was to delineate the extent of the contaminant plume within the overburden in these areas.

Soils excavated during the test pit program were visually classified and also screened with an HNu photoionization detection meter. Test Pit Logs completed for each test pit location, including PID screening results, are presented in Appendix E.

PID screening performed during the test pit program indicated the presence of volatile organic compounds (VOCs) at several locations. VOCs were detected in the subsurface soils excavated from test pits TP-4 and TP-9 at concentrations of 200 ppm and 400 ppm, respectively. TP-4 and TP-9 were located adjacent to the northeast toe of the landfill between monitoring well MW-7S and the MW-3 well cluster (refer to Figure 8.9). Although there was no visible staining or discoloration, the soils exhibited a strong solvent odor. Elevated PID readings and odors were detected in the two test pits at depths ranging from approximately 3 to 10 feet below ground surface, which corresponds to the approximate location of the upper till unit. Samples were collected from test pits TP-4 and TP-9 at depths of 6 to 7 feet and 4 to 5 feet, respectively for subsequent chemical analysis. The results are discussed in Section 9.1.1 of this report.

A total of four test pits (TP-5, 10, 11 & 12) were excavated adjacent to and downgradient of test pits TP-4 and TP-9 to attempt to delineate the extent of the contaminant plume. There were no elevated PID readings detected or odors noted within the soils excavated from any of these locations. Therefore, it is assumed that the contamination detected in test pits TP-4 and TP-9 is localized, and is limited to a relatively small area within the upper till unit.

Elevated PID readings were also detected in the soil excavated from test pit TP-6, which was located between the toe of the landfill and monitoring well cluster MW-3. As was the case with test pits TP-4 and TP-9, the elevated PID readings were detected within the upper till unit in test pit TP-6. However, the vertical extent (4 to 6 ft.) and severity (PID of 4-15 ppm) of the contamination was less significant. A soil sample was collected from test pit TP-6 at a depth of 4 to 5 feet for chemical analysis and the results are discussed in Section 9.11 and presented on Table 9.8. Notably, there were no elevated readings detected in test pit TP-7, which was located south of test pit TP-6 adjacent to the toe of the landfill.

Contaminated soils were encountered at only one other test pit location, test pit TP-13, which was located adjacent the northern toe of the landfill between monitoring well clusters MW-2 and MW-6. Elevated PID readings were detected in test pit TP-13 at a depth of approximately 10 to 15 feet below ground surface, which corresponds to the lower till unit. Solvent odors were noted in the lower till unit and PID readings ranged from 5 to 60 ppm. A sample was collected from test pit TP-13 at a depth of 11 to 12 feet for subsequent chemical analysis. The results are discussed in Section 9.1.1 and presented on Table 9.8.

Based on the presence of elevated organic compounds detected in the groundwater at monitoring well MW-6S during the Phase I Investigation and the evidence of soil contamination at both monitoring well MW-6S and MW-6I during drilling, a series of test pits (TP1, 2 and 3) were excavated proximal to monitoring well cluster MW-6 to define the extent of soils contamination downgradient of the source area (landfill). Samples were obtained from each of these test pits for subsequent chemical analysis (refer to Section 9.1.1 for results).

Overall, a total of ten soil samples were collected during Phase II from discrete intervals within selected test pits for subsequent chemical analysis. Field Sampling Logs describing the collection of each sample are presented in Appendix C-3. Nine of the soil samples were analyzed for site specific indicator compounds (SSICs) as identified in the Phase I RI Report. The remaining soil sample (TP-4) was analyzed for Full CLP parameters. The analytical results are discussed in Section 9.1.1 and presented on Table 9.8, 9.7A and B.

8.3 Soil Gas Survey

The reported soil gas data are considered useable for the purpose intended, which was to determine if there was a potential for significant shallow subsurface volatile organic contamination, and if there was, where the areas of greatest concern were located. The data would be used to direct further investigation to confirm the extent and degree of contamination. With the exception of four samples collected from within the landfill, the soil gas investigation did not reveal any significant areas of contamination.

Analyses of soil gas samples by gas chromatography (GC) were conducted in a trailer mobilized to the Site by DUNN. The trailer was climate controlled and consisted of approximately 100 square feet of isolated floor space with a dedicated outside entrance. A dedicated 20 amp service was installed to accommodate the gas chromatograph. The following equipment was utilized for the program:

- Hewlett Packard 5890 gas chromatograph.
- J&W Scientific DB-624 capillary column, 75m x 0.75mm x 1.5 micron film thickness.
- An O/I photoionization detector (PID) followed by an electrolytic conductivity detector (ELCD) in series. This combination of detectors detected all compounds of interest with confirmation of those analytes recognized by both (i.e., aromatics were not detected by ELCD, thus no confirmation if detected with PID).
- Two Hewlett Packard 3396A integrators; one for each detector.
- Analytical balance-capable of accurately weighing 0.0001g.
- Miscellaneous - All associated glassware, hardware and accessory items required for analytical analyses including reagents, standards, gases, molecular sieves, syringes, vials, column cleavers, etc.

Sampling locations were prepared by using a "slam bar" to drive a 5/8 inch steel rod to a maximum depth of four feet, removing it and inserting a 1/2 inch diameter hollow aluminum tube into the probe hole to maintain the opening in the shallow vadose zone. Care was taken to ensure that the tube was not plugged or inserted into shallow groundwater. Surface soil was packed into the annular space around the top of the tube to prevent infiltration of surface air during sampling.

Soil gas samples were collected with 125 milliliter gas sampling bulbs. A sampling bulb consists of a wide glass cylinder with Teflon stopcock valves on either end, and a septa in the center of the glass wall to allow for sample withdrawal. The top of the aluminum tube in the probe hole was connected with dedicated 1/2 inch polyethylene tubing to the sample bulb, which in turn was connected to an SKC vacuum pump. The vacuum pump withdrew soil gas through the subsurface probe and glass bulb at a rate of approximately 3 L/min until approximately 2 liters (6 sampling train volumes) of soil gas was purged. Soil gas was contained in the glass bulb by closing the valve nearest the pump (to prevent backflow), shutting off the vacuum pump, and removing the pump from the glassware. The other valve (nearest the aluminum tube) was left open to the soil source for approximately one minute to allow the system to come to equilibrium pressure. Following the equilibration period, the second valve was closed and the sample removed for analysis.

The PID and ELCD detectors in series were effective in the analyses of soil gas samples where the potential of false positive results for chlorinated compounds may occur due to the presence of aromatic hydrocarbons. However, the ELCD detector was not as sensitive as the PID detector. As a result the working calibration range was at the extreme low end of the ELCD detectors sensitivity yielding erratic results and poor integrations. Therefore, the PID detector was used for the quantitation of target compounds. The ELCD was used for the detection of 1,1-dichloroethane and 1,1,1-trichloroethane and confirmation only.

The MDL study performed June 16 and 17, 1992 yielded some erroneous results. Toluene, tetrachloroethene, ethylbenzen, m-xylene and o-xylene MDL results yielded numbers higher than the low standard of 0.5 ppm, which was consistently seen on the PID detector. These compounds are late eluters and poor integraton due to broader peaks in this region may have caused false MDLs. An MDL of 0.25 ppm was imposed for all compounds (1/2 the low standard of 0.5 ppm) on the PID which was reasonable upon visual inspection. The MDLs for the ELCD detector were calculated using peak height and are reasonable values for the compounds detected.

Two initial calibrations were performed (6/17/92 and 6/23-6/24/92) which demonstrated that the instrumentations performance over the working range was satisfactory (< 30% RSD for all analytes). However, analytes in continuing calibrations performed daily frequently exceeded the 30% difference limit, with the exception of vinyl chloride which was introduced to the standard bulb from a certified cylinder and was consistently within control limits throughout the analyses. This indicates that the saturated headspace method of standards preparation was inconsistent, and not due to the instrumentation. Due to the unavoidable variations in sample preparation, the MDL for all compounds was estimated on the PID to be 0.25 ppm and used 0.50 as the practical quantitation limit (PQL).

Sixty three soil gas points and one headspace sample taken from monitoring well MW-65, were analyzed and reported. Of the sixty three samples, only three samples have reported values that are suspect. Station 450, 150 and its duplicate (analyzed 6/23/92) exhibited the confirmed presence of trichloroethene and tetrachloroethene. The location of soil gas survey points are present on Figure 8.6. However, the quantitation of these two analytes is suspect due to daily continuing calibration exceedences. In both cases there was a response factor increase due to the unavoidable inconsistency in standard preparation. Sample results are potentially lower than actually reported. Sample MW-6S headspace (analyzed 6/18/92) was not a required sampling point but was analyzed to ascertain what compounds might be encountered during the soil gas study. The trichloroethene value for this sample may also be slightly lower due to a response factor increase. All reported results are considered satisfactory. Analytical test results are presented in Appendix K.

Stations (50,50), (50,50 Dup), (150,275), (150,300), (400,150), (400,150 Dup), (450,150 Dup), (500,200), (500,250) and (550,250) all exhibited the presence of target compounds below the imposed MDL.

Station 100,150 and its duplicate exhibited the presence of a compound on the ELCD detector at a retention time corresponding to 1,1-dichloroethene. However, the compound was not detected by the PID detector, therefore, it is not 1,1-dichloroethene. The unknown is most likely a halogenated compound possessing an ionization potential greater than 10.2ev.

Duplicate samples were collected at stations (50,50), (100,150), (350,200), (400,150) and (450,150). Duplicate discrepancies are most likely attributed to sampling variability and not analytical variability since samples and respective duplicates were analyzed in the same day and calculated with the same daily response factor. A triplicate sample of station 350,200 was collected and exhibited the presence of vinyl chloride, indicating its tentative presence. Cis-1,2-dichloroethene was detected in station 450,150 duplicate, however, the concentration was below the imposed MDL and was not reported.

8.4 Drilling and Monitoring Well Installation

Drilling, monitoring well installation and groundwater sampling were conducted at the Sweden-3 Chapman Site during both phases of the Remedial Investigation. The drilling programs were implemented to determine the subsurface geology at the Site and characterize the extent of contamination in subsurface soils. At selected locations, groundwater monitoring wells were installed and subsequently sampled to characterize the groundwater quality at the Site downgradient of the landfill. The Phase I drilling program focused on the soils and groundwater at locations downgradient of the landfill, but within the fenced portion of the Site.

The Phase II drilling program focused on two separate objectives in two distinct regions of the Sweden-3 Chapman Site. The first objective was to determine the extent and degree of residual contamination in the soils underlying the landfill that were not excavated during the IRM drum removal. The second objective was to determine the subsurface geology and the extent of soil and groundwater contamination in the wetlands portion of the site, downgradient of the landfill. An important aspect of this objective was to determine the downgradient limits of a suspected contaminate plume in the interface and bedrock water-bearing zones.

The Phase III drilling program focused on delineating the vertical upward hydraulic gradient between the Overburden unit and Interface Zone. A vertical upward hydraulic gradient between these two water bearing zones will directly effect groundwater remediation alternatives of the Interface Zone. In addition, the groundwater contaminant plume was further defined to reduce affected areas of the wetlands.

8.4.1 Phase I Investigation

During the Phase I RI, a total of eight monitoring wells were added to the existing monitoring well network at the Sweden-3 Chapman Site. Five existing monitoring wells (MW1I - MW5I) were installed across the overburden/bedrock interface prior to the IRM drum removal. The Phase I monitoring wells consisted of five bedrock and three overburden groundwater monitoring wells.

Bedrock monitoring wells (MW-1D, 2D, 3D, and 5D) were installed adjacent to existing interface wells to create monitoring well clusters. Monitoring well MW-8D was installed in conjuction with monitoring well MW-8S to formulate a new monitoring well cluster on the east side of the landfill. These clusters assisted in determining the vertical hydraulic gradients at each monitoring location and the hydraulic relation between water-bearing units.

Three overburden monitoring wells (MW-6S, MW-7S, and MW-8S) were installed exclusively in the overburden along the landfill perimeter to characterize the extent of contamination in the overburden soils, the overburden groundwater quality, and to supplement data gaps in the existing monitoring well network. Figure 8.7 illustrates the areal distribution of monitoring wells at the Site.

Soil borings converted to overburden wells were advanced using four and one quarter inch ID hollow stem augers whereas soil borings converted to bedrock monitoring wells were advanced using six and one quarter inch hollow stem augers. During the Phase I Investigation, all soil borings were continuously sampled at two-foot intervals using standard split spoon samplers and ASTM Method D-1586, *"Standard Method of Penetration Testing and Split Spoon Sampling of Soils"*. Split spoons and other downhole equipment were decontaminated between each sampling location using a high-pressure steam cleaner. All split spoon soil samples were visually classified by the on-site geologist in accordance with the New York State Department of Transportation (NYSDOT) Soil Description Procedure and screened for the presence of volatile organic compounds using a PID organic vapor analyzer. Detailed geologic test boring logs were prepared for each boring and all logs are presented in Appendix D. In addition, a representative portion of each split spoon soil sample was placed in sample jars, labeled, and covered with aluminum foil for geologic documentation and subsequent head space screening.

One soil sample was obtained from each of the eight soil borings and analyzed for Full CLP. The depth at which the soil samples were obtained was based on visual evidence of contamination and PID field screening and headspace results of split spoon samples. The corresponding analytical results and soil sampling logs are presented in Section 9.1.3 and Appendix C-3 respectively.

In addition, five soil samples were collected for geotechnical analysis to provide appropriate data for the subsequent Feasibility Study. The samples were tested for percent moisture, gradation and Atterburg limits. The geotechnical sample results are presented in Appendix J.

Overburden wells were constructed through the four and one quarter inch ID hollow stem augers and consisted of two inch Schedule 40 PVC slotted screen (0.010 inches) and threaded PVC riser. Refer to Appendix F for the well construction details of each overburden montioring well.

Boreholes designated for bedrock monitoring wells were first advanced through the overburden deposits using six and one quarter inch ID hollow stem augers. The augers were advanced into the weathered bedrock zone and "seated" into the top of rock. A five to ten foot interval of rock was cored until competent bedrock was encountered. The five to ten foot "rock-socket" was subsequently reamed to a six-inch ID borehole. Four inch black (Schedule 40) steel casing was then installed through the augers, seated at the bottom of the "rock socket" and grouted to the surface. This procedure effectively sealed off the weathered bedrock zone such that potential contamination at the Interface Zone would not be carried down to the Bedrock Aquifer. After the grout had cured (approximately 24 hours), the borehole was advanced by HQ coring out the grout plug and coring an additional 20 to 25 feet of competent bedrock. The bedrock monitoring well construction details are also presented in Appendix F.

Upon installation of the overburden and bedrock monitoring wells, each well was developed by evacuating up to ten well volumes of groundwater. The monitoring wells were developed to increase the hydraulic connection between the sand pack and the surrounding formation. Overburden monitoring wells were developed using a suction-lift pump while the bedrock wells were developed using a submersible pump. Well development logs for each well are presented in Appendix G.

A total of thirteen monitoring wells (five existing wells and eight newly installed wells) were sampled as part of the Phase I groundwater sampling program. Prior to sampling, three well volumes were purged from each monitoring well. The wells were sampled with well-dedicated PVC bailers and analyzed for Full CLP. In addition, field parameter measurements including pH, conductivity, temperature and turbidity were obtained at the time of sampling. The groundwater sampling logs and corresponding analytical results are presented in Appendix C-2 and Section 9.3, respectively.

Table 8.6 summarizes the PID readings of soil samples screened during drilling operations, their associated headspace readings after drilling and the corresponding interval at which environmental samples were obtained. Based on this table, elevated PID readings, which indicate possible contamination, were encountered in soils at the following locations: MW-2 cluster, MW-3 cluster, MW-4I, MW-6 cluster and MW-7S.

The highest headspace readings were encountered at monitoring well MW-6S and 3I at depths of 10 to 12 feet and 14 to 16 feet respectively. These depths correspond to contamination in the lower till unit. At monitoring well MW-6S, the most elevated readings were encountered in a saturated, fine sand horizon within the lower till. Monitoring well MW-6S was screened in this interval and a soil sample was obtained for chemical analysis. The soils and groundwater at this location showed the most severe contamination encountered in the Phase I RI.

Geologic information obtained from intrusive activities during the Phase I investigation were incorporated into various geologic maps and associated tables which are presented in Section

6.2.

8.4.2 Phase II Investigation

The Phase II intrusive investigation at the Sweden-3 Chapman Site was divided into two separate investigations. A soil boring program was conducted on the landfill portion of the Site to determine the extent of residual contamination beneath the landfill. In conjunction with this program, a soil boring and well installation program was initiated in the wetlands portion of the Site to determine the extent of contamination downgradient of the landfill. Due to the high water table and the amount of standing water in the wetlands, an all-terrain rig (ATV) and specialized ATV support vehicles were necessary to conduct this portion of the investigation. A standard truck-mounted rig was used for the landfill borings.

The following subsections discuss the methodologies and results of each investigation.

8.4.2.1. Landfill Investigation

A total of twenty soil borings (B-1 through B-20) were completed on the Sweden-3 Chapman landfill as part of the Phase II investigation. The borings were installed on the perimeter of the landfill at the locations shown in Figure 8.7. The purpose of the soil boring program was to delineate the extent and severity of the contamination within the overburden beneath the landfill.

The soil borings were advanced to the top of bedrock at each location (except B-18, 19 & 20) utilizing hollow stem augers. Continuous split-barrel sampling of soils was used in accordance with ASTM Designation D-1586 *"Standard Method of Penetration Testing and Split Barrel Sampling of Soils"*.

All recovered soil samples were visually classified by DUNN's on-site geologist. Test Boring Logs are presented in Appendix D. A representative portion of each sample was placed in a clean glass jar, sealed with aluminum foil and subsequently screened with a PID. All split-spoons, drill rods and augers were steam-cleaned between each boring to prevent cross-contamination. All bore holes were grouted to surface upon completion.

Headspace screening of the recovered soil samples indicated the presence of VOCs at numerous boring locations. Results of the headspace screening are presented in Table 8.7. As indicated on the table, elevated PID readings were recorded in B-2, 4, 5, 6, 7, 9, 10, 11, 12, 13 and 16. With the exception of B-16, all of the borings with elevated PID readings were located on the western portion of the landfill. Auger cuttings were drummed at each location where elevated PID readings were recorded. The highest VOC concentrations (400-420 ppm) were detected in the soil recovered from B-6, B-7, B-9. A heavy sheen was observed on the soil recovered from soil boring B-4.

A total of nine soil samples were obtained from discrete intervals within the soil borings for Full CLP analysis. One soil sample (B-11) was analyzed for SSICs. In addition, two soil samples, two ambient air samples and two borehole air samples were collected from selected borings in order to aid in the air pathway analysis; the samples were analyzed for asbestiform minerals and TCL VOAs, respectively. Finally, one soil sample was analyzed for total organic carbon (TOCs) to assist in the development of soil cleanup values. The result of these analyses are discussed in Sections 9.0 and 10.0.

8.4.2.2 Wetlands Investigation

During this portion of the Phase II Remedial Investigation, a total of nine monitoring wells were added to the existing groundwater monitoring network. The newly installed wells consisted of Interface and Bedrock monitoring wells at four new clusters in the wetlands portion of the Site (Cluster 9, 10, 11 and 12) and the installation of an Interface monitoring well adjacent to MW-6S. Refer to Figure 8.7 for the location of the wetland monitoring wells.

Soil borings converted to Interface monitoring wells were advanced using four and one quarter inch ID hollow stem augers whereas soil borings converted to bedrock monitoring wells were advanced using six and one quarter inch hollow stem augers. During this portion of the Phase II Investigation, at least one soil boring at each monitoring well cluster was sampled continuously using techniques described during the Phase I Investigation. A total of five subsurface soil samples were obtained during the wetlands boring investigation. One soil sample was obtained from each well cluster and analyzed for SSIC's parameters. The depth at which the sample was obtained was based on headspace results in the adjacent borehole at each cluster. The analytical results and corresponding soil sampling logs are presented in Section 9.1.3 and Appendix C-3, respectively.

As was the procedure in the Phase I RI, each soil boring was subsequently converted into a groundwater monitoring well upon completion of the borehole. Interface monitoring wells were constructed using the following procedure. Four and one quarter inch ID hollow stem augers were advanced through the overburden and "seated" into the weathered bedrock zone. An approximately two-foot interval of bedrock was cored using an HQ system and a three to five-foot, two-inch, PVC well screen was installed across the weathered bedrock/overburden interface. A short well screen was used to monitor the groundwater quality and hydraulics of a discrete interval at the Interface Zone exclusively.

Construction of the bedrock monitoring wells in this portion of the Phase II Investigation was identical to the procedures employed during the Phase I Investigation. These procedures are described in Section 8.4.1. The monitoring well construction logs for the Interface and Bedrock monitoring wells are presented in Appendix F.

The monitoring well development procedures for both the Interface monitoring wells and the Bedrock monitoring wells were also identical to those described in Section 8.4.1. The corresponding logs are presented in Appendix G.

A total of twenty-two groundwater monitoring wells were sampled as part of the Phase II groundwater sampling program. The sampling procedures were identical to those employed during the Phase I Investigation and which are described in Section 8.4.1, however, the constituents of the analysis varied. The thirteen existing, and previously sampled monitoring wells, were sampled for SSICs, which included volatile organics and lead. The nine newly installed Phase II monitoring wells were sampled for Full CLP constituents. The analytical results and corresponding sampling logs are presented in Section 9.3 and Appendix C-2 respectively.

Table 8.6, which summarizes soil screening results during drilling, indicates that only slightly elevated PID readings were encountered during the Phase II wetlands subsurface investigation. The highest readings were encountered in the soils at monitoring well MW-6I, which registered headspace readings up to 10 ppm. With the exception of monitoring well MW-6I, elevated PID readings were not encountered at the Interface Zone or in the bedrock at any other monitoring well location during the wetlands drilling program.

Subsurface geologic data acquired during the wetlands Phase II Investigation has been incorporated into the site geology section presented in Section 6.2.

8.4.3 Phase III Investigation

During the Phase III RI, a total of four monitoring wells were added to the existing groundwater monitoring network. The newly installed wells consisted of one overburden monitoring well, one monitoring well cluster, representing the Overburden unit and Interface Zone, and one interface monitoring well.

Interface Zone monitoring wells (MW-13I and MW-14I) were installed in the wetlands to further delineate the contaminant plume. Monitoring well MW-13S was installed in conjunction with monitoring well MW-13I to formulate a new monitoring well cluster west of monitoring well location MW-12. In addition, monitoring well MW-10S was installed to monitor the Overburden unit at monitoring well cluster MW-10. These new monitoring wells assisted in determining the vertical hydraulic gradient between the Overburden unit and Interface Zone. Figure 8.7 illustrates the locations of monitoring wells at the Site.

One soil sample was collected during the drilling operations of monitoring well MW-14I. The sample was obtained from the overburden/top of rock interface.

8.5 Surface Sampling

Surface soil sampling and surface water sampling were conducted during all three phases of the Remedial Investigation at the Sweden-3 Chapman Site to document the absence or presence of surficial contamination.

During the Phase I RI, three surface water samples (SWE-LOC1 to SWE-LOC3) were obtained at the Site. SWE-LOC1 was located upgradient of the landfill outside the western property fence line while SWE-LOC2 and SWE-LOC3 were located directly downgradient of the landfill approximately 50 feet north of the landfill limit. Refer to Figure 8.8 for the respective sampling locations.

The Phase II program expanded the areal extent of sampling to the wetlands region north of the landfill. A total of ten surface sampling locations (SWE-LOC1 to SWE-LOC10), located primarily downgradient of the landfill, comprised the Phase II surface sampling program. Duplicate and matrix spike/matrix spike duplicate (MS/MSD) surface samples were obtained at downgradient locations during the Phase I RI. During the Phase II RI, two duplicate surface soil samples and one duplicate surface water sample was obtained as part of the quality assurance and quality control (QA/QC) program.

The Phase III program was limited in the extent of surface sampling. A total of one surface water and one surface sediment sample were collected. These surface samples are associated with the vertical upward hydraulic gradient and delineates possible contaminant migration from the Interface Zone into the Overburden Unit.

All surface sediment/soil samples were obtained using location-dedicated stainless steel spoons and all surface water samples were obtained by the direct fill method or with laboratory-cleaned dipper jar when necessary. At locations where both surface water and sediment was required, the acquisition of the surface water sample always preceded the acquisition of the sediment sample to limit the turbidity of the water sample.

Phase I surface water samples were analyzed for Full CLP while Phase II samples were analyzed for Site Specific Indicator Chemicals (SSICs). Surface soil/sediment SSICs consisted of volatile organics, semi-volatile organics and TAL metals. Surface water SSICs included volatile organics, TAL metals and cyanide. The analytical results are discussed in Section 9.5 and the sampling logs are presented in Appendix C-4.

8.6 Permeability Testing

Selected groundwater monitoring wells were subjected to permeability testing to determine the saturated, horizontal hydraulic conductivities of the respective water-bearing units.

The permeability of the deposits across the interval in which the monitoring wells were screened was determined by use of the slug injection/slug withdrawal method. Water-level recoveries were measured in each monitoring well (relative to a static, initial water level) in response to the instantaneous displacement of water within the well by means of injection or withdrawal of an object of known volume (slug). The water-level recovery of each monitoring well was measured using an In-Situ Hermit 1000B Environmental Data Logger and pressure transducer.

The field data from each monitoring well test was evaluated using the Bower and Rice method to determine the hydraulic conductivity of the screened interval at each well (Bower & Rice, 1976). These results are discussed in Section 7.2.4 and the calculations are presented in Appendix I-7.

8.7 Residential Well Sampling

A residential well sampling program was conducted in all phases of the Remedial Investigation to document the impact of the Sweden-3 Chapman Site on local groundwater supplies. In addition, the analytical data was used to determine if the residents surrounding the Site continued to have an acceptable potable water supply as defined by the New York State Department of Health (NYSDOH).

Groundwater samples were obtained from seven residential supply wells (RES-W1 to RES-W7) in the first two phases of the RI. In all cases, the groundwater samples were obtained from sample points located prior to any groundwater treatment systems. The supply system was purged for approximately 20 minutes prior to sample collection to insure a representative groundwater sample. In addition, temperature, pH, and conductivity measurements were obtained from each residential well supply. The Phase I groundwater samples were analyzed for Drinking Water Parameters which included, volatile organics (Method 524.2), semi-volatile organics, Pesticides/PCBs, Target Analyte List (TAL) Metals, and various inorganics (cyanide, chloride, nitrate, sulfate and fluoride). The Phase II groundwater samples were analyzed for Drinking Water SSIC parameters which included; volatile organics (Method 524.2), lead and arsenic. The Phase III groundwater samples were analyzed for drinking water SSIC parameters which included volatile organics (Method 524.2) and lead.

The analytical results and the corresponding sampling logs are presented in Section 9.6 and Appendix C-2 respectively.

Analytical results obtained during the IRM drum removal from RES-W6 well indicated elevated lead concentrations. Therefore, a separate lead contamination study was implemented to determine the source of the elevated lead at RES-W6. The investigation consisted of obtaining groundwater samples at the well head and at a sample point prior to the treatment system before and after purging of the well system. Each water sample was subsequently analyzed for lead to determine if the elevated lead concentrations were indicative of the groundwater in the area or a result of leaching from the internal plumbing system. During the Phase III investigation, RES-W6 water well was resampled for lead under controlled purging conditions. The Lead Contamination Study of RES-W6 Water Well is presented in Appendix A.

TABLE 8.1
MAGNETOMETER SURVEY DATA SUMMARY TABLE
SATELLITE SITE 2

Page 1 of 3

NORTH-SOUTH TRENDING GRID LINES	EAST WEST TRENDING GRID LINES	MAGNETOMETER READING (GAMMA)
0.00	0.00	4.00
0.00	20.00	6.00
0.00	40.00	7.00
0.00	60.00	7.00
0.00	80.00	9.00
0.00	100.00	4.00
0.00	120.00	4.00
0.00	140.00	0.00
0.00	160.00	-7.00
0.00	180.00	-39.00
0.00	200.00	-106.00
20.00	0.00	0.00
20.00	20.00	1.00
20.00	40.00	4.00
20.00	60.00	4.00
20.00	80.00	9.00
20.00	100.00	2.00
20.00	120.00	0.00
20.00	140.00	-1.00
20.00	160.00	-5.00
20.00	180.00	79.00
40.00	0.00	-1.00
40.00	20.00	2.00
40.00	40.00	1.00
40.00	60.00	9.00
40.00	80.00	5.00
40.00	100.00	-1.00
40.00	120.00	6.00
40.00	140.00	2.00
40.00	160.00	39.00
40.00	180.00	495.00
40.00	260.00	-29.00
40.00	280.00	52.00
40.00	300.00	444.00
40.00	320.00	183.00
40.00	340.00	-134.00
60.00	0.00	-1.00
60.00	20.00	0.00
60.00	40.00	-1.00
60.00	60.00	3.00
60.00	80.00	2.00
60.00	100.00	5.00
60.00	120.00	12.00
60.00	140.00	76.00
60.00	160.00	9.00
60.00	260.00	-151.00
60.00	280.00	97.00
60.00	300.00	1029.00
60.00	320.00	381.00
60.00	340.00	29.00
80.00	0.00	2.00
80.00	20.00	4.00
80.00	40.00	1.00
80.00	60.00	4.00
80.00	80.00	9.00
80.00	100.00	-16.00
80.00	120.00	9.00
80.00	140.00	23.00
80.00	160.00	14.00
80.00	180.00	269.00
80.00	200.00	-141.00
80.00	220.00	-115.00
80.00	240.00	-142.00
80.00	260.00	13.00
80.00	280.00	151.00
80.00	300.00	115.00
80.00	320.00	11.00
80.00	340.00	215.00
100.00	0.00	-2.00
100.00	20.00	3.00
100.00	40.00	0.00
100.00	60.00	7.00
100.00	80.00	105.00
100.00	100.00	-251.00
100.00	120.00	-1.00
100.00	140.00	-3.00
100.00	160.00	-8.00
100.00	180.00	-40.00
100.00	200.00	-46.00
100.00	220.00	-49.00
100.00	240.00	-44.00
100.00	260.00	-25.00
100.00	280.00	-18.00
100.00	300.00	-46.00

TABLE 8.1
MAGNETOMETER SURVEY DATA SUMMARY TABLE
SATELLITE SITE 2

Page 2 of 3

NORTH-SOUTH TRENDING GRID LINES	EAST WEST TRENDING GRID LINES	MAGNETOMETER READING (GAMMA)
100.00	320.00	85.00
120.00	0.00	5.00
120.00	20.00	4.00
120.00	40.00	13.00
120.00	60.00	8.00
120.00	80.00	14.00
120.00	100.00	-15.00
120.00	120.00	8.00
120.00	140.00	4.00
120.00	160.00	11.00
120.00	180.00	-40.00
120.00	200.00	-28.00
120.00	220.00	-30.00
120.00	240.00	-21.00
120.00	260.00	-15.00
120.00	280.00	54.00
120.00	300.00	-83.00
140.00	0.00	-7.00
140.00	20.00	-15.00
140.00	40.00	-6.00
140.00	60.00	-7.00
140.00	80.00	-5.00
140.00	100.00	-21.00
140.00	120.00	-10.00
140.00	140.00	-1.00
140.00	160.00	-4.00
140.00	180.00	-29.00
140.00	200.00	-24.00
140.00	220.00	-23.00
140.00	240.00	-35.00
140.00	260.00	-36.00
140.00	280.00	-57.00
140.00	300.00	-79.00
140.00	320.00	-61.00
160.00	0.00	-15.00
160.00	20.00	-14.00
160.00	40.00	-13.00
160.00	60.00	-13.00
160.00	80.00	4.00
160.00	100.00	2.00
160.00	120.00	-8.00
160.00	140.00	-3.00
160.00	160.00	-19.00
160.00	180.00	-16.00
160.00	200.00	-29.00
160.00	220.00	-27.00
160.00	240.00	-27.00
160.00	260.00	-96.00
160.00	280.00	-35.00
160.00	300.00	-124.00
180.00	0.00	-11.00
180.00	20.00	-16.00
180.00	40.00	-13.00
180.00	60.00	-13.00
180.00	80.00	-12.00
180.00	100.00	-65.00
180.00	120.00	-6.00
180.00	140.00	-3.00
180.00	160.00	14.00
180.00	180.00	13.00
180.00	200.00	-21.00
180.00	220.00	-23.00
180.00	240.00	211.00
180.00	260.00	-5.00
180.00	280.00	46.00
180.00	300.00	-82.00
200.00	0.00	-5.00
200.00	20.00	-10.00
200.00	40.00	-9.00
200.00	60.00	-9.00
200.00	80.00	-11.00
200.00	100.00	-13.00
200.00	120.00	-7.00
200.00	140.00	-8.00
200.00	160.00	0.00
200.00	180.00	-8.00
200.00	200.00	-18.00
200.00	220.00	-8.00
200.00	240.00	0.00
200.00	260.00	30.00
200.00	280.00	-68.00
200.00	300.00	-60.00
220.00	0.00	-20.00
220.00	20.00	-14.00

TABLE 8.1
MAGNETOMETER SURVEY DATA SUMMARY TABLE
SATELLITE SITE 2
Page 3 of 3

NORTH-SOUTH TRENDING GRID LINES	EAST WEST TRENDING GRID LINES	MAGNETOMETER READING (GAMMA)
220.00	40.00	-13.00
220.00	60.00	-11.00
220.00	80.00	-20.00
220.00	100.00	-8.00
220.00	120.00	-6.00
220.00	140.00	-7.00
220.00	160.00	-12.00
220.00	180.00	-12.00
220.00	200.00	-15.00
220.00	220.00	-17.00
220.00	240.00	-19.00
220.00	260.00	-13.00
220.00	280.00	-38.00
220.00	300.00	-43.00
240.00	0.00	-5.00
240.00	20.00	0.00
240.00	40.00	3.00
240.00	60.00	0.00
240.00	80.00	-4.00
240.00	100.00	-3.00
240.00	120.00	-1.00
240.00	140.00	5.00
240.00	160.00	4.00
240.00	180.00	-1.00
240.00	200.00	0.00
240.00	220.00	-1.00
240.00	240.00	-11.00
240.00	260.00	-7.00
240.00	280.00	-17.00
240.00	300.00	-20.00
260.00	0.00	-5.00
260.00	20.00	-4.00
260.00	40.00	-8.00
260.00	60.00	-13.00
260.00	80.00	-8.00
260.00	100.00	-5.00
260.00	120.00	-5.00
260.00	140.00	-3.00
260.00	160.00	-7.00
260.00	180.00	2.00
260.00	200.00	-7.00
260.00	220.00	-8.00
260.00	240.00	-9.00
260.00	260.00	-4.00
260.00	280.00	1.00
260.00	300.00	-2.00
20.00	230.00	-732.00
20.00	240.00	-172.00
20.00	250.00	-107.00
20.00	260.00	-14.00
20.00	270.00	224.00
330.00	130.00	17.00
330.00	140.00	19.00
330.00	160.00	13.00
330.00	180.00	15.00

TABLE 8.2
MAGNETOMETER SURVEY DATA SUMMARY TABLE
SATELLITE SITE 3

Page 1 of 2

NORTH-SOUTH TRENDING GRID LINES	EAST WEST TRENDING GRID LINES	MAGNETOMETER READING (GAMMA)
0.00	0.00	35.00
0.00	20.00	73.00
0.00	40.00	68.00
0.00	60.00	76.00
0.00	80.00	91.00
0.00	100.00	-74.00
0.00	120.00	-159.00
0.00	140.00	-23.00
0.00	160.00	-30.00
20.00	0.00	27.00
20.00	20.00	90.00
20.00	40.00	160.00
20.00	60.00	159.00
20.00	80.00	223.00
20.00	100.00	162.00
20.00	120.00	-142.00
20.00	140.00	-193.00
20.00	160.00	-9.00
40.00	0.00	30.00
40.00	20.00	129.00
40.00	40.00	218.00
40.00	60.00	150.00
40.00	80.00	326.00
40.00	100.00	29.00
40.00	120.00	378.00
40.00	140.00	-87.00
40.00	160.00	-104.00
60.00	0.00	155.00
60.00	20.00	93.00
60.00	40.00	95.00
60.00	60.00	392.00
60.00	80.00	133.00
60.00	100.00	104.00
60.00	120.00	710.00
60.00	140.00	20.00
60.00	160.00	26.00
80.00	0.00	40.00
80.00	20.00	101.00
80.00	40.00	188.00
80.00	60.00	335.00
80.00	80.00	78.00
80.00	100.00	138.00
80.00	120.00	685.00
80.00	140.00	318.00
80.00	160.00	-230.00
100.00	0.00	24.00
100.00	20.00	99.00
100.00	40.00	183.00
100.00	60.00	526.00
100.00	80.00	-125.00
100.00	100.00	55.00
100.00	120.00	600.00
100.00	140.00	70.00
100.00	160.00	-77.00
120.00	0.00	40.00
120.00	20.00	82.00
120.00	40.00	216.00
120.00	60.00	408.00
120.00	80.00	-83.00
120.00	100.00	77.00
120.00	120.00	556.00
120.00	140.00	-258.00
120.00	160.00	-107.00
140.00	0.00	52.00
140.00	20.00	88.00
140.00	40.00	166.00
140.00	60.00	423.00
140.00	80.00	-93.00
140.00	100.00	208.00
140.00	120.00	367.00
140.00	140.00	-213.00
140.00	160.00	-8.00
160.00	0.00	70.00
160.00	20.00	64.00
160.00	40.00	250.00
160.00	60.00	167.00
160.00	80.00	63.00
160.00	100.00	337.00
160.00	120.00	492.00
160.00	140.00	-200.00
160.00	160.00	68.00
180.00	0.00	58.00
180.00	20.00	104.00
180.00	40.00	183.00

TABLE 8.2
MAGNETOMETER SURVEY DATA SUMMARY TABLE
SATELLITE SITE 3
Page 2 of 2

NORTH-SOUTH TRENDING GRID LINES	EAST WEST TRENDING GRID LINES	MAGNETOMETER READING (GAMMA)
180.00	60.00	182.00
180.00	80.00	724.00
180.00	100.00	174.00
180.00	120.00	-19.00
180.00	140.00	-12.00
200.00	0.00	98.00
200.00	20.00	174.00
200.00	40.00	176.00
200.00	60.00	56.00
200.00	80.00	139.00
200.00	100.00	-51.00
200.00	120.00	-151.00
200.00	140.00	-18.00
220.00	0.00	69.00
220.00	20.00	54.00
220.00	40.00	64.00
220.00	60.00	78.00
220.00	80.00	-34.00
220.00	100.00	20.00
220.00	120.00	-31.00
240.00	0.00	-9.00
240.00	20.00	-6.00
240.00	40.00	374.00
240.00	60.00	271.00
240.00	80.00	-41.00

Table 8.3
Satellite Site 1 Test Pit
PID Readings Data Summary Table

	Test Pit TP1	Test Pit TP2	
Depth (feet)	Reading (ppm)	Reading (ppm)	Sample Number
0'-2'	BKG	BKG	-
2'-4'	BKG	BKG	SWE/SAT1-TP2-2'-2.5' SWE/SAT1-TP1-2'

NOTE: Background (BKG)=0.5ppm

Table 8.4
Satellite Site 2 Test Pit
PID Readings Data Summary Table

	Test Pit TP1	Test Pit TP2	Test Pit TP3	Test Pit TP4	Test Pit TP5	Test Pit TP6	Test Pit TP7	Test Pit TP8	
Depth (feet)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
2'-4'	BKG	BKG	BKG	BKG	BKG	BKG*	BKG	BKG*	SWE/SAT2-TP4-2'
4'-6'	BKG	BKG*	BKG	BKG(5.5')*	BKG(5')*		BKG(5')*		SWE/SAT2-TP1-4'
6'-8'	BKG		BKG(7')*						-
8'-10'	BKG								-
10'-12'	BKG								-
12'-14'	BKG*								-

NOTE: Background (BKG)=0.5ppm
* Bottom of Test Pit

Table 8.5
Satellite Site 3 Test Pit
PID Readings Data Summary Table

	Test Pit TP1	Test Pit TP2	Test Pit TP3	Test Pit TP4A	Test Pit TP4B	Test Pit TP5	
Depth (feet)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	-
2'-4'	BKG	BKG	BKG	BKG	BKG	BKG	SWE/SAT3-TP4A-4'
4'-6'	BKG	BKG*	BKG	BKG	BKG	BKG	SWE/SAT3-TP1-5'
6'-8'	BKG	BKG(7')*	BKG(7.5')*	BKG(7')*	BKG(6.5')*	BKG(8')*	-
8'-10'	BKG(9')*						-

NOTE: Background (BKG)=0.5ppm
* Bottom of Test Pit

Table 8.6
Page 1 of 7
Monitoring Well Installation
PID Readings Data Summary Table

	MW-1I	MW-1D		MW-2I	MW-2D		
Depth (feet)	Reading (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Reading (ppm)	Head Space (ppm)	Sample Number
0'-2'	BKG	BKG	BKG	40	BKG	BKG	-
2-4'	BKG	BKG	BKG	20	BKG	BKG	SWE-B1D-3-4'
4'-6'	BKG	BKG	BKG	20	BKG	BKG	SWE-B2D-4-6'
6'-8'	BKG	BKG	BKG	60	BKG	BKG	-
8'-10'	BKG	BKG	BKG	20	BKG	1	-
10'-12'	BKG	BKG	BKG	BKG	BKG	1	SWE-B2D-10-12'
12'-14'	BKG	BKG	BKG	BKG	BKG	BKG	-
14'-16'	BKG	BKG	BKG	BKG	BKG	NA	-
16'-18'	BKG	BKG	BKG	BKG	BKG	NA	-
18'-20'	BKG	BKG	BKG	BKG(20.0')*	BKG	NA	-
20'-22'	BKG	BKG	BKG		BKG	NA	-
22'-24'	BKG	BKG	BKG		BKG	NA	-
24'-26'	BKG	BKG	BKG		BKG	NA	-
26'-28'	BKG(27.5')*	BKG	BKG		BKG	NA	-
28'-30'		BKG	NA		BKG	NA	-
30'-32'		BKG	NA		BKG	NA	-
32'-34'		BKG	NA		BKG	NA	-
34'-36'		BKG	NA		BKG	NA	-
36'-38'		BKG	NA		BKG	NA	-
38'-40'		BKG	NA		BKG	NA	-
40'-42'		BKG	NA		BKG	NA	-
42'-44'		BKG	NA		BKG	NA	-
44'-46'		BKG	NA		BKG(45.1')*	NA	-
46'-48'		BKG	NA				-
48'-50'		BKG	NA				-
50'-55'		BKG(52.5')*	NA				-

NOTE: Background (BKG)= 0.0-0.5ppm
* Bottom of Borehole

Table 8.6
Page 2 of 7
Monitoring Well Installation
PID Readings Data Summary Table

	MW-3I	MW-3D		MW-4I	MW-5I	MW-5D		
Depth (feet)	Reading (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Reading (ppm)	Reading (ppm)	Head Space (ppm)	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
2-4'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
4'-6'	BKG	BKG	1	90	BKG	BKG	BKG	SWE-B3D-4-6'
6'-8'	BKG	BKG	5	12	BKG	BKG	BKG	-
8'-10'	BKG	BKG	2	BKG	BKG	BKG	BKG	-
10'-12'	BKG	BKG	1	BKG	BKG	BKG	BKG	-
12'-14'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
14'-16'	BKG	BKG	BKG	200	BKG	BKG	BKG	-
16'-18'	BKG(17.2')*	BKG	20	3	BKG	BKG	BKG	-
18'-20'		BKG	NA	BKG	BKG	BKG	BKG	-
20'-22'		BKG	NA	BKG	BKG	BKG	BKG	-
22'-24'		BKG	NA	BKG	BKG	BKG	BKG	-
24'-26'		BKG	NA	BKG	BKG	BKG	BKG	-
26'-28'		BKG	NA	BKG(27.7')*	BKG	BKG	BKG	-
28'-30'		BKG	NA		BKG	BKG	BKG	-
30'-32'		BKG	NA		BKG	BKG	BKG	-
32'-34'		BKG	NA		BKG	BKG	BKG	-
34'-36'		BKG	NA		BKG	BKG	BKG	-
36'-38'		BKG	NA		BKG(41.8')*	BKG	BKG	-
38'-40'		BKG	NA			BKG	NA	-
40'-42'		BKG	NA			BKG	NA	-
42'-44'		BKG(46')*	NA			BKG	NA	-
44'-46'						BKG	NA	-
46'-48'						BKG	NA	-
48'-50'						BKG	NA	-
50'-55'						BKG	NA	-
55'-60'						BKG	NA	-
60'-65'						BKG	NA	-
65'-67.5'						BKG(67.5')*	NA	-

NOTE: Background (BKG)= 0.0-0.5ppm
* Bottom of Borehole

Table 8.6
Page 3 of 7
Monitoring Well Installation
PID Readings Data Summary Table

	MW-6S		MW-6I		MW-7S		
Depth (feet)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Sample Number
0'-2'	BKG	12	BKG	BKG	BKG	BKG	-
2-4'	10	17	BKG	0.5	BKG	1	-
4'-6'	3	30	BKG	1.3	BKG	7	SWE-B6S-4-5'
6'-8'	7	40	NO REC.	NO REC.	BKG	1	-
8'-10'	BKG	10	BKG	2.2	BKG	4	SWE-B7S-8-10'
10'-12'	25*	200*	BKG	1.3	NO REC.	NO REC.	SWE-B6S-11-12'
12'-14'			BKG	10	BKG(13')*	BKG(13')*	SWE-B6I-12-14'
14'-16'			BKG	1			-
16'-18'			BKG	0.8			-
18'-20'			BKG	1.2			-
20'-22'			BKG(20.5')*	0.6(20.5')*			-

NOTE: Background (BKG)= 0.0-0.5ppm
* Bottom of Borehole

Table 8.6
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Monitoring Well Installation
PID Readings Data Summary Table

	MW-8S		MW-8D		MW-9I		
Depth (feet)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	-
2-4'	NO REC.	NO REC.	BKG	BKG	BKG	BKG	-
4'-6'	NO REC.	NO REC.	BKG	BKG	BKG	BKG	-
6'-8'	BKG	BKG	BKG	BKG	BKG	BKG	-
8'-10'	BKG	BKG	BKG	BKG	BKG	BKG	SWE- B8S-9-10'
10'-12'	BKG	0.6	BKG	BKG	BKG	BKG	-
12'-14'	BKG(14')*	0.4(14')*	BKG	BKG	BKG	BKG	-
14'-16'			BKG	BKG	BKG	BKG	-
16'-18'			BKG	BKG	BKG	BKG	-
18'-20'			BKG	NA	BKG	BKG	SWE-B9I-18-20'
20'-22'			BKG	NA	BKG	BKG	-
22'-24'			BKG	NA	BKG(24.3')*	BKG(24.3')*	-
24'-26'			BKG	NA			-
26'-28'			BKG	NA			-
28'-30'			BKG	NA			-
30'-32'			BKG	NA			-
32'-34'			BKG	NA			-
34'-36'			BKG	NA			-
36'-38'			BKG	NA			-
38'-40'			BKG	NA			-
40'-42'			BKG	NA			-
42'-44'			BKG	NA			-
44'-46'			BKG(46')*	NA			

NOTE: Background (BKG)= 0.0-0.5ppm
* Bottom of Borehole

Table 8.6
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Monitoring Well Installation
PID Readings Data Summary Table

	MW-9D		MW-10S		MW-10I		
Depth (feet)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Sample Number
0'-2'	BKD	BKD	BKD	BKD	BKD	BKD	-
2-4'	BKD	BKD	BKD	BKD	BKD	BKD	-
4'-6'	BKD	BKD	BKD	BKD	BKD	BKD	-
6'-8'	BKD	BKD	BKD	BKD	BKD	BKD	-
8'-10'	BKD	1	BKD	BKD	BKD	BKD	SWE- B10I-8-10'
10'-12'	BKD	BKD	BKD	BKD	BKD	BKD	-
12'-14'	BKD	BKD	BKD(12.5')*	BKD(12.5')*	BKD	BKD	-
14'-16'	BKD	BKD			BKD(16.2')*	BKD(16.2')*	-
16'-18'	NO REC.	NO REC.					-
18'-20'	BKD	BKD					-
20'-22'	BKD	NA					-
22'-24'	BKD	NA					-
24'-26'	BKD	NA					-
26'-28'	BKD	NA					-
28'-30'	BKD	NA					-
30'-32'	BKD	NA					-
32'-34'	BKD	NA					-
34'-36'	BKD	NA					-
36'-38'	BKD	NA					-
38'-40'	BKD	NA					-
40'-42'	BKD	NA					-
42'-44'	BKD	NA					-
44'-46'	BKD	NA					-
46'-48'	BKD	NA					-
48'-50'	BKD(50')*	NA					-

NOTE: Background (BKG)= 0.0-0.5ppm
* Bottom of Borehole

Table 8.6
Page 6 of 7
Monitoring Well Installation
PID Readings Data Summary Table

	MW-10D		MW-11I		MW-11D		MW-12I		
Depth (feet)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Sample Number
0'-2'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
2-4'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
4'-6'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
6'-8'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
8'-10'	BKD	3	BKD	BKD	BKD	BKD	BKD	BKD	SWE- B11D-8-10'
10'-12'	BKD	BKD	BKD	BKD	BKD	NA	BKD	BKD	-
12'-14'	BKD	BKD	BKD(13.5')*	BKD(13.5')*	BKD	NA	BKD	BKD	SWE-B12I-12-14'
14'-16'	BKD	BKD			BKD	NA	BKD	BKD	-
16'-18'	BKD	BKD			BKD	NA	BKD	BKD	-
18'-20'	BKD	NA			BKD	NA	BKD	BKD	-
20'-22'	BKD	NA			BKD	NA	BKD(21')*	BKD(21')*	-
22'-24'	BKD	NA			BKD	NA			-
24'-26'	BKD	NA			BKD	NA			-
26'-28'	BKD	NA			BKD	NA			-
28'-30'	BKD	NA			BKD	NA			-
30'-32'	BKD	NA			BKD	NA			-
32'-34'	BKD	NA			BKD	NA			-
34'-36'	BKD	NA			BKD	NA			-
36'-38'	BKD	NA			BKD	NA			-
38'-40'	BKD	NA			BKD(39')*	NA			-
40'-42'	BKD	NA							-
42'-44'	BKD	NA							-
44'-46'	BKD	NA							-
46'-48'	BKD(47')*	NA							-

NOTE: Background (BKG)= 0.0-0.5ppm
* Bottom of Borehole

Table 8.6
Page 7 of 7
Monitoring Well Installation
PID Readings Data Summary Table

	MW-12D		MW-13S		MW-13I		MW-14I		
Depth (feet)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Reading (ppm)	Head Space (ppm)	Sample Number
0'-2'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
2-4'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
4'-6'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
6'-8'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
8'-10'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
10'-12'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
12'-14'	BKD	BKD	BKD	BKD	BKD	BKD	BKD	BKD	-
14'-16'	BKD	BKD	BKD(14.5')*	BKD(14.5')*	BKD	BKD	BKD	BKD	-
16'-18'	BKD	BKD			BKD	BKD	BKD	BKD	-
18'-20'	BKD	NA			BKD(19')*	BKD(19')*	BKD(18.5')*	BKD(18.5')*	SWE-MW14I-19'
20'-22'	BKD	NA							-
22'-24'	BKD	NA							-
24'-26'	BKD	NA							-
26'-28'	BKD	NA							-
28'-30'	BKD	NA							-
30'-32'	BKD	NA							-
32'-34'	BKD	NA							-
34'-36'	BKD	NA							-
36'-38'	BKD	NA							-
38'-40'	BKD	NA							-
40'-42'	BKD	NA							-
42'-44'	BKD	NA							-
44'-46'	BKD	NA							-
46'-48'	BKD(47.5')*	NA							-

NOTE: Background (BKG)= 0.0-0.5ppm

* Bottom of Borehole

Table 8.7
Page 1 of 3
Soil Borings
PID Readings Data Summary Table

	B-1		B-2		B-3		B-4		
Depth (feet)	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	2	-
2-4'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	3	-
4'-6'	BKG	BKG	NO REC.	NO REC.	BKG	BKG	BKG	6	-
6'-8'	BKG	BKG	BKG	6	BKG	BKG	1	20	-
8'-10'	BKG	BKG	1	5	BKG	BKG	160	150	-
10'-12'	BKG	BKG	BKG	40	BKG	BKG	180	180	SWE-B4-10-12'
12'-14'	BKG	BKG	BKG	100	BKG	BKG	90	150	-
14'-16'	BKG	BKG	BKG	60	BKG	BKG	9	30	-
16'-18'	BKG	BKG	BKG	30**	BKG	BKG	20	20	-
18'-20'	BKG	BKG	BKG	80**	BKG	BKG	4	20	-
20'-22'	BKG	BKG	BKG	25**	BKG	BKG	6	10	-
22'-24'	BKG(22.5')*	BKG(22.5')*	BKG	70**	BKG(23.5')*	BKG(23.5')*	2	8	-
24'-26'			BKG(26')*	3(26')*			1(24.4')*	20(24.4')*	-

	B-5		B-6		B-7		B-8		
Depth (feet)	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
2-4'	BKG	BKG	BKG	BKG	BKG	BKG	NO REC.	NO REC.	-
4'-6'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
6'-8'	10	12	20	200	4	50	BKG	BKG	SWE-B8-4-8'(Asb)
8'-10'	60	110	15	35	NO REC.	NO REC.	BKG	BKG	SWE-B5-8-10'
10'-12'	30	90	70	200	50	320	NO REC.	NO REC.	SWE-B7-10-12'
12'-14'	5	130	70	400	60	350	BKG	2	SWE-B6-12-14'
14'-16'	20	150	40	60	50	400	BKG	2	-
16'-18'	BKG	40	11	30**	6	300**	BKG	BKG	-
18'-20'	NO REC.*	NO REC.*	7	80**	4	80**	NO REC.	NO REC.	-
20'-22'			NO REC.	NO REC.	2	200**	BKG	BKG	-
22'-24'			BKG(24.4')*	10**	BKG	2	BKG	BKG	-
24'-26'					BKG(25.7')*	1(25.7')*	BKG(25.1')*	BKG(25.1')*	-

NOTE: Background (BKG)= 0.0-0.5ppm

* Bottom of Borehole

** Possible chemical carry down

Table 8.7
Page 2 of 3
Soil Borings
PID Readings Data Summary Table

	B-9		B-10		B-11		B-12		
Depth (feet)	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Sample Number
0'-2'	BKG	5	BKG	BKG	BKG	BKG	BKG	BKG	-
2-4'	BKG	BKG	BKG	1	BKG	BKG	NO REC.	BKG	-
4'-6'	20	12	BKG	2	BKG	BKG	7	30	SWE-B9-4-6'(Asb)
6'-8'	BKG	8	NO REC.	N0 REC.	BKG	1.5	NO REC.	NO REC.	-
8'-10'	BKG	9	BKG	BKG	17	40	3	50	
10'-12'	NO REC.	NO REC.	300	120	30	30	8	250	SWE-B9-12-14'
12'-14'	150	400	NO REC.	NO REC.	50	120	14	50	SWE-B11-12-14'
14'-16'	170	420	150	30	7	35	14	60	SWE-B12-12-14'
16'-18'	50	400	50	180	2	30	6	40	-
18'-20'	40	380	7	200	2	18	15	80	-
20'-22'	BKG	70	BKG	15	BKG	4	12	90	-
22'-24'	5	380**	NO REC.	NO REC.	BKG	1	4(22.6')*	70(22.6')*	-
24'-26'	BKG(25.6')*	18**	BKG(25.5')*	70**	BKG(25.4')*	BKG(25.4')*			-

	B-13		B-14		B-15		B-16		
Depth (feet)	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
2-4'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
4'-6'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	90	-
6'-8'	NO REC.	NO REC.	BKG	BKG	BKG	BKG	20	35	-
8'-10'	BKG	BKG	BKG	BKG	BKG	2	17	50	-
10'-12'	BKG	BKG	BKG	BKG	BKG	BKG	1	2	-
12'-14'	5	5	BKG	BKG	BKG	BKG	BKG	BKG	-
14'-16'	2	30	BKG	BKG	BKG	BKG	BKG	BKG	SWE-B13-14-16'
16'-18'	BKG	4	BKG	BKG	BKG	BKG	BKG	BKG	SWE-B16-14-16'
18'-20'	BKG	BKG	NO REC.	NO REC.	BKG	BKG	BKG	BKG	-
20'-22'	BKG(21')*	1(21')*	NO REC.*	NO REC.*	BKG	BKG	BKG	BKG	-
22'-24'					BKG(22.5')*	BKG(22.5')*	BKG(23.5')*	BKG(23.5')*	-
24'-26'									-

NOTE: Background (BKG)= 0.0-0.5ppm

* Bottom of Borehole

** Possible chemical carry down

Table 8.7
Page 3 of 3
Soil Borings
PID Readings Data Summary Table

	B-17		B-18		B-19		B-20		
Depth (feet)	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Reading ppm	Headspace ppm	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
2-4'	BKG	BKG	BKG	BKG	NO REC.	NO REC.	BKG	BKG	-
4'-6'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	2	-
6'-8'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
8'-10'	BKG	BKG	BKG(10')*	BKG(10')*	BKG(10.5')*	BKG(10.5')*	BKG	BKG	-
10'-12'	BKG	1					BKG	BKG	-
12'-14'	BKG	BKG					BKG	BKG	-
14'-16'	BKG	BKG					BKG(15')*	BKG(15')*	-
16'-18'	NO REC.	NO REC.							-
18'-20'	BKG	BKG							-
20'-22'	BKG	BKG							-
22'-24'	BKG(22.2')*	BKG(22.2')*							-

NOTE: Background (BKG)= 0.0-0.5ppm
* Bottom of Borehole

Table 8.8
Page 1 of 3
Test Pits
PID Readings Data Summary Table

	Test Pit TP1		Test Pit TP2		Test Pit TP3		Test Pit TP4		
Depth (feet)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Sample Number
0'-2'	BKG	BKG	BKG	BKG	BKG	BKG	BKG	7	-
2'-4'	BKG	BKG	2	2	BKG	BKG	BKG	7	SWE-TP1-2-3'
4'-6'	BKG	BKG	3	3	BKG	BKG	8	50	-
6'-8'	BKG	BKG	BKG	BKG	BKG	BKG	200	250	SWE-TP4-6-7'
8'-10'	BKG	BKG	BKG	BKG	BKG	BKG	20(10')*	300(10')*	SWE-TP1-9-10' SWE-TP2-10-11'
10'-12'	BKG(11)*	BKG(11)*	BKG(11')*	BKG(11')*	BKG(12')*	BKG(12')*			SWE-TP3-11-12'

	Test Pit TP5		Test Pit TP6		Test Pit TP7		Test Pit TP8		
Depth (feet)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Sample Number
0'-2'	BKG	BKG	BKG	1	BKG	BKG	BKG	BKG	-
2'-4'	BKG	BKG	4	2	BKG	BKG	BKG	BKG	-
4'-6'	BKG	BKG	15	40	BKG	BKG	BKG	BKG	SWE-TP6-4-5'
6'-8'	BKG	BKG	5	40	BKG	BKG	BKG	BKG	-
8'-10'	BKG(8.5')*	BKG(8.5')*	BKG(9')*	20(9')*	BKG(8.5')*	BKG(8.5')*	BKG(10')*	BKG(10')*	SWE-TP7-8-9'

NOTE: Background (BKG)=0.5ppm
* Bottom of Test Pit

Table 8.8
Page 2 of 3
Test Pits
PID Readings Data Summary Table

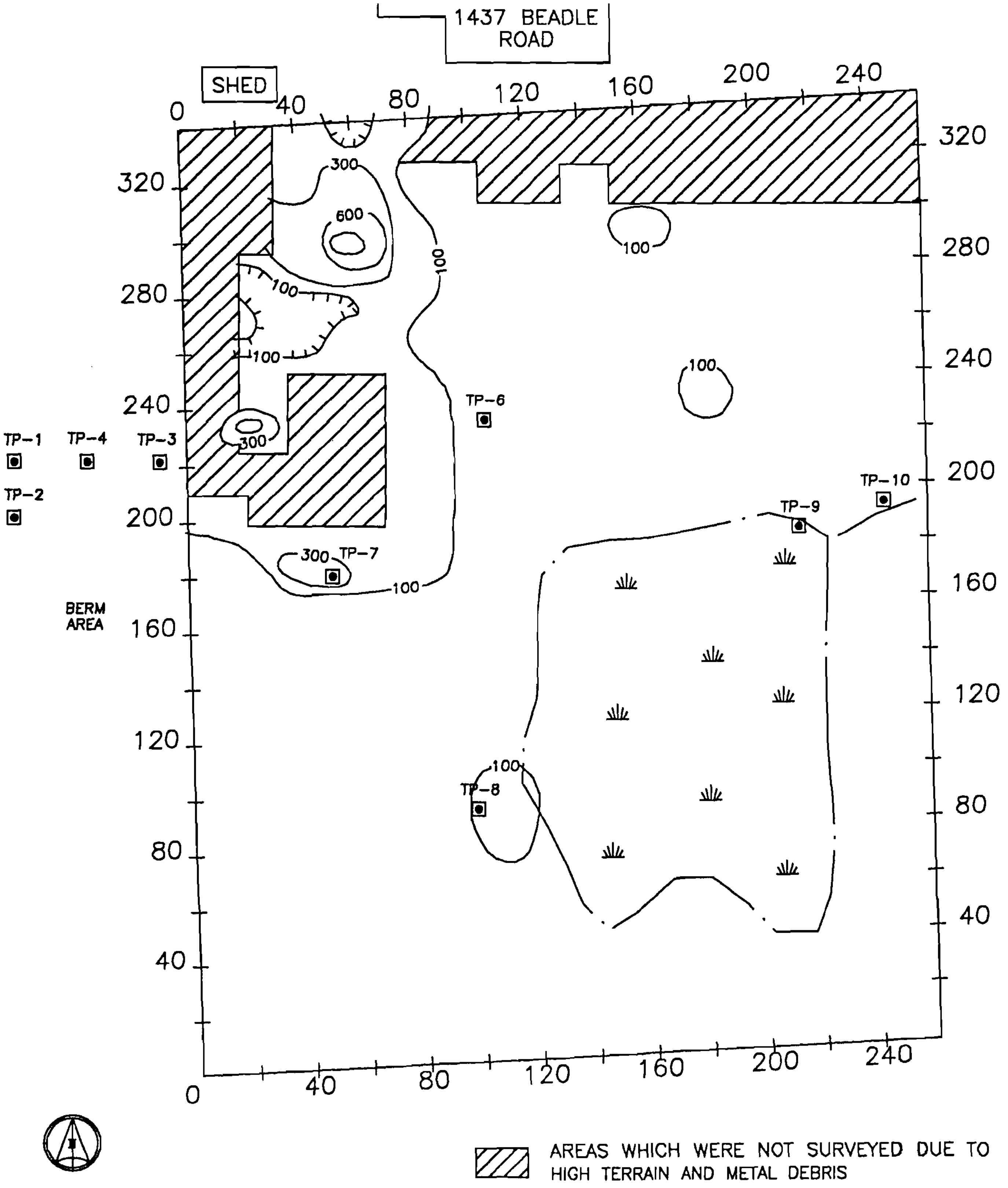
	Test Pit TP9		Test Pit TP10		Test Pit TP11		Test Pit TP12		
Depth (feet)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Sample Number
0'-2'	10	BKG	BKG	BKG	BKG	BKG	BKG	BKG	-
2'-4'	15	500	BKG	BKG	BKG	BKG	BKG	BKG	-
4'-6'	400	400	BKG	BKG	BKG	BKG	BKG	BKG	SWE-TP9-4-5'
6'-8'	150	15	BKG	2	BKG	BKG	BKG(7')*	BKG(7')*	-
8'-10'	200	20	BKG(10')*	1(10')*	BKG(10')*	BKG(10')*			-
10'-12'	50(12')*	NA							-

NOTE: Background (BKG)=0.5ppm
* Bottom of Test Pit

Table 8.8
Page 3 of 3
Test Pits
PID Readings Data Summary Table

	Test Pit TP13		Test Pit TP14		
Depth (feet)	Reading (ppm)	Headspace (ppm)	Reading (ppm)	Headspace (ppm)	Sample Number
0'-2'	BKG	BKG	BKG	BKG	-
2'-4'	BKG	BKG	BKG	BKG	-
4'-6'	BKG	BKG	BKG	BKG	SWE-TP14-5'
6'-8'	BKG	BKG	BKG(8')*	BKG(8')*	-
8'-10'	5	NA			-
10'-12'	20	NA			SWE-TP13-12'
14'-16'	20(16')*	NA			-

NOTE: Background (BKG)=0.5ppm
* Bottom of Test Pit



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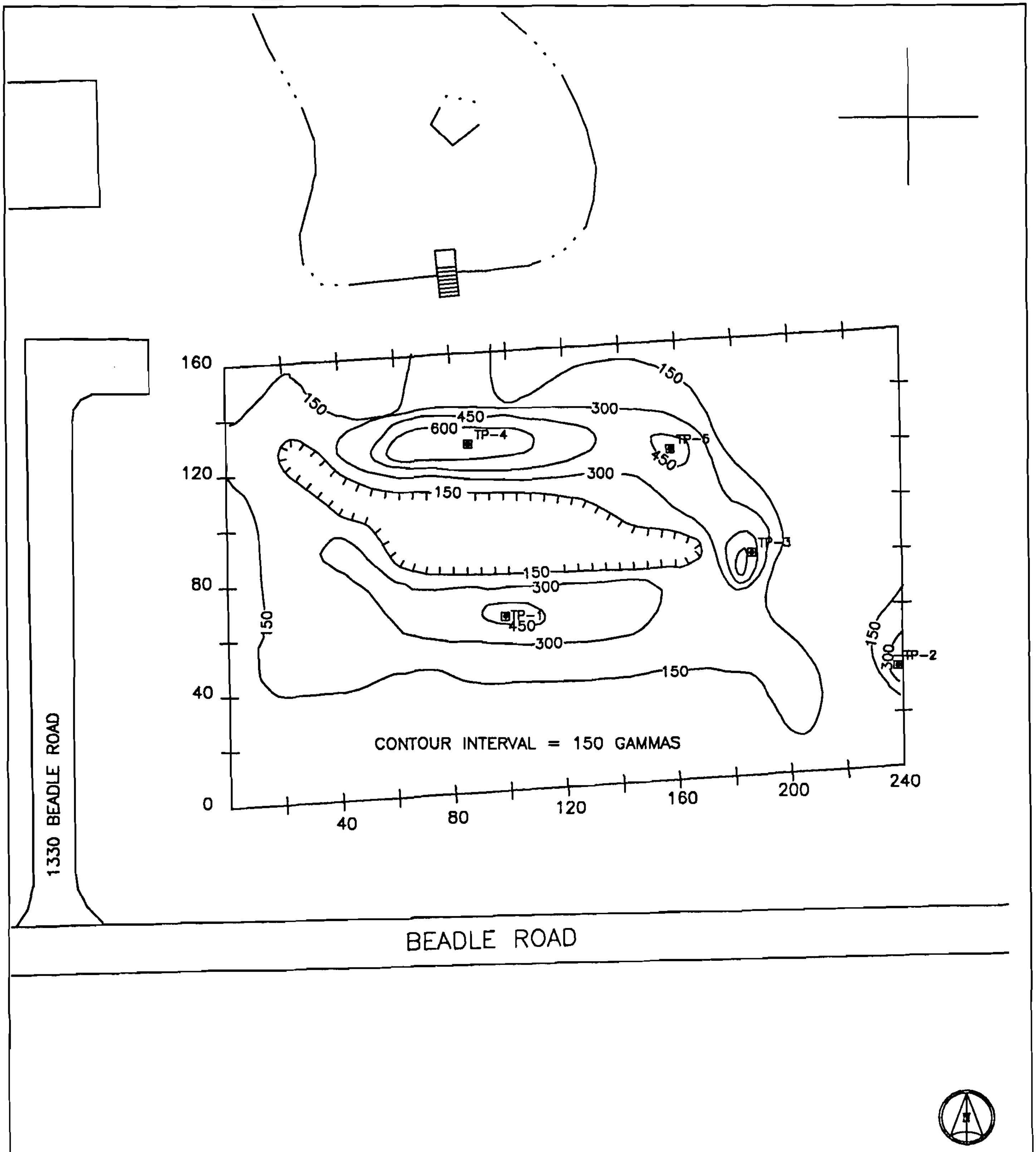
12 Metro Park Road
Albany, NY 12205

NYS DEPT. OF ENVIRONMENTAL CONSERVATION
WORK ASSIGNMENT No. D-2520-14

SATELLITE SITE 2
MAGNETOMETER SURVEY CONTOUR MAP
SWEDEN-3 – CHAPMAN SITE

PROJECT NO. 40296-00150	DATE Dec.,1992	DWG. NO. 9184_c	SCALE 1"=50'	FIGURE NO. 8.1



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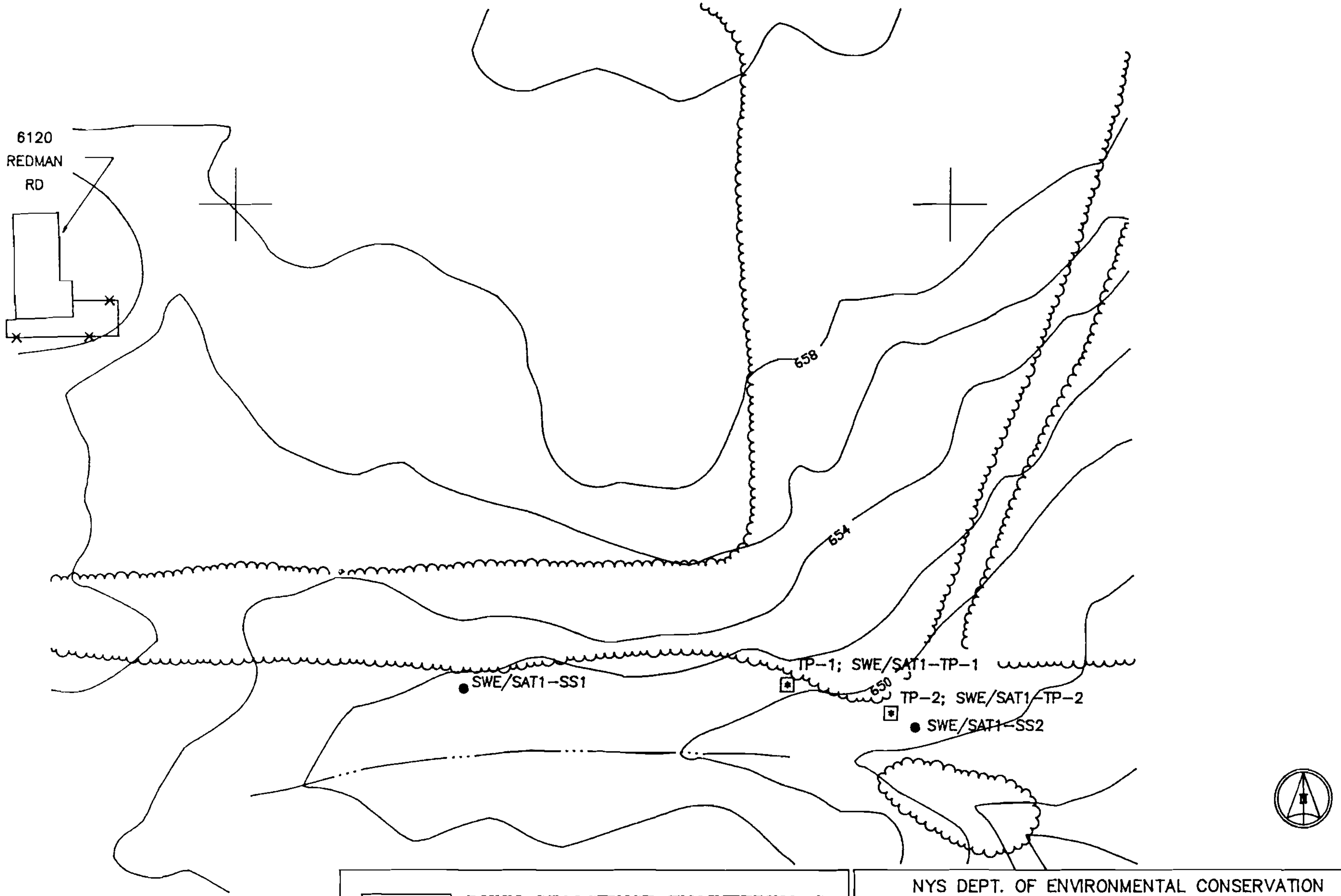
NYS DEPT. OF ENVIRONMENTAL CONSERVATION
WORK ASSIGNMENT No. D-2520-14
SATELLITE SITE 3
MAGNETOMETER SURVEY CONTOUR MAP
SWEDEN-3 – CHAPMAN SITE

PROJECT NO. 40296-00150	DATE Dec.,1992	DWG. NO. 9184_c	SCALE 1"=50'	FIGURE NO. 8.2



- ☐ TEST PIT
- ● SURFACE SAMPLE
- • SOIL SAMPLE

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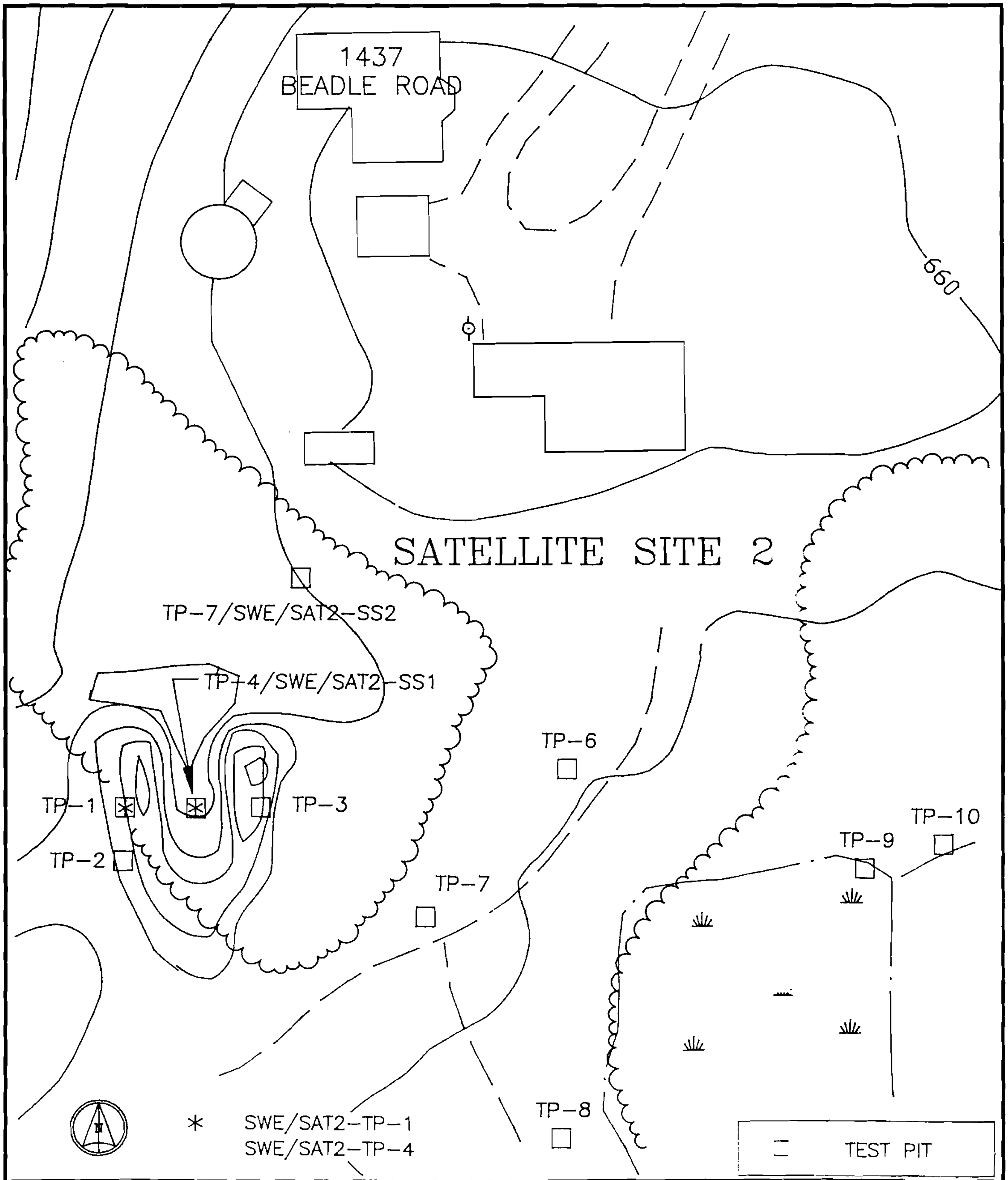
SATELLITE SITE 1
TEST PIT AND SAMPLE LOCATION MAP
SWEDEN-3 CHAPMAN SITE

PROJECT NO 40296-00150	DATE Dec., 1992	DWG. NO. 9183_A	SCALE 1"=100'	FIGURE NO. 8.3



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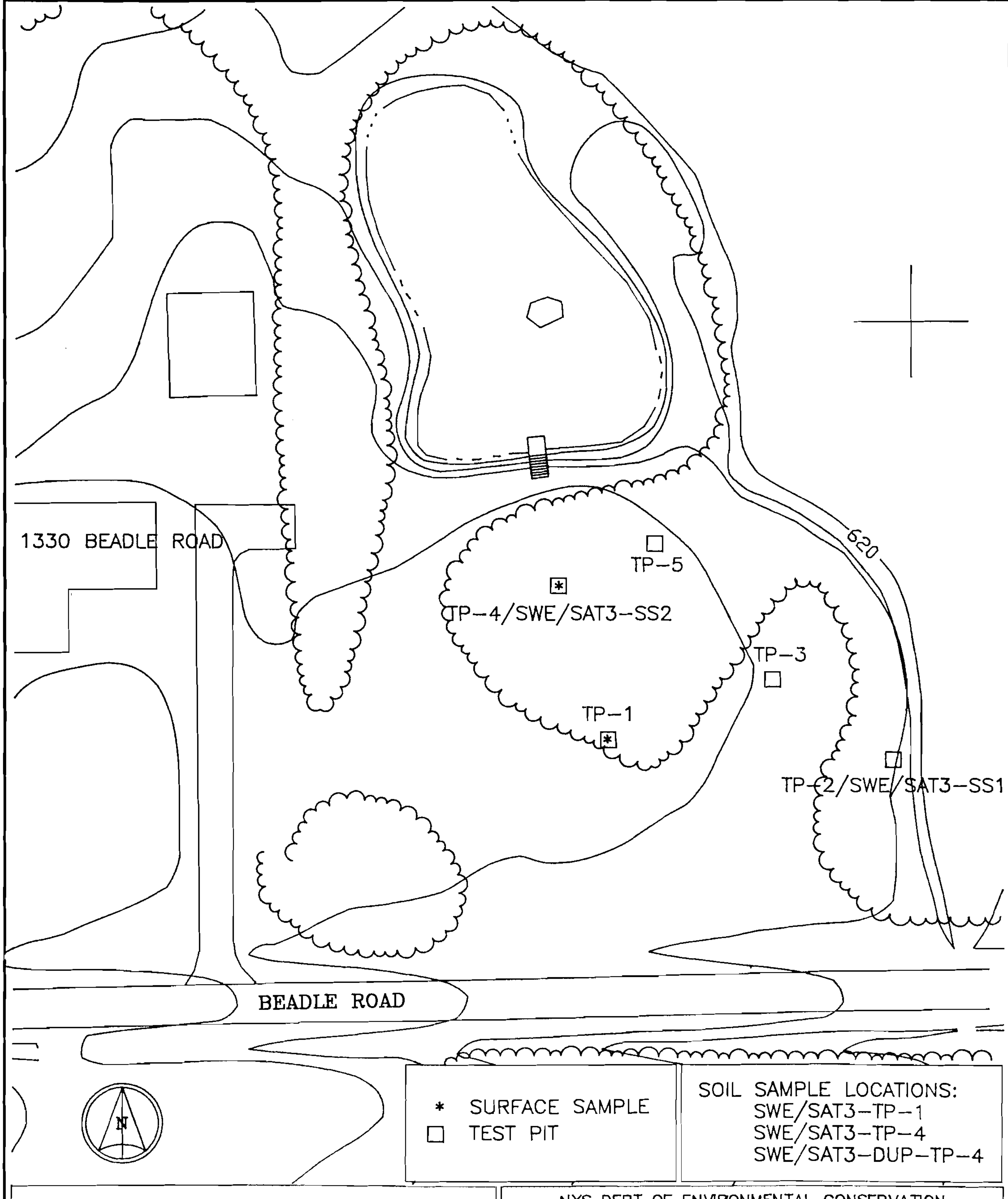
TEST PIT AND SOIL SAMPLE LOCATION MAP
SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-00150	DATE Dec., 1992	DWG. NO. 9184_B	SCALE 1"=50'	FIGURE NO. 8.4



* SURFACE SAMPLE
☐ TEST PIT

SOIL SAMPLE LOCATIONS:
SWE/SAT3-TP-1
SWE/SAT3-TP-4
SWE/SAT3-DUP-TP-4

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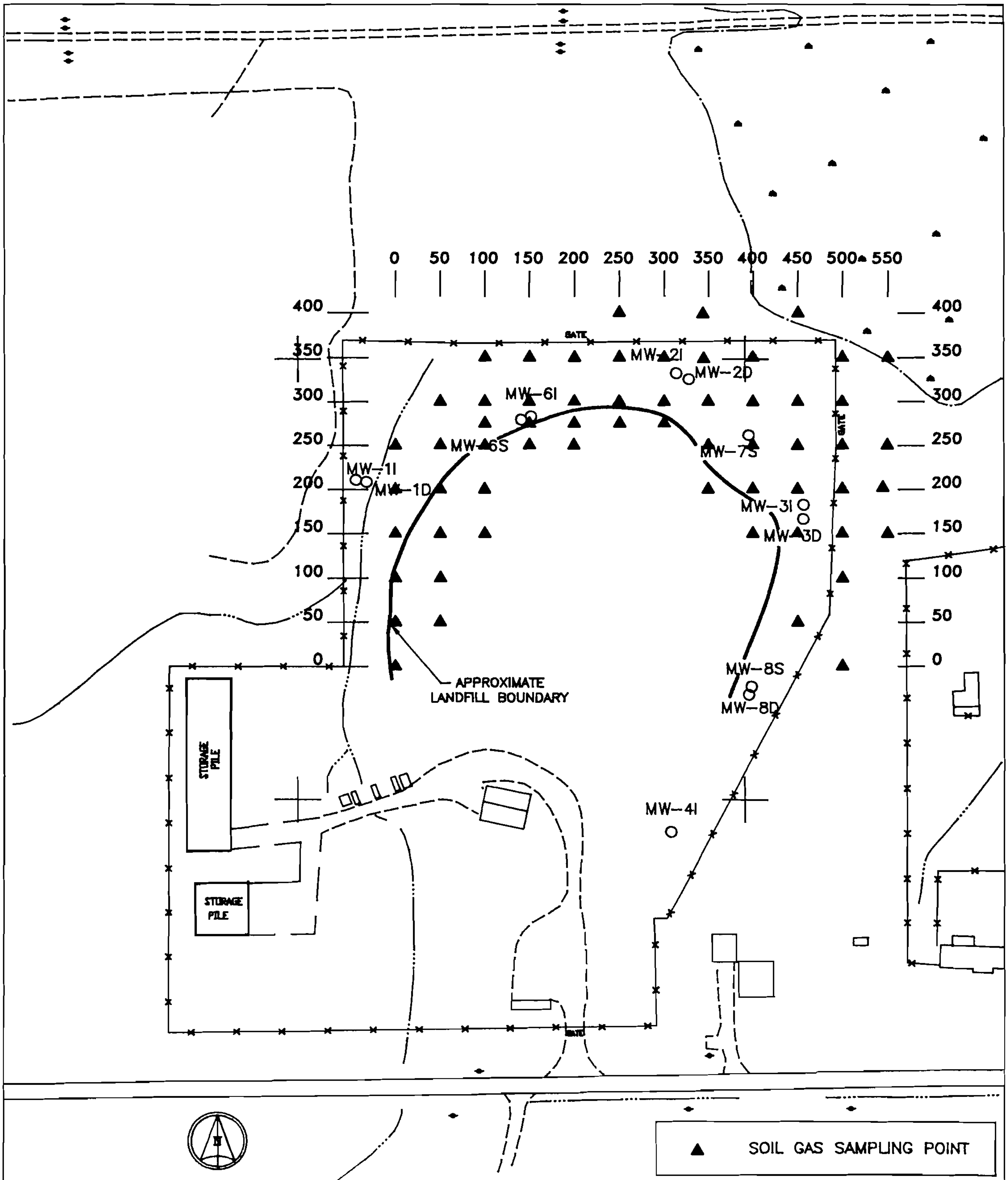
SATELLITE SITE 3
TEST PIT AND SAMPLE LOCATION MAP
SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-00150	DATE Dec., 1992	DWG. NO. 9184_B	SCALE 1"=60'	FIGURE NO. 8.5



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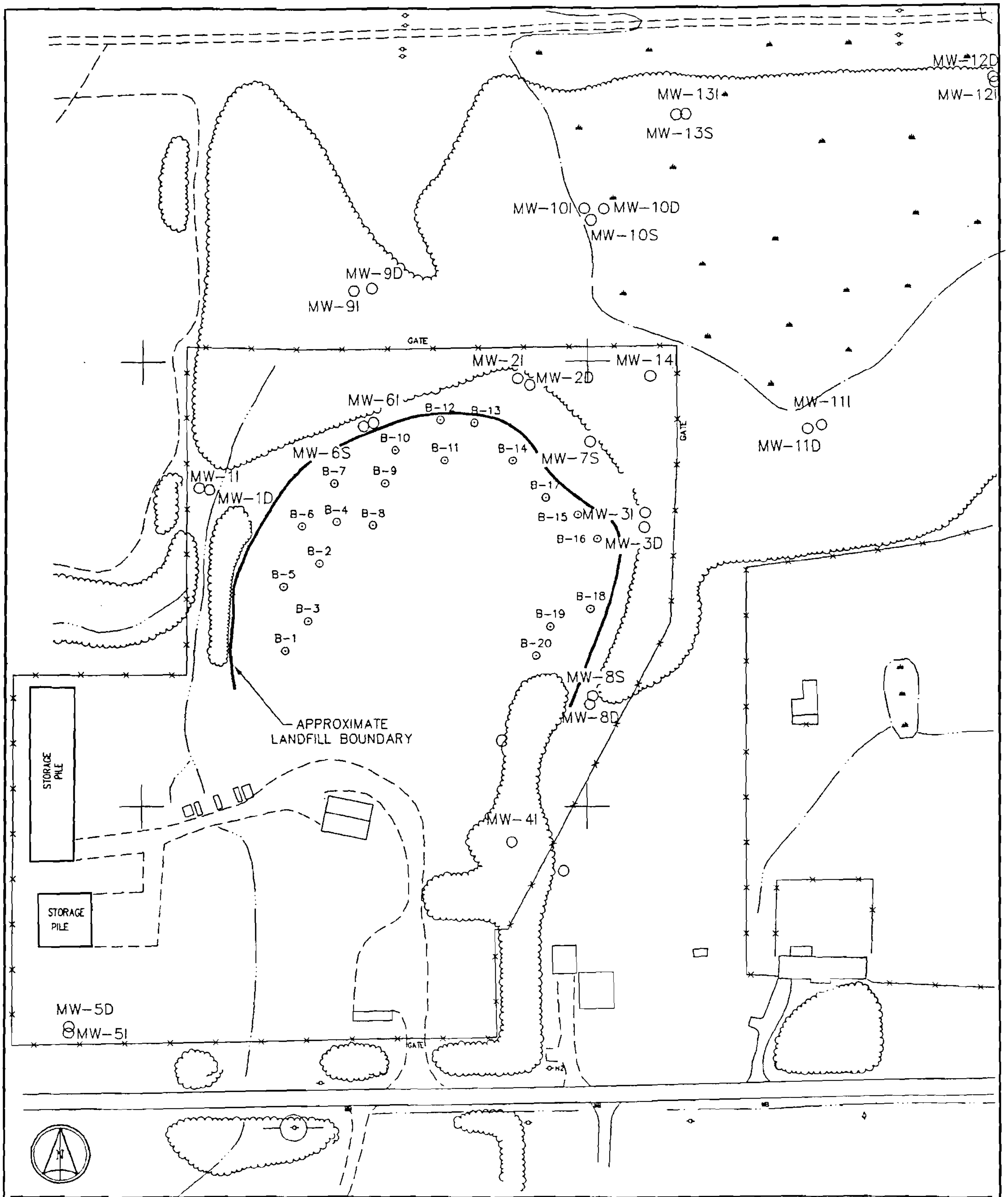
SOIL GAS SURVEY SAMPLE POINT MAP

SWEDEN-3 – CHAPMAN SITE

PROJECT NO. 40296-150
DATE Dec.,1992
DWG. NO. R9182_9
SCALE 1"=150'
FIGURE NO. 8.6



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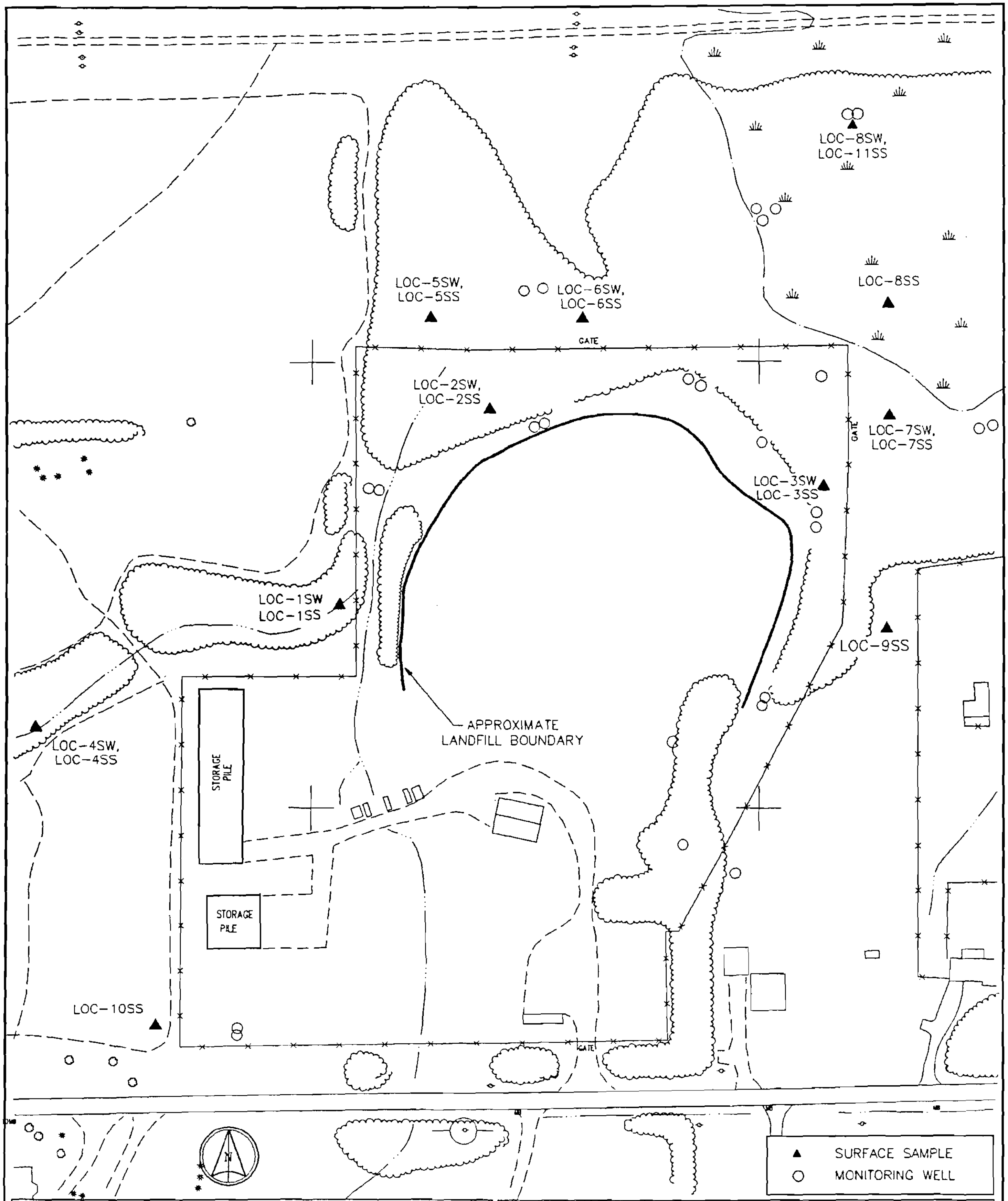
MONITORING WELL AND SOIL BORING LOCATION MAP
SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE Dec.,1992	DWG. NO. R9182_9	SCALE 1"=150'	FIGURE NO. 8.7



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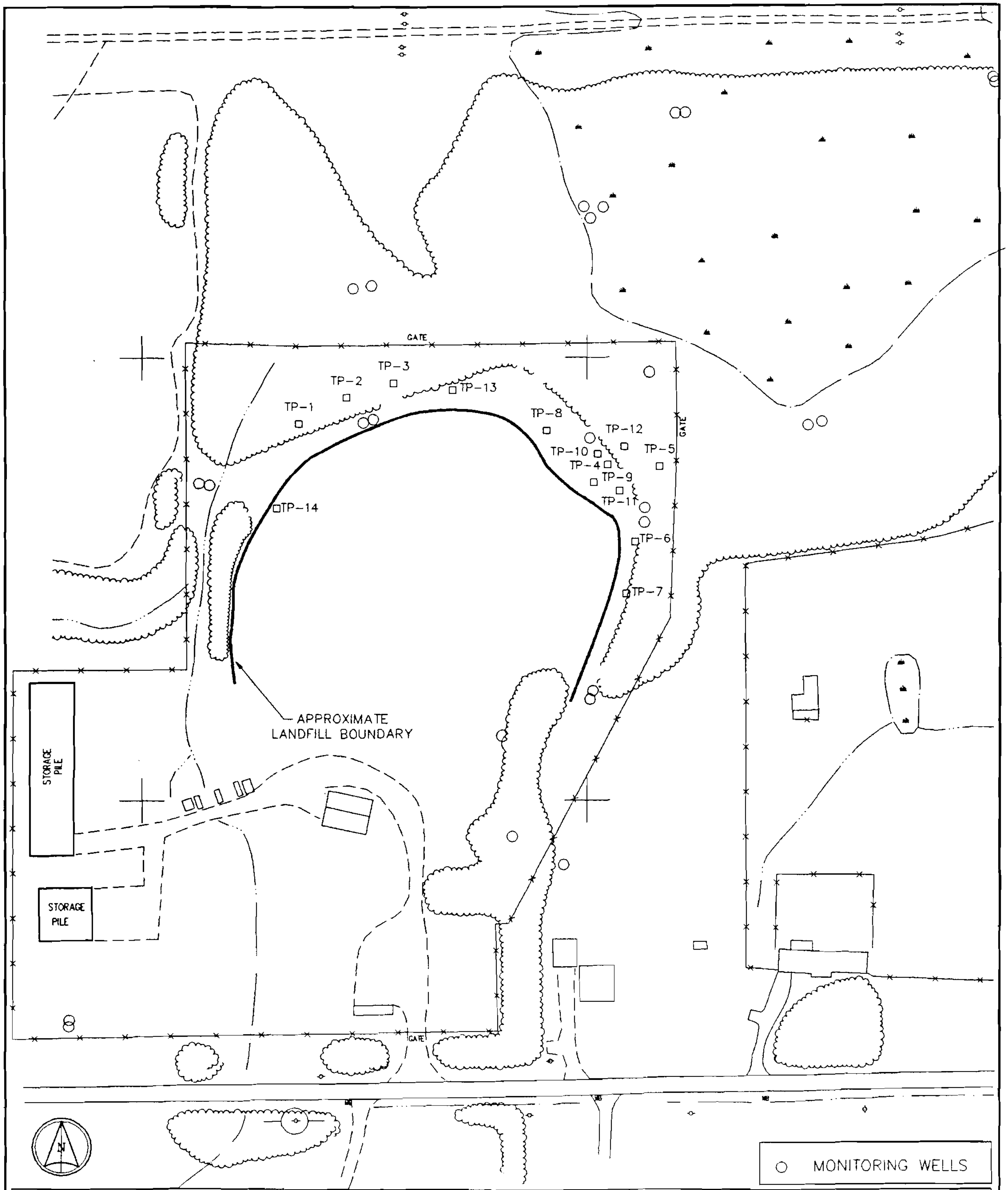
SURFACE SAMPLE LOCATION MAP

SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE Dec.,1992	DWG. NO. R9182_9	SCALE 1"=150'	FIGURE NO. 8.8



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TEST PIT LOCATION MAP

SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150
DATE Dec. 1992
DWG. NO. R9182_9
SCALE 1"=150'
FIGURE NO. 8.9

9.0 CONTAMINATION ASSESSMENT

9.1 Sweden-3 Chapman Site Analytical Results

9.1.1 Test Pits

This section presents a discussion of the results obtained from analyses of the ten soil samples collected during the Phase II test pit program performed at the Sweden-3 Chapman Site. As previously mentioned in Section 8.2.5, nine samples were analyzed for SSICs and one sample (SWE-TP4) was analyzed for Full CLP parameters. It should be noted that a duplicate sample was collected from TP-4 and analyzed for SSICs only. The analytical results are presented in Tables 9.7A, 9.7B and 9.8.

A review of the analytical results indicated that the most significant concentrations of volatile organics were detected in the soils collected from the upper till unit in both test pit TP-4 (SWE-TP4 6′-7′) and TP-9 (SWE-TP9 4′-5′), which is consistent with the field observations. Trichloroethene (TCE) was detected in SWE-TP4 (dup) and SWE-TP9 at a concentration of 1100 ppb and 1400 ppb, respectively. Toluene (170 ppb), ethylbenzene (570 ppb) and total xylenes (3900 ppb) were also detected in SWE-TP9. Each of the above values exceeds NYS Soil Guidance Values for the respective compounds. There were no significant concentrations of semi-volatile organic compounds detected in SWE-TP9 or SWE-TP4. In addition, there were no elevated metals detected in SWE-TP4; nor were there any pesticides or polychlorinated biphenyls (PCBs) detected above the detection limits of the respective analytical methodologies. The elevated levels of volatile organic compounds detected in the upper till unit in test pits TP-4 and TP-9 confirms the existence of a localized "hot spot" of contamination adjacent the northeast toe of the landfill.

Four soil samples were collected from test pits TP-1, 2 & 3, which were located in the area north and west of monitoring well cluster MW-6. A sample was collected at each location from the lower till unit and a lacustrine sample was also collected from test pit TP-1. Volatile organic compounds were detected in both the lacustrine sample (SWE-TP1 2′-3′) and lower till sample (SWE-TP1 9′-10′) collected from test pit TP-1, as well as the lower till sample collected from test pit TP-2 (SWE-TP2 10′-11′). 1,2-Dichlorethene (DCE) was detected in SWE-TP1 2′-3′, SWE-TP1 9′-10′ and SWE-TP2 10′-11′ at concentrations of 2 ppb , 7 ppb and 350 ppb, respectively. In addition, TCE was detected in SWE-TP1 9′-10′ (6 ppb) and SWE-TP2 10′-11′ (63 ppb). The levels of TCE and DCE detected in sample SWE-TP2 10′-11′ exceed NYS Soil Guidance Values. Tetrachloroethene (PCE) was detected at a concentration of 290 ppb in the lower till sample obtained from test pit TP-3 (SWE-TP-3 11′-12′). Methylene chloride was also detected in this sample, however, it was detected in the method blank as well. There were no significant concentrations of semi-volatile organic compounds detected in any of the four soil samples. The slightly elevated levels of TCE and DCE detected in the lower till sample collected from test pit TP-2 are evidence of lateral and downward migration of contaminants from the source area located within the lacustrine/upper till deposits beneath the landfill (Refer to the discussion in Section 13.1.

Chemical analysis of the lacustrine soil sample collected from test pit TP-14 (SWE-TP1 4′-5′) indicated the presence of total xylenes at a concentration of 67 ppb, which exceeds NYS Soil Guidance Values. The slightly elevated concentration of xylene may indicate that limited lateral migration of contaminants has occurred within the lacustrine deposit. There were no significant concentrations of semi-volatile organics detected in sample SWE-TP1 4'-5'.

Chemical analysis of the upper till soil sample collected from test pit TP-6 (SWE-TP6 4'-5') detected the presence of PCE at concentrations exceeding the Soil Guidance Values. In addition, several volatile organic compounds at relatively low concentrations were also detected in this sample. These included: DCE (1 ppb); TCE (15 ppb); and 1,1,2,2, Tetrachlorethene (14 ppb). The presence of these contaminants represents a localized plume of contamination previously detected in MW-3I, which is located downgradient and in proximity to test pit TP-6. There were no significant concentrations of semi-volatile organic compounds detected in sample SWE-TP6 4'-5'.

Chemical analysis of the soil samples collected from the remaining two test pits TP-7 and TP-13 did not indicate the presence of any significant concentrations of either volatile organics or semi-volatile organics. Field observations indicated the presence of volatile organics within the lower till sample collected from test pit TP-13. This, however, contradicts the analytical data. Volatile organic analytical results appeared to be considerably lower than field observations would have predicted. This discrepancy could possibly be attributed to field sampling protocol that called for the use of 40 mil vials. A considerable amount of effort was expended to pack the sampled soil into the vials resulting in unnecessary mixing, handling and aeration. The additional handling required to pack the sample vials possibly drove off some of the volatile fraction. Despite the lack of hard analytical data, it is Dunn's opinion that contaminants exist within the lower till unit at test pit TP-13. This would be consistent with the contaminant migration pathway discussed in Section 13.1.1, as well as the analytical data obtained from soil borings B-12, B-13 and monitoring well MW-2I which all indicate the presence of volatile organics within the lower till unit. These sample locations are all located in close proximity to TP-13.

9.1.2 Landfill Soil Borings

This section presents a discussion of the results obtained from analyses of the ten soil samples collected during the Phase II test boring program performed at the Sweden-3 Chapman Site. As previously mentioned in Section 8.4.2.1, nine samples were analyzed for Full CLP parameters and one sample (SWE-B11) was analyzed for SSICs. The analytical results are presented in Tables 9.7A and B.

In order to confirm the field observations obtained during the test boring program (Section 8.4.2.1), a total of four lacustrine samples were obtained from beneath the western portion of the landfill for chemical analysis. These samples included: SWE-B4 10'-12'; SWE-B5 8'-10'; SWE-B6 12'-14'; and SWE-B7 10'-12'. Elevated levels of numerous volatile organic compounds were detected in samples SWE-B4 and SWE-B7 at concentrations exceeding NYS Soil Guidance Values. Sample SWE-B4 contained elevated concentrations of acetone (7,800 ppb), 1,2-DCE (350 ppb), 2-Butanone (12,000 ppb), 1,1,1,TCA (140 ppb), 4-methyl-2-pentanone (10,000 ppb), toluene (840 ppb), ethylbenzene (53 ppb) and total xylenes (160 ppb). Sample SWE-B7 contained elevated concentrations of acetone (8,900 ppb), 1,1-DCA (79 ppb), 1,2-DCE (4,900 ppb), 2-butonone (11,000 ppb), 1,1,1-Trichloroethane (TCA) (600 ppb), 4-methyl-2-pentanone (7,700 ppb) and toluene (200 ppb). Volatile organic compounds detected in soil samples SWE-B4 and SWE-B7 that exceeded the NYSDEC Soil Cleanup

Values include: Acetone; 1,2 DCE; 2-Butanone; 1,1,1,1 TCA.

Elevated levels of volatile organics were also detected in the upper till samples collected from beneath the western portion of the landfill. These samples included: SWE-B9 12'-14'; SWE-B10 14'-16'; and SWE-B11 12'-14'. Some of the volatile organic compounds detected within the upper till unit included vinyl chloride, acetone, 1,2-DCE, TCE, tetrachloroethene (PCE), toluene, ethylbenzene and xylene. TCE was detected in soil sample SWE-B10 at an estimated concentration of 19,000 ppb. Volatile organic compounds detected in soil samples SWE-B9, SWE-B10 and SWE-B11 that exceeded the NYSDEC Soil Cleanup Values include: Acetone; 1,2 DCA; 2-Butanone; TCE.

In addition, several volatile organic compounds were detected in the lower till samples collected from the northwest portion of the landfill. These samples included SWE-B12 12'-14' and SWE-B13 14'-16'. However, there were fewer VOCs detected and the concentrations were less significant. Trace amounts of VOCs were detected in soil sample SWE-B16 14'-16', located on the eastern portion of the landfill. Volatile organic compounds detected in soil samples SWE-B12 and SWE-B13 that exceeded the NYSDEC Soil Cleanup Values include only Acetone and 2-Butanone.

Volatile organic analytical results appeared to be considerably lower than field observations would have predicted. This discrepancy could possibly be attributed to field sampling protocol that called for the use of 40 ml vials. A considerable amount of effort was expended to pack the sampled soils into the vials resulting in unnecessary mixup, handling and aeration. The additional handling required to pack the sample vials possibly drove off some of the volatile fraction.

There were no significant concentrations of semi-volatile organics detected within any of the landfill boring samples. Also, there were no metals detected above normal ranges for uncontaminated soils in any of the boring samples. Polychlorinated biphenyls (PCBs) which were detected in one soil sample (SWE-B6 12'-14') at a concentration of 6,900 ppb, appear to be restricted to a localized area.

9.1.3 Monitoring Well Soil Borings

This section presents a discussion of results obtained from chemical analysis of soil boring samples collected during the Phase I, II, and III monitoring well installations. As previously mentioned in Section 8.4, eight soil samples were collected during the Phase I program for Full CLP analysis, five soil samples were collected during the Phase II program for SSIC's analysis and one soil sample was collected during the Phase III program for only the volatile fraction. The analytical results are presented in Table 9.7A and 9.7B.

Chemical analysis of the fourteen soil samples (plus one duplicate) indicated the presence of elevated levels of volatile organic compounds at two boring locations (SWE-B6S and SWE-B6I). Two soil samples were collected from SWE-B6S. SWE-B6S 4'-5' represents a sample collected from the lacustrine unit; and SWE-B6S 11'-12' represents a sample collected from the lower till unit. Notably, elevated concentrations of 1,2-DCE and TCE were detected within both units. 1,2-DCE was also detected at slightly elevated concentrations in SWE-B6I

12'-14', collected from the lower till unit. In addition, elevated concentrations of 2-Butanone and Acetone were detected in soil sample SWE-B6S and SWE-B6I, respectively. All volatile organic compounds detected in these soil samples exceeded the NYSDEC Soil Guidance Values, however, did not exceed NYSDEC Soil Cleanup Values.

Chemical analysis of the thirteen soil samples did not indicate the presence of any semi-volatile organics at levels exceeding NYSDEC Soil Guidance Values. Also, there were no pesticides or PCBs detected in the eight Phase I soil samples above the detection limit of the analytical methodologies. Finally, there were no metals detected within any of the eight Phase I soil samples at levels exceeding normal ranges for uncontaminated soils.

9.2 Satellite Sites Analytical Results

As part of the Phase I Remedial Investigation, surface and/or subsurface soil samples were obtained from Satellite Sites 1, 2, 3 and 4. All soil samples were analyzed for Full CLP constituents and the analytical results are presented on Tables 9.1, 9.2, 9.3 and 9.4, respectively.

Table 9.1A summarizes the analytical results of the surface samples and subsurface samples obtained from Satellite Site 1. Except for Acetone, which was detected at elevated levels above the NYSDEC Soil Guidance Value and below NYSDEC Soil Cleanup Value at surface soil sampling location SAT1-SS1, no volatile organic compounds were detected in any other Satellite Site 1 sampling location.

Semi-volatile organic compounds were detected in each soil sample analyzed from Satellite Site 1, however, with the exception of several elevated semi-volatile compounds detected in soil sample SAT1-TP2, the concentrations were below the NYSDEC Soil Guidance Values and do not pose a significant environmental concern. Bis(2-Ethylhexyl) phthalate was detected above the Soil Guidance Value and below the Soil Cleanup Value in SAT1-SS1, but it was also detected in the method blank and may not be indicative of the true concentration at that location.

Pesticides and PCBs were detected in two Satellite Site 1 soil samples, however, only Aroclor-1248 which was detected in soil sample SAT1-SS1 was above the NYSDEC Soil Guidance Value and below the NYSDEC Soil Cleanup Value.

The Satellite Site 1 metal results are summarized in Table 9.1B. These results indicate that, with the exception of elevated lead and zinc concentrations at SAT1-SS1, no other sampling location had metal concentrations exceeding the concentration range of these constituents in uncontaminated soils. The analytical results from the established background sample SAT1-SS2 compares reasonably well with SAT1-SS1 with the exception of lead and zinc concentrations.

Based on the analytical results at SAT1-SS1, which showed elevated concentrations of volatile organics, PCBs and metals, a limited Interim Remedial Measure (IRM) was implemented during the Phase II RI to excavate and remove contaminated surface soils at this location. Soil samples (SAT1-IRM, and SAT1-DUP) were obtained from the bottom of the excavation to confirm that all the contaminated soil had been removed. The analytical results of these samples indicated that the concentrations of all the chemical constituents analyzed were below NYSDEC Soil Guidance Values and/or fall within normal ranges for uncontaminated soils. Elevated levels of acetone, aroclor-1248, lead and zinc detected in soil sample SAT1-SS1 diminished to below NYSDEC Soil Guidance Values in confirmatory soil samples SAT1-IRM and SAT1 DUP.

During the Satellite Site 1 Investigation, two 55-gallon drums containing waste were encountered. These drums were subsequently overpacked, staged and sampled at the Sweden-3 Chapman Site. The analytical results are summarized in Tables 9.5A, 9.5B and 9.5C. The results indicate that although high-level concentrations of volatile and semi-volatile organic compounds were detected in the wastes, the drum contents are considered non-hazardous based on TCLP and RCRA Waste Characterization. Based on the Satellite Site 1 analytical results, the removal and overpacking of drummed waste at the site, and the subsequent excavation of contaminated surface soils, Satellite Site 1 no longer poses an environmental concern.

Two test pit soil samples (SAT2-TP1 and 2) and two surface soil samples (SAT2-SS1 and 2) were obtained as part of the investigation at Satellite Site 2. Satellite Site 2 analytical results are summarized in Table 9.2A and 9.2B. Based on the results, volatile organic compounds, pesticides and PCBs were not detected in any Satellite Site 2 soil samples at concentrations exceeding NYSDEC Soil Cleanup Values. As summarized in Table 9.2B, only one soil sampling location indicated the presence of elevated metals at this site. The elevated lead concentration was encountered in surface soil sample SAT2-SS1. The analytical results from the established background sample SAT2-SS2 compares reasonably well with SAT2-SS1 with exception of lead concentrations. The analytical results of soil samples from Satellite Site 2 do not indicate the presence of significant soil contamination at the site and, therefore, the site does not appear to pose an environmental concern.

The Satellite Site 3 Investigation also consisted of two test pit soil samples (SAT3-TP1 and 4) and two surface soil samples (SAT3-SS1 and 2). A duplicate soil sample was obtained from SAT3-TP4. The Satellite Site 3 soil analytical results are summarized in Table 9.3A and 9.3B. Volatile organic compounds were not detected in soils at any sampling location at the site. Numerous semi-volatile organic compounds were detected in both surface soil samples and test pit sample SAT3-TP1. Seven compounds were detected at concentrations exceeding NYSDEC Soil Guidance Values, however, were below NYSDEC Soil Cleanup Values. None of the semi-volatiles detected at test pit TP-4 were above the Guidance Values. Low-level concentrations of pesticides were detected at all sampling locations except for SAT3-SS1. The concentration of 4,4-DDT exceeded the Soil Guidance Values but not the Soil Cleanup Values at both test pit locations, however, the concentrations detected do not indicate significant soil contamination at the site, therefore, the site does not appear to be an environmental concern. The analytical results for inorganic analyses are summarized in Table 9.3B. Three inorganic constituents (calcium, lead, and magnesium) were detected at concentrations above the normal range of uncontaminated soils, however, the reported concentrations do not indicate significant metals contamination at the site.

Based on the soil analytical results at Satellite Site 3, significant and pervasive contamination was not encountered at the site and, therefore, the site does not pose an environmental concern.

The Satellite Site 4 Investigation consisted of one surface soil sample, which was analyzed for Full CLP. The analytical results for this sample are presented in Table 9.4A and 9.4B. Although slightly elevated levels of PCBs and several inorganic constituents were detected above NYSDEC Soil Guidance Values and below NYSDEC Soil Cleanup Values in the soil sample, the analytical results do not indicate a significant surficial soils contamination at the site and, therefore, the site does not appear to pose an environmental concern.

9.3 Groundwater Analytical Results

The groundwater analytical results of the Phase I, II. and III RI groundwater sampling programs are summarized in Tables 9.9A and 9.9B. During the Phase I Investigation, groundwater samples were obtained from each of the thirteen on-site monitoring wells and analyzed for Full CLP. Twenty-two wells were sampled as part of the Phase II Investigation, nine of which were analyzed for Full CLP (newly installed wetland wells). The thirteen existing Phase I wells were analyzed for SSICs, which included Target Compound List (TCL) volatile organics (VOA) and Lead. The Phase III sampling program consisted of sampling four newly installed wetland wells and selected existing wells for SSIC's only (TCL VOA and Lead). A total of twenty-one wells were sampled as part of the Phase III program.

In addition to presenting the groundwater analytical results for each monitoring well sampled, the analytical tables also include the New York State Ambient Water Quality Standard for each constituent analyzed. Shaded analytical results indicate concentrations of volatile constituents in groundwater which exceed the Water Quality Standard for that particular constituent.

In general, the predominant and most pervasive compounds detected in groundwater at the Sweden-3 Chapman Site are volatile organic compounds. Semi-volatile organic compounds were also detected in groundwater at the Site, however, none of the reported concentrations exceeded the Water Quality Standards, for any constituent analyzed.

Pesticides/PCBs were not detected in any groundwater samples analyzed. Several metal constituents exceeded the Water Quality Standards, but many of these constituents were also detected above the standards in the upgradient wells and, therefore, appear to represent the natural background water quality in the area and may not be indicatative of groundwater contamination from the landfill.

As shown in Table 9.9A, the concentrations of various volatile organic compounds in groundwater at the Site exceed Water Quality Standards at the following monitoring well locations: MW-2I, MW-2D, MW-3I, MW-3D, MW-6S, MW-6I, MW9I, MW10S, MW10I, and MW11D.

The most common volatile organic compound detected above Water Quality Standards in the groundwater was, Trichloroethene (TCE). In addition, common degradation compounds of TCE, were encountered in the groundwater above standards, the most prevalent of which was 1,2 Dichloroethene (total). The highest concentration of any volatile organic compound was 100,000 ppb of 1,2 Dichlorethene (total) and was encountered in groundwater from monitoring well MW-6S. The TCE concentration at this location was also the highest encountered in groundwater at the Site with a reported concentration of 78,000 ppb. TCE and 1,2 Dichloroethene (total) were also detected at relatively high concentrations in groundwater from monitoring well MW-6I. Based on groundwater sampling analytical results from the Phase I , II, and III programs, groundwater at the monitoring well cluster MW-6 is the most heavily contaminated at the Site having total volatile organic concentrations of 178,311 ppb at monitoring well MW-6S and 2052 ppb at monitoring well MW-6I. However, it should be noted that the concentrations of TCE, 1,2 Dichloroethene (total) and the total volatile organic concentrations decreased markedly at monitoring well MW-6S from the Phase I to the Phase II and III sampling rounds. Significant concentrations of TCE were also detected in the groundwater at monitoring well MW-2I relative to other monitoring wells on Site.

Based on the analytical results, groundwater contamination at the Site is primarily limited to the permeable horizons in the Overburden unit and Interface Zone. During the Phase III groundwater sampling round, only one bedrock monitoring well (MW-2D) revealed the presence of a volatile organic compound exceeding Water Quality Standards. Trichloroethene was detected in this monitoring well at the Water Quality Standard of 5 ppb.

Phase II and III groundwater analytical data confirm the presence of Interface Zone volatile organic contamination extending into the wetlands portion of the Site. TCE and 1,2 Dichloroethene (total) were detected at concentrations of 190 ppb and 2 ppb respectively in MW-10I during the Phase II RI and at 200 ppb and 40 ppb respectively during the Phase III sampling program. Analytical data from MW10S, which was installed during the Phase III RI also indicates the presence of volatile organic contamination (TCE and 1,2 - Dichloroethene) in the Overburden unit downgradient of the landfill concentration's exceeding the Water Quality Standards. The cause of the Overburden contamination in the wetlands is addressed in Section 9.9 and the resulting implications discussed in Section 13.0.

Monitoring wells MW-13S and MW-13I, which were installed in the wetlands directly downgradient of the MW-10 cluster to determine the downgradient limits of the primary TCE plume, did not indicate the presence of TCE or related compounds above Water Quality Standards.

Although MW-9I did not show the presence of volatile organic contamination during the Phase II RI, Phase III results indicate the presence of TCE and 1,2 Dichloroethene at concentrations exceeding Water Quality Standards. This data is significant for it implies migration of a contaminant plume in the Interface Zone towards the wetlands. This issues is discussed further in Section 9.9 and 13.0.

The analytical results of groundwater samples from monitoring well MW-3I may indicate the presence of a distinctly different source area on the eastern side of the Site. At this location, tetrachloroethene was detected in the groundwater at concentrations of 3800 ppb, 4300 ppb and 4900 ppb during the Phase I ,Phase II, and Phase III sampling rounds, respectively. Only one other monitoring well (MW-6S) had tetrachloroethene concentrations above the Water Quality Standard, however, the concentrations were significantly less than those detected at monitoring well MW-3I. TCE was also detected in monitoring well MW-3I above Water

Quality Standards, but the concentrations were less than other Site wells detected with TCE. In addition Phase III analytical results from monitoring well MW-14I, which was installed during the Phase III RI to determine the existence of multiple and distinct groundwater plumes did not indicate the presence of any volatile organic compound exceeding the Water Quality Standard. However, an estimated value below detection limits of 4ppb TCE was reported. This implies the existence of two physically distinct groundwater plumes of differenct chemical origins. Consequently, a separate, predominately tetrachloroethene plume and source area may exist on the east side of the Site resulting in the markedly elevated tetrachloroethene concentrations in this region. The presence of a possible tetrachlorethene source area on the eastern region of the Site is confirmed by soil samples obtained from TP-6 which was excavated proximal to the monitoring well MW-3 Cluster. Soil analytical results at this location indicated the presence of tetrachloroethene at concentrations significantly above Soil Guidance Values. Refer to Section 9.1.1 and Table 9.8 for discussion of these analytical results.

9.4 Residential Well Water Analytical Results

During Phase I and Phase II of the Remedial Investigation, groundwater samples were obtained from seven residential well supplies proximal to the Sweden-3 Chapman Site. Phase I well water samples were analyzed for Full CLP constituents whereas Phase II well water samples were analyzed for SSICs. The SSIC analysis included volatile organics, arsenic and lead only. The Phase III RI residential well sampling program was reduced to include ony the three most proximal residents to the Sweden Site. Each of the three samples were analyzed for SSIC's which included volatile organics and lead only.

The Phase I, II and III analytical results are presented in Tables 9.10A and 9.10B. The analytical results indicate that no volatile organic compounds, semi-volatile organic compounds, pesticides or PCBs were detected at concentrations above New York State Water Quality Standards. Methylene chloride was detected at a concentration of 0.7 ppb in the RES-W4 sample. However, methylene chloride is a common laboratory contaminant and therefore, this sample result may not be indicative of the true groundwater quality at that location. The Phase I sampling round did not detect any volatile organic compounds at this, or any other, location.

Table 9.10B summarizes the analytical results of the inorganic parameters, predominately metals. The results indicate that concentrations of several metals and anions, namely; iron, lead, magnesium, silver, sodium and sulfate exceed Water Standards for those constituents. However, as stated previously in Section 9.3 with the exception of lead, these values may represent the natural "background" water quality of the area and do not appear to indicate a potential contamination problem. Appendix A discusses the results of the lead contamination study at (RES-W6). Arsenic, which was included as a SSIC in the Phase II Investigation was not detected above standards in any well supply.

9.5 Surface Sampling Analytical Results

Surface sampling programs were conducted in all three phases of the Remedial Investigation. Three surface water samples were obtained during the Phase I Remediation and analyzed for Full CLP. The Phase II program consisted of collecting seven surface water samples and ten surface sediment/soil samples. The Phase II surface water samples were analyzed for SSICs which included TCL volatile organics, TAL metals and cyanide. The ten surface sediment/soil samples were analyzed for a different set of SSICs including; TCL VOA, TCL semi-VOA and TAL metals. The Phase III program consisted of one surface water sample and one surface sediment sample. The samples were obtained from the wetlands portion of the Site adjacent to the MW-13 cluster, where a upward hydraulic gradient exists between the Interface Zone and the Overburden unit. A corresponding duplicate sample was obtained from each location. Each surface sample (and duplicate) was analyzed for SSIC's, which consisted of TCL, VOA only. The corresponding analytical results are summarized in Tables 9.6A and 9.6B.

Analytical results of the Phase I and Phase II surface sediment samples indicated the presence of both volatile organics and semi-volatile organics in surface sediment/soils. However, Methylene chloride and Acetone, both common laboratory contaminants and were detected within the method blank. 2-Butanone, which was detected at LOC-1 and LOC-5 at concentrations above NYSDEC Soil Guidance Values is also a common laboratory constituent. The Phase III analytical results of LOC-11SS, which was analyzed for VOA's only, also indicated the presence of Methylene Chloride, however, the duplicate sample from this location did not reveal the presence of any volatile organic compounds. Consequently, the volatile organic compounds detected in the surface soils may not be indicative of the true soil conditions at the Site as a result of possible laboratory contamination. Regardless of the origin of these compounds, the levels do not appear to pose a significant environmental concern. Low-level concentrations of semi-volatile organic compounds were detected in each surface sediment/soil sample, however, only one compound (chrysene), detected at location LOC-5 was above NYSDEC Soil Guidance Values. Chrysene was also detected at levels above the Soil Guidance Values in surface soil sample LOC-10SS, (the upgradient background sample) but was also detected in the method blank and, therefore, may not be representative of the soil conditions at that location. Consequently, the presence of semi-volatile compounds in surface soil/sediment samples at the Site does not appear to pose a significant environmental concern.

The TAL metal analytical results are summarized in Table 9.6B. Several metal constituents, namely; cadmium, lead, mercury and zinc were detected in surface soils/sediments at concentrations above the range encountered in uncontaminated soils. However, with the exception of mercury, the extent of the elevated metal concentrations is limited. Elevated mercury levels were detected in the upgradient background sediment sample LOC-4SS and also were not consistent for duplicate samples at LOC-3SS and LOC-6SS. There was no mercury detected in upgradient background soil sample LOC-10SS. Based on the analytical results and the media sampled (surface sediment versus surface soil), the elevated mercury appears to be limited to the sediment samples, however, the concentrations reported do not appear to pose a significant environmental concern.

The concentrations of other inorganics detected in surface soils/sediments are within the range for uncontaminated soils and do not appear to pose a significant environmental concern.

Analytical results of the Phase I surface water samples indicated the presence of two volatile organic compounds (tetrachloroethene and methylene chloride) in surface waters directly downgradient of the landfill. As stated previously, methylene chloride is a common laboratory contaminant and the low concentrations if they exist do not appear to pose a significant environmental concern. Tetrachloroethene was detected at 21 ppb in the surface water sample collected at LOC-3SW during the Phase I sampling but was not detected in the Phase II surface water sample from the same location. LOC-3SW is located proximal to monitoring well MW-3 Cluster and test pit TP-6 from which elevated concentrations of tetrachloroethene were detected. Tetrachloroethene was not detected in any other surface water sample. Phase III analytical results of LOC8-SW, which is adjacent to MW-13 cluster, indicate the presence of acetone at concentrations exceeding Water Quality Standards. Acetone, like Methylene Chloride, is a common laboratory contaminant and may not be indicative of the surface water quality in the wetlands.

The Full CLP results for the Phase I surface water samples did not indicate the presence of significant concentrations of semi-volatile organics at the Site. Only bis(2-Ethylexyl) phthalate was detected at concentrations exceeding the New York State TOGS Guidance value. The presence of pesticides and PCBs were not detected in any Phase I surface water sample. Semi-volatiles, pesticides and PCBs were not analyzed as part of the Phase II surface water SSICs.

The Phase I and Phase II inorganic analytical results for surface water samples are summarized in Table 9.6B. The results indicate the presence of several metal constituents at concentrations exceeding the New York State Surface Water Quality Standards. Generally, the elevated metal concentrations were found in surface water samples LOC-1SW and LOC-3SW during the Phase I sampling round. Phase II analytical results at similar locations are commonly less and with the exception of lead detected in surface water sample LOC1-SW (Phase I), the metal concentrations in surface waters at the Site do not appear to pose a significant environmental concern. The elevated lead concentration was detected at the Phase I upgradient sampling location but lead was not detected at this location during the Phase II sampling round.

Consequently, the Phase I, II and III analytical results of the surface sampling program detected several compounds exceeding Guidance Values and Water Quality Standards, however, the concentrations and extent of elevated readings in the soils, sediment and surface water do not, in general, pose an environmental concern.

9.6 Site Specific Indicator Chemical (SSICs)

This section presents a discussion of the development of SSICs for the Sweden-3 Chapman Site. The SSICs were determined for each respective media through a review of the validated analytical data generated during the Phase I investigation, and were subsequently implemented for the Phase II and Phase III investigations. A summary of the SSICs for the respective media is presented in Table 9.13.

Full CLP analysis of the groundwater samples collected from the monitoring wells installed during the Phase I investigation did not indicate the presence of elevated levels of semi-volatile organics, pesticides/PCBs or inorganic parameters (metals). Volatile organics were detected within several groundwater samples and lead was detected in a residential well sample RES-W6. The SSICs for the groundwater on-site were therefore determined to consist of volatile organics (EPA Method 8240) and total lead. Analysis for SSICs only was conducted on samples collected from Phase I installed groundwater monitoring wells during the Phase II investigation. The Phase II installed groundwater monitoring wells were analyzed for Full CLP parameters. Wells installed during the Phase III RI were analyzed for SSIC's.

Full CLP analysis of the residential well samples collected during the Phase I investigation did not indicate the presence of any significant levels of volatile organics, semi-volatile organics, or pesticides/PCBs. Lead was detected in one sample as mentioned above and arsenic was detected in sample RES-W3. Although volatile organics were not detected in the residential well samples, they are the main contaminants of concern on the Site and should be monitored as a precautionary measure. The SSICs for the residential well samples collected during the Phase II investigation were therefore determined to consist of volatile organics (EPA Method 524.2), total lead and arsenic. Silver also was analyzed as a SSIC in the Phase II RI in well sample RES-W5. During the Phase III RI, the SSIC's consisted of volatile organics and Lead only.

Full CLP analysis of subsurface soil previously sampled from the Site (Phase I and IRM) indicated the presence of elevated levels of volatile organics and to a lesser degree some semi-volatile organics. There were no significant levels of inorganic or pesticides/PCBs detected in the subsurface soils. The SSICs for the subsurface soils were therefore determined to consist of volatile organics (EPA Method 8240) and semi-volatile organics (EPA Method 8270). Analysis for SSICs was implemented for both the test pit soil samples and the newly installed monitoring well/boring soil samples during the Phase II investigation. However, the landfill boring samples were analyzed for Full CLP in order to better define the nature of the contamination within the source area. The Phase III SSIC's consisted of volatile organics only.

Full CLP analysis of surface water samples collected during the Phase I investigation indicated the presence of volatile organics. There were no elevated levels of semi-volatile organics, pesticides/PCBs or inorganics detected in the surface water samples. Because slightly elevated levels of metals were detected in the surface water samples, and the documented presence of metals within a few residential well samples, the SSICs for the surface water samples collected during the Phase II investigation were determined to consist of volatile organics (EPA Method 8240), TAL metals and total cynaide. The Phase III SSIC's consisted of volatile organics only.

There were no surface soil/sediment samples collected during the Phase I investigation. The SSICs for the surface soil/sediment samples collected during the Phase II investigation were determined to consist of volatile organics (EPA Method 8240), semi-volatile organics (EPA Method 8270) and TAL metals. Pesticides/PCBs analysis (EPA Method 8080) was not included as there were no significant concentrations of these parameters detected within any media during the Phase I investigation. The Phase III SSIC's consisted of volatile organics only.

9.7 Applicable or Relevant and Appropriate Requirements

The following section identifies and discusses Federal, State and local laws and regulations which may be applicable or relevant and appropriate requirements (ARARs) associated with the remediation of the Sweden-3 Chapman Site.

Section 121(d) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) of 1980, as amended by the Superfund Amendments and Reauthorization Act (SARA) of 1986, establishes standards that govern the degree of cleanup required at a site. The selected remedy must attain a level or standard of control which satisfies ARARs except under certain situations/conditions. SARA mandates that remedies must meet federal and/or state ARARs. State ARARs can take precedent over federal ARARs providing that the state requirements are promulgated, and are more stringent than the federal requirements. Since New York State does not have ARARs in its statues, the NYSDEC utilizes the term "New York State Standards, Criteria and Guidelines" (SCGs) to represent state requirements. Remedial activities for a site must comply with the substantive portions of a requirements or regulation, but need not comply with the administrative requirements of federal and/or state permits.

A requirements promulgated under an environmental status may either be "applicable" or "relevant and appropriate", but not both. The term "applicable" requirements pertains to "those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that specifically address a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site. "Applicability" implies that the circumstances or the remedial action undertaken at a site satisfactorily meet all of the jurisdictional prerequisites of a given requirements.

Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive environmental protection requirements, criteria, or limitations promulgated under Federal or State law that, while not "applicable" to a hazardous substance, pollutant, contaminant, remedial action, location, or other circumstance at a CERCLA site, address problems or situations which are sufficiently similar to those encountered at the CERCLA site that their use is well suited to the particular site.

The determination that a requirements is relevant and appropriate is based on the following two-step process:

- Determination if a requirements is relevant; and
- Determination if a requirement is appropriate.

In general, the determination process involves the comparison of a number of site-specific factors, including the characteristics of the remedial action, the type and nature of the hazardous substances present at the site, and the physical characteristics/circumstances of the site, with those addressed in the statutory and/or regulator requirement. The determination that a requirement is relevant and appropriate is often times site-specific and must rely on best professional judgement. If a given requirements is determined to be both relevant and appropriate, that specific requirement must be compiled with the same degree as if it was applicable.

ARARs represent minimum requirement that a remedy must satisfy. ARARs can be waived providing one of the following circumstances is encountered:

- The action undertaken is an interim measure and is only part of the total remedial action that will attain the requirement when completed;
- Compliance with the requirement presents a greater risk than alternative options;
- Meeting the requirement is technically impracticable and/or unobtainable from an engineering perspective;
- An equivalent standard of performance that is equal to or better than that specified by the requirement can be achieved through use of another method or approach;
- The state has not consistently applied (or demonstrated the intention to consistently apply) the standard, requirement, or limitation in similar circumstances at other remedial actions; and
- Fund balancing is warranted because the requirement would not provide a balance between the need to be protective at the site and the availability of the amounts in the fund to respond to threats at other sites.

It should be noted that the requirement that the selected remedy for a site should be protective of human health and/or the environment cannot be waived (CERCLA 121(d)(4).

In general, there are several different types of requirements that CERCLA actions may have to comply with. The classification of ARARs listed below was utilized to provide guidance on how to identify and comply with ARARs for the Sweden-3 Chapman RI/FS.

- Location-specific requirements;
- Performance, design, or other action-specific requirements; and
- Ambient or chemical-specific requirements.

Location-specific ARARs are restrictions/limitations against certain types of actions in certain locations because the location is somehow special and/or protected. Some examples of special locations include floodplains, historic places, wetlands and sensitive habitats. Table 9.14 provides a matrix of location-specific requirements established under several Federal and State statutes that are potential ARARs for the Sweden-3 Chapman Site.

Action-specific ARARs set controls or restrictions on the performance, design and other aspects of implementation for actions undertaken at a site. Since action-specific ARARs apply to discrete remedial activities, their evaluation will be discussed with the detailed analysis of alternatives for each retained alternative presented within the feasibility study.

Chemical-specific ARARs are typically based upon health or risk numerical values or methodologies which, when applied to site-specific conditions, result in the establishment of numerical values. These values establish the acceptable concentration or amount of a particular chemical compound (or element) can be found in, or discharged to, the ambient environment. If a chemical has more than one ARAR, the most stringent requirement generally should be complied with.

The total carcinogenic risk or hazard index for all chemicals of concern detected in a given medium are calculated as part of the risk assessment process. As a starting point for determining cleanup goals for a site, the risk assessment based values are compared with Federal and State chemical-specific promulgated and/or non-promulgated requirements. In general, the following standards and/or requirements were utilized as part of the determination and evaluation of possible chemical-specific ARARs for the Sweden-3 Chapman Site:

- Safe Drinking Water Act (SDWA)
  Maximum Contaminant Levels (MCLs)
- SDWA MCL Goals (MCLGs)
- SDWA Secondary MCL (SMCLs)
- RCRA Maximum Concentration Limits
- Clean Water Act (CWA) Water
  Quality Criteria (WQC)
- CWA Ambient Water Quality Criteria (AWQC)
- Water Quality Regulations - NYCRR
  Title 6, Chapter X, Parts 700-705
- NYSDOH MCL - Public Water Supplies
  10 NYCRR, Subpart 5-1
- NYSDOH Standards - Sources of Water
  Supply 10 NYCRR, Part 170

There are no promulgated federal ARARs or state SCGs which are directly applicable for establishing target cleanup concentrations in soil. However, the DHWR TAGM-4046 is considered a SCG but not a promulgated SCG. Because there are no specific ARARS/SCGs pertaining to soil, establishing target cleanup concentrations for soils may be done using an environmental/health-based exposure analysis giving consideration to site-specific conditions. Site-specific conditions depend on various factors including the nature of the soils, the nature of the chemistry, open exposure pathways, and the effects of the chemistry in the soils on human health and the environment.

Tables 9.15 and 9.16 provide a matrix of chemical - specific ARARs which can be applied to the Sweden-3 Chapman Site. In general, most of the chemical-specific ARARs shown on Tables 9.15 and 9.16 are relevant and appropriate rather than applicable to the Sweden-3 Chapman Site.

In addition to promulgated standards and requirements, To-Be-Considered (TBCs) materials were also reviewed and evaluated as part of the ARARs process. TBC materials are non-promulgated advisories or guidance issued by Federal or State agencies that are not legally binding and do not have the same level of importance as a potential ARAR. In many circumstances, TBCs will be considered and evaluated along with ARARs as part of the risk assessment process and may be utilized in determining the necessary level of cleanup needed for the protection of human health and/or the environment for a site.

9.8 Contaminant Characteristics

The following section highlights the physical and chemical properties of the various contaminants of concern detected at the Sweden-3 Chapman Site and the Satellite sites. A variety of both organic and inorganic contaminants were detected in the ground above regulatory guidelines and/or standards (refer to Section 9.1 to 9.5). In general, a majority of the elevated contaminants of concern identified during the RI Study were detected at the Site.

A number of volatile organic compounds and inorganic parameters exceeded regulatory standards in the Bedrock Aquifer, the Interface Zone and the Overburden unit at the Sweden-3 Chapman Site. The following volatile organic compounds and inorganic parameters were detected at concentration levels exceeding regulatory standards and for guidelines:

- Benzene;
- 2-Butanone;
- Chloroform;
- 1,1-Dichloroethane;
- 1,1-Dichlorothene;
- 1,2-Dichloroethene (total);
- Trichlorethene
- Tetrachloroethene;
- Toluene;
- Vinyl Chloride;
- Chloride;
- Copper
- Iron;
- Magnesium;
- Silver;

- Sodium; and
- Sulfate.

Concentrations of several volatile organic compounds and inorganic parameters were detected in the soil at concentrations which exceed regulatory guideline values at the Sweden-3 Chapman Site. In summary, the following volatile organic compounds were detected at levels exceeding the guideline values:

- 2-Butanone;
- 1,2-Dichloroethene (Total); and
- Trichlorethene

The inorganic parameters detected at elevated values, above the average concentration level for uncontaminated soils, included antimony, calcium, and magnesium. The above elevated inorganic parameters may be naturally occurring at the Site and not necessarily resulting from anthropogenic sources.

Elevated concentrations of tetrachlorethene and bis (2-ethylhexyl) phthalate were detected in surface water samples collected from the Site. The reported concentrations were detected at levels which exceed NYS water quality standards or guidance values for Class B waters. In addition, the following inorganic parameters were also detected in surface water samples at concentrations exceeding NYS water quality standards or guidance values:

- Aluminum;
- Antimony;
- Cobalt;
- Iron;
- Lead;
- Magnesium;
- Manganese; and
- Vanadium

Due to the elevated presence of the above inorganic parameters in the upgradient surface water sample (LOC-1SW), the concentration values reported may be indicative of the overall surface water quality of the study area and not necessarily the result of an on-site source area.

Table 9.17 highlights specific information on the physio-chemical properties of the volatile organic compounds detected at concentrations which exceed regulatory standards and/or guidance values. The information presented in Table 9.17 will be used to define and evaluate the fate and transport properties of the contaminants of concern as they relate to the physical characteristics of the study area. In particular, the listed properties contained in the table will be used to determine the relative mobility of the organic contaminants. The relative mobility of a given organic contaminant is a function of several different physio-chemical properties which are briefly described below:

- **Water Solubility** - The solubility of a compound is one of the most important properties affecting environment fate and transport. The solubility of a compound is described as the maximum dissolved quantity of a compound in pure water at a specific temperature and pH. Solubilities of most common organic compounds range from 1 to 100,000 ppm at ambient temperature. In general, highly soluble compounds are easily transported by the hydrologic cycle, and tend to have low absorption coefficient for soils, and low bio concentration factors in aquatic life. Highly soluble compounds also are less likely to volatilize from water and are generally more likely to biodegrade. Low water soluble compounds are just the opposite; they tend to partition to soil and/or sediments and biocentrate in aquatic life; volatilize more readily from water and are less likely to be biodegradable.

- **Specific Gravity** - The specific gravity of a compound is defined as the ratio of the weight of a compound of a given volume at a specific temperature to the weight of the same volume of water at a given temperature. For reference purposes, the specific gravity of water at 4°C is used as a basis for comparison with other compounds because the density of water at 4°C is 1.000 g/ml. The specific gravity of a compound is used to determine whether liquids will float or sink in water. Pure compounds which are lighter than water will form a layer on top of the water surface. However, organic compounds that are heavier than water will move through an aquifer system until they are fully absorbed by soil particles or until they encounter an impenetrable layer.

- **Octanol/Water Partition Coefficient** - The Octanol/Water Partition Coefficient (Kow) is defined as the ratio of a compound's concentration in the octanol phase to its concentration in the aqueous phase of a two-phase system. The Kow values are utilized to evaluate fate in the environment. The Kow parameter can be related to solubility in water and bioconcentration effects of a given organic compound, but it is mainly used to determine soil/sediment absorption. Kow values, when calculated with the organic content of a soil, can be used to model and predict the amount of a given compound will be absorbed in the soil and the retardation factor for movement through an aquifer. In general, measured Kow values for organic compounds range from 10^{-3} to 10^{7}. Low Kow values (<10) indicate that the organic compounds can be considered to be hydrophilic and will tend to have higher water solubility. Inversely, high Kow values ($>10^{4}$) indicate that the organic compounds are very hydrophobic.

- **Organic Carbon Partition Coefficient** - The Organic Carbon Partition Coefficient (Koc) is defined as the ratio of the amount of chemical compound absorbed per unit weight of organic carbon to the chemical concentration in solution at equilibrium. The Koc values are chemical-specific and are largely independent of soil conditions and properties. For organic compounds, the Koc values are directly related to soil and sediment sorption. In general, chemicals with high Koc values have correspondingly high bioconcentration factors, while chemicals with low Koc values tend to be leachable from soil and relatively mobile in groundwater.

- **Vapor Pressure** - The vapor pressure of a chemical provides insight into the transport of a chemical in the environment. The vapor pressure is a relative measure of the volatility of a chemical in a pure state and is an important factor in determining the rate of vaporization from a particular media. For example, the volatilization of a chemical compound from water is dependent upon the vapor pressure and water solubility properties (refer to Henry's Law constant).

- **Henry's Law Constant** - Henry's Law Constant, H, expanses the amount of chemical partitioning between air and water at equilibrium and can be used to calculate the rate of evaporation from water. In general, the greater the Henry's Law Constant (>160 atm), the more volatile a compound, and the more easily it can be removed from solution.

For discussion purposes, the contaminants of concern detected at the study area have been categorized into the following groups:

- Trichloroethene and associated compounds;
- 2-Butanone (Methyl Ethyl Ketone-MEK);
- Semi-Volatiles; and
- Inorganics

The following subsections briefly describe the physio-chemical properties of the above contaminant groups, which provides the basis for the subsequent fate, transport and health evaluations presented in later sections of this report.

9.8.1 Trichloroethene and Associated Compounds

Trichloroethene (TCE) is a volatile, chlorinated organic solvent which is primarily used for vapor degreasing. TCE is also utilized for extracting caffeine from coffee, as a dry-cleaning agent, and as a chemical intermediate in the production of pesticides, waxes, resins, gums, tars, paints, varnishes, and specific chemicals such as chloroacetic acid (Sitting, 1985). Common synonyms associated with trichloroethene include trichloroethylene, triethylene trichloride, and ethinyl trichloride. TCE can be formed by the biodegradation of tetrachloroethene (PCE).

The biodegradation of TCE can successively result in the formation of cis-1,2-dichloroethene, trans-1,2-dichloroethene, and 1,1-dichloroethene (1,1-DCE). The further breakdown of these compounds can result in the formation of vinyl chloride (Wood, 1981). The following compounds from the TCE/PCE biodegradiation series were detected during the RI:

- PCE;
- TCE;
- 1,2-Dichloroethene (Total);
- 1,1-DCE; and
- Vinyl chloride.

TCE is a colorless, non-flammable, non-corrosive liquid. TCE has a specific gravity of 1.46 (at $20^{o}c$) and a solubility of 1,100 mg/l; which indicates that the compound is only slightly soluble in water and will tend to migrate downward in a column of water. If TCE is released into a surface water body, the primary removal process will be evaporation with a half-life of minutes to hours, depending upon turbulence. Adsorption to sediment and bioconcentration in aquatic organisms are not significant in removing TCE from surface water (Howard, 1990). Based on the Koc value for TCE, this compound will tend to be readily mobile in soil and will leach into ground water. Spills or releases of TCE to surface soils will evaporate rapidly due to its relatively high vapor pressure.

PCE is a clear, colorless, nonflammable liquid solvent. PCE is a widely available solvent and is commonly used as a dry cleaning agent, a degreaser, a chemical intermediate, and a fumigant. PCE has a specific gravity of 1.631 (at 15^{o}C) and a solubility of 150 mg/l (refer to Table 9.17). This indicates that PCE is only slightly soluble in water and will tend to settle or migrate down through a water column. If PCE is released into surface water, it will tend to undergo rapid volatilization and exhibit short residence time. Depending on site conditions, PCE is not expected to significantly biodegrade, bioconcentrate in aquatic organisms, or absorb to sediment (Howard, 1990). Based on the Koc value, PCE will tend to exhibit low to moderate mobility in soil and, therefore, may leach slowly to groundwater.

The isomers, cis-1,2,-dichloroethene and trans-1,2-dichloroethene were not differentiated as part of the analytical program and were reported as 1,2-dichloroethene (total). Therefore, general information on 1,2-dichloroethene (1,2-DCE) is presented in this section. It should be noted that there are differences in the physio-chemical properties and toxidity of the two isomers. In general, the cis-1,2 DCE isomer is more commonly found and associated with the biodegradation of the TCE and PCE. 1,2-DCE is a flammable liquid (at room temperatures) which is used as a solvent for waxes, resins, and acetylcellulose (Sitting,1985). 1,2-DCE has a specific gravity over 1.25 and a solubility value of 3,500 mg/l (cis-1,2 DCE) which indicates that the compound is only moderately soluble in water and will tend to migrate downward in a column of water. If released into surface water, 1,2-DCE will be lost mainly through volatilization. Biodegration, bioconcentration in aquatic organisms, and adsorption to sediment should not be significant in regards to the removal of 1,2-DCE in surface water (Howard, 1990). Based on the Koc value, 1,2-DCE will not tend to adsorb significantly to soil, and will leach into groundwater.

1,1-Dichloroethene (1,1-DCE) is a colorless flammable liquid organic solvent. 1,1-DCE is used as a solvent for adhesives and as a component for the manufacturing of synthetic fibers. 1,1-DCE has a specific gravity of 1.250 and a solubility value of 2,250 mg/l; which indicates that the compound is only slightly soluble in water and will tend to settle or migrate down through a water column. Based on the Koc value, 1,1-DCE will not tend to adsorb significantly to soil, and will leach into groundwater.

Vinyl Chloride (VC) is a colorless flammable gas at normal room temperatures. VC is used as a vinyl monomer in the manufacture of polyvinyl chloride and other resins and as a solvent. VC may occur as a dissolved gas in water. VC, in the liquid state, has a solubility of 2,670 mg/l and is considered slightly soluble in water (Howard, 1989). If VC is released to the soil, it will be subject to rapid volatilization based on the reported vapor pressure. Any VC which does not evaporate will be expected to be highly to very highly mobile in the soil and it may leach to the groundwater

9.8.2 2-Butanone

2-Butanone is a commonly utilized organic solvent. Common synonyms associated with 2-Butanone include methyl ethyl ketone, MEK, butanone, and ethyl methyl ketone. MEK is a clear, colorless liquid and is used as a solvent in nitrocellulose coating and vinyl film manufacture, in smokeless powder manufacture, in cements and adhesives and in the dewaxing of lubricating oils (Sitting, 1985). MEK has a specific gravity of .805 mg/l and a solubility of 268,000 mg/l; which indicates that the compound is soluble in water and will tend to migrate upward in a column of water. If released into surface water, MEK will be lost by evaporation or will be slowly biodegraded. Absorption to sediments and bioconcentration in aquatic organisms are not important potential pathways for MEK. If MEK is released to soil, it will partially evaporate into the atmosphere from near surface soil and may leach into the groundwater. Based on the Koc value, MEK will be expected to exhibit very high mobility in soil and, therefore, may leach to the groundwater (Hard, 1990).

9.8.3 Retardation Effects and Modeling

Retardation modeling provides a gross estimate of the degree to which compounds are retarded in their movement through the subsurface relative to the sorption to soil particles and groundwater velocity. In general, hydrophobic or cationic contaminants that are migrating as a dilute solute are subject to retardation effects. Highly concentrated plumes from pure product source areas are not subject to retardation effects. As a dilute solute plume, contaminant migration and retardation effects can be modeled. Estimated retardation factors can be calculated using the following formula:

$Rd = 1 + kd(B/pt)$

Where
Rd = retardation factor, (unitless);
B = bulk density, (g/ml);
pt = total porosity, (unitless); and
Kd = distribution factor for sorption on aquifer medium (ml/g).

For hydrophobic contaminants, the term Kd can be estimated by using the formula:

$Kd = Koc \times foc$

Where
Kd = distribution factor for sorption on soil, (ml/g);
Koc = partition coefficient for organic carbon, (ml/g); and
foc = fraction of organic carbon in the soil

The use of the retardation factor, Kd, is described in the following equation (Kent Et Al., 1985):

$Rd = Upw/Vd$ or $Ud = Vpn/Rd$

Where
Rd = Retardation factor, (Unitless);
Vpn = Velocity of groundwater, (ft/yr); and
Vd = Velocity of contaminant, (ft/yr).

The retardation factor is based on the assumption that adsorption of hydrophobic contaminants is due to sorption to the organic carbon contained with the soil matrix. When a hydrophobic contaminant flowing in a dilute plume flows past a soil particle that contains organic carbon, the contaminant partitions between the polar solvent (water) and the solid organic carbon. When the concentration in the water is high and the concentration in the soil is low, the net migration is from the water to the soil. Inversely, when the concentration in the water is low and the concentration in the soil is high, the net migration is from the soil to the water. In situations when the soil and water concentrations are in equilibrium, there is no net migration. When the partitioning is between concentrated chemical and soil particles, the contaminant does not prefer the solid "solvent" effects of the organic carbon in the soil to the organic liquid solvent effects of the concentrated chemical plume.

To simplify modeling, equilibrium conditions are modeled as the contaminant velocity being a fraction of the groundwater velocity.

In order to simplify the presentation and discussion of this section, retardation effects and modeling will be only calculated for trichloroethene (TCE) and tetrachloroethene (PCE). The selection of TCE and PCE was based upon the following factors:

- TCE and PCE contamination was detected in both the subsurface soils and groundwater at concentrations above regulatory standards and/or guidelines;
- Analytical data from the Phase II and Phase III RI indicates the presence of a groundwater plume (refer to Section 9.3); and
- IRM Data supports the assumption that large quantities of TCE and PCE wastes were present at the Site (refer to Section 4.0).

The following parameters and variables were utilized to calculate and model the retardation effects and contaminant velocities for the Site:

Parameter/Variables	Assumed Value
B - bulk density	1.75 g/ml
pt - total porosity	35% or .35
Koc - partition coefficient for organic carbon	
• TCE	126
• PCE	364
foc - Fraction of organic carbon	
• Soil	3% or .03

• Interface Zone	.001

Vpw - Velocity of Groundwater

The Interface Zone foc value is a questimated value taking into consideration the type of materials at top of rock and lower till soils. The foc value at lower depths will have a tendency toward lower values than in a highly organic rich wetland soil.

• Overburden Water-Bearing Zone	2.8 ft/yr landfill; 4.1 ft/yr wetlands
• Interface Zone	61 ft/yr landfill; 11 ft/yr wetlands

The use and calculation of the above parameters/variables with the formulas presented in this section, result in the following findings (assumes that TCE and PCE contamination detected in the groundwater exists as a dilute solute plume):

<u>Contaminant of Concern: TCE</u>

Retardation Value (Kd) in Soils - 19.9
Retardation Value (Kd) in Interface Zone - 1.63
Contaminant Velocity in Soils - 0.14 ft/yr (landfill); 0.20 ft/yr (wetlands)
Contaminant Velocity in the Interface Zone - 37.4 ft/yr (landfill); 6.8 ft/yr (wetlands)

<u>Contaminant of Concern: PCE</u>

Retardation Value (Kd) in Soils - 55.6
Retardation Value (Kd) in Interface Zone - 2.82
Contaminant Velocity in Soils - 0.050 ft/yr (landfill); 0.074 ft/yr (wetlands)
Contaminant Velocity in the Interface Zone - 21.6 ft/yr (landfill); 3.9 ft/yr (wetlands)

In order to model the possible extent of the plume(s), based on the retardation effects and velocity values shown above, it was assumed that the contamination within the landfill area took approximately five (5) years to reach the interface zone. This assumption would result in a potential migration time frame of approximately 15 years for the contaminants to be transported within the Interface Zone. The above assumption is based on an estimated landfill age of approximately twenty years.

Based on groundwater analytical data acquired during the Phase II and Phase III Remedial Investigation, two distinct groundwater plumes have been delineated within the Interface Zone downgradient of the landfill portion of the Site. The principal groundwater plume emanates from the northwestern source area and is predominately TCE (and its associated daughter products) in origin. The smaller, more localized, plume emanates from the northeastern source area and is primarily PCE in origin.

Retardation modeling, using the 15-year time frame, results in a calculated TCE plume extending approximately 385 feet downgradient of the northwestern source area (Figure 9.5) The calculated extent of the PCE plume from this same source area would be approximately 325 feet downgradient of the landfill. The downgradient extent of the PCE plume and TCE plumes associated with the northeastern source area was calculated to be approximately 240 feet and 280 feet respectively.

The direction and orientation of the plumes is directly controlled by the geologic and hydrogeologic Site conditions. Based on information contained in this section and sections 6.0, 7.0, and 9.8.1, a map depicting the downgradient extent of each Interface plume (TCE and PCE) emanating from each source is presented in Figure 9.3.

9.9 Contaminant Fate and Transport

9.9.1 General

The following section discusses the fate and transport of the contaminant groups identified in Section 9.8. In general, a majority of the contamination detected during the RI Study appears to be present at the Site. Distinctive patterns of contamination appear to exist at the Site and are based on the detection of different contaminant groups in various media (i.e., soil and groundwater) at different portions of the Sweden-3 Chapman Site. For example, the major contamination on the Sweden-3 Chapman Site was related to volatile organics (primarily TCE/PCE and associated compounds) in the Bedrock Aquifer, Interface Zone, and the Overburden unit. In association, significant concentrations of the same contaminant group were detected in subsurface soil samples collected from the former landfill area of the Site. Conversely, significant concentrations of other volatile organics (i.e., 2-Butanone and acetone) were detected in the subsurface soil below the landfill but were not found in significant concentrations in the groundwater.

For presentation purposes, this section will only discuss the fate and transport of the contaminant groups which exceed regulatory standards and/or guidelines for *both* groundwater and soils. Unless stated otherwise, all analytical data presented in this section will be from the Phase II and Phase III RI Investigation. The Phase II and Phase III data are more comprehensive in scope and extent and present a clearer picture of the Site conditions than the Phase I RI data.

9.9.2 Trichloroethene and Associated Compounds

Trichloroethene (TCE) and the associated compounds, tetrachloroethene (PCE), 1,2-Dichloroethene (1,2-DCE), 1,1-Dichloroethene (1,1-DCE), and vinyl chloride (VC) were detected in the groundwater and subsurface soils during the RI program.

As discussed in Section 9.8.1, TCE, PCE and 1,2-DCE are all volatile and have a high specific gravity (>1) relative to water. In addition, the above compounds range from being slightly soluble to moderately soluble in water and have a low affinity for adsorption to soils. VC probably occurs as a dissolved gas in groundwater. Because of its high rate of volatilization, 1,1-DCE may also be occurring as a dissolved gas in the groundwater.

Given the properties of these volatile organics, TCE, PCE and their associated compounds would tend to support ready transport through the soil. Due to the moderate to high mobility of these compounds in soil, they would be expected to leach into the groundwater. Data from the RI study tend to support the above statements. Elevated concentrations of TCE and the various associated compounds were detected in the groundwater from the following monitoring well locations: MW-2I; MW-2D; MW-3I; MW-6S; MW-6I; MW-9I; MW-10.and MW10-S. The highest concentration levels of TCE were detected in groundwater samples SWE-MW-2I, SWE-MW-6S and SWE-MW-6I. The highest PCE concentration was detected in the groundwater sample collected from monitoring well MW-3I.

With the exception of Overburden groundwater contamination detected in MW-10S, the TCE contamination of the Overburden unit appears to be limited to the north-central portion of the Site. Overburden contamination in this area was probably a result of buried drums and/or surface spills which contaminated the surface and subsurface soils in the vicinity of the landfill. The Overburden contamination encountered at MW-10S, however, may result from the upward gradient occurring between the contaminated Interface Zone and the Overburden deposits that may subsequently discharge contaminated groundwater into overlying deposits.

Contamination of the Interface Zone results from the infiltration of contaminated groundwater in response to downward hydraulic gradients occurring in the landfill portion of the Site. Contamination of the Interface Zone could also result from the direct leaching of a concentrated "slug" of denser-than-water-chemicals (TCE,PCE) from the subsurface soils to the top of bedrock horizons beneath the source areas within the landfill.

As discussed in 13.1.3, the horizontal and vertical migration of the contaminants could be directly influenced by the geologic conditions encountered at the Site. In addition, the migration of the contaminants within the soil could be influenced by such factors as the physio-chemical properties of the compounds and the amount of available carbon within the soil material. The direct discharge of chemical products from spills and/or leaking drums on the ground surface or the soils beneath the landfill surface could have resulted in the complete utilization of available carbon for adsorption. Once the available carbon within the soil was exhausted, the physio-chemical properties of the compounds indicate that the contaminants would migrate downward. The downward migration of the compound through the soil is based upon the displacement of water within the porespace of the overburden strata by the denser and less viscous contaminants of concern.

The contamination caused by TCE and the associated degradation compounds is more extensive in the Interface Zone than in the Overburden unit. This pattern is somewhat expected with compounds having moderate solubility and a greater specific gravity than water. The contaminant plume, based upon the Phase II and Phase III analytical data, is illustrated in Figures 9.2 through 9.4. As indicated by the figures, the highest levels of contamination are found near the original source area, the landfill.

The presence of elevated concentrations of PCE detected in groundwater sample SWE-MW3I could be the result of localized surficial and/or subsurface contamination in the adjacent landfill area. The potential migration of PCE from the landfill area to the groundwater is probably similar to the transport processes described for TCE.

Analytical data from surface water samples, sediment samples, and surface soil samples collected during the Phase II and Phase III RI indicate that these media are not being influenced by the presence of known contamination at the Site. The main migration pathway at the Site would appear to be groundwater.

Table 9.1A

SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile and Semi-Volatile Organic Compounds

Confirmatory Soil Samples, Satellite Site No.1

CLP Analytical Results - Unvalidated (Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	SOIL SAMPLE LOCATION AND DEPTH							NYSDOH Soil Guideline Values (1)	NYSDEC Soil Guidance Values (2)
	SWE SAT1-SS1	SWE SAT1-IRM	SWE SAT1-DUP	SWE SAT1-SS2	SWE SAT1-TP1	SWE SAT1-TP2	SWE DUP1-TP		
	0-6"	1.5'	1.5'	0-6" **	1-2'	2-2.5'	2-2.5'		
Volatile Organic Compounds									
Acetone	100	28	8J	ND	ND	ND	ND	1000	3.30
Total Volatiles	100	28	8	ND	ND	ND	ND	-	-
Total Volatile TIC's	74 J	35J	ND	ND	ND	ND	ND	-	-
Semi-Volatile Organics									
Butylbenzylphthalate	ND*	ND	-	ND	ND*	ND	50 J	1000	4964
Naphthalene	ND*	ND	-	ND	ND*	ND	ND	-	325
2-Methylnaphthalene	ND*	ND	-	ND	ND*	ND	ND	-	10000
Di-n-Butylphthalate	3900 J*	22J	-	2100	3300 D*	2100	1400	1000	10000
Diethylphthalate	ND*	10J	-	ND	ND*	ND	ND	-	10000
bis(2-Ethylhexyl)phthalate	15000 B*	ND	-	200 BJ	750 BDJ*	340 BJ	180 BJ	1000	10000
Pyrene	5500	ND	-	ND	ND*	300 J	ND	1000	10000
Di-n-octylphthalate	ND*	ND	-	18 J	ND*	ND	ND	1000	-
Phenanthrene	ND*	ND	-	ND	ND*	330 J	ND	1000	10000
Anthracene	ND*	ND	-	ND	ND*	50 J	ND	1000	10000
Fluoranthene	ND*	ND	-	ND	ND*	460	35 J	1000	10000
Benzo(a)anthracene	ND*	ND	-	ND	ND*	160 J	ND	1000	83.0
Chrysene	ND*	ND	-	ND	ND*	200 J	ND	0.04	12.0
Benzo(b)fluoranthene	ND*	ND	-	ND	ND*	130 J	ND	0.04	33.0
Benzo(k)fluoranthene	ND*	ND	-	ND	ND*	130 J	ND	0.04	33.0
Benzo(a)pyrene	ND*	ND	-	ND	ND*	89 J	ND	-	330
Total Semi-Volatiles	24400*	32	-	2318	4050*	4289	1665	-	-
Total Semi-Volatile TIC's	23,280 J*	12070JAB	-	310 J	520 J*	6200 J	1429 J	-	-
Pesticides/PCB's									
4,4-DDD	6.0	ND	ND	ND*	ND	ND	ND	-	23.1
4,4'-DDT	5.0	ND	ND	ND*	ND	ND	ND	-	7.3
Methoxychlor	23.0 J	ND	ND	ND*	ND	ND	ND	700	-
Endrin Ketone	5.0	ND	ND	ND*	ND	ND	ND	-	-
Aroclor-1248	480	ND	ND	ND*	ND	ND	ND	2	15.9
Chlordane	ND	ND	ND	ND*	ND	ND	3.0	2	420
Total Pesticides/PCB's	499	ND	ND	ND*	ND	ND	3.0		

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

*SAT-SS1, SAT-SS2, SAT-TP1; Sample holding times exceeded, however results determined useable.

**SWE SAT1-SS2 is the background soil sample for Satellite Site 1.

Table 9.1B

SWEDEN-3 CHAPMAN SITE

Soil Samples, Satellite Site No. 1

CLP Analytical Results Unvalidated (Concentration Values in mg/kg-ppm)

Analytes	SOIL SAMPLE LOCATION AND DEPTH							Avg. Conc of Element in Uncont. Soils	Conc. Range of Element in Uncont. Soils
	SWE SAT1-SS1	SWE SAT1-IRM	SWE SAT1-DUP	SWE SAT1-SS2	SWE SAT1-TP1	SWE SAT1-TP2	SWE DUP1-TP		
	0-6"	1.5'	1.5'	0-6" **	1-2'	2-2.5'	2-2.5'		
TAL Metals									
Aluminum	11700	19000	16000	12600	4110	10600	11300	33000	10000-300000
Antimony	29.2	13.4B	ND	35.4	12.5 B	25.3	25.1	0.076	0.2-150
Arsenic	4.5	4.7	5.7	4.1	2.0 B	3.9	3.9	5.0	3.0-12.0
Barium	489	182	138	101	32.7 B	74.5	75.7	290	15-35000
Beryllium	0.44 B	0.98B	0.77B	0.58 B	ND	0.40 B	0.41 B	0.6	0-1.75
Cadmium	2.2	ND	ND	1.2 B	ND	ND	ND	0.6	0-7.0
Calcium	4740	4290	4310	3030	2110	3470	3650	3400	130-35000
Chromium	19.7	23.1	20.8	15.4	5.8	14.8	14.3	33	1.5-40
Cobalt	4.8 B	12.5B	8.2B	7.5 B	2.3 B	5.4 B	7.9 B	5.9	2.5-60
Copper	24.2	4.6B	3.9B	7.1	4.9 B	9.0	8.2	20	2.0-100
Iron	16200	27000	25000	17700	8430	16200	15800	14000	2000-550000
Lead	5520	9.6	11.5	9.5	3.6	28.6	43.4	14	4.0-61
Magnesium	2550	4230	3730	2650	1310	2390	2460	6300	400-9000
Manganese	301	1620	797	1080	309	389	618	850	100-4000
Mercury	ND	ND	ND	ND	ND	ND	ND	0.06	0.001-0.2
Nickel	ND	25.8	16.5	10.4 B	8.4 B	15.2	14.0	40	0.5-60
Potassium	1420	2540	1320	1490	524 B	1240 B	1140 B	1200	100-37000
Selenium	ND	ND	ND	ND	ND	ND	ND	0.06	0.01-12.0
Silver	ND	ND	ND	ND	ND	ND	ND	-	0.01-8.0
Sodium	ND	ND	ND	ND	ND	ND	ND	6300	150-15000
Thallium	ND	ND	ND	ND	ND	ND	ND	-	-
Vanadium	22.6	39.5	29.4	27.6	11.5 B	21.2	22.6	100	1.3-300
Zinc	417	84.3	78.5	55.3	30.2	65.9	69.0	50	10-300
Misc. Compounds									
Total Cyanide	ND	ND	ND	ND	ND	ND	ND	-	-

** SWE SAT1-SS2 is the background soil sample for Satellite Site 1.

Table 9.1C

SWEDEN-3 CHAPMAN SITE
Summary Table of RCRA Waste Characteristics
IRM Confirmatory Soil Sample
Satellite Site No. 1

Sample	SWE- IRM WASTE	
TCLP		Max. Allowable Levels
All Parameters	ND	Not applicable
Additional Parameters		
pH @ 20 C	7.45	2-12.5
Ignitability, F PM	>212	140
Corrosivity, in/yr	< 0.01	0.25
Reactivity to Cyanide, ppm	< 1	-----
Reactivity to Sulfide, ppm	< 1	-----

Table 9.2A
SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Soil Samples, Satellite Site No.2

CLP Analytical Results - Unvalidated (Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	SOIL SAMPLE LOCATION AND DEPTH				NYSDOH	NYSDEC
	SWE SAT2-SS1	SWE SAT2-SS2	SWE SAT2-TP1	SWE SAT2-TP4	Soil Guideline	Soil Guidance
	0-6"	0-6" **	4'	2'	Values (1)	Values (2)
Volatile Organic Compounds						
Total Volatiles	ND	ND	ND	ND	-	-
Total Volatile TIC's	ND	ND	16 JN	ND	-	-
Semi-Volatile Organics						
4-Methylphenol	51 J	ND*	ND	ND	-	63
Di-n-Butylphthalate	4700	14J*	1200	ND	1000	10000
Butylbenzylphthalate	2200	ND*	690	ND	1000	4964
bis(2-Ethylhexyl)phthalate	4600 B	270BJ*	1600 B	300 BJ	1000	10000
N-Nitrosodiphenylamine	ND	9J*	ND	ND	-	-
Diethylphthalate	ND	14J*	ND	41 J	-	177.5
Phenanthrene	ND	14J*	30 J	ND	-	10000
Anthracene	ND	ND*	5.0 J	ND	-	10000
Fluoranthene	ND	34J*	31 J	ND	-	10000
Pyrene	ND	34J*	ND	ND	-	10000
Chrysene	ND	19J*	ND	ND	-	12.0
Di-n-Octyl Phthalate	ND	4J*	ND	ND	-	-
Total Semi-Volatiles	11,551	3154*	2954	341	-	-
Total Semi-Volatiles TIC's	5090 J	4801*	3556	1817	-	-
Pesticides/ PCB'S						
4,4'-DDE	ND	ND	2.0 J*	ND	-	132
4,4'-DDT	4.0 J	ND	3.0 J*	ND	-	7.3
Chlordane	ND	4.0	ND*	ND	2	420

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

SWE SAT2-SS2 Semi Volatile fraction was resampled during Phase II after Phase I results was characterized as unusable data due to a sample holding time violation.

* SAT2-SS2 and SAT2-TP1 Sample holding time exceeded, however results determined useable.

** SWESAT2-SS2 is the background soil sample for Satellite Site 2.

Table 9.2B

SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Soil Samples, Satellite Site No.2

CLP Analytical Results - Unvalidated (Concentration Values in mg/kg-ppm)

Analytes	SOIL SAMPLE LOCATION AND DEPTH				Avg. Conc. of Element in Uncont. Soils	Conc. Range of Element in Uncont. Soils
	SWE SAT2-SS1	SWE SAT2-SS2	SWE SAT2-TP1	SWE SAT2-TP4		
	0-6"	0-6" *	4'	2'		
TAL Metals						
Aluminum	4980	10400	8680	4110	33000	10000-300000
Antimony	67.5	32.0	28.4	16.4	0.076	0.2-150
Arsenic	4.5	3.3	4.0	3.5	5.0	3.0-12.0
Barium	231	33.8 B	49.0	20.4 B	290	15-35000
Beryllium	ND	0.54 B	ND	ND	0.6	0-1.75
Calcium	18800	2630	11900	19300	3400	130-35000
Cadmium	ND	ND	ND	ND	0.6	0.1-7.0
Chromium	15.2	13.1	11.1	6.3	33	1.5-40
Cobalt	6.6 B	6.8 B	3.9 B	3.0 B	5.9	2.5-60
Copper	38.6	4.5 B	10.0	9.7	20	2.0-100
Iron	34900	17000	13500	10100	14000	2000-550000
Lead	93.1	7.6	17.0	4.3	14	4.0-61
Magnesium	5550	2690	4170	6350	6300	400-9000
Manganese	465	469	459	171	850	100-4000
Mercury	ND	ND	ND	ND	0.06	0.001-0.2
Nickel	22.6	10.9	12.9	ND	40	0.5-60
Potassium	1380 B	1750	1740	980 B	12000	100-37000
Selenium	ND	ND	ND	ND	0.2	0.01-12.0
Silver	ND	ND	ND	ND	-	0.01-8.0
Sodium	ND	ND	ND	ND	6300	150-15000
Thallium	ND	ND	ND	ND	-	-
Vanadium	14.6 B	25.7	17.5	12.6	100	1.3-300
Zinc	188	24.7	64.5	25.7	50	10-300
Misc. Compounds						
Total Cyanide	ND	ND	ND	ND	-	-

*SWE SAT2-SS2 is the background soil sample for Satellite Site 2.

Table 9.3A

SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile and Semi-Volatile Organic Compounds

Soil Samples, Satellite Site No.3

CLP Analytical Results - Unvalidated (Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	SOIL SAMPLE LOCATION AND DEPTH					NYSDOH Soil Guideline Values (1)	NYSDEC Soil Guidance Values (2)
	SWE SAT3-SS1	SWE SAT3-SS2	SWE SAT3-TP1	SWE SAT3-TP4	SWE DUP2-TP		
	0-6"	0-6" *	5'	4'	4'		
Volatile Organic Compounds							
Total Volatiles	ND	ND	ND	ND	ND	-	-
Total Volatile TIC's	ND	ND	ND	ND	ND	-	-
Semi-Volatile Organics							
Di-n-Octylphthalate	ND	ND	15 J	ND	ND	1000	-
Di-n-Butylphthalate	2800	4300	4600	4500 D	4100 D	1000	10000
Butylbenzylphthalate	ND	810 J	350 J	520	1200	1000	4964
bis(2-Ethylhexyl)phthalate	750 BJ	1400 B	1800 B	910 B	2200 BD	1000	10000
2-Methylnapthalene	27 J	13 J	ND	ND	ND	1000	10000
Acenapthylene	160 J	45 J	68 J	ND	ND	1000	3750
Acenaphthene	19 J	39 J	ND	ND	ND	400	2760
Dibenzofuran	69 J	32 J	ND	ND	ND	1000	-
Fluorene	140 J	94 J	ND	ND	ND	1000	10000
Phenanthrene	1400	980	210 J	ND	ND	1000	10000
Anthracene	230 J	130 J	73 J	ND	ND	1000	10000
Carbazole	90 J	49 J	ND	ND	ND	1000	-
Fluoranthene	1900	1500	630 J	ND	ND	1000	10000
Pyrene	1300	1100	520 J	ND	ND	1000	10000
Benzo(a)anthracene	830 J	650 J	530 J	ND	ND	1000	83.0
Chrysene	990	800 J	590 J	ND	ND	0.04	12.0
Benzo(b)fluoranthene	610 J	540 J	430 J	ND	ND	0.04	33.0
Benzo(k)fluoranthene	700 J	480 J	480 J	ND	ND	0.04	33.0
Benzo(a)pyrene	680 J	540 J	510 J	ND	ND	-	330
Indeno(1,2,3-cd)pyrene	450 J	380 J	480 J	ND	ND	1000	96.0
Benzo(g,h,i)perylene	350 J	ND	390 J	ND	ND	1000	33.0
Total Semi-Volatiles	13,495	13,882	11,676	5930	7500	-	-
Total Semi-Volatile TIC's	9630 J	3920 J	2440 J	88 J	760 J	-	-
Pesticides/PCB's							
4,4'-DDE	ND	4.0 J	6.0	13.0	5.0	-	132
4,4-DDD	ND	ND	5.0	10.0	3.0 J	-	23.1
4,4'-DDT	ND	ND	10.0	12.0	2.0 J	-	7.3
Total Pesticides	ND	4	21	25	10		

NOTE: NYSDEC Cleanup Goals are afactor of 100 times the NYSDEC Soil Guidance Values.

* SWE SAT3-SS2 is the background soil sample for Satellite Site 3.

Table 9.3B

SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Soil Samples, Satellite Site No.3

CLP Analytical Results - Unvalidated (Concentration in mg/kg-ppm)

Analytes	SOIL SAMPLE LOCATION AND DEPTH					Avg. Conc. of Elements in Uncont. Soils	Conc. Range of Elements in Uncont. Soils
	SWE SAT3-SS1	SWE SAT3-SS2	SWE SAT3-TP1	SWE SAT3-TP4	SWE DUP2-TP		
	0-6"	0-6" *	5'	4'	4'		
TAL Metals							
Aluminum	8930	8260	11400	7420	9020	33000	10000-300000
Antimony	31.1	27.9	46.7	38.1	30.8	0.76	0.2-150
Arsenic	7.4	5.6	6.9	9.7	7.4	5	3.0-12.0
Barium	58.6	55.2	108	92.5	110	290	15-35000
Beryllium	ND	ND	0.54 B	0.39 B	0.56 B	0.6	0-1.75
Cadmium	ND	ND	ND	4.0	ND	0.6	0-7.0
Calcium	26900	13500	23500	151000	43700	3400	130-35000
Chromium	10.9	11.0	20.6	9.7	10.2	33	1.5-40
Cobalt	4.8 B	5.2 B	7.0 B	4.4 B	3.7 B	5.9	2.5-60
Copper	11.9	5.8 B	28.1	15.2	14.8	20	2.0-100
Iron	14800	14700	22800	15700	14900	14000	2000-550000
Lead	44.9	27.4	127	104	132	14	4.0-61
Magnesium	10800	8010	7150	7080	6610	6300	400-9000
Manganese	598	598	477	605	412	850	100-4000
Mercury	ND	ND	ND	ND	ND	0.06	0.001-0.2
Nickel	11.1	12.0	20.3	10.1 B	10.6	40	0.5-60
Potassium	1100 B	1010 B	2260	1330	1360	12000	100-37000
Sodium	ND	ND	140 B	316 B	460 B	6300	150-15000
Selenium	ND	ND	ND	ND	ND	0.2	0.01-12.0
Silver	ND	ND	ND	ND	ND	-	0.01-8.0
Thallium	ND	ND	ND	ND	ND	-	-
Vanadium	18.7	20.1	23.1	17.3	23.8	100	1.3-300
Zinc	96.2	111	303	192	156	50	10-300
Misc. Compounds							
Total Cyanide	ND	ND	ND	ND	ND	-	-

* SWE SAT3 SS2 is the background soil sample for Satellite Site 3.

Table 9.4A

SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Soil Samples
Satellite Site No.4

CLP Analytical Results - Unvalidated

(Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	L OCATION SWE SAT4-SS1 0-6"	NYSDOH Soil Guideline Values (1)	NYSDEC Soil Guidance Values (2)
Volatile Organic Compounds			
Methylene Chloride	4J	100	5.25
Total Volatiles	4	-	-
Total Volatile TIC's	ND	-	-
Semi-Volatile Organics			
Diethylphthalate	39J	1000	177.5
Phenanthrene	20J	1000	10000
Di-n-Butylphthalate	230 J	1000	10000
Fluoranthene	32J	1000	10000
Pyrene	1300	1000	10000
bis(2- Ethylhexyl)phthalate	390BJ	1000	10000
Di-n-octylphalalate	21 J	1000	-
Total Semi-Volatiles	2,032	-	-
Total Semi-Volatile TIC's	12563	-	-
Pesticides/PCB's			
Aroclor-1254	59	2	15.9

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

Table 9.4B

SWEDEN-3 CHAPMAN SITE

Summary Table of Inorganic Parameters

Soil Samples

Satellite Site No. 4

CLP Analytical Results - Unvalidated

(Concentration Values in mg/kg-ppm)

Analytes	LOCATION SWE SAT4-SS1 0-6"	Avg. Conc. of Element in Uncont. Soils	Conc. Range of Element in Uncont. Soils
TAL Metals			
Aluminum	8240	33000	10000-300000
Antimony	37.3	0.076	0.2-150
Arsenic	8.1	5	3.0-12.0
Barium	88.1	290	15-35000
Beryllium	.69B	0.6	0-1.75
Cadmium	ND	0.6	0.1-7.0
Calcium	4290	3400	130-35000
Chromium	74.6	33	1.5-40
Cobalt	17.2	5.9	2.5-60
Copper	18.4	20	2.0-100
Iron	89900	14000	2000-550000
Lead	320	14	4.0-61
Magnesium	2530	6300	400-9000
Manganese	1030	850	100-4000
Mercury	ND	0.06	0.001-0.2
Nickel	30.9	40	0.5-60
Potassium	1510	12000	100-37000
Sodium	ND	6300	150-15000
Selenium	ND	0.2	0.01-12.0
Silver	ND	-	0.01-8.0
Thallium	ND	-	-
Vanadium	23.5	100	1.3-300
Zinc	284	50	10-300
Misc. Compounds			
Total Cyanide	ND	-	-

Table 9.5A
SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Drum Samples
Satellite Site No.1
CLP Analytical Results - Unvalidated
(Concentration Values in ug/kg - ppb)

	DRUM SAMPLE LOCATION	
Analytical Fraction/Analytes	SWE DS-1	SWE DS-2
Volatile Organic Compounds		
Methylene Chloride	450 BJ	520 BJ
Acetone	30,000	1800
4-Methyl-2-Pentanone	4,100,000 DE	ND
Toluene	3,100,000 DE	120 J
Total Xylenes	6,500,000 DE	3100
Ethylbenzene	890,000 D	580 J
Total Volatiles	15,031,000	6120
Total Volatile TIC's	22,760,000 J	13,560 J
Semi-Volatile Organics		
Acenapthylene	ND	3200 J
2- Methylphenol	9800 J	ND
4- Methylphenol	13,000	ND
Isophorone	240,000 D	ND
2,4- Dimethylphenol	140,000 D	ND
Napthalene	5800 DJ	ND
2- Methylnapthalene	1300 DJ	4500 J
bis(2-Chloroethoxy)methane	6800 J	ND
2,4- Dinitrotoluene	11,000 DJ	ND
Fluorene	2900 DJ	4200 J
Phenanthrene	2000 DJ	17,000
Di-n-Butylphthalate	21,000	2600 J
bis(2-Ethylhexyl)phthalate	730 J	7500 J
N-Nitrosodiphenylamine	ND	5500 J
Di-n-octylphthalate	ND	680 J
Total Semi-Volatiles	456,530	45,180
Total Semi-Volatile TIC's	1,125,000 J	252,500 J
Pesticides/PCB's		
All Parameters	ND	ND

Table 9.5B

SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Drum Samples
Satellite Site No. 1

CLP Analytical Results - Unvalidated

(Concentration Values in mg/kg - ppm)

Analytical Fraction/Analytes	DRUM SAMPLE LOCATION SWE DS-1	 SWE DS-2
TAL Metals		
Aluminum	2110	ND
Antimony	1290	ND
Barium	2.5 B	425
Calcium	364 B	381 B
Chromium	10,200	0.86 B
Cobalt	2.0 B	ND
Iron	25,800	19.6 B
Lead	44,500	6.7
Manganese	76.4	ND
Sodium	183 B	ND
Zinc	35.9	352
Misc. Compounds		
Total Cyanide	ND	ND

Table 9.5C

SWEDEN-3 CHAPMAN SITE
Summary Table of RCRA Waste Characteristics
Drum Samples
Satellite Site No. 1

Sample	SWE DS-1	SWE DS-2	
TCLP			Max. Allowable Levels
All Parameters	ND	ND	Not applicable
Additional Parameters			
pH @ 20 C	6.00	8.33	2-12.5
Ignitability, F PM	> 212	145	140
Corrosivity, in/yr	< 0.01	< 0.01	0.25
Reactivity to Cyanide, ppm	< 1	< 1	-----
Reactivity to Sulfide, ppm	< 1	< 1	-----

Table 9.6A

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SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Parameters
Surface Samples

(Concentration Values in ug/kg-ppb unless noted)

Analytical Fraction	SURFACE SOIL SAMPLES														NYSDOH Soil Guidance Values	NYSDEC Soil Guidance Values
	LOC-1SS	LOC-2SS	LOC-3SS	LOC-4SS	LOC-5SS	LOC-6SS	LOC-7SS	LOC-8SS	LOC-9SS	LOC-10SS •	LOC-DUP1 (LOC-3SS)	LOC-DUP2 (LOC-6SS)	LOC-11SS	DUP3-SS (LOC-11SS)		
	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Mar-93	Mar-93		
Volatile Organics																
Methylene Chloride	47 B	42 B	40 B	18 B	53 B	100 B	35 B	150 B	120 B	71 B	45 B	79 B	18J	ND	100.0	5.25
Acetone	250 B	64	180	100	280 B	290 B	310 B	ND	ND	ND	ND	ND	ND	ND	-	3.30
2-Butanone	35	ND	ND	ND	37	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	6.75
Total Volatiles	332	106	220	118	370	390 B	345 B	150 B	120 B	71 B	45 B	79 B	18	ND		
Total Volatile TIC's	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Semi-Volatile Organics																
4-Methylphenol	230.0 J	ND	ND	ND	150.0 J	20.0 J	ND	ND	ND	ND	ND	ND	-	-	-	63.0
Benzoic Acid	ND	ND	32.0 J	ND	ND	ND	ND	ND	ND	38.0 J	ND	ND	-	-	-	-
Di-n-Butylphthalate	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	270.0 J	-	-	1000	10000
Phenanthrene	ND	ND	21.0 J	ND	110.0 J	ND	ND	ND	ND	ND	ND	ND	-	-	1000	10000
N-Nitrosodiphenylamine	ND	ND	ND	ND	ND	ND	41.0 J	ND	ND	ND	ND	ND	-	-	-	-
Anthracene	ND	ND	ND	ND	21.0 J	ND	ND	ND	ND	ND	ND	ND	-	-	1000	10000
Fluoranthene	ND	ND	49.0 J	ND	130.0 J	ND	ND	ND	17.0 J	14.0 J	ND	ND	-	-	1000	10000
Pyrene	28.0 J	ND	39.0 J	ND	110.0 J	ND	ND	ND	12.0 J	12.0 J	43.0 J	ND	-	-	1000	10000
Benzo(a)Anthracene	ND	ND	ND	ND	62.0 J	ND	ND	ND	ND	ND	ND	ND	-	-	1000	83.0
Chrysene	ND	ND	ND	ND	75.0 J	ND	ND	ND	ND	29.0 JB	ND	ND	-	-	0.04	12.0
bis(2-Ethylhexyl)phthala	120.0 J	100.0 J	40.0 JB	72.0 J	82.0 J	110.0 J	150.0 J	180.0 J	63.0 J	ND	86.0 J	88.0 J	-	-	1000	10000
Benzo(a)Pyrene	ND	ND	ND	ND	23.0 J	ND	ND	ND	ND	ND	ND	ND	-	-	-	330
Total Semi-Volatiles	378.0 J	100.0 J	181.0 JB	72.0 J	763.0 J	130.0 J	191 J	180.0 J	92.0 J	93.0 JB	129.0 J	358.0 J	-	-		
Total Semi-Volatile TIC'S	15230JAB	20930JAB	5590JB	103060JAB	13740JAB	146450JAB	138460JAB	26490JAB	101410JAB	5095.0 JB	122870JAN	153990JAN	-	-		

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

March 1993 sampling was analyzed for SSICs.

*LOC-10SS is an upgradient background surface soil samples for the Site.

Table 9.6A

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SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile and Semi-Volatile Parameters

Surface Samples

(Concentration Values in ug/l-ppb unless noted)

Analytical Fraction	SURFACE WATER LOCATION														NYS	NYSDEC
	LOC1-SW		LOC2-SW		LOC3-SW		DUP1-SW**		LOC4-SW*	LOC5-SW	LOC6-SW	LOC7-SW	LOC8-SW	DUP2-SW	Water Quality	TOGS
	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Oct-92	Oct-92	Oct-92	Oct-92	Mar-93	Mar-93	Standards	(1.1.1)
Volatile Organics														***		
Tetrachloroethene	ND	ND	ND	ND	21	ND	21	ND	ND	ND	ND	ND	ND	ND	NS	0.7
Methylene Chloride	ND	1J	ND	3J	ND	4J	ND	4J	4J	4J	4J	4J	ND	9BJ	-	5.0
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	22	11	5.0	-
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2J		
Total Volatiles	ND	1J	ND	3J	21	4J	21	4J	4J	4J	4J	4J	22	24	NS	100
Total Volatile TIC's	0	0	0	0	0	0	0	0	0	0	0	8J	0	0	NS	-
Semi-Volatile Organics																
bis(2-Ethylhexyl)phthalate	ND	-	41	-	ND	-	ND	-	-	-	-	-	-	-	-	4.0
Total Semi-Volatiles	ND	-	41	-	ND	-	ND	-	-	-	-	-	-	-	NS	-
Total Semi-Volatile TIC'S	5J	-	17J	-	2JB	-	8J	-	-	-	-	-	-	-	NS	-
Pesticides/PCB's																
All Parameters	ND	-	ND	-	ND	-	ND	-	-	-	-	-	-	-	-	-

NOTE: June 1992 sampling was analyzed for Full CLP and validated.
October 1992 sampling was analyzed for SSICs.
March 1993 sampling was analyzed for SSICs.

* LOC4-SW is an upgradient background surface water samples for the Site.

** Duplicate of LOC3-SW

*** Duplicate of LOC8-SW

Table 9.6B

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SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Surface Samples

(Concentration Values in mg/kg-ppm unless noted)

Analytes	SURFACE SOIL SAMPLES												Avg. Conc. of Element in Uncont. Soils	Conc. Range of Element in Uncont. Soils
	LOC-1SS	LOC-2SS	LOC-3SS	LOC-4SS *	LOC-5SS	LOC-6SS	LOC-7SS	LOC-8SS	LOC-9SS	LOC-10SS *	LOC-DUP1 (LOC-3SS)	LOC-DUP2 (LOC-6SS)		
TAL Metals														
Aluminum	8610	12100	15600	19600	20200	27700	14100	11600	16000	7650	15500	26600	33000	10000 - 300000
Antimony	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	17.80 B	ND	0.76	0.2 - 150
Arsenic	9.30	5.50	4.40	8.20	2.80 B	5.80	3.50 B	3.20 B	3.20 B	4.70	4.30	5.70	5.0	3.0 - 12.0
Barium	132.0	147.0	120.0	213.0	186.0	226.0	119.0	164.0	176.0	48.80 B	126.0	218.0	290	15 - 600
Beryllium	0.60 B	0.56 B	0.91 B	0.58 B	0.62 B	1.40 B	0.73 B	0.79 B	0.62 B	0.44 B	1.10 B	1.10 B	0.6	0.0-1.75
Cadmium	ND	ND	ND	1.80 B	ND	ND	2.20 B	15.50	ND	ND	ND	ND	0.6	0.1-7.0
Calcium	10100	14000	9810	11000	8930	16600	23700	33500	7610	1890	9230	15300	3400	130-35000
Chromium	13.80	15.70	20.90	20.50	21.10	29.60	31.50	17.00	19.90	8.90	20.40	30.00	33	1.5-40
Cobalt	9.70 B	9.80 B	11.50 B	12.50 B	12.30 B	14.70 B	9.50 B	6.60 B	8.40 B	7.30 B	7.90 B	7.60 B	5.9	2.5-60
Copper	8.00 B	21.90	16.00	11.00	13.60	29.10	78.70	156	12.90	10.60	14.00	19.60	20	2.0-100
Iron	18600	20700	20700	16800	27900	23500	15000	13100	16800	13100	22300	21400	14000	2000-550000
Lead	37.50	37.40	22.50	27.20	35.90	108	54.20	56.30	22.50	16.30	23.00	49.30	14	4.0-61
Magnesium	3530	4490	5310	5420	4250	7100	6320	5360	4230	1720	5140	6840	6300	400-9000
Manganese	1480	847.0	563.0	131.0	489.0	1050.0	224.0	134.00	323.0	453.00	665.0	1270.0	850	100-4000
Mercury	1.10	1.30	0.51	0.42	0.30	0.39	ND	ND	ND	ND	0.27	ND	0.06	0.001-0.2
Nickel	20.30	ND	15.30	19.70	17.00 B	20.20 B	24.10	24.50	19.10	11.30	20.60	14.30 B	40	0.5-60
Potassium	1170 B	1050 B	1740.00	2630	2910	3670	1740 B	891 B	1460 B	509 B	1250 B	2880	12000	100-37000
Selenium	ND	ND	ND	ND	ND	ND	ND	5.50	ND	ND	ND	ND	0.2	0.01-12.0
Silver	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	0.01-8.0
Sodium	313.0 B	266.00 B	ND	ND	362.00 B	423.00 B	291.00 B	358.00 B	165.00 B	88.00 B	149.00 B	463.00 B	6300	150-15000
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Vanadium	21.40 B	24.40	31.00	30.50	40.90	41.40	26.10 B	48.60	25.20	15.90	28.50	37.20	100	1.3-300
Zinc	117.0	131.0	95.60	148.0	120.0	269	193	1090	99.60	41.50	94.40	251	50	10-300
Total Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-

*LOC-4SS and LOC-10SS are upgradient background surface soil samples for the Site

Table 9.6B

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SWEDEN-3 CHAPMAN SITE

Summary Table of Inorganic Parameters, Surface Samples

(Concentration Values in ug/l-ppb unless noted)

Analytes	SURFACE WATER LOCATION												NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	LOC-1SW		LOC-2SW		LOC-3SW		DUP-1SW*		LOC-4SW	LOC-5SW	LOC-6SW	LOC-7SW		
	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Oct-92 ***	Oct-92	Oct-92	Oct. 92		
TAL Metals														
Aluminum	25700	83.40	447	54.70	17100	399.0	21100	608.0	154.0	45.0	129.0	293	100	-
Antimony	93.5	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	3.0
Arsenic	6.9B	ND	ND	ND	5.6B	ND	5.2B	ND	ND	ND	ND	ND	190	-
Barium	429	73.80 B	58.3B	62.20 B	206	42.80 B	221	57.00 B	84.20 B	73.80 B	68.70 B	90.7 B	1000	-
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11	-
Cadmium	ND	ND	ND	ND	ND	ND	ND	3.00 B	ND	ND	4.00 B	ND	10*	-
Calcium	134000	11700	70800	10800	69200	85200	71600	91200	10600	10200	10600	215000	NS	-
Chromium	38.3	ND	ND	ND	16.6	ND	22.2	ND	ND	ND	ND	ND	50*	-
Cobalt	22.6B	ND	ND	ND	9.1B	ND	9.3B	ND	ND	ND	ND	ND	5.0	-
Copper	17.7B	ND	9.6B	ND	31.6	ND	27.8	ND	ND	ND	ND	6.1 B	200*	-
Iron	36500	281.0	574	173.0	22200	640.0	24800	924.0	380.0	200.0	275.0	840	300	-
Lead	80.1	ND	ND	3.00	12.3	ND	23.4	ND	ND	ND	ND	ND	15	-
Magnesium	39300	35600	27200	34000	30800	31900	31400	34200	32100	36000	33000	77400	NS	35000
Manganese	5690	432.0	170	108.0	1590	302.0	1650	373.0	143.0	140.0	91.0	791	300*	-
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	0.2
Nickel	ND	ND	ND	ND	33.6B	ND	31.8B	ND	ND	ND	ND	ND	NS	-
Potassium	6350	1270 B	2860B	2170.0 B	10500	4420.0 B	12200	4710.0 B	2540.0 B	983.0 B	1620.0 B	6130	NS	-
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1.0	-
Silver	ND	ND	ND	ND	ND	ND	ND	4.10 B	ND	ND	8.30 B	ND	0.1	-
Sodium	44300	54700	36500	42700	11200	7730	11500	8500	80000	30600	50700	35200	20000*	-
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	NS	-
Vanadium	54.1	ND	ND	ND	33.5B	ND	36.3B	ND	ND	ND	ND	ND	14	-
Zinc	269	ND	25.1	ND	102	ND	145	ND	ND	ND	ND	9.6 B	300	-
Anions														
Total Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.2	-
Chloride (mg/l)	72	-	52	-	18	-	18	-	-	-	-	-	250*	-
Fluoride (mg/l)	0.2	-	0.22	-	0.26	-	0.25	-	-	-	-	-	1.5*	-
Nitrate (mg/l)	<.04	-	<.04	-	<.04	-	<.04	-	-	-	-	-	10*	-
Sulfate (mg/l)	203	-	82	-	88	-	94	-	-	-	-	-	250*	-

NOTE: June 1992 sampling was analyzed for Full CLP and validated.

October 1992 sampling was analyzed for SSICs.

- * Represents Groundwater Standard(Class GA)
- * Duplicate of LOC-3SW

***LOC-4SW is an upgradient background surface water samples for the Site.

Table 9.7A

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SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile and Semi-Volatile Organic Compounds

Boring Soil Samples

Validated CLP Analytical Results (Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	LANDFILL SOIL BORING SAMPLE LOCATION AND DEPTH												NYSDEC Soil Guidance Values (2)
	SWE-B4	SWE-B5	SWE-B6	SWE-B7	SWE-B9	SWE-B10	SWE-B11	SWE-B12	SWE-B13	SWE-B16	SWE-TP4	SWE-TPdup	
	10-12'	8-10'	12-14'	10-12'	12-14'	14-16'	12-14'	12-14'	14-16'	14-16'	6-7' *	(TP4-6-7')	
Volatile Organic Compounds													
Chloromethane	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
Bromomethane	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
Vinyl Chloride	ND	ND	ND	ND	11 V	27	ND	ND	ND	ND	ND	ND	3.42
Chloroethane	11	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	55.5
Methylene Chloride	110 B	3800 B	ND	ND	11 V	ND	ND	ND	ND	ND	230 J	6	5.25
Acetone	7800	13000 V	ND	8900 V	3800 V	39	460 E	ND	990 E	ND	ND	ND	3.30
Carbon Disulfide	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	81
1,1-Dichloroethene	ND	ND	ND	14 J	11 V	ND	ND	ND	ND	ND	ND	ND	9.75
1,1-Dichloroethane	18	ND	ND	79	11 V	ND	ND	ND	ND	ND	ND	ND	4.50
1,2-Dichloroethene (total)	350 J	ND	ND	4900 E	2600 V	120	110	ND	ND	4 J	6 J	6	7.35
Chloroform	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	93
1,2-Dichloroethane	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	4.5
2-Butanone	12000	5000 V	ND	11000 V	15000 V	ND	200	ND	1300 E	ND	ND	ND	6.75
1,1,1-Trichloroethane	140	ND	ND	600	11 V	ND	ND	ND	ND	ND	ND	ND	22.8
Carbon Tetrachloride	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	16.5
Bromodichloromethane	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
1,2-Dichloropropene	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
cis-1,3-Dichloropropene	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
Trichloroethene	ND	ND	ND	ND	11 V	19000 V	ND	ND	ND	ND	260 D	1400	18.9
Dibromechlormethane	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
1,1,2-Trichloroethane	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	8.4
Benzene	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	1.74
trans-1,3-Dichloropropene	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
Bromoform	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
4-Methyl-2-Pentanone	10000	ND	ND	7700 V	180 V	ND	51	ND	1100 E	ND	ND	ND	-
2-Hexanone	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
Tetrachloroethene	4 J	ND	ND	ND	7 V	25	ND	ND	ND	1 J	ND	ND	54.6
1,1,2,2-Tetrachlorethane	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	17.7
Toluene	840 J	ND	ND	200	240 V	ND	5 J	51	ND	ND	2 J	ND	45.0

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

Table 9.7A

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SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Boring Soil Samples

Validated CLP Analytical Results (Concentration Values in ug/kg-ppb)

	LANDFILL SOIL BORING SAMPLE LOCATION AND DEPTH												NYSDEC
Analytical Fraction/Analytes	SWE-B4	SWE-B5	SWE-B6	SWE-B7	SWE-B9	SWE-B10	SWE-B11	SWE-B12	SWE-B13	SWE-B16	SWE-TP4	SWE-TPdup	Soil Guidance
Volatile Organic Compounds	10-12'	8-10'	12-14'	10-12'	12-14'	14-16'	12-14'	12-14'	14-16'	14-16'	6-7' *	(TP4-6-7')	Values (2)
Chlorobenzene	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	4.5
Ethylbenzene	53	ND	ND	ND	88 V	ND	ND	37	ND	ND	ND	ND	165
Styrene	ND	ND	ND	ND	11 V	ND	ND	ND	ND	ND	ND	ND	-
Total Xylenes	160	ND	28	ND	520 E	ND	ND	120	ND	ND	ND	ND	36.0
Total Volatiles	31486	21800	28	33393	22710	19211	826	208	3390	5	498	1412	-
Total Volatile TIC's	109 J	0	108	0	826 J	5600 J	45 J	0	183 J	0	29 J	0	-
Semi-Volatile Organics													
Phenol	190 J	ND	ND	ND	270 J	ND	ND	ND	ND	ND	ND	ND	0.81
2-Methylphenol	ND	ND	ND	ND	ND	ND	ND	13 J	ND	ND	ND	ND	63.0
4-Methylphenol	230 J	ND	ND	ND	ND	ND	50 J	15 J	ND	ND	ND	ND	63.0
1,2,4-Trichlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	9 J	ND	ND	1380
Naphthalene	68 J	ND	150 DJ	7 J	120 J	ND	ND	ND	ND	ND	ND	ND	325
Hexachlorobutadiene	22 J	110 J	ND	ND	51 J	ND	ND	ND	ND	ND	ND	ND	4350
4 Chloro-3-methylphenol	ND	ND	ND	ND	ND	ND	ND	ND	ND	10 J	ND	ND	-
2-Methylnaphthalene	45 J	5 J	190 DJ	2 J	110 J	ND	ND	ND	ND	ND	ND	ND	10000
Hexachlorocyclopentadiene	390 V	ND	ND	ND	51 J	ND	ND	ND	ND	ND	ND	ND	4350
2,4,6-Trichlorophenol	390 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
2,4,5-Trichlorophenol	940 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.67
2-Chloronapphthalene	390 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
2-Nitroaniline	940 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	12.9
Dimethylphthalate	390 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
Acenaphthylene	390 V	13 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3750
2,6-Dinitrotoluene	390 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
3-Nitroaniline	940 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	29.7
Acenaphthene	390 V	17 J	ND	ND	ND	ND	ND	ND	ND	9 J	ND	ND	2760
2,4- Dinitrophenol	940 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	11.4
4-Nitrophenol	940 V	ND	ND	ND	ND	ND	ND	ND	ND	26 J	ND	ND	3.15
2,4-Dinitrotoluene	390 V	ND	ND	ND	ND	ND	ND	ND	ND	4 J	ND	ND	-
Diethylphthalate	390 V	19 J	ND	63 J	ND	6 J	ND	92 J	17 J	52 J	ND	6 J	10000
Dibenzofuran	390 V	9 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

Table 9.7A

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SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile and Semi-Volatile Organic Compounds Boring Soil Samples

Validated CLP Analytical Results (Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	LANDFILL SOIL BORING SAMPLE LOCATION AND DEPTH												NYSDEC
	SWE-B4	SWE-B5	SWE-B6	SWE-B7	SWE-B9	SWE-B10	SWE-B11	SWE-B12	SWE-B13	SWE-B16	SWE-TP4	SWE-TPdup	Soil Guidance
	10-12'	8-10'	12-14'	10-12'	12-14'	14-16'	12-14'	12-14'	14-16'	14-16'	6-7' *	(TP4-6-7')	Values (2)
Semi-Volatile Organics													
4-Chlorophenyl-phenylether	390 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	10000
Flourene	64 V	31 J	64 DJ	ND	53 J	ND	ND	ND	ND	ND	ND	ND	10000
4-Nitroaniline	940 V	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-
4,6-Dinitro-2-methylphenol	940 V	ND	ND	ND	ND	880 V	ND	ND	ND	ND	ND	ND	-
N-Nitrosodiphenylamine	390 V	ND	ND	9 J	140 J	360 V	ND	ND	ND	ND	ND	ND	10000
4-Bromophenyl-phenylether	390 V	ND	ND	ND	ND	360 V	ND	ND	ND	ND	ND	ND	-
Hexachlorobenzene	390 V	ND	ND	ND	ND	360 V	ND	ND	ND	ND	ND	ND	-
Pentachlorophenol	940 V	ND	ND	ND	ND	880 V	ND	ND	ND	ND	ND	ND	-
Phenanthrene	280 V	220 J	190 DJ	ND	190 J	360 V	22 J	ND	ND	ND	ND	ND	10000
Anthracene	390 V	32 J	ND	ND	ND	360 V	6 BJ	ND	ND	ND	ND	ND	10000
Carbazole	390 V	13 J	ND	18 BJ	ND	360 V	ND	ND	ND	ND	ND	ND	-
Di-n-butylphthalate	37 V	120 J	ND	ND	560 B	360 V	38 J	ND	ND	920 B	ND	ND	10000
Flouranthene	390 V	200 J	17 DJ	ND	13 J	360 V	18 J	ND	ND	ND	ND	ND	10000
Pyrene	390 V	120 J	26 DJ	ND	30 J	360 V	12 J	ND	ND	5 J	ND	ND	10000
Butylbenzylphthalate	390 V	16 J	330 BDJ	ND	ND	360 V	ND	ND	ND	ND	ND	ND	4964
3,3'-Dichlorobenzidine	390 V	ND	ND	ND	ND	360 V	ND	ND	ND	ND	ND	ND	-
Benzo (a) anthracene	390 V	85 J	ND	ND	ND	360 V	ND	ND	ND	ND	ND	ND	83
Chrysene	390 V	110 J	ND	ND	18 J	360 V	ND	ND	ND	ND	ND	ND	12
bis(2-Ethylhexyl)phthalate	390 UV	ND	5200 BD	5100 B	1500 B	ND	140 BJ	ND	ND	ND	ND	ND	10000
Di-n-octylphthalate	4 J	5 J	ND	29 BJ	ND	ND	160 J	ND	ND	ND	ND	ND	10000
Benzo(b)flouranthene	ND	76 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33
Benzo(k)flouranthene	ND	47 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	33
Benzo(a)pyrene	ND	53 J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	330
Total Semi-Volatiles	17430	1301	6167	5228	3106	6446	446	120	17	1035	ND	ND	-
Total Semi-Volatile TIC'S	20750JA	9123JA	25090JA	2045J	19060JAB	2482J	7653 JAB	1682J	7949JAB	1830J	11961JAB	26484JAB	-

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Boring Soil Samples

Validated CLP Analytical Results (Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	LANDFILL SOIL BORING SAMPLE LOCATION AND DEPTH												NYSDEC
	SWE-B4	SWE-B5	SWE-B6	SWE-B7	SWE-B9	SWE-B10	SWE-B11	SWE-B12	SWE-B13	SWE-B16	SWE-TP4	SWE-TPdup	Soil Guidance
	10-12'	8-10'	12-14'	10-12'	12-14'	14-16'	12-14'	12-14'	14-16'	14-16'	6-7'	(TP4-6-7')	Values (2)
Pesticides/PCB's													
alpha-BHC	1.8 V	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	10000
beta-BHC	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	10000
delta-BHC	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	10000
gamma-BHC (Lindane)	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	10000
Heptachlor	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	-
Aldrin	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	5.76
Hepatachlor epoxide	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	-
Endosulfan I	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	24.5
Dieldrin	ND	ND	ND	ND	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	-
4,4'-DDE	ND	ND	ND	ND	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	-
Endrin	ND	ND	ND	ND	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	-
Endosulfan II	ND	ND	ND	ND	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	24.1
4,4'-DDD	ND	ND	ND	ND	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	231
Endosulfan sulfate	ND	ND	ND	ND	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	10000
4,4'-DDT	ND	ND	ND	ND	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	10000
Methoxychlor	ND	ND	ND	ND	18 V	ND	ND	19 V	ND	ND	ND	ND	-
Endrin ketone	ND	ND	ND	ND	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	10000
Endrin aldehyde	ND	ND	ND	4.1 V	3.6 V	ND	ND	3.7 V	ND	ND	ND	ND	10000
alpha-Chlordane	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	10000
gamma-Chlordane	ND	ND	ND	ND	1.8 V	ND	ND	1.9 V	ND	ND	ND	ND	4964
Toxaphene	ND	ND	ND	ND	180 V	ND	ND	190 V	ND	ND	ND	ND	-
Aroclor-1016	ND	ND	ND	ND	36 V	ND	ND	37 V	ND	ND	ND	ND	83
Aroclor-1221	ND	ND	ND	ND	73 V	ND	ND	ND	ND	ND	ND	ND	12
Aroclor-1232	ND	ND	ND	ND	36 V	ND	ND	37 V	ND	ND	ND	ND	10000
Aroclor-1242	ND	ND	ND	ND	36 V	ND	ND	37 V	ND	ND	ND	ND	10000
Aroclor-1248	ND	ND	ND	ND	36 V	ND	ND	37 V	ND	ND	ND	ND	33
Aroclor-1254	ND	ND	6900	ND	36 V	ND	ND	37 V	ND	ND	ND	ND	15.9
Aroclor-1260	ND	ND	ND	ND	36 V	ND	ND	37 V	ND	ND	ND	ND	330
Total Pesticides/PCBs	1.8	ND	6900	4.1	537.4	ND	ND	483.3	ND	ND	ND	ND	-

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

Table 9.7A

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SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Boring Soil Samples

CLP Validated Analytical Results (Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	MONITORING WELL SOIL BORING SAMPLE LOCATION AND DEPTH								NYSDOH	NYSDEC
	SWE-B1D	SWE-B2D	SWE-B2D	SWE-B3D	SWE-B6S	SWE-B6S	SWE-B7S	SWE-B8S	Soil Guideline	Soil Guidance
	3-4'	4-6'	10-12'	4-6'	4-5'	11-12'	8-10'	9-10' **	Values (1)	Values (2)
Volatile Organic Compounds										
Vinyl Chloride	ND	ND	ND	ND	ND	7.0 J	ND	ND	40	3.42
Methylene Chloride	ND	ND	ND	ND	ND	ND	ND	ND	-	5.25
Acetone	ND	ND	ND	ND	ND	ND	ND	ND	-	3.30
Carbon Disulfide	ND	ND	ND	ND	ND	2.0 J	ND	ND	1000	81.0
2-Butanone	ND	ND	ND	ND	ND	120D	ND	ND	1000	6.75
1,2-Dichloroethene (total)	ND	ND	ND	1.0 J	97	430 J	ND	ND	100	7.35
Trichloroethene	ND	ND	ND	3.0 J	52	3000J	ND	ND	100	18.9
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	7.0 J	ND	ND	-	-
Toluene	ND	ND	ND	ND	ND	2.0 J	ND	ND	100	45.0
1,1-Dichloroethene	ND	ND	ND	2.0 J	ND	ND	ND	ND	100	9.75
Total Volatiles	ND	ND	ND	6.0	149	3568	ND	ND	-	-
Total Volatile TIC's	0	0	0	0	0	7011J	0	0	-	-
Semi-Volatile Organics										
Phenol	ND	ND	110BJ*	ND*	ND	ND	ND	ND	-	-
Diethylphthalate	100 J	11 J	ND*	ND*	ND	ND	ND	52 J	1000	177.5
N-Nitrosodiphenylamine	ND	ND	ND*	ND*	ND	ND	ND	ND	-	-
Di-n-Butylphthalate	450	3100	ND*	100J*	74 J	ND	ND	140 J	1000	10000
Butylbenzylphthalate	ND	49 J	ND*	ND*	ND	ND	ND	ND	1000	10000
bis(2-Ethylhexyl)phthalate	ND	1500 J	260BJ*	870B*	ND	ND	ND	1900	1000	10000
Di-n-octylphthalate	ND	ND	ND*	ND*	ND	ND	ND	ND	-	-
Total Semi-Volatiles	550	4660	370BJ*	970BJ*	74	ND	ND	2092	-	-
Total Semi-Volatile TIC'S	130 J	2260 J	ND*	ND*	85 J	1447 J	140 J	960 J	-	-
Pesticides/PCB's										
gamma-BHC(Lindane)	18*	ND	ND	ND	ND	ND	ND	ND	-	-
Heptachlor	16*	ND	ND	ND	ND	ND	ND	ND	-	-
Aldrin	17*	ND	ND	ND	ND	ND	ND	ND	-	-
Dieldrin	39*	ND	ND	ND	ND	ND	ND	ND	-	-
Endrin	41*	ND	ND	ND	ND	ND	ND	ND	-	-
4,4'-DDT	37*	ND	ND	ND	ND	ND	ND	ND	-	-

NOTE: NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

* SWE-B1D; SWE-B2D; and SWE-B3D Sample holding times exceeded , however determined useable.

** SWE-B8S is the upgradient background soil sample for the Site.

Table 9.7A

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SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile and Semi-Volatile Organic Compounds

Boring Soil Samples

(Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	MONITORING WELL SOIL SAMPLE LOCATION AND DEPTH								NYSDOH	NYSDEC
	SWE-B6I	DUP1B	SWE-B9I	SWE-B10I	SWE-B11D	SWE-B12I	SWE-B14I**	DUP-1S**	Soil Guideline	Soil Guidance
	12-14'	12-14'	18-20'	8-10'	8-10'	12-14'	16-16.5'	16-16.5'	Values (1)	Values (2)
Volatile Organic Compounds										
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	40	3.42
Methylene Chloride	13 B	10 B	6 B	9 B	7 B	4 BJ	7 B	8 B	-	5.25
Acetone	18	16	9 J	ND	ND	ND	13 B	11 J	-	3.30
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	1000	81.0
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	1000	6.75
1,2-Dichloroethene (total)	16	9	ND	ND	ND	ND	ND	ND	100	7.35
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	100	18.9
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Toluene	ND	ND	ND	ND	ND	ND	2 J	1 J	100	45.0
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	100	9.75
Total Volatiles	47	35	15	9	7	4	22	20	-	-
Total Volatile TIC's	0	0	0	0	0	0	0	0	-	-
Semi-Volatile Organics										
Phenol	ND	ND	ND *	ND	150 J	ND	-	-	1000	-
2-Methylphenol	ND	ND	ND *	ND	14 J	ND	-	-	-	-
4-Methylphenol	ND	ND	ND *	ND	100 J	ND	-	-	-	-
Naphthalene	ND	ND	ND *	30 J	51 J	ND	-	-	-	325
2-Methylnaphthalene	ND	ND	ND *	8 J	14 J	ND	-	-	-	10000
Diethylphthalate	400	ND	230 *	ND	9 J	ND	-	-	1000	10000
N-Nitrosodiphenylamine	ND	ND	ND *	7 J	8 J	ND	-	-	-	-
Di-n-butylphthalate	ND	ND	370 *	42 BJ	19 BJ	1400	-	-	1000	10000
Butylbenzylphthalate	ND	ND	ND *	ND	ND	ND	-	-	1000	10000
bis(2-Ethylhexyl)phthalate	670 B	620 B	1000 *	2000 B	3100 B	92 BJ	-	-	1000	10000
Di-n-octylphthalate	11 J	12 J	15 *	48 BJ	4 BJ	ND	-	-	-	10000
Total Semi-Volatiles	1081	632	1615 *	2135	3469	1492	-	-	-	-
Total Semi-Volatile TIC'S	2304 J	10640JA	82 *	1864	5269	15699JAB	-	-	-	-

Note: Sampling was analyzed for SSICs

NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

* SWE-B9I analytical method blank TIC greater than 10%, however results determined not required.

** SWE-14I and DUP-1S analyzed for Phase III SSICs

Table 9.7B

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SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Boring Soil Samples

Validated CLP Analytical Results (Concentration Values in mg/kg-ppm)

Analytes	LANDFILL SOIL BORING SAMPLE LOCATION AND DEPTH										Avg. Conc. of Element in Uncont. Soils	Conc. Range of Element in Uncont. Soils
	SWE-B4	SWE-B5	SWE-B6	SWE-B7	SWE-B9	SWE-B10	SWE-B12	SWE-B13	SWE-B16	SWE-TP4		
	10-12'	8-10'	12-14'	10-12'	12-14'	14-16'	12-14'	14-16'	14-16'	6-7'		
TAL Metals												
Aluminum	3680	4850	14000	12200	4020	2130	2150	3840	1950	3470	33000	10000 - 300000
Antimony	ND	12.70 B	ND	11.40 B	ND	ND	19.00 J	23.10	ND	19.20 J	0.76	0.2 - 150
Arsenic	ND	3.00 J	1.80 J	2.00 J	2.80	1.7 J	1.90 J	1.50 B	2.10 J	2.50 J	5.0	3.0 - 12.0
Barium	22.40 B	38.80 B	102.0	127.0	22.70 B	42.40 B	46.10	38.30 B	35.70 B	30.90 B	290	15 - 600
Beryllium	ND	0.33 UJ	0.55 UJ	ND	0.26 B	0.51 UJ	0.43 UJ	ND	0.4 UJ	ND	0.6	0.0-1.75
Cadmium	ND	ND	ND	ND	ND	0.66 UJ	0.67 UJ	ND	0.78 UJ	0.66 UJ	0.6	0.1-7.0
Calcium	26300	50800	43500	124000	86200	77700	80300	72700	116000	118000	3400	130-35000
Chromium	5.00	9.20	22.10	19.40	8.40	5.6 J	5.30 J	5.90	5.9 J	2.50 J	33	1.5-40
Cobalt	3.00 B	3.90 UJ	11.80 B	13.20	3.20 B	2.20 J	2.50 J	3.10 B	2.00 J	2.20 J	5.9	2.5-60
Copper	15.20	15.30 J	32.00 J	6.60 J	5.60	1.7 UJ	0.9 UJ	6.10	1 UJ	5.50 UJ	20	2.0-100
Iron	6890	12800	21600	25000	8610	7870	7790	9220	7830	7900	14000	2000-550000
Lead	3.00	8.80 J	8.30 J	8.10 J	6.90	4.6	3.50	4.70	4.6	6.60	14	4.0-61
Magnesium	8190	29100	12800	8180	31600	23800	20900	18900	43800	43500	6300	400-9000
Manganese	136.0	401.0	458.0	967.0	333.0	299.0 J	393.0 J	316.0	418.0 J	343.0 J	850	100-4000
Mercury	0.13	ND	ND	ND	ND	0.12	ND	ND	ND	ND	0.06	0.001-0.2
Nickel	ND	9.50	30.40	27.20	8.20 B	4.2 UJ	4.3 UJ	10.00	4.9 UJ	6.40 UJ	40	0.5-60
Potassium	586.0 B	492.0 B	2900	1080 B	1310	639.0 J	331.0 J	1100	415.0 J	555.0 J	12000	100-37000
Selenium	ND	1.1 UJ	1.2 UJ	1.3 UJ	ND	1.1 R	1.1 R	ND	1.3 R	1.1 R	0.2	0.01-12.0
Silver	ND	0.89 UJ	0.98 UJ	1 UJ	ND	0.88 UJ	0.9 UJ	ND	1 UJ	0.88 UJ	-	0.01-8.0
Sodium	288.0 B	102.0 B	286.0 B	356.0 B	198.0 B	156.0 UJ	132.0 UJ	188.0	171.0 UJ	269.0 B	6300	150-15000
Thallium	ND	1.1 UJ	1.2 UJ	1.3 UJ	ND	ND	ND	ND	ND	ND	-	-
Vanadium	12.80	15.20	30.60	25.20	12.70	10.8 J	10.10 J	13.10	9.7 J	8.70 B	100	1.3-300
Zinc	25.00	44.00	58.20	56.40	61.50	17.8 J	22.10 J	21.00	44.2 J	29.90	50	10-300
Cyanide	ND	ND	ND	ND	ND	0.37 UJ	0.43 UJ	ND	0.57 UJ	0.6 UJ	-	-

Asbestos Analytical Results: B8-4'-8'-ND
B9-4'-6'-ND

Total Organic Carbon (TOC): B16-14'-16'=30132 mg/kg
B6I-12'-14'= 25688 mg/kg

Table 9.7B
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SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Boring Soil Samples
Validated CLP Analytical Results (Concentration Values in mg/kg-ppm)

Analytes	MONITORING WELL SOIL BORING SAMPLE LOCATION AND DEPTH								Avg. Conc. of Element in Uncont. Soils	Conc. Range of Element in Uncont. Soils
	SWE-B1D	SWE-B2D	SWE-B2D	SWE-B3D	SWE-B6S	SWE-B6S	SWE-B7S	SWE-B8S		
	3-4'	4-6'	10-12'	4-6'	4-6'	11-12'	8-10'	9-10' *		
TAL Metals										
Aluminum	5200	4560	2080	2190	7480	2190	3140	5970	33000	10000 - 300000
Antimony	18.4	ND	26.2	ND	ND	ND	8.4 B	ND	0.76	0.2 - 150
Arsenic	ND	2.9	1.8 B	ND	1.6 B	1.5 B	1.5 B	2.6	5.0	3.0 - 12.0
Barium	32.8 B	39.5 B	26.3 B	19.3 B	41.6 B	36.8 B	43.7	43.9 B	290	15 - 600
Beryllium	ND	ND	ND	ND	ND	ND	ND	ND	0.6	0.0-1.75
Cadmium	ND	ND	ND	ND	ND	ND	ND	ND	0.6	0.1-7.0
Calcium	2450	76000	100000	95600	40900	74900	86200	68300	3400	130 - 35000
Chromium	8.1	7.7	6.2	3.3	12.5	4.1	5.6	9.7	33	1.5 - 40
Cobalt	2.2 B	3.0 B	1.7 B	ND	3.2 B	ND	1.9 B	4.3 B	5.9	2.5 - 60
Copper	3.4 B	10.7	6.0	4.0 B	8.8	7.1	7.4	15.5	20	2.0 - 100
Iron	10400	10400	6920	5400	13500	6890	7610	12100	14000	2000 - 550000
Lead	2.6	3.9	4.0	6.4	3.7	4.9	4.0	3.9	14	4.0 - 61
Magnesium	1800	17700	45800	38700	12400	26600	31700	15200	6300	400 - 9000
Manganese	77.6	280	343	296	220	290	322	395	850	100 - 4000
Mercury	ND	ND	ND	ND	ND	ND	ND	ND	0.6	0.001-0.2
Nickel	10.6	8.2 B	ND	ND	9.3	ND	ND	9.1	40	0.5 - 60
Potassium	544 B	927 B	583 B	378 B	1390	759 B	791 B	1900	12000	100 - 37000
Selenium	ND	ND	ND	ND	ND	ND	ND	ND	0.2	0.01-12.0
Silver	ND	ND	ND	ND	ND	ND	ND	ND	-	0.01-8.0
Sodium	ND	158 B	213 B	146 B	264 B	144 B	179 B	199 B	6300	150 - 15000
Thallium	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Vanadium	12.9	14.3	9.1 B	6.9 B	24.1	9.7 B	11.9	16.8	100	1.3 - 300
Zinc	23.2	26.7	11.2	79.2	28.7	26.3	16.4	22.2	50	10 - 300
Misc. Compounds										
Total Cyanide	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Chloride	137	92	77	103	119	91	78	70	-	-
Fluoride	0.06	0.08	0.09	0.08	0.1	0.12	0.09	0.07	-	-
Nitrate	<0.10	0.24	<0.10	<0.10	<0.10	<0.10	<0.10	<0.10	-	-
Sulfate	188	51	134	206	73	105	155	166	-	-

* SWE-B8S is the background soil sample for the Site.

Table 9.8

SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile and Semi-Volatile Organic Compounds

Test Pit Soil Samples

(Concentration Values in ug/kg-ppb)

Analytical Fraction/Analytes	TEST PIT SAMPLE LOCATION AND DEPTH									NYSDOH	NYSDEC
	SWE-TP1	SWE-TP1	SWE-TP2	SWE-TP3	SWE-TP6	SWE-TP7	SWE-TP9	SWETP13	SWE-TP14	Soil Guideline	Soil Guidance
	2-3'	9-10'	10-11'	11-12'	4-5'	8-9'	4-5'	12'	5'	Values (1)	Values (2)
Volatile Organic Compounds											
Methylene Chloride	19 B	18 B	3 J	880 B*	24 DJ	3 BJ	21 BJ	ND	ND	100	5.25
1,2-Dichloroethene (total)	2 J	7	350	ND *	1 J	ND	ND	ND	ND	100	7.35
Trichloroethene	ND	6 J	63	ND *	15	ND	1000	ND	ND	100	18.9
Tetrachloroethene	ND	ND	ND	290 J*	450 D	5 J	ND	ND	ND	100	54.6
1,1,2,2-Tetrachloroethane	ND	ND	ND	ND *	14	ND	ND	ND	ND	100	17.7
Toluene	ND	ND	ND	ND *	ND	ND	170 J	ND	4 J	100	45.0
Ethylbenzene	ND	ND	ND	ND *	ND	ND	570 J	ND	6 J	100	165
Total Xylenes	ND	ND	ND	ND *	ND	ND	3900	ND	67	100	36.0
Total Volatiles	21	31	416	1170 *	504	8	5661	ND	77	-	-
Total Volatile TIC's	0	0	13J	392J *	0	0	540J	0	9.3J	-	-
Semi-Volatile Organics											
Benzoic Acid	ND	ND	ND	ND	20 J	ND	ND	ND	6 J	-	-
Diethylphthalate	ND	6 J	ND	ND	ND	ND	ND	ND	ND	1000	177.5
Chrysene	ND	ND	8 J	ND	ND	ND	ND	ND	ND	0.04	12.0
Di-n-butylphthalate	42 J	52 J	24 J	300 J	840	1700	86 BJ	65 BJ	80 BJ	1000	10000
Naphthalene	ND	ND	ND	ND	ND	ND	330 J	ND	ND	-	325
bis(2-Ethylhexyl)phthalate	36 BJ	30 BJ	43 BJ	23 BJ	190 BJ	37 BJ	810 B	2200 B	66 BJ	1000	10000
Di-n-octylphthalate	ND	ND	ND	ND	ND	ND	ND	6 J	ND	1000	-
2-Methylnaphthalene	ND	ND	ND	ND	ND	ND	30 J	ND	ND	-	10000
Total Semi-Volatiles	78	88	75	323	1180	1737	1256	2271	152	-	-
Total Semi-Volatile TIC'S	29524J	29400J	21651JAB	26964JAB	16577JAB	19232JAB	12150JA	10987JA	9861JB	-	-

Note : TP-4 was analyzed for Full CLP and is reported on Table 9.7A&B(Soil Boring Sample Analytical Results)
NYSDEC Soil Cleanup Goals are a factor of 100 times the NYSDEC Soil Guidance Values.

* SWE-TP3 Sample holding times exceeded, however results determined useable.

Table 9.9A

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SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Monitoring Well Groundwater Samples

(Concentration Values in ug/l-ppb)

	GROUNDWATER SAMPLE LOCATION												NYS	NYSDEC
Analytical Fraction/Analytes	SWE-MW1I-GW			SWE-MW1D-GW			SWE-MW2I-GW			SWE-MW2D-GW			Water Quality	TOGS
Volatile Organic Compounds	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Mar-93	Standards	(1.1.1)
Vinyl Chloride	ND	ND	ND	ND	ND	ND	78	79	100	ND	ND	ND	2.0	-
Acetone	ND	ND	7BJ	ND	ND	7BJ	ND	ND	7BJ	ND	ND	7BJ	50.0	-
Methylene Chloride	ND	7B	3BJ	ND	5B	3BJ	3J	2BJ	4BJ	ND	3BJ	4BJ	5.0	-
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	23	24	21	ND	ND	ND	5.0	-
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	10	27	24	ND	ND	ND	5.0	-
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	50.0
1,2-Dichloroethene(total)	ND	ND	ND	ND	ND	ND	200	190D	230D	ND	ND	ND	5.0	-
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	-
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
1,1,1-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	1J	ND	ND	ND	-	
Trichloroethene	ND	ND	ND	ND	ND	ND	1500D	1400D	1200D	ND	4J	5	5.0	-
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Benzene	2J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	-
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	50.0
Tetrachloroethene	ND	ND	ND	ND	ND	ND	3J	4J	2J	ND	ND	ND	5.0	-
Toluene	ND	ND	ND	ND	ND	ND	2J	2J	2J	ND	ND	ND	5.0	-
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	2J	ND	ND	5.0	-
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Total Volatiles	2	7	10	ND	5	10	1819	1608	1481	2	7	16		100.0
Total Volatile TIC's	0	0	0	0	0	0	0	0	0	0	0	0		
Semi-Volatile Organics														
Di-n-Butylphthalate	ND	-	-	ND	-	-	ND	-	-	ND	-	-	50.0	-
4-Methylphenol	ND	-	-	ND	-	-	ND	-	-	ND	-	-	-	-
bis(2-Ethylhexyl)phthalate	ND	-	-	ND	-	-	ND	-	-	ND	-	-	50.0	-
Phenol	ND	-	-	ND	-	-	ND	-	-	ND	-	-	50.0	-
Chrysene	ND	-	-	ND	-	-	ND	-	-	ND	-	-	50.0	0.002
Total Semi-Volatiles	ND	-	-	ND	-	-	ND	-	-	ND	-	-		
Total Semi-Volatile TIC'S	272J	-	-	459J	-	-	489J	-	-	96	-	-		
Pesticides/PCB's														
All Parameters	ND	-	-	ND	-	-	ND	-	-	ND	-	-	-	-

NOTE: June 1992 sampling was analyzed for Full CLP and validated.

October 1992 sampling was analyzed for SSICs.

March 1993 sampling was analyzed for SSICs.

SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.

Table 9.9A

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SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Monitoring Well Groundwater Samples

(Concentration Values in ug/l-ppb)

	GROUNDWATER SAMPLE LOCATION												NYS	NYSDEC
Analytical Fraction/Analytes	SWE-MW3I-GW			SWE-MW3D-GW			SWE-MW4I-GW		SWE-MW5I-GW		SWE-MW5D-GW		Water Quality	TOGS
Volatile Organic Compounds	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Standards	(1.1.1)
Vinyl Chloride	5J	ND	ND	ND	ND	ND	ND	ND*	ND	ND	ND	ND	2.0	-
Methylene Chloride	ND	140B	6BJ	ND	ND	5B	ND	2J*	ND	18	ND	ND	50.0	-
Acetone	ND	ND	7BJ	21	2BJ	10B	ND	ND*	ND	ND	ND	ND	5.0	-
1,1-Dichloroethene	11	ND	4J	ND	ND	ND	ND	ND*	ND	ND	ND	ND	5.0	-
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND*	ND	ND	ND	ND	5.0	-
2-Butanone	ND	ND	ND	62	ND	ND	ND	ND*	ND	ND	ND	ND	-	50.0
1,2- Dichloroethene(total)	17	21J	12	8J	2J	ND	ND	ND*	ND	ND	ND	ND	5.0	-
Chloroform	ND	ND	ND	9J	ND	ND	ND	ND*	ND	ND	ND	ND	7.0	-
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND*	ND	ND	ND	ND	5.0	-
Trichloroethene	39	72	43	9J	ND	ND	ND	ND*	ND	ND	ND	ND	5.0	-
1,1,2-Trichloroethane	ND	ND	1J	ND	ND	ND	ND	ND*	ND	ND	ND	ND	5.0	-
Benzene	ND	ND	ND	ND	3J	ND	ND	ND*	2J	ND	ND	ND	0.7	-
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND*	ND	ND	ND	ND	-	50.0
Tetrachloroethene	3800D	4300D	4900D	ND	2J	2J	ND	ND*	ND	ND	ND	ND	5.0	-
Toluene	2J	ND	3J	ND	4J	ND	ND	ND*	ND	ND	ND	ND	5.0	-
Chlorobenzene	ND	ND	ND	ND	4J	ND	ND	ND*	ND	ND	ND	ND	5.0	-
Ethylbenzene	ND	ND	ND	ND	3J	ND	ND	ND*	ND	ND	ND	ND	5.0	-
Total Xylenes	ND	ND	ND	ND	10	ND	ND	ND*	ND	ND	ND	ND	5.0	-
Total Volatiles	3874	4533	4976	109	30	17	ND	2*	2	18	ND	ND		100.0
Total Volatile TIC's	6JN	0	0	78J	0	0	0	0*	0	0	0	0		
Semi-Volatile Organics														
Di-n-Butylphthalate	ND	-	-	2J	-	-	ND	-	ND	-	ND	-	50.0	-
4-Methylphenol	ND	-	-	ND	-	-	ND	-	ND	-	ND	-	-	-
bis(2-Ethylhexyl)phthalate	ND	-	-	11	-	-	1J	-	5J	-	11	-	50.0	-
Phenol	ND	-	-	ND	-	-	ND	-	ND	-	ND	-	50.0	-
Chrysene	ND	-	-	ND	-	-	ND	-	ND	-	ND	-	50.0	0.002
Total Semi-Volatiles	ND	-	-	13	-	-	1	-	5	-	11	-		
Total Semi-Volatile TIC'S	220J	-	-	37J	-	-	38J	-	35J	-	236J	-		
Pesticides/PCB's														
All Parameters	ND	-	-	ND	-	-	ND	-	ND	-	ND	-	-	-

NOTE: June 1992 sampling was analyzed for Full CLP and validated

October 1992 sampling was analyzed for SSICs

March 1993 sampling was analyzed for SSICs

SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.

* SWE-MW4I-GW sample holding times exceeded, however results determined useable.

Table 9.9A

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SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Monitoring Well Groundwater Samples

(Concentration Values in ug/l-ppb)

Analytical Fractions/Analytes	GROUNDWATER SAMPLE LOCATION											NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	SWE-MW6S-GW			DUP1GW	SWE-MW7S-GW			SWE-MW8S-GW		SWE-MW8D-GW			
	Jun-92	Oct-92	Mar-93	Jun-92 **	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Jun-92	Oct-92		
Volatile Organic Compounds													
Vinyl Chloride	ND	40	16	ND	ND	ND	ND	ND	ND*	ND	ND	2.0	-
Methylene Chloride	4J	120DJ	4BJ	6J	ND	5	2BJ	ND	ND*	ND	2J	50.0	-
Acetone	87	ND	7BJ	110	ND	ND	10B	ND	ND*	ND	ND	5.0	-
1,1-Dichloroethene	110	28	12	110	ND	ND	ND	ND	ND*	ND	ND	5.0	-
1,1-Dichloroethane	47	18	9	48	ND	ND	ND	ND	ND*	ND	ND	5.0	-
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND*	ND	ND	-	50.0
1,2- Dichloroethene(total)	100000D	18000DE	5300D	86000D	ND	ND	ND	ND	ND*	ND	ND	5.0	-
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND*	ND	ND	7.0	-
1,2-Dichloroethane	ND	5	ND	ND	ND	ND	ND	ND	ND*	ND	ND	5.0	-
Trichloroethene	78000D	14000DE	3700D	62000D	ND	ND	ND	ND	ND*	ND	ND	5.0	-
1,1,2-Trichloroethane	7J	4J	4J	9J	ND	ND	ND	ND	ND*	ND	ND	5.0	-
Benzene	4J	2J	ND	4J	ND	ND	ND	ND	ND*	ND	ND	0.7	-
4-Methyl-2-Pentanone	31	ND	ND	33	ND	ND	ND	ND	ND*	ND	ND	-	50.0
Tetrachloroethene	9J	7	4J	10	ND	ND	ND	ND	ND*	ND	ND	5.0	-
Toluene	12	2J	2J	13	ND	ND	ND	ND	ND*	ND	ND	5.0	-
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND*	ND	ND	5.0	-
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND*	ND	ND	5.0	-
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND*	ND	ND	5.0	-
Total Volatiles	178311	32226	9058	148343	ND	5	12	ND	ND*	ND	2		100.0
Total Volatile TIC's	19000J	110J	0	14000J	0	0	0	0	0*	0	0		
Semi-Volatile Organics													
Di-n-Butylphthalate	ND	-	-	ND	ND	-	-	ND	-	ND	-	50.0	-
4-Methylphenol	2J	-	-	ND	ND	-	-	ND	-	ND	-	-	-
bis(2-Ethylhexyl)phthalate	ND	-	-	ND	ND	-	-	ND	-	2J	-	50.0	-
Phenol	ND	-	-	ND	ND	-	-	ND	-	ND	-	50.0	-
Chrysene	ND	-	-	ND	ND	-	-	ND	-	ND	-	50.0	0.002
Total Semi-Volatiles	2	-	-	ND	ND	-	-	ND	-	2	-		
Total Semi-Volatile TIC'S	28J	-	-	15J	13J	-	-	23J	-	61J	-		
Pesticides/PCB's	ND	-	-	ND	ND	-	-	ND	-	ND	-	-	-

NOTE:June 1992 sampling was analyzed for Full CLP and validated.

October 1992 sampling was analyzed for SSICs.

March 1993 sampling was analyzed for SSICs.

* SWE-MW8S-GW samples holding times exceeded, however results determined useable.

** Duplicate of MW6S-GW

SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.

Table 9.9A Page 4 of 7

SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Monitoring Well Groundwater Samples (Concentration Values in ug/l-ppb)

Analytical Fraction/Analytes	GROUNDWATER SAMPLE LOCATION													NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	MW6I		DUP2**	MW9I		MW9D		MW10S	MW10I		DUP3	MW10D			
Volatile Organic Compounds	Oct-92	Mar-93	Oct-92	Oct-92	Mar-93	Oct-92	Mar-93	Mar-93	Oct-92	Mar-93	Mar-93	Oct-92	Mar-93		
Vinyl Chloride	52	29	48	2J	ND	ND	ND	14	9J	16	12	ND	ND	2.0	-
Methylene Chloride	ND	8B	ND	ND	4BJ	ND	13B	21B	ND	4BJ	4BJ	ND	7B	50.0	-
Acetone	ND	7BJ	ND	ND	9BJ	ND	48B	17B	ND	7BJ	12B	ND	11B	5.0	-
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2J	-	-
1,1-Dichloroethene	10	8	10	ND	ND	ND	ND	3J	2J	3J	3J	ND	ND	5.0	-
1,1-Dichloroethane	ND	2J	ND	ND	3J	ND	ND	3J	ND	4J	3J	ND	ND	5.0	-
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	50.0
1,2-Dichloroethene (total)	690D	310D	620D	2J	6	2J	ND	36	26	40	40	ND	ND	5.0	-
Chloroform	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	7.0	-
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Trichloroethene	1300D	140D	1300D	ND	7	ND	1J	140	190	200	200	ND	ND	5.0	-
Dibromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	-
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	50.0
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	100.0
Total Volatiles	2052	504	1978	4	29	2	62	234	227	274	274	ND	20		
Total Volatile TIC's	96J	0	100J	0	5J	0	0	0	0	0	0	0	0		
Semi-Volatile Organics															
Di-n-Butylphthalate	ND	-	ND*	ND	-	ND	-	-	ND	-	-	ND	-	50.0	-
4-Methylphenol	ND	-	ND*	ND	-	ND	-	-	ND	-	-	ND	-	-	-
3,3'-Dichlorobenzidine	ND	-	ND*	ND	-	ND	-	-	ND	-	-	ND	-	-	-
bis(2Ethylhexyl)phthalate	ND	-	ND*	ND	-	ND	-	-	ND	-	-	ND	-	50.0	-
Phenol	ND	-	ND*	ND	-	ND	-	-	ND	-	-	ND	-	50.0	-
Chrysene	ND	-	1BJ	1J	-	3J	-	-	ND	-	-	ND	-	50.0	0.002
Hexachlorocyclopentadiene	ND	-	ND*	ND	-	ND	-	-	ND	-	-	ND	-		
Total Semi-Volatiles	ND	-	1*	1	-	3	-	-	ND	-	-	ND	-		
Total Semi-Volatile TIC'S	0	-	0*	0	-	0	-	-	0	-	-	0	-		

NOTE: March 1993 sampling was analyzed for SSICs.

October 1992 sampling was analyzed for Full CLP and validated.

SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.

* MW6I-GW and DUP-GW analytical method blank TIC greater than 10%,however results determined useable.

** Duplicate of MW6I-GW

*** Duplicate of MW10I-GW

Table 9.9A Page 5 of 7

SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Monitoring Well Groundwater Samples (Concentration Values in ug/l-ppb)

Analytical Fraction/Analytes	GROUNDWATER SAMPLE LOCATION											NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	MW11I		MW11D		MW12I		MW12D		MW13S	MW13I	MW14I		
Volatile Organic Compounds	Oct-92	Mar-93	Oct-92	Mar-93	Oct-92	Mar-93	Oct-92	Mar-93	Mar-93	Mar-93	Mar-93		
Vinyl Chloride	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	2.0	-
Methylene Chloride	ND	2BJ	ND	2BJ	ND	4BJ	ND	4BJ	5B	4BJ	4BJ	50.0	-
Acetone	ND	6BJ	ND	7BJ	ND	17B	ND	10B	8BJ	10B	10B	5.0	-
Carbon Disulfide	ND	ND	ND	ND	ND	ND	ND	1J	ND	ND	ND	-	-
1,1-Dichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
1,1-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
2-Butanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	50.0
1,2-Dichloroethene (total)	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	1J	5.0	-
Chloroform	ND	ND	10	ND	ND	ND	ND	ND	ND	5	ND	7.0	-
1,2-Dichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Bromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	4J	ND	-	-
Trichloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	3J	5.0	-
Dibromodichloromethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
1,1,2-Trichloroethane	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Benzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.7	-
4-Methyl-2-Pentanone	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	50.0
Tetrachloroethene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Toluene	ND	ND	ND	ND	ND	ND	ND	ND	ND	1J	ND	5.0	-
Chlorobenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Ethylbenzene	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	-
Total Xylenes	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	5.0	100.0
Total Volatiles	ND	8	10	9	ND	21	ND	15	13	24	18		
Total Volatile TIC's	0	0	0	0	0	0	6J	6.5J	0	0	0		
Semi-Volatile Organics													
Di-n-Butylphthalate	ND	-	ND	-	ND	-	ND	-	-	-	-	50.0	-
4-Methylphenol	ND	-	ND	-	ND	-	ND	-	-	-	-	-	-
3,3'-Dichlorobenzidine	ND	-	ND	-	ND	-	ND	-	-	-	-	-	-
bis(2Ethylhexyl)phthalate	ND	-	ND	-	ND	-	ND	-	-	-	-	50.0	-
Phenol	ND	-	ND	-	ND	-	9J	-	-	-	-	50.0	-
Chrysene	ND	-	7J	-	2J	-	11	-	-	-	-	50.0	0.002
Hexachlorocyclopentadiene	ND	-	ND	-	ND	-	ND	-	-	-	-	-	-
Total Semi-Volatiles	ND	-	7	-	2	-	20	-	-	-	-		
Total Semi-Volatile TIC'S	0	-	0	-	0	-	0	-	-	-	-		

NOTE: March 1993 sampling was analyzed for SSICs.

October 1992 sampling was analyzed for Full CLP and validated.

* MW6I-GW and DUP-GW analytical method blank TIC greater than 10%,however results determined useable.

** Duplicate of MW6I-GW

*** Duplicate of MW10I-GW

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SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Monitoring Well Groundwater Samples (Concentration Values in ug/l-ppb)

Analytical Fraction/Analytes	GROUNDWATER SAMPLE LOCATION													NYS	NYSDEC
	MW6I		DUP2**	MW9I		MW9D		MW10S	MW10I		DUP3	MW10D		Water Quality	TOGS
	Oct-92	Mar-93	Oct-92	Oct-92	Mar-93	Oct-92	Mar-93	Mar-93	Oct-92	Mar-93	Mar-93	Oct-92	Mar-93	Standards	(1.1.1)
Pesticides/PCB's											***				
alpha-BHC	1.8V	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
beta-BHC	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
delta-BHC	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
gamma-BHC (Lindane)	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
Heptachlor	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
Aldrin	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
Hepatachlor epoxide	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
Endosulfan I	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
Dieldrin	ND	-	ND	ND	-	0.1V	-	-	ND	-	-	ND	-	-	-
4,4'-DDE	ND	-	ND	ND	-	0.1V	-	-	ND	-	-	ND	-	-	-
Endrin	ND	-	ND	ND	-	0.1V	-	-	ND	-	-	ND	-	-	-
Endosulfan II	ND	-	ND	ND	-	0.1V	-	-	ND	-	-	ND	-	-	-
4,4'-DDD	ND	-	ND	ND	-	0.1V	-	-	ND	-	-	ND	-	-	-
Endosulfan sulfate	ND	-	ND	ND	-	0.1V	-	-	ND	-	-	ND	-	-	-
4,4'-DDT	ND	-	ND	ND	-	0.1V	-	-	ND	-	-	ND	-	-	-
Methoxychlor	ND	-	ND	ND	-	0.5	-	-	ND	-	-	ND	-	-	-
Endrin ketone	ND	-	ND	ND	-	0.1	-	-	ND	-	-	ND	-	-	-
Endrin aldehyde	ND	-	ND	ND	-	0.1	-	-	ND	-	-	ND	-	-	-
alpha-Chlordane	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
gamma-Chlordane	ND	-	ND	ND	-	0.05V	-	-	ND	-	-	ND	-	-	-
Toxaphene	ND	-	ND	ND	-	5V	-	-	ND	-	-	ND	-	-	-
Aroclor-1016	ND	-	ND	ND	-	1V	-	-	ND	-	-	ND	-	0.1	-
Aroclor-1221	ND	-	ND	ND	-	2V	-	-	ND	-	-	ND	-	0.1	-
Aroclor-1232	ND	-	ND	ND	-	1V	-	-	ND	-	-	ND	-	0.1	-
Aroclor-1242	ND	-	ND	ND	-	1V	-	-	ND	-	-	ND	-	0.1	-
Aroclor-1248	ND	-	ND	ND	-	1V	-	-	ND	-	-	ND	-	0.1	-
Aroclor-1254	ND	-	ND	ND	-	1V	-	-	ND	-	-	ND	-	0.1	-
Aroclor-1260	ND	-	ND	ND	-	1V	-	-	ND	-	-	ND	-	0.1	-
Total Pesticides/PCBs	1.8	-	ND	ND	-	14.9	-	-	ND	-	-	ND	-		

NOTE: SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.
October 1992 sampling was analyzed for Full CLP and validated.
March 1993 sampling was analyzed for SSICs.

* MW6I-GW and DUP-GW analytical method blank TIC greater than 10%,however results determined useable.

** Duplicate of MW6I-GW

*** Duplicate of MW10I-GW

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SWEDEN-3 CHAPMAN SITE
Summary Table of Volatile and Semi-Volatile Organic Compounds
Monitoring Well Groundwater Samples (Concentration Values in ug/l-ppb)

Analytical Fraction/Analytes	GROUNDWATER SAMPLE LOCATION											NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	MW11I		MW11D		MW12I		MW12D		MW13S	MW13I	MW14I		
	Oct-92	Mar-93	Oct-92	Mar-93	Oct-92	Mar-93	Oct-92	Mar-93	Mar-93	Mar-93	Mar-93		
Pesticides/PCB's													
alpha-BHC	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
beta-BHC	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
delta-BHC	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
gamma-BHC (Lindane)	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
Heptachlor	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
Aldrin	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
Hepatachlor epoxide	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
Endosulfan I	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
Dieldrin	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
4,4'-DDE	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
Endrin	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
Endosulfan II	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
4,4'-DDD	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
Endosulfan sulfate	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
4,4'-DDT	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
Methoxychlor	ND	-	ND	-	ND	-	0.5V	-	-	-	-	-	-
Endrin ketone	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
Endrin aldehyde	ND	-	ND	-	ND	-	0.1V	-	-	-	-	-	-
alpha-Chlordane	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
gamma-Chlordane	ND	-	ND	-	ND	-	0.05V	-	-	-	-	-	-
Toxaphene	ND	-	ND	-	ND	-	5V	-	-	-	-	-	-
Aroclor-1016	ND	-	ND	-	ND	-	1V	-	-	-	-	0.1	-
Aroclor-1221	ND	-	ND	-	ND	-	2V	-	-	-	-	0.1	-
Aroclor-1232	ND	-	ND	-	ND	-	1V	-	-	-	-	0.1	-
Aroclor-1242	ND	-	ND	-	ND	-	1V	-	-	-	-	0.1	-
Aroclor-1248	ND	-	ND	-	ND	-	1V	-	-	-	-	0.1	-
Aroclor-1254	ND	-	ND	-	ND	-	1V	-	-	-	-	0.1	-
Aroclor-1260	ND	-	ND	-	ND	-	1V	-	-	-	-	0.1	-
Total Pesticides/PCBs	ND	-	ND	-	ND	-	14.9	-	-	-	-		

NOTE: SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.

October 1992 sampling was analyzed for Full CLP and validated.

March 1993 sampling was analyzed for SSICs.

* MW6I-GW and DUP-GW analytical method blank TIC greater than 10%,however results determined useable.

** Duplicate of MW6I-GW

*** Duplicate of MW10I-GW

Table 9.9B

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SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Monitoring Well Groundwater Samples

(Concentration Values in ug/l-ppb unless otherrwise noted)

Analytes	GROUNDWATER SAMPLE LOCATION												NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	SWE-MW1I-GW			SWE-MW1D-GW			SWE-MW2I-GW			SWE-MW2D-GW				
	Jun-92	Oct-92	Mar-92	Jun-92	Oct-92	Mar-92	Jun-92	Oct-92	Mar-92	Jun-92	Oct-92	Mar-92		
TAL Metals														
Aluminum	3400			258			804			ND			NS	-
Antimony	60.4B			ND			ND			ND			NS	-
Arsenic	ND			ND			ND			ND			25.0	3.0
Barium	77.5B			16.6B			56.9B			17.8			1000	-
Beryllium	ND			ND			ND			ND			NS	3.0
Cadmium	ND			ND			ND			ND			10.0	-
Calcium	153000			137000			123000			95300			NS	-
Chromium	7.4B			ND			6.1B			ND			50.0	-
Cobalt	ND			ND			ND			ND			NS	-
Copper	ND			ND			8.1B			ND			200.0	-
Iron	5400			24700			1680			5560			300.0	-
Lead	3.4	ND	3.6	ND	ND	ND	ND	ND	4.6	ND	ND	ND	15.0	-
Magnesium	84200			65700			58600			43200			NS	35000
Manganese	271			173			73.5			57.1			300.0	-
Mercury	ND			ND			ND			ND			2.0	-
Nickel	ND			ND			ND			ND			NS	-
Potassium	6770			12800			6210			6500			NS	-
Selenium	ND			ND			ND			ND			10.0	-
Silver	ND			ND			ND			ND			50.0	-
Sodium	34100			282000			47600			93500			20000	-
Thallium	ND			ND			ND			ND			NS	-
Vanadium	ND			ND			7.4B			ND			NS	-
Zinc	24.2			6.2B			35.3			ND			300.0	-
Misc. Compounds														
Total Cyanide	ND			ND			ND			ND			100.0	-
Chloride (mg/l)	19			321			73			95			250.0	-
Fluoride (mg/l)	0.76			1.48			0.64			1			1.5	-
Nitrate (mg/l)	<.04			<.04			<.04			<.04			10.0	-
Sulfate (mg/l)	390			486			188			168			250.0	-

NOTE: SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.

June 1992 sampling was analyzed for Full CLP and validated.

October 1992 sampling was analyzed for SSICs.

March 1993 sampling was analyzed for SSICs.

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SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Monitoring Well Groundwater Samples
(Concentration Values in ug/l-ppb unless noted)

Analytes	GROUNDWATER SAMPLE LOCATION												NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	SWE-MW3I-GW			SWE-MW3D-GW			SWE-MW4I-GW		SWE-MW5I-GW		SWE-MW5D-GW			
	Jun-92	Oct-92	Mar-92	Jun-92	Oct-92	Mar-92	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92		
TAL Metals														
Aluminum	1930			277			1480		1260		765		NS	-
Antimony	ND			39.1B			ND		ND		69.8		NS	-
Arsenic	ND			ND			6.9B		ND		7.2B		25.0	3.0
Barium	40.7B			11.7B			61.7B		76.2B		ND		1000	-
Beryllium	ND			ND			ND		ND		ND		NS	3.0
Cadmium	ND			ND			ND		ND		ND		10.0	-
Calcium	158000			15400			57300		102000		154000		NS	-
Chromium	7.4B			ND			9.0B		4.8B		14.8		50.0	-
Cobalt	ND			ND			ND		ND		ND		NS	-
Copper	ND			ND			ND		ND		102000		200.0	-
Iron	3280			14200			1950		2730		ND		300.0	-
Lead	3.3	14.1	4.6	3.0	3.1	ND	ND	ND	ND	ND	ND	ND	15.0	-
Magnesium	74900			6140			61800		59300		71800		NS	35000
Manganese	135			89.8			79.6		91.1		553		300.0	-
Mercury	ND			ND			ND		ND		ND		2.0	-
Nickel	ND			ND			ND		ND		ND		NS	-
Potassium	4450B			2940			4070B		2430B		5360		NS	-
Selenium	ND			ND			ND		ND		ND		10.0	-
Silver	ND			ND	ND		ND		ND		ND		50.0	-
Sodium	39600			12800			12900		124000		15100		20000	-
Thallium	ND			ND			ND		ND		ND		NS	-
Vanadium	ND			ND			5.6B		ND		ND		NS	-
Zinc	7.1B			48.1			19.3B		34.8		48.1		300.0	-
Misc. Compounds														
Total Cyanide	ND			ND			ND		ND		ND		100.0	-
Chloride (mg/l)	68			28			21		203		27		250.0	-
Fluoride (mg/l)	0.48			0.23			0.35		0.16		1.18		1.5	-
Nitrate (mg/l)	<.04			0.12			<.04		<.04		<.04		10.0	-
Sulfate (mg/l)	320			36			95		91		358		250.0	-

NOTE: SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.
June 1992 sampling was analyzed for Full CLP and validated
October 1992 sampling was analyzed for SSICs
March 1993 sampling was analyzed for SSICs

Table 9.9B

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SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Monitoring Well Groundwater Samples

(Concentration Values in ug/l-ppb unless noted)

Analytes	GROUNDWATER SAMPLE LOCATION											NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	SWE-MW6S-GW			DUP1-GW*	SWE-MW7S-GW			SWE-MW8S-GW		SWE-MW8D-GW			
	Jun-92	Oct-92	Mar-92	Jun-92	Jun-92	Oct-92	Mar-92	Jun-92	Oct-92	Jun-92	Oct-92		
TAL Metals													
Aluminum	4630			5760	14700			10900		ND		NS	-
Antimony	ND			71.8	58.7B			41.3B		ND		NS	-
Arsenic	ND			ND	ND			ND		ND		25.0	3.0
Barium	97.2B			106B	209			135		23.6B		1000	-
Beryllium	ND			ND	ND			ND		ND		NS	3.0
Cadmium	ND			ND	ND			ND		ND		10.0	-
Calcium	191000			192000	312000			163000		102000		NS	-
Chromium	6.8B			5.0B	20.2			22		ND		50.0	-
Cobalt	10.8B			ND	9.7B			10B		ND		NS	-
Copper	24.3B			9.6B	35.3			29.4		ND		200.0	-
Iron	9160			10000	27300			17000		2530		300.0	-
Lead	7.2	52.3	20.2	10.9	16.4	ND	ND	13.9	3.2	ND	ND	15.0	-
Magnesium	74500			75000	82900			60200		46300		NS	35000
Manganese	457			485	1140			828		32.9		300.0	-
Mercury	ND			ND	ND			ND		ND		2.0	-
Nickel	32.6B			ND	35.0B			36.1B		ND		NS	-
Potassium	4050B			1870B	4820B			6120		6240		NS	-
Selenium	ND			ND	ND			ND		ND		10.0	-
Silver	ND			ND	872			55.7		ND		50.0	-
Sodium	46400			45900	11600			5700		81100		20000	-
Thallium	ND			ND	ND			ND		ND		NS	-
Vanadium	15.1B			ND	23.7B			21.7B		ND		NS	-
Zinc	96			101	147			82.4		7.6B		300.0	-
Misc. Compounds													
Total Cyanide	10			ND	ND			ND		ND		100.0	-
Chloride (mg/l)	161			162	26			8		128		250.0	-
Fluoride (mg/l)	0.49			0.47	0.16			0.2		0.66		1.5	-
Nitrate (mg/l)	4.23			3.59	0.05			<.04		<.04		10.0	-
Sulfate (mg/l)	169			145	157			124		202		250.0	-

NOTE: June 1992 sampling was analyzed for Full CLP and validated

October 1992 sampling was analyzed for SSICs

March 1993 sampling was analyzed for SSICs

* Duplicate of SWE-MW-6S

Table 9.9B

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SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Monitoring Well Groundwater Samples

(Concentration Values in ug/l-ppb)

	GROUNDWATER SAMPLE LOCATION													NYS	NYSDEC
	MW6I-GW		DUP2-GW*	MW9I-GW		MW9D-GW		MW10S	MW10I-GW		DUP3**	MW10D-GW		Water Quality	TOGS
Analytes	Oct-92	Mar-93	Oct-92	Oct-92	Mar-93	Oct-92	Mar-93	Mar-93	Oct-92	Mar-93	Mar-93	Oct-92	Mar-93	Standards	(1.1.1)
TAL Metals															
Aluminum	635.0		753.0	2940 J		689.0 J			808.0 J			683.0 J		NS	-
Antimony	ND		ND	ND		44.8 UJ			ND			ND		NS	3
Arsenic	ND		ND	5.0 UJ		ND			ND			50.0 UJ		25.0	-
Barium	38.10 B		36.90 B	66.10 B		42.8 B			103.0 B			11.5 J		1000	-
Beryllium	ND		ND	ND		ND			ND			1.0 UJ		NS	3.0
Cadmium	ND		ND	ND		ND			3.0 UJ			3.0 UJ		10.0	-
Calcium	140000		140000	123000		122000			103000 J			406000 J		NS	-
Chromium	ND		ND	6.9 B		ND			5.0 UJ			10.6 J		50.0	-
Cobalt	ND		ND	5.0 UJ		5.0 UJ			ND			ND		NS	-
Copper	4.0 UJ		4.0 UJ	9.2 J		4.0 UJ			4.0 UJ			4.0 UJ		200.0	-
Iron	1580.0		1740.0	5630.0 J		6490.0 J			1860.0 J			26500 J		300.0	-
Lead	3.0 UJ	ND	3.0 UJ	9.60 J	4.9	3.4 J	ND	ND	3.9 J	ND	ND	ND	ND	15.0	-
Magnesium	68400		68400	44800		44900			39000			185000		NS	35000
Manganese	95.80		101.0	166.0		76.5			118.0			243.0		300.0	-
Mercury	ND		ND	ND		ND			ND			ND		2.0	-
Nickel	19.0 UJ		19.0 UJ	ND		ND			ND			ND		NS	-
Potassium	4230.0 B		3810.0 B	3820.0 UJ		4480.0 UJ			2040.0 UJ			30400		NS	-
Selenium	5.0 R		25.0 R	ND		ND			5.0 R			ND		10.0	-
Silver	51.30 J		6.40 UJ	4.0 UJ		4.0 UJ			4.0 R			ND		50.0	-
Sodium	24100		24100	61800		58900			54900			990000		20000	-
Thallium	5.0 UJ		ND UJ	50.0 UJ		50.0 UJ			5.0 UJ			50.0 UJ		NS	-
Vanadium	ND		ND	5.10 B		ND			ND			9.6 B		NS	-
Zinc	5.60 B		ND	24.30		7.7 B			11.4 UJ			33.2 UJ		300.0	-
Cyanide	ND		ND	ND		ND			ND			ND		100.0	-

NOTE: SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.

March 1993 sampling was analyzed for SSICs.

October 1992 sampling was analyzed for Full CLP and validated.

* Duplicate of SWE-MW-6S

** Duplicate of SWE-MW-10I

Table 9.9B

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SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Monitoring Well Groundwater Samples

(Concentration Values in ug/l-ppb)

	GROUNDWATER SAMPLE LOCATION											NYS	NYSDEC
	MW11I-GW		MW11D-GW		MW12I-GW		MW12D-GW		MW13S	MW13I	MW14I	Water Quality	TOGS
Analytes	Oct-92	Mar-93	Oct-92	Mar-93	Oct-92	Mar-93	Oct-92	Mar-93	Mar-93	Mar-93	Mar-93	Standards	(1.1.1)
TAL Metals													
Aluminum	27200 J	6690.0	133.0 UJ		1720.0 J		552.0 J					NS	-
Antimony	ND	63.9	ND		ND		80.00 UJ					NS	3
Arsenic	18.80	ND	ND		ND		5.0 UJ					25.0	-
Barium	303.00	106B	12.9 B		73.8 B		ND					1000	-
Beryllium	1.10 J	ND	ND		ND		ND					NS	3.0
Cadmium	3.0 UJ	ND	3.0 UJ		ND		3.0 UJ					10.0	-
Calcium	540000 J	208000.0	16200 J		101000		421000					NS	-
Chromium	41.70 J	35.7	5.0 UJ		ND		7.60 J					50.0	-
Cobalt	24.30 J	11.1B	ND		5.0 UJ		5.0 UJ					NS	-
Copper	47.20 J	11.8B	4.0 UJ		4.1 J		4.0 UJ					200.0	-
Iron	51600 J	13600.0	10500 J		3410 J		30600 J					300.0	-
Lead	32.60 J	16.0	3.0 R	ND	12.4 J	7.7	3.0 UJ	ND	10.5	4.2	3.4	15.0	-
Magnesium	143000	60500	8770.0		38500		201000					NS	35000
Manganese	2440.00	616.0	54.1		178.0		305.00					300.0	-
Mercury	ND	ND	ND		ND		0.53					2.0	-
Nickel	45.60 UJ	ND	ND		ND		ND					NS	-
Potassium	6440.0 UJ	3820.0	2560.0 UJ		6100.0		36500					NS	-
Selenium	50.0 R	ND	5.0 R		ND		20.0 UJ					10.0	-
Silver	4.0 R	ND	4.0 R		4.0 UJ		4.0 UJ					50.0	-
Sodium	35400.0	18600.0	16200.0		7570.0		620000					20000	-
Thallium	5.0 UJ	ND	5.0 UJ		5.0 UJ		50.0 UJ					NS	-
Vanadium	64.20	19.2B	ND		ND		6.40 J					NS	-
Zinc	138.00	61.0	9.8 UJ		38.9		42.80 J					300.0	-
Cyanide	ND	ND	ND		ND		ND					100.0	-

NOTE: SWE-MW5I-GW and SWE-MW5D-GW are background groundwater samples for the Site.

March 1993 sampling was analyzed for SSICs.

October 1992 sampling was analyzed for Full CLP and validated.

Table 9.10A

SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile and Semi-Volatile Organic Compounds

Residential Well Groundwater Samples

(Concentration Values in ug/l-ppb)

Analytical Fractions	RESIDENTIAL WELL SAMPLE LOCATION																	NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	RES-W1			RES-W2		RES-W3		RES-W4		RES-W5		RES-W6			RES-W7				
	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Mar-93		
Volatile Organics																			
Methylene Chloride	ND	ND	1.2B	ND	ND	ND	ND	ND	0.7	ND	ND	ND	ND	1.0B	ND	ND	1.8B	5.0	-
Toluene	ND	ND	0.2J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.1J	ND	ND	0.1J	5.0	-
All Other Parameters	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	-	-
Total Volatiles	ND	ND	1.4	ND	ND	ND	ND	ND	0.7	ND	ND	ND	ND	1.1	ND	ND	1.9	-	100.0
Total Volatile TIC's	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	-	-
Semi-Volatile Organics																			
All Parameters	ND	-	-	ND	-	ND	-	ND	-	ND	-	ND	-	-	ND	-	-	-	-
Total Semi-Volatile TIC'S	2J	-	-	8J	-	8J	-	20J	-	20JB	-	8J	-	-	25J	-	-	-	-
Pesticides/PCB's																			
All Parameters	ND	-	-	ND	-	ND	-	ND	-	ND	-	ND	-	-	ND	-	-	-	-

NOTE: June 1992 sampling was analyzed for Full CLP and validated.
October 1992 sampling was analyzed for SSICs.
March 1993 sampling was analyzed for SSICs.

Table 9.10B

SWEDEN-3 CHAPMAN SITE
Summary Table of Inorganic Parameters
Residential Well Groundwater Samples

(Concentration Values in ug/l-ppb unless noted)

Analytes	RESIDENTIAL WELL SAMPLE LOCATION																	NYS Water Quality Standards	NYSDEC TOGS (1.1.1)
	RES-W1			RES-W2		RES-W3		RES-W4		RES-W5		RES-W6*			RES-W7				
	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Jun-92	Oct-92	Mar-93	Jun-92	Oct-92	Mar-93		
TAL Metals																			
Aluminum	ND			40.2B		ND		ND		ND		55.8B			ND			NS	-
Antimony	ND			ND		ND		ND		ND		38.5B			ND			NS	3.0
Arsenic	ND	ND		ND	ND	27.2	5.6B	ND	ND	ND	ND	ND	ND		ND	ND		25.0	-
Barium	11.7B			44.7B		31.1B		92.4B		160B		15.6B			155B			1000	-
Beryllium	ND			ND		ND		ND		ND		ND			ND			NS	3.0
Cadmium	ND			ND		ND		ND		ND		ND			ND			10.0	-
Calcium	119000			98300		134000		110000		121000		87500			97400			NS	-
Chromium	ND			ND		ND		ND		ND		ND			ND			50.0	-
Cobalt	ND			ND		ND		ND		ND		ND			ND			-	-
Copper	ND			30.2		7.4B		ND		ND		69.2			22.1B			200.0	-
Iron	115			784		3020		43.4B		156		985			ND			300.0	-
Lead	ND	ND	ND	7.4	ND	4.0	ND	ND	ND	ND	ND	5.9	ND	4.2	ND	ND	ND	15.0	-
Magnesium	44500			49100		54100		50600		51200		33400			31300			NS	35000
Manganese	10.7B			25.4		14.3B		64.6		32.2		35.9			ND			300.0	-
Mercury	ND			ND		ND		ND		ND		ND			ND			2.0	-
Nickel	ND			ND		ND		ND		ND		ND			ND			NS	-
Potassium	4330B			4090B		6370		7080		2390B		ND			ND			NS	-
Selenium	ND			ND		ND		ND		ND		ND			ND			10.0	-
Silver	ND			ND		ND		ND		50.4	ND	ND			ND			50.0	-
Sodium	82600			21100		78500		53500		94300		5100			34200			20000	-
Thallium	ND			ND		ND		ND		ND		ND			ND			NS	-
Vanadium	ND			ND		ND		ND		ND		ND			ND			NS	-
Zinc	ND			246		27.9		17.4B		7.3B		9.9B			27.3			300.0	-
Anions(mg/l)																			
Total Cyanide	ND			ND		ND		ND		ND		ND			ND			0.10	-
Chloride	138			36		73		107		206		5			71			250.0	-
Fluoride	0.73			0.19		0.92		0.19		0.13		0.29			0.15			1.5	-
Nitrate	<.04			<.04		<.04		<.04		0.09		<.04			0.35			10.0	-
Sulfate	206			134		108		297		89		82			48			250.0	-

NOTE: June 1992 sampling was analyzed for Full CLP and validated.
October 1992 sampling was analyzed for SSICs.
March 1993 sampling was analyzed for SSICs.

* Additional Lead Samples from RES-W6

Basement
Before Purge
RES-IB*

Jun-92	Oct-92	Mar-93
54.2	4.9	ND

Well
Before Purge
RES-OB*

Jun-92	Oct-92	Mar-93
5.9	7.7	3

Well
After Purge
RES-OA*

Jun-92	Oct-92	Mar-93
4.7	ND	ND

Table 9.11

SWEDEN-3 CHAPMAN SITE

Summary Table of Volatile Organic Compounds

Air Samples

(Concentration in ug/l-ppb)

Analytical Fraction/Analytes	Air Samples			
	APA-A1*	APA-B6*	APA-A2	APA-B12*
Volatile Organic Compounds				
Vinyl Chloride	ND	260	ND	20
Methylene Chloride	ND	8 JB	3 J	2 J
Acetone	ND	ND	46	ND
1,1-Dichloroethene	ND	4 J	ND	4 J
1,1-Dichloroethane	ND	14	ND	ND
1,2-Dichloroethene (total)	ND	370	ND	47
Chloroform	ND	ND	1 J	ND
2-Butanone	ND	ND	22	ND
1,1,1-Trichloroethane	ND	140	ND	ND
Bromodichloromethane	ND	ND	1 J	ND
1,2-Dichloropropane	ND	ND	3 J	ND
Trichloroethene	ND	390	2 J	31
Benzene	ND	ND	4 J	4 J
4-Methyl-2-Pentanone	ND	4 J	10	ND
2-Hexanone	ND	ND	12	ND
Tetrachloroethene	ND	ND	3 J	40
1,1,2,2-Tetrachloroethane	ND	ND	3 J	ND
Toluene	ND	62	5	4 J
Chlorobenzene	ND	ND	3 J	4 J
Ethylbenzene	ND	9 J	3 J	ND
Total Xylenes	ND	16	6	ND
Total Volatiles	ND	1277	122	156
Total Volatile TIC's	25 J	ND	30 JB	8 J

NOTE: APA-A1 and APA-A2 are background air samples for Samples APA-B6 and APA-B12, respectively.

* APA-A1, APA-A6, APA-B16 sample holding times exceeded, however results determined useable.

Table 9.12A

EXPLANATION OF QUALIFIERS FOR ORGANIC COMPOUND ANALYTICAL RESULTS

U - Indicates that the compound was analyzed for but not detected at or above the detection limit.

J - Indicates that the compound was analyzed for and determined to be present in the sample. The mass spectrum of the compound meets the identification criteria of the method. The concentration listed is an estimated value which is less than the specified quantitation limit but is greater than zero.

B - The analyte is found in the blanks as well as the sample. It indicates possible sample contamination and warns the data user to use caution when applying the results of this analyte.

C - Indicates that the compound was detected beyond the calibration range and was subsequently analyzed at a dilution.

K - This is a common laboratory contaminant where the sample result was less than 10 times the associated blank value. The original sample was revised to the Contract Required Quantitation Limit (CRQL)/laboratory reporting limit and qualified with a "U".

L - The parameter is not a common laboratory contaminant but was in the sample result as less than five times the blank result. The original sample result was revised to the CRQL/laboratory reporting limit and qualified with a "U".

N - Indicates that the compound was analyzed for but not requested as an analyte. Value will not be listed on tabular result sheet.

NA - Not analyzed

ND - Not detected

NS - A clean-up standard has not been determined.

M - Matrix spike compound.

V - Reported value is estimated due to variance from quality control limits.

R - Reported value is unusable and rejected due to variance from quality control limits.

E - Reported value is estimated due to the presence of matrix interference.

D - Reported result taken from diluted sample analysis.

A - Aldol condensation product.

▨ Shaded area exceed standards

Table 9.12B

EXPLANATION OF QUALIFIERS FOR INORGANIC ANALYTE RESULTS

U - Indicates analyte result less than Instrument Detection Limit (IDL).

B - Indicates analyte result between IDL and CRDL.

V - Reported value is estimated due to variance from quality control limits identified during data validation procedures.

E - Reported value is estimated because of the presence of interference.

R - Reported value is unusable and rejected due to variance from quality control limits.

K - Since this is a common laboratory contaminant, EPA guidelines suggest this data revision whenever the sample is less than 10 times the associated blank value. The original sample result was revised to the CRDL/laboratory reporting limit and qualified with a "U".

L - Although the parameter is not a common laboratory contaminant, EPA guidelines suggest that if the sample result is less than five time the blank result this data revision is appropriate. The original sample result was revised to the CRDL/laboratory reporting limit and qualified with a "U".

M - Duplicate injection precision not met.

N - Spiked sample recovery not within control limits.

NA - Not analyzed

ND - Not detected

NS - A clean-up standard has not been determined.

S - The reported value was determined by the Method of Standard Additions (MSA).

W - Post-digest spike recovery furnace analysis was out of 85 - 125 percent control limit while sample absorbance was less than 50 percent of spike absorbance.

* - Duplicate analysis not within control limit.

\+ - Correlation coefficient for MSA is less than 0.995.

P -This flag is used for a pesticide/Aroclor target analyte when there is greater than 25% difference for detected concentrations between the two GC columns. The lower of the two values is reported on Form I and flagged with a "P".

Table 9.12C

SOURCES OF STANDARDS/GUIDELINE VALUES
APPEARING ON
ANALYTICAL SUMMARY TABLES

- 6NYCRR Part 703 Standards - obtained from the New York State Official Compilation of Codes, Rules and Regulations, Title 6, Chapter X, Part 703 (revised 1990). *"Water Quality Regulations: Surface Water and Groundwater Classification and Standards"*, September 25, 1990.

- NYSDEC TOGS (1.1.1) Guidance - Guidance values obtained from the New York State Department of Environmental Conservation Division of Water, Technical Operations Guidance Series (1.1.1) September 25, 1990.

- 10NYCRR Part 5 Standards - obtained from the New York State Official Compilation of Codes, Rules and Regulations Title 10, Part 5 - NYSDOH Maximum Contaminant Levels for Public Water Supplies.

- 10NYCRR Part 170 Standards - obtained from the New York State Official Compilation of Codes, Rules and Regulations, Title 10, Part 170 - NYSDOH Standard for Sources of Water Supply.

- NYSDEC Soil Guidance Values are based on the Water - Soil Partition Model.

The model predicts the maximum contaminant concentration which is allowed in soil such that if the soil were to be exposed to the groundwater, it would not leach in excess of the groundwater standards. It is based on the soil sorption coefficient between water and soil and the fraction of organic matter in the soil. There is a direct relationship between the organic matter in soils and their capacity to sorb most organic chemicals.

Using the equation below, the maximum soil concentration can be determined for a contaminant given the values for the fraction of organic matter in the soil, the contaminant's partition coefficient, and the contaminant's groundwater or drinking water standard.

$$Cs = f \times Koc \times Cw$$

where: Cs = allowable concentration in the soil
f = fraction of the total organic matter (TOC) in the soil. (A value of 3 % was used as a conservative estimate.)
Koc = partition coefficient between water and soil
Cw = allowable groundwater/drinking water standard (whichever is more stringent)

TABLE 9.13
SWEDEN-3 CHAPMAN SITE
SUMMARY TABLE OF SITE SPECIFIC INDICATOR CHEMICALS (SSICs) FOR THE PHASE II AND PHASE III RI

PHASE II

MEDIA/LOCATION	SSICs
Groundwater (Monitoring Wells)	Target Compound List (TCL) Volatile Organics USEPA Method 8240 Total Lead
Groundwater (Residential Wells)	Volatile Organics - USEPA Method 524.2 Total Lead Total Arsenic
Surface Water	TCL Volatile Organics - USEPA Method 8240 Target Analyte List (TAL) Metals Total Cyanide
Surface Soil and Sediment	TCL Volatile Organics - USEPA Method 8240 TCL Semi-Volatile Organics - USEPA Method 8270 TAL Metals
Subsurface Soil (Test Pits and Soil Borings)	TCL Volatile Organics - USEPA Method 8240 TCL Semi-Volatile Organics - USEPA Method 8270

PHASE III

MEDIA/LOCATION	SSICs
Groundwater (Monitoring Wells)	TCL Volatile Organics Total Lead
Groundwater (Residential Wells)	Volatile Organics - USEPA Method 524.2 Total Lead
Surface Water	TCL Volatile Organics
Surface Sediment	TCL Volatile Organics
Subsurface Soil (Soil Borings)	TCL Volatile Organics

TABLE 9.14

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SWEDEN 3 - CHAPMAN SITE
SELECTED LOCATION - SPECIFIC POTENTIAL ARARs/SCGs

FEDERAL ARARs

LOCATION/PHYSICAL FEATURE	REQUIREMENTS	PREREQUISITES	CITATION
Critical habitat upon which endangered species or threatened species depend.	Action to conserve endangered species or threatened species, including consultation with the Department of Interior.	Determination of presence of endangered or threatened species.	Endangered Species Act of 1973 (16 USC 1531 et seq.); 50 CFR Part 200, 50 CFR Part 402 Fish and Wildlife Coordination Act (16 USC 661 et seq.); 33 CFR Parts 320-330.
Wetlands	Action to prohibit discharge of dredged or fill material into wetlands without permit.	Wetlands as defined in U.S. Army Corps of Engineers regulations.	Clean Water Act Section 404; 40 CFR Part 230, 33 CFR Parts 320-330.
	Action to avoid adverse effects, minimize potential harm, and preserve and enhance wetlands, to the extent possible.	Action involving construction of facilities or management of property in wetlands, as defined by 40 CFR Part 6, Appendix A, Section 4 (j).	40 CFR Part 6, Appendix A.
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts.	Action to recover and preserve artifacts.	Alteration of terrain that threatens significant scientific, prehistorical, historical, or archaelogical data.	National Historical Preservation Act (16 USC Section 469); 36 CFR Part 65.

TABLE 9.14

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SWEDEN 3 - CHAPMAN SITE
SELECTED LOCATION - SPECIFIC POTENTIAL ARARs/SCGs

STATE SCGs

LOCATION/PHYSICAL FEATURE	REQUIREMENTS	PREREQUISITES	CITATION
Endangered and threatened species of fish and wildlife.	Action to conserve endangered species or threatened species.	Determination of presence of endangered or threatened species.	6 NYCRR Part 182.
Wetlands	Action to protect, preserve and conserve freshwater wetlands.	Determination and classification of wetland area.	6 NYCRR Part 663 6 NYCRR Part 664 6 NYCRR Part 665 ECL Article 24 and Article 71, Title 23
	Action to avoid adverse effects; minimize potential harm; and prohibit discharge of dredged or fill material into a wetland area (or within one hundred feet boundary of a freshwater wetland) without a permit.	Action involving construction of facilities; management of property in or around a wetland area; and any other regulated activity as defined in ECL Article 24, Title 7.	ECL Article 24 and Article 71, Title 23.

Table 9.15
SWEDEN 3-CHAPMAN SITE
SELECTED CHEMICAL - SPECIFIC POTENTIAL ARARS/SCGS
AQUEOUS MATRIX - GROUNDWATER
All units in ug/L-ppb, unless noted otherwise

Contaminant of Concern	FEDERAL ARARs						STATE SCGs	
	USEPA SDWA MCLs	USEPA SDWA SMCLs	USEPA SDWA MCLGs	CWA AWQC Freshwater Acute/Chronic	CWA AWQC Water & Fish Ingestion	CWA WQC Adjusted for Drinking Water Only	NYS Water Quality Standards	NYSDEC TOGS 1.1.1
Benzene	5.0	-	0	-	-	-	0.7	-
2-Butanone	-	-	-	-	-	-	50	-
Chloroform	-	-	-	-	-	-	7.0	-
1,1-Dichloroethane	100 proposed		-	-	-	-	5.0	-
1,1-Dichloroethene	7.0	-	7.0	11,000	3100	0	5.0	-
1,2-Dichloroethene (total)	-	-	-	-	-	-	5.0	-
Tetrachloroethene	5.0	-	0	5200/840	.08	0(0.88)	5.0	-
Toluene	1000	-	1000	17000	14000	15000	5.0	-
Trichloroethene	5.0	-	0	4500/21000	2.7	0(2.8)	2.0	-
Vinyl Chloride	5.0	-	0	-	2.0	0(2.0)	2.0	-
							-	-
Chloride	-	250000	-	-	-	1000	250000	-
Copper	-	1000	1300	.18/.12	-	-	200	-
Iron	-	300	-	-	-	-	300	-
Magnesium	-	50	-	-	50	50	-	35000
Silver	50	90	-	4.12/.12	-	-	50	-
Sodium	-	-	-	-	-	-	20000	-
Sulfate	400000/ 5000000 proposed	250000	4000000/ 5000000 proposed	-	-	-	250000 -	 -

* These adjusted criteria, for drinking water ingestion only, were derived from published EPA ambient water quality criteria (45 Federal Register 79318 - 79379, Nov. 28, 1980) for combined fish and drinking water ingestion and for fish ingestion alone.
The adjusted values are not official EPA ambient water quality criteria, but may be appropriate for Superfund sites with contaminated ground water.
The concentration value in parenthesis for potential carcinogens corresponds to a risk of (10)-6 .

TABLE 9.16
page 1 of 2
SWEDEN - 3 CHAPMAN SITE
SELECTED CHEMICAL - SPECIFIC POTENTIAL ARARs/SCGs
NON-AQUEOUS MATRIX - SOIL

(all units in mg/kg - ppm, unless noted otherwise)

	Federal ARARs	State SCGs		
Contaminant of Concern	Risk Based Concentration Residential Soil Ingestion (1)	NYSDOH Guideline Values (2)	NYSDEC Allowable Soil Concentration (3)	NYSDEC Soil Cleanup Goals Protect Water Quality (4)
Acetone	160	1	.0033	0.198
Benzene	47	0.014	.0017	0.102
Chlorobenzene	1,600	0.1	.0495	2.970
1,1 - Dichloroethene	2.3	0.1	.0097	0.582
1,2 - Dichloroethene (total)	-	0.1	.0073	0.438
2-Butanone	-	1	.0068	0.408
Ethylbenzene	7,800	0.1	.1650	9.900
Methyl chloride	-	0.1	.0052	0.312
Tetrachloroethene	27	0.1	.0546	3.276
4-Methyl-2-Pentanone	-	1	.0285	1.710
1,1,1 Trichloroethane	7000	0.1	.0228	1.368
Trichloroethene	120	0.1	.0189	1.134
Toluene	16,000	0.1	.0450	2.700
Xylene (total)	160,000	0.1	.0360	2.160
Benzo (a) anthracene	0.82	.00004	.0828	.0828
Benzo (b) fluoranthene	0.85	.00004	.0330	.0330
Bis(2-ethylhexyl)phthalate	97	1	13.05	13.05
Butylbenzylphthalate	16,000	1	4.963	8.14
Fluoranthene	3,100	1	57.0	57.0
Phenanthrene	2,300	1	21.0	21.0
Pyrene	1.5	1	57.0	57.0

TABLE 9.16
Page 2 of 2

SWEDEN-3 CHAPMAN SITE
SELECTED CHEMICAL SPECIFIC POTENTIAL ARARS/SCGS
NON-AQUEOUS MATRIX - SOIL

(1) Risk-based concentration values for residential soil ingestion were obtained from a USEPA III document, dated February 27, 1991. These toxicity constants have been combined with "standard" exposure scenarios to estimate chemical concentrations which correspond to fixed levels of risk (a hazard quotient of 1, or lifetime concern risk of 1 in a 1,000,000, whichever occurs at a lower concentration).

(2) New York State Department of Health (NYSDOH) Cleanup Guideline Values are based on the use of the following model:

Cs = Cw x 20
Where: Cs = allowable concentration in the soil.
Cw = allowable groundwater/drinking water standard (whichever is more strigent).

(3) NYSDEC Allowable Soil Concentration Values are based on the Water - Soil Partition Model

The model predicts the maximum contaminant concentration which is allowed in soil such that if the soil were to be exposed to the groundwater, it would not leach in excess of the groundwater standards. It is based on the soil sorption coefficient between water and soil and the fraction of organic matter in soils and their capacity to sorb most organic chemicals.

Using the equation below, the maximum soil concentration can be determined for a contaminant given the values for the fraction of organic matter in the soil. There is a direct relationship between the organic matter in soils and their capacity to sorb most organic chemicals.

Using the equation below, the maximum soil concentration can be determined for a contaminant given the values for the fraction of organic matter in the soil, the contaminant's partition coefficient, and the contaminant's groundwater or drinking water standard.

Cs = f x Koc x Cw
Where: Cs = allowable concentration in the soil.
f = fraction of the total organic matter (TOC) in the soil (a value of 3.0 percent was used).
Koc = partition coefficient between water and soil.

Cw = allowable groundwater/drinking water standard (whichever is more strigent).

(4) NYSDEC soil cleanup goals to protect groundwater/drinking water quality are determined based on the following calculation:

Soil cleanup goal = Cs x DAM
Where: Cs = allowable soil concentration
DAM = dilution attenuation multiplier

Table 9.17

SWEDEN 3-CHAPMAN SITE

PHYSICAL AND CHEMICAL PROPERTIES

OF THE ORGANIC CONTAMINANTS OF CONCERN

All units in ug/l-ppb, unless noted otherwise

Contaminant of Concern	Water Solubility (S) mg/l	Specific Gravity (SG)*	Octanol/Water Partition Coefficient (Kow)	Organic Carbon Partition Coefficient (Koc)	Vapor Pressure (V.P.) mm Hg	Henry's Law Constant atm m3 Water/m3 air
Acetone	1,000,000**	.791	.60	2.2	270	0
Benzene	1,750	.879	130	83	95.2	230
2-Butanone	268,000	.805	1.8	4.5	77.5	1.16
Chlorobenzene	466	1.106	690	330	11.7	145
Chloroform	8,200	1.49 (20C liquid)	93	31	151	171
1,1-Dichloroethane	5,500	1.176	62	30	182	240
1,1-Dichloroethene	2,250	1.250	69	65	600	1841
1,2-Dichloroethene (total)	3,500	1.27 (25C liquid)	5.0	49	208	160
Tetrachloroethene	150	1.631 (15/4)	390	364	17.8	1035
Toluene	535	.866	130	300	28.1	217
Trichloroethene	1,100	1.466 (20/20)	240	126	57.9	544
Vinyl Chloride	2,670	.908	24	57	2260	355,000
Xylene (total)	198 (Mixed)	.860-.880	1819 (Mixed)	240 (Mixed)	10	266 (0-Xylene)

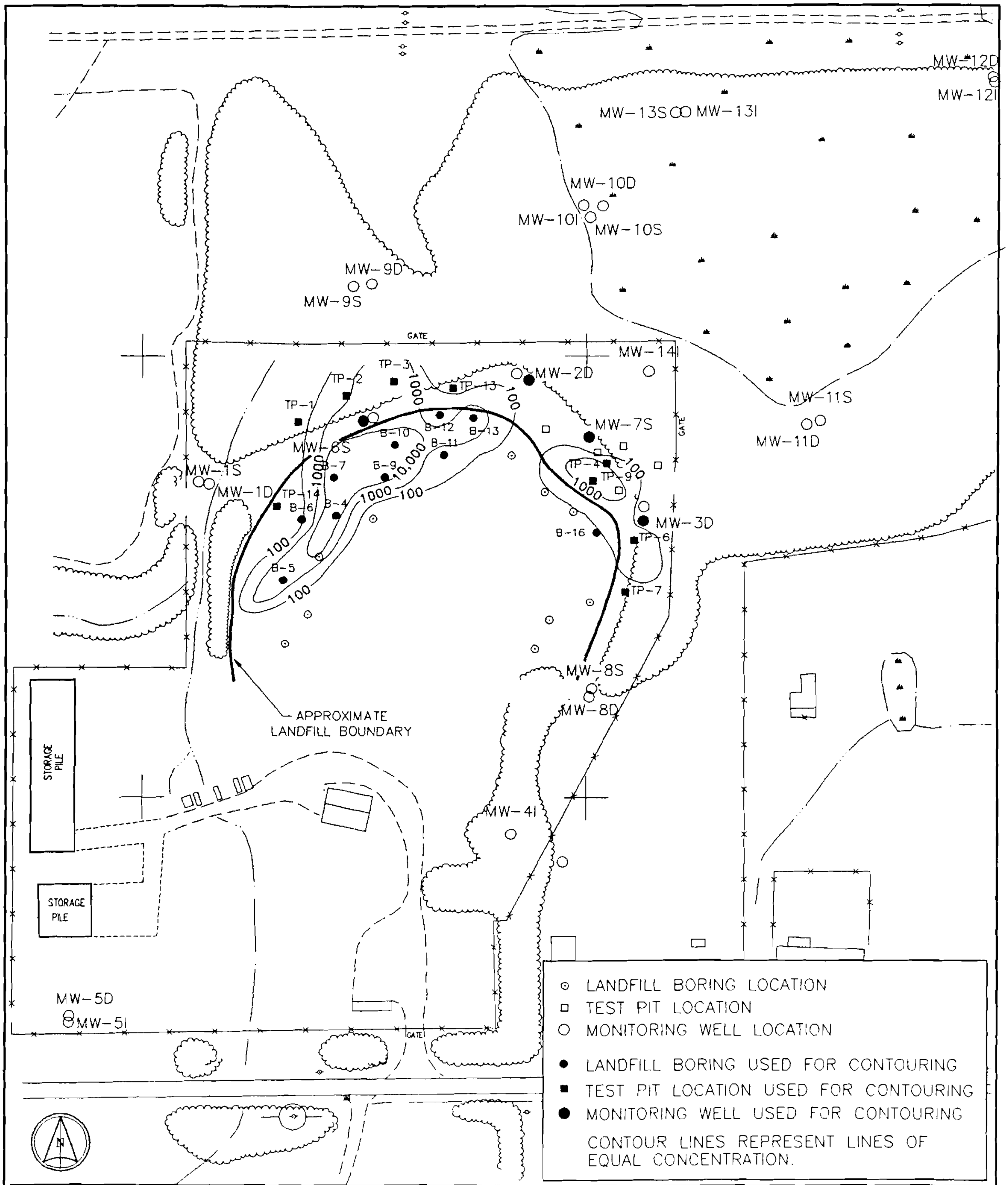
* - Specific gravity of compount at 20C referred to water at 4C (20/4), unless noted otherwise.

** - Solubility of 1,00,000 mg/l assigned because of reported "infinite solubility" in the literature.

\+ - Physical/Chemical properties of cis-1,2-Dichloroethene(cis-1,2 DCE) were substituted for 1,2 -Dichloroethene(total). The cis-1,2 DCE information was used based on the assumption that this compound is generally associated with the degradation of one of the primary contaminants found at the project site, trichloroethene.

Source of Information:

Evan Nyer, Gary Boettcher and Bridget Morello. "Using the Properties of Organic Compounds to Help Design a Treatment System", Groundwater Monitoring Review - Fall 1991.



⊙ LANDFILL BORING LOCATION
□ TEST PIT LOCATION
○ MONITORING WELL LOCATION

• LANDFILL BORING USED FOR CONTOURING
▪ TEST PIT LOCATION USED FOR CONTOURING
● MONITORING WELL USED FOR CONTOURING

CONTOUR LINES REPRESENT LINES OF EQUAL CONCENTRATION.

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NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION
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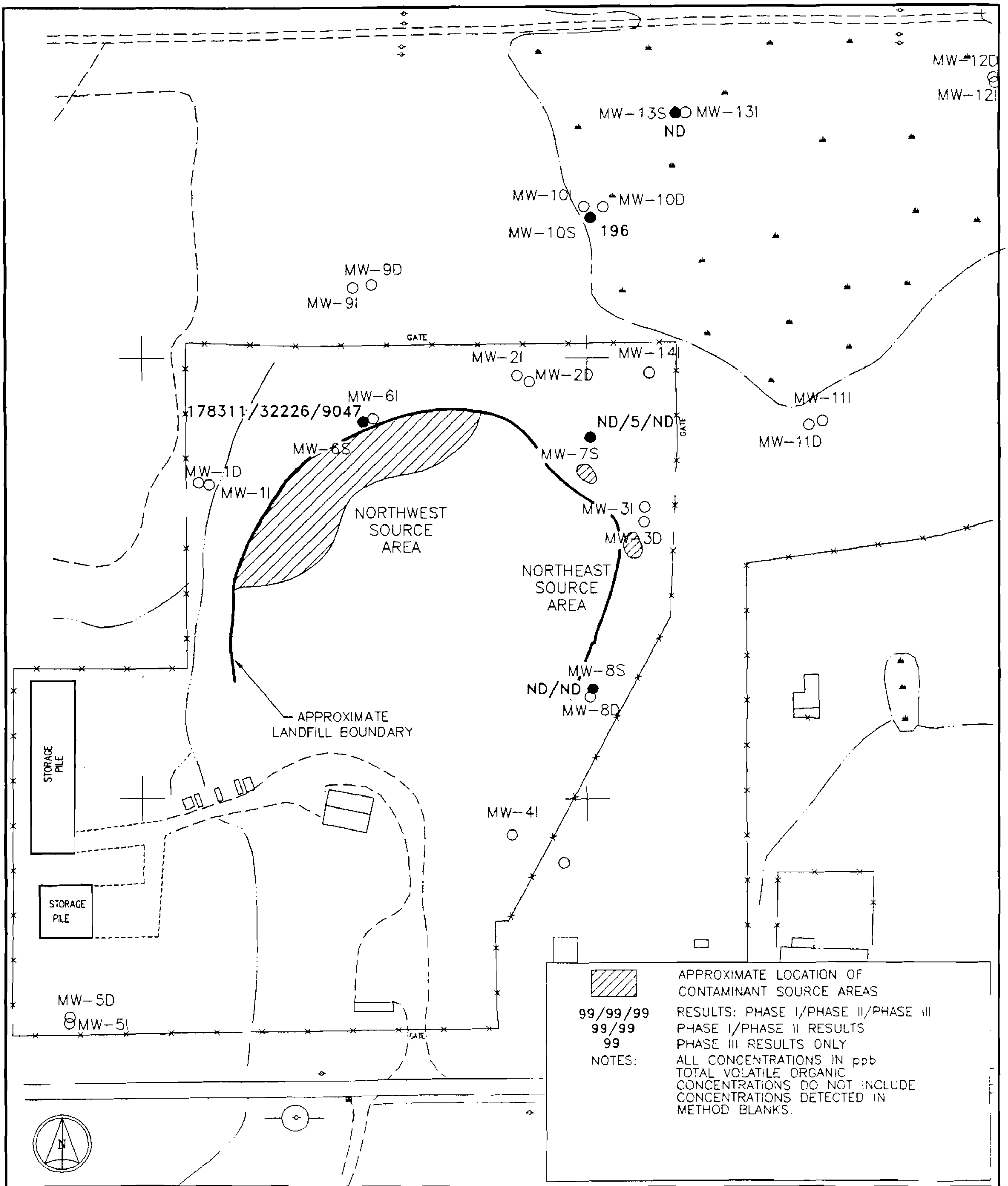
TOTAL VOLATILE ORGANIC CONCENTRATION MAP OF SUBSURFACE SOILS

SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE Dec.,1992	DWG. NO R9182_9	SCALE 1"=150'	FIGURE NO 9.1



▨	APPROXIMATE LOCATION OF CONTAMINANT SOURCE AREAS
99/99/99	RESULTS: PHASE I/PHASE II/PHASE III
99/99	PHASE I/PHASE II RESULTS
99	PHASE III RESULTS ONLY
NOTES:	ALL CONCENTRATIONS IN ppb TOTAL VOLATILE ORGANIC CONCENTRATIONS DO NOT INCLUDE CONCENTRATIONS DETECTED IN METHOD BLANKS.

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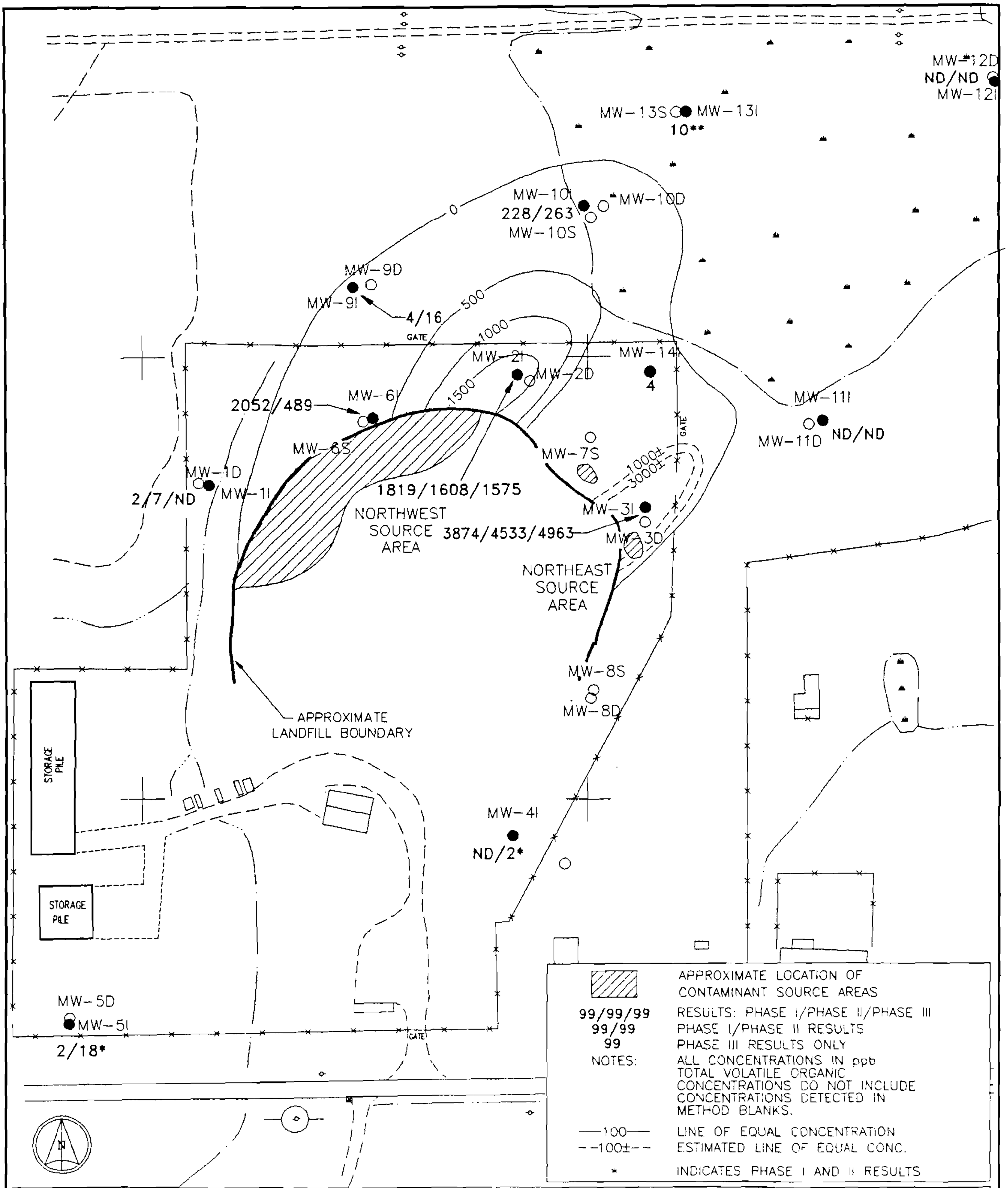
TOTAL VOLATILE ORGANICS IN OVERBURDEN GROUNDWATER SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE March, 1993	DWG NO. R9182_9	SCALE 1"=150'	FIGURE NO. 9.2



▨	APPROXIMATE LOCATION OF CONTAMINANT SOURCE AREAS
99/99/99	RESULTS: PHASE I/PHASE II/PHASE III
99/99	PHASE I/PHASE II RESULTS
99	PHASE III RESULTS ONLY
NOTES:	ALL CONCENTRATIONS IN ppb TOTAL VOLATILE ORGANIC CONCENTRATIONS DO NOT INCLUDE CONCENTRATIONS DETECTED IN METHOD BLANKS.
—100—	LINE OF EQUAL CONCENTRATION
--100±--	ESTIMATED LINE OF EQUAL CONC.
*	INDICATES PHASE I AND II RESULTS

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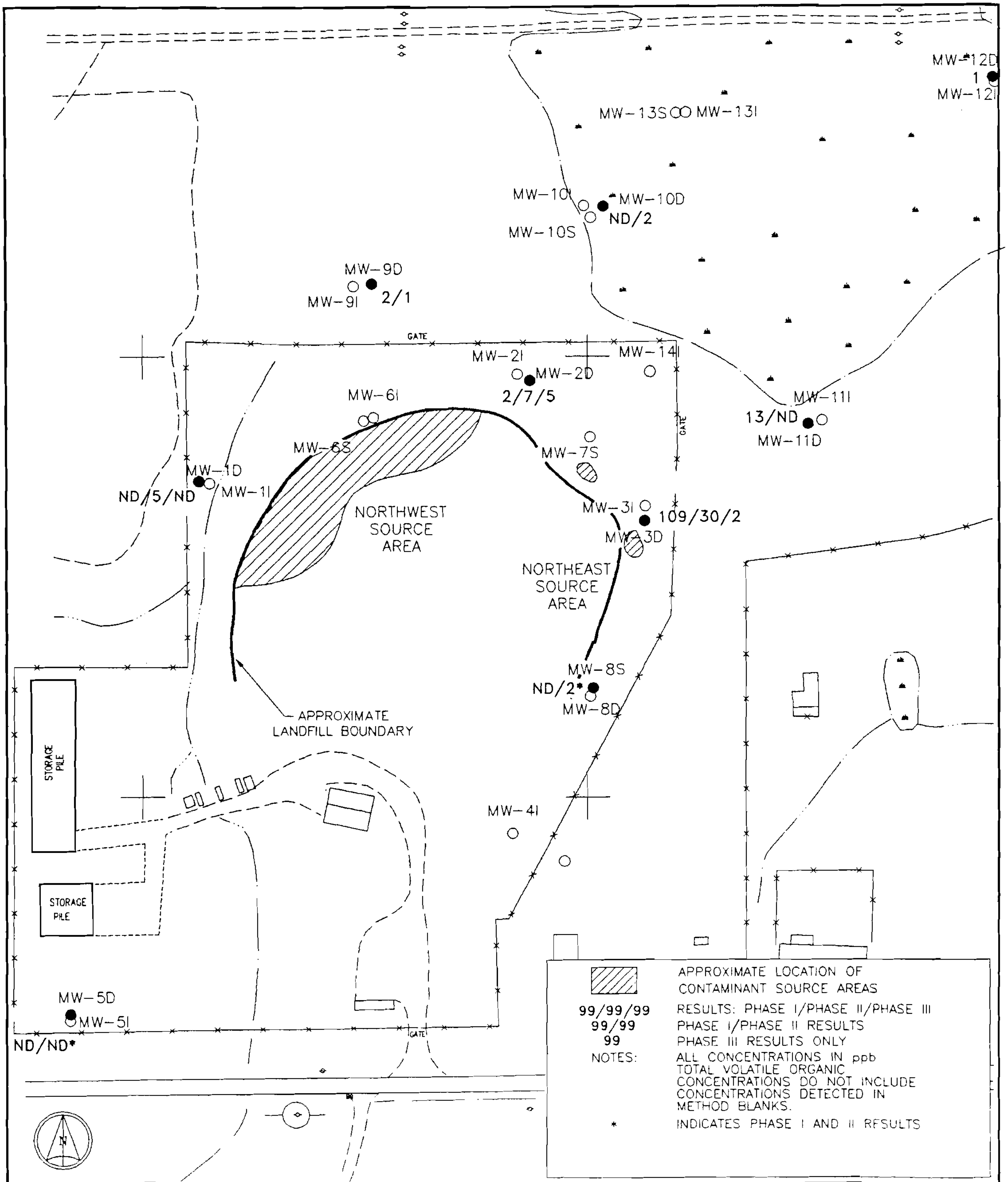
TOTAL VOLATILE ORGANICS IN INTERFACE ZONE GROUNDWATER PLUME CONCENTRATION MAP
SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE March, 1993	DWG NO. R9182_9	SCALE 1"=150'	FIGURE NO. 9.3



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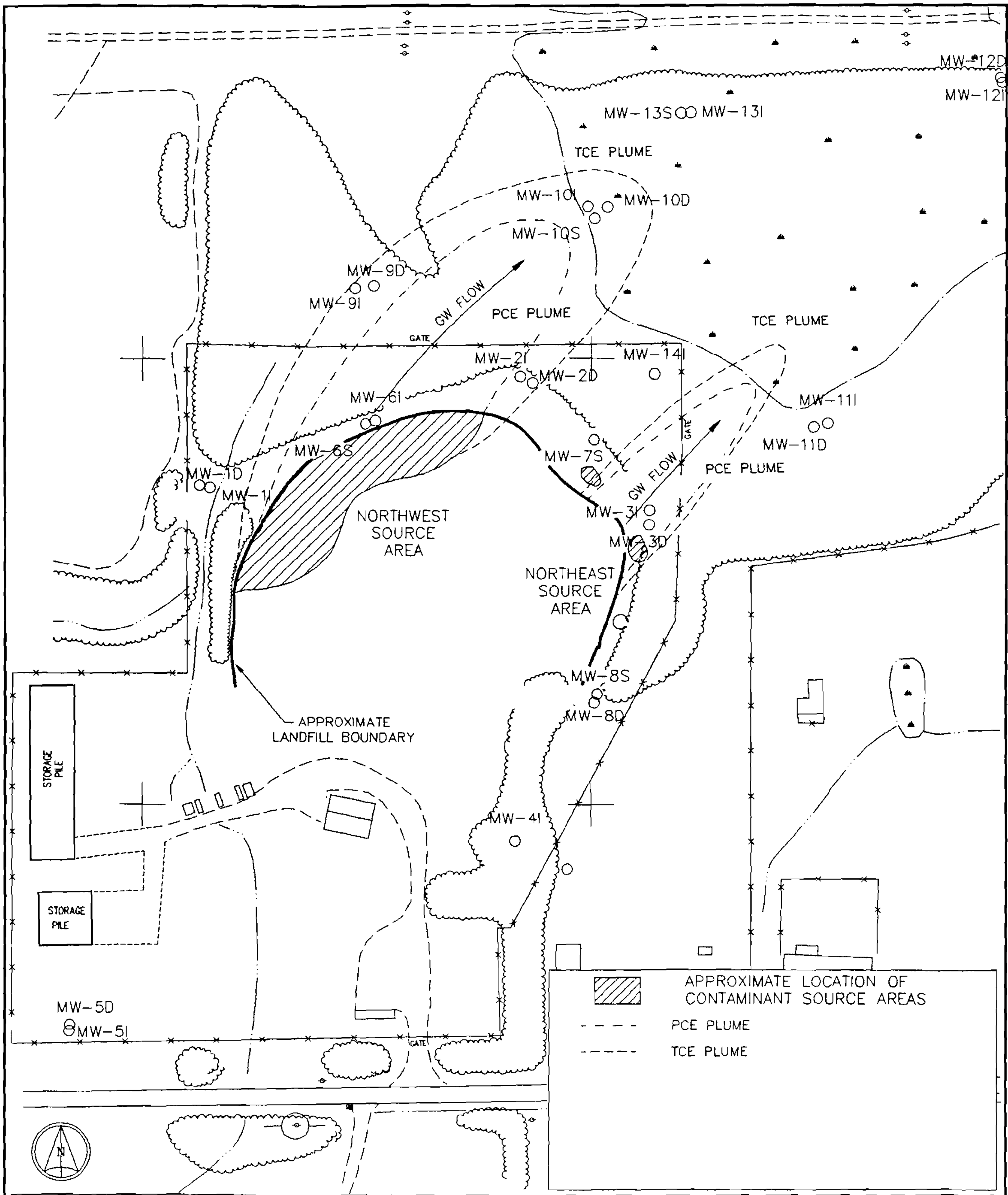
TOTAL VOLATILE ORGANICS IN BEDROCK AQUIFER
SWEDEN-3 - CHAPMAN SITE

PROJECT NO. 40296-150	DATE March, 1993	DWG. NO R9182_9	SCALE 1"=150'	FIGURE NO 9.4



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APPROXIMATE LIMIT OF TCE AND PCE PLUMES BASED ON RETARDATION MODELING
SWEDEN-3 – CHAPMAN SITE

PROJECT NO. 40296-150	DATE Dec.,1992	DWG. NO R9182_9	SCALE 1"=150'	FIGURE NO 9.5

10.0 AIR PATHWAY ANALYSIS

An Air Pathway Analysis (APA) Study was performed as part of this Phase II Remedial Investigation in Accordance with NYSDEC Division of Air Resources documents "Air Pathway Analysis Requirements in the Remedial Investigation - April 2, 1991" and "Air Cleanup Criteria - January 8, 1990".

There were two fundamental air objectives to be achieved during the remedial investigation of a site:

- Determine whether or not the site requires remediation to protect air quality.
- Obtain data necessary to assess and control the ambient air impact of any remedial activities undertaken.

A list of possible indicator compounds for the APA Study were identified based on a review of available data from the Phase II Remedial Investigation. This data consisted of soil, groundwater and surface water sample analysis from the Site. The highest compound concentration per sample media (refer to Table 10.1) were compared to develop the list.

The need for an APA Study was then determined by comparing the highest concentration of the indicator compounds to the Ambient Guideline Concentration (AGC) values on a volume/volume basis (refer to Table 10.2). The following compounds had concentrations above the AGC value and may potentially pose an impact to air quality:

COMPOUND	CLASSIFICATION
Vinyl Chloride	volatile
1,1-Dichloroethylene	volatile
1,2-Dichloroethylene	volatile
1,2-Dichloroethane	volatile
Chloroform	volatile
2-Butanone	volatile
4-Methyl-2-pentanone	volatile
Trichloroethylene	volatile
Tetrachloroethylene	volatile
1,1,2,2-tetrachloroethane	volatile
Xylenes	volatile
Phenanthrene	semi-volatile
Diethylphtalate	semi-volatile
Di-n-butylphthalate	semi-volatile

Analytical test results from ambient air sample A-2 detected elevated readings of a various number of volatile compounds. Since the ambient air sample was collected after the borehole air samples, the possibility then exists that a chemical residue was left in the battery operated air pump. Other chemicals not detected in borehole air samples are known lab contaminates. Analytical test results of air samples collected from ambient air and borehole air are presented on Table 9.11.

Currently, the likeliness of vapor emissions negatively impacting the ambient air quality of the site and surrounding area is minimal because of the presence of the clay cap. By preserving the integrity of the clay cap, air quality concerns are minimal. However, if remediation activities are required that will disturb the clay cap, conflicts with air quality may occur. At this point, the APA study will continue as required under the Feasibility Study.

Table 10.1

SWEDEN-3 CHAPMAN SITE

Air Pathway Analysis Indicator Compounds

Highest Concentrations in Samples

(Concentration Values in ppb)

Analytical Fraction	Landfill Borings	Monitoring Wells Soil Borings	Test Pit Soil Samples	Surface Water Samples	Ground Water Samples
Volatile Organic Compound					
Vinyl Chloride	27.0	-	-	-	79.0
Methylene Chloride	6.0	-	-	-	5.0
Acetone	8900	18	-	-	110
1,1-Dichloroethylene	-	-	-	-	110
1,2-Dichloroethylene	4900	16	350	-	100000
1,1-Dichloroethane	79.0	-	-	-	47.0
1,2-Dichloroethane	-	-	-	-	5.0
2-Butanone	15000	-	-	-	62.0
1,1,1-Trichloroethane	600	-	-	-	-
4-Methyl-2-Pentanone	10000	-	-	-	33.0
Chloroform	-	-	-	-	10.0
Trichloroethylene	19000	-	1000	14	78000
Tetrachloroethylene	25.0	-	450	-	4300
1,1,2,2-Tetrachloroethane	-	-	14.0	-	-
Toluene	240	-	-	-	13.0
Ethylbenzene	88.0	-	-	-	-
Xylene	520	-	3900	-	10.0
Semi-Volatile Organics					
Diethylphthalate	-	400	-	-	-
Di-n-Butylphthalate	-	1400	1700	-	-
Phenanthrene	420	-	-	-	-
Chrysene	-	-	-	-	11.0

Table 10.2

SWEDEN-3 CHAPMAN SITE
Air Pathway Analysis
Comparison of Indicator Compounds to AGC Values

(Concentration Values in ppb)

Indicator Compounds	Highest Detected Concentration	AGC Value	Possible Impact to Air Quality
Volatile Organic Compound			
Vinyl Chloride	79	0.16	YES
Methylene Chloride	6.0	7.77	NO
Acetone	8900	17841.18	NO
1,1-Dichloroethylene	110	0.01	YES
1,2-Dichloroethylene	100000	474.17	YES
1,1-Dichloroethane	79	2353.09	NO
1,2-Dichloroethane	5.0	0.05	YES
2-Butanone	15000	475.98	YES
1,1,1-Trichloroethane	600	8290.75	NO
4-Methyl-2-Pentanone	10000	119.13	YES
Chloroform	10	4.77	YES
Trichloroethylene	78000	0.08	YES
Tetrachloroethylene	4300	0.01	YES
1,1,2,2-Tetrachloroethane	14	0.003	YES
Toluene	240	2369.12	NO
Ethylbenzene	88	238.58	NO
Xylene	3900	238.58	YES
Semi-Volatile Organics			
Diethylphthalate	400	1.31	YES
Di-n-Butylphthalate	1700	1.05	YES
Phenanthrene	420	20.58	YES
Chrysene	11	16.06	NO

11.0 FISH AND WILDLIFE IMPACT ANALYSIS

This section presents the findings of the Fish and Wildlife Impact Analysis (FWIA) at the Sweden-3 Chapman Site. A Step I Site description and a Step II pathway/exposure analysis were performed and the results are presented in the following sections.

11.1 Step I Site Description

The objective of the Step I analysis is to identify the fish and wildlife resources that exist in the vicinity of the Site which could potentially be affected by site related contaminants. This baseline analysis includes descriptions of the vegetative habitats, landuse, fish and wildlife resources, value of the habitats to fish and wildlife, and, the value of the resources to humans. Additionally, applicable fish and wildlife regulatory criteria are presented.

11.1.1 Landuse/Major Vegetative Communities Within One-half Mile of The Site

A covertype map detailing the major landuse/vegetative habitats or covertypes located within one-half mile of the Site is presented in Figure 11.1. The covertype map was prepared through the evaluation/interpretation of aerial photographs and topographic maps, followed by field checking for accuracy. The base map was prepared from aerial photographs. The covertype classifications were performed using a combination of the New York Natural Heritage Program Classification System (NHPCS, Reschke, 1990) and the U.S. Geological Survey Classification System (Anderson, 1976).

Where access during field inspection of the covertype map was possible, the dominant vegetation in each covertype was identified for areas classified as terrestrial natural (TN) and Palustrine (P). The determination of dominance was qualitative, based on visual estimation. Vegetative plots and transects were not used in determining dominance. These methods are beyond the scope of a Step I analysis.

The land use within one-half mile of the Site is a mixture of agricultural, residential, undeveloped natural areas and abandoned agricultural fields. Natural areas identified as TN or P and that are identified with a number on the covertype map were accessible during the field checking of the map. The areas not numbered were either similar in nature to other areas or access to these areas was not available. The numbers within each area correspond to the numbers and vegetative descriptions presented in Table 11.1.

There is a significant quantity of undeveloped natural habitat located within one-half mile of the Site. The types of habitats/vegetative communities include deciduous forest, coniferous forest, mixed deciduous and coniferous forest, forested wetlands, successional old fields and riparian habitat.

The Site itself is composed primarily of successional old field habitat. The principle vegetative species present include red panicle dogwood (Cornus racemosa), goldenrod species (Soladago spp.), common cottonwood (Populus deltoides) and grass spp.

An NYSDEC Class II regulated wetland, SW-7, is located directly north of, and adjacent to, the Site. This wetland has also been categorized by the U.S. Fish and Wildlife Service and is described as a broad-leaved deciduous scrub shrub and forested wetland which is seasonally saturated. NYSDEC also considers SW-7 to be a deciduous/shrub swamp. While deciduous swamps are frequently used by nesting waterfowl and by songbirds and other wildlife and are thus considered to be relatively valuable by the NYSDEC, the value of shrub swamps varies from site to site.

The dominant vegetative species identified in wetland SW-7 are common spice bush (Lindera benzoin), silver maple (Acer saccharinum), and red panicle dogwood. Small elevated areas of upland habitat are scattered throughout the forested wetland. The dominant vegetation in these isolated upland habitats is american beech (Fagus grandifolia), sugar maple (Acer Saccharum), spice bush and white oak (Quercus alba).

The area south of the Site is primarily successional old field and agricultural. The dominant vegetation in the successional old fields are red panicle dogwood, grass spp., goldenrod spp., and queen anne's lace (Daucus carota). Forested wetlands, upland deciduous forest and agricultural fields are located east of the Site. Successional old fields are located adjacent to and west of the Site.

11.1.2 Wetlands Within One-half Mile and Two miles of The Site

There are three NYSDEC regulated wetlands located within one-half mile of the Site. Figure 11.2 depicts the location of these wetlands in relation to the Site. Figure 11.2 also shows the location of all NYSDEC regulated wetlands within a two mile radius of the Site.

The three NYSDEC regulated wetlands located within one-half mile of the Site are SW-7, SW-11 and SW-44. As discussed in the preceding section, wetland SW-7 is located adjacent to and north of the Site. Wetlands SW-11 and SW-44 are located south and southwest of the Site, respectively. SW-44 is a NYSDEC class II wetland and SW-11 is a Class III wetland and both are deciduous forest and shrub swamps.

Other wetlands located in a two mile radius of the Site and their respective classifications are listed below. These wetlands are located either upgradient and/or at such a distance from the Site that any impact from the Site is unlikely.

SW-4	Class II
SW-5	Class III
SW-12	Class III
SW-13	Class III
SW-27	Class II
SW-38	Class III
SW-43	Class III
HO-9	Class II

11.1.3 Streams Within 0.5 and 2 Miles of The Site

There are four NYSDEC classified streams located within one-half mile of the Site. All four of these streams are considered tributaries of Salmon Creek and are Class "C" streams. Water quality in a Class "C" stream is defined as suitable for fish propagation and survival. Fishing is considered the best usage of Class "C" streams. The water quality in Class "C" streams is considered suitable for primary and secondary contact recreation, although other factors may limit the use of the stream for these purposes. The streams located within a half mile of the Site are generally four to six feet wide and one to two foot deep. They typically would flood the surrounding terrain in the spring.

There are several other tributaries of Salmon Creek located within a two mile radius of the Site. All these streams are categorized as Class "C" streams. There are also several tributaries of Black Brook and the North Branch of Black Brook located within two miles of the site which are Class "C" streams.

11.2 Resource Characterization Within One-Half and Two Miles of The Site

Resource characterization consists of determining the wildlife species that may potentially utilize the habitats identified in the previous sections as existing within one-half mile of the Site. Additionally, the general quality of the habitat in providing for the needs of the organisms, any areas of observed vegetative stress, leachate seeps, fish and/or wildlife mortality and any known wildlife population impacts related to site contaminants are discussed.

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

The U.S. Fish and Wildlife Service (USFWS), the NYSDEC Wildlife Resources Center and the NYSDEC Region 8 Office were contacted regarding the known occurrence of endangered, threatened or special concern species or habitats within a two mile radius of the Site. Neither the USFWS or the NYSDEC identified any species of concern utilizing the habitats within two miles of the Site. Additionally, no significant habitat types were reported.

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

Mammals/amphibians, bird and fish species, that could potentially utilize the habitats within one-half mile of the Site, for at least a portion of their life cycle are listed in Tables 11.2, 11.3 and 11.4, 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 habitats within one-half mile of the Site and a review of available literature. Also, these lists are not the result of a site specific population survey. Actual population surveys are very complex and time intensive, and are beyond the scope of a Step One baseline evaluation.

Many wildlife species are very mobile and generally require a wide 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 one-half mile of the Site.

During field checking of the covertype map the species listed below were directly observed within one-half mile of the Site:

- white-tailed deer
- ruffed grouse
- american crow
- blue jay
- red-tailed hawk
- black-capped chickadee
- white-breasted nut hatch

11.2.3 General Habitat Quality Within One-Half Mile of The Site

The landuse/habitats within 0.5 miles of the Site are a combination of residential, natural and limited agricultural. The following text describes the general quality of the different habitat types to wildlife.

There are several nearby residential homes located east, west, and south of the Site. Habitats available to wildlife within the cultivated areas associated with the residential areas is limited. The number of species utilizing these areas is limited to those adjusted to survival in close proximity to man, species that require small habitats for their life requisites and/or species that are highly mobile. Such species would include small birds (american robin, sparrows, etc.) and small mammals (eastern cotton tails, moles, eastern gray squirrels, etc..). Generally, these habitats would be of marginal quality for other species. However, these homes are located in a rural setting, near or adjacent to habitats that would support larger and more diverse populations of wildlife. There would be significant opportunities for the observation of wildlife associated with the residential areas.

The deciduous swamp (NYSDEC Freshwater Wetland SW-7) located adjacent to and north of the Site, represents a high quality habitat. The deciduous swamp itself potentially provides nesting and feeding habitat for waterfowl as well as other wildlife species. There are a number of other habitat types located adjacent to the wetland. These include old field, deciduous forest and mixed coniferous and deciduous forest. The juxtaposition of these habitat types in relation to the wetland represent a valuable resource for species which require a variety of different habitat types (e.g., white-tailed deer) and species which utilize edge habitat (e.g., ruffed grouse).

There are a number of mature fields located within a one-half mile radius of the Site. As previously stated, many of these fields are located adjacent to wetland SW-7 and the juxtaposition of these fields in relation to the wetland also increase their value as wildlife habitat. Many of these fields are abandoned agricultural fields and are in an early stage of succession. These characteristics create a high quality habitat for wildlife which utilize early successional stage habitats (e.g. eastern cotton tail, ruffed grouse, many song birds, etc..).

The Site itself, due to its relatively small size and the fact that it is mostly fenced, does not represent a high quality habitat. Generally, the area can be classified as old field. However, the Site is located adjacent to freshwater wetland SW-7, creating edge habitat. If the area was not disturbed (i.e., fenced) it would most likely be utilized by wildlife in the same manner as the other old fields which are located adjacent to other habitat types. Currently, the Site does not represent a high quality habitat. This is primarily due to physical disturbances and is not related to chemical contamination.

DUNN has submitted a letter to the NYSDEC Wildlife Pathology Unit requesting information on known occurrences of wildlife mortality within a two mile radius of the Site. No response has been received and it is assumed that there are no known cases. Additionally, no signs of stressed vegetation that could be attributed to site contaminants were observed.

11.2.4 Use of Natural Resources Within One-half Mile of The Site by Humans

The habitats/wildlife located within one-half mile of the Site would provide recreational opportunities for hunting, photography and observation of wildlife. Considering that SUNY at Brockport is located within twenty miles of the Site, the resources within one-half mile of the site could be utilized for scientific and educational purposes.

The old fields located within one-half mile of the Site were most likely at one time used for agricultural purposes, and could potentially be converted back to agricultural uses. Many of the old fields/agricultural fields have been and will most likely continue to be developed into residential homes, which reduces the value of the area to wildlife and associated recreational activities.

The deciduous swamps could be used for limited logging (subject to wetland regulation restrictions). However, the dominant species in the deciduous swamps is silver maple, which is not a high quality hardwood. The primary use would most likely be for firewood.

11.3 Applicable Fish and Wildlife Regulatory Criteria

The appropriate SCGs that may potentially be applicable to the Site will be partially dependent on the selected remedial alternative (if any). This section presents the fish and wildlife SCGs that should be considered. SCGs will be further discussed in the Feasibility Report for the Site.

Fish and wildlife related SCGs that may be applicable to the Site are presented below:

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

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

- New York State Surface Water and Groundwater Standards, Title 6 Chapter 10 Part 700-703 NYCRR.

- Executive Order 11990, Protection of Wetlands - this order recognizes the value of wetlands and directs federal agencies to minimize the degradation, destruction and loss of wetlands.

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

- Fish and Wildlife Coordination Act.

11.4 Pathway/Exposure Evaluation

This section evaluates the potential for wildlife exposure to site related contaminants. This evaluation includes identification of habitats which could potentially be impacted by site related contaminants and the identification of possible food chain contamination pathways. The magnitude and significance of any potential exposure is dependent upon site chemistry, the extent of contamination and the landuse/habitats located near the Site. Additionally, habitat quality and utilization and the extent/duration of exposure, are important factors in evaluating the significance of any impact the Site may have on the ecosystems.

The habitat areas representing the greatest potential for wildlife exposure to site related contaminants are the Site itself and the wetland (SW-7) located adjacent to and north of the Site.

Ground water, surface water, soil, sediment and soil gas samples have been collected and analyzed. Two phases of sample collection and analysis were performed. Analytical results from the first phase have been reported in the Phase I Remedial Investigation Report. Analytical results from the second phase have been presented in Section 9.0, herein.

Analytical results from the first and second phase sampling events reveal that the principle site contaminants are volatile organics in ground water and volatile organics and to a lesser extent, semi-volatile organics and metals (zinc, copper) in sub-surface soil and sediment samples.

Contamination at the Site itself is limited to the sub-surface environment; primarily overburden ground water and sub-surface soils. The potential for wildlife exposure to contaminated media on the Site itself is very limited considering that contamination on the Site is limited to sub-surface media. This observation is supported by the surface water results from the Phase I investigation, the soil gas results from the Phase I investigation and the surface water and sediment results from the Phase II investigation.

In order to evaluate the impact of site contaminants on wetland SW-7, three surface water and four sediment samples were collected downgradient of the Site, and within wetland SW-7, during the Phase II investigation. Additionally, an upgradient surface water and sediment sample were collected (location SW/SS-4). All surface water samples were analyzed for TCL volatile organics and the TAL metals/cyanide. The sediment samples were analyzed for the TCL volatile and semi-volatile organics and the TAL metals/cyanide

Analytical results revealed that all wetland (SW-7) surface water analytical results were consistent with the upgradient SW-4 concentrations. Analytical results indicate that surface water in wetland SW-7 has not been impacted by site contaminants.

With the exception of sediment sample LOC-5SS all wetland (SW-7) organic results were consistent with upgradient sample LOC-4SS. Sample 5SS exhibited one volatile organic compound, 2-butanone, at a low concentration (37 ug/L) and several semi-volatile parameters, all at estimated concentrations below the contract required detection limit. With the exception of chrysene and benzo(a)anthracene, all compound concentrations (for the compounds with applicable criteria) were below either the USEPA Interim Sediment Criteria Values (May 1988) or the NYSDEC Division of Fish and Wildlife, Sediment Criteria (December 1989), assuming an organic matter content of 3 percent. The table below summarizes the concentration reported in sample 5SS and the USEPA and or the NYSDEC sediment criteria concentration, assuming 3 percent organic matter.

Parameter	Sample Concentration	Sediment Criteria ug/Kg
2-butanone	37	NA
4-methylphenol	150	NA
Phenanthrene	110	4,170*
Anthracene	21	NA
Fluroanthene	130	12,690*
Pyrene	110	7,950*
Benzo(a)anthracene	62	6,510*; 39 **
Chyrsene	75	39**
bis (2-ethylhexyl)-phthalate	82	NA
Benzo(a)pyrene	23	6,750*; 39**

* USEPA Sediment Criteria; Based on Aquatic Toxicity

** NYSDEC Sediment Criteria Based on Health Risks Associated With Human Consumption of Aquatic Life

NA= not available

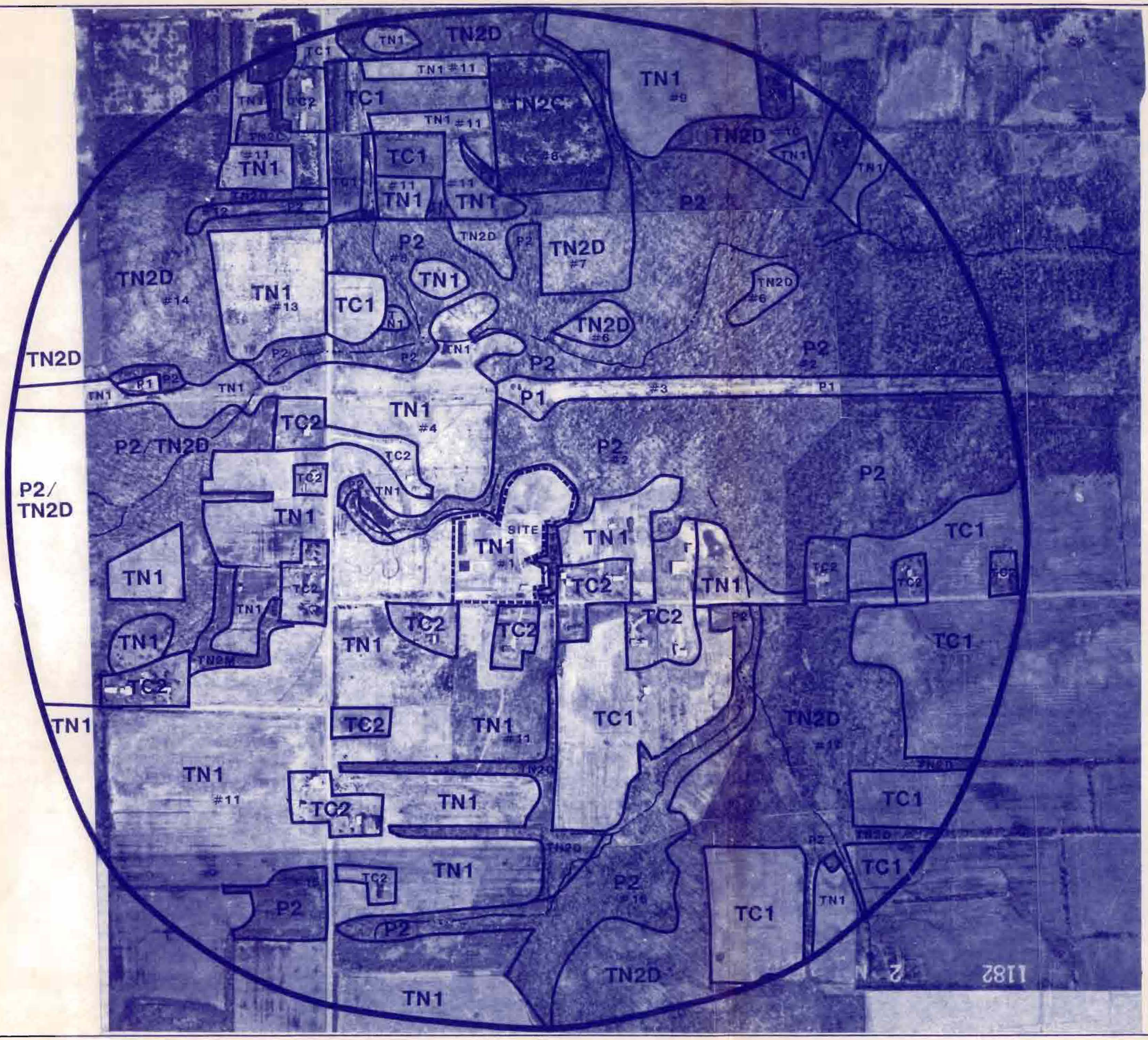
The 2-butanone reported in sediment sample 5SS is not considered significant since this compound is not expected to bioconcentrate in the environment. The bioconcentration factor (calculated from the Kow; ATSDR, Toxicological Profile) is 0.98.

While the NYSDEC sediment criteria value for chrysene and benzo(a)anthracene, based on a human health residue basis, is 39 ug/Kg, the concentrations detected in sample 5SS were 75 ug/Kg and 62 ug/Kg for chrysene and benzo(a)anthracene, respectively. The human health residue criteria is based on accumulation of chemicals in aquatic animals to concentrations that could result in the exceedence of a human health tolerance or cancer risk dose if the aquatic life were consumed by humans. Considering that human consumption of aquatic animals from wetland SW-7 is most likely very limited, the reported exceedences of the NYSDEC criteria are not considered significant. Additionally, only one of four samples from wetland SW-7 exhibited an exceedence. The USEPA has established a sediment criteria guideline for benzo(a)anthracene, based on toxicity to aquatic life, of 6510 ug/kg, which is significantly higher than the concentration reported in sample 5SS (62 ug/Kg).

Since sample 5SS is the only sample from wetland SW-7 to exhibit detectable concentrations of organic chemicals at relatively low concentrations, the biota of wetland SW-7 have most likely not been significantly exposed to concentrations of organic chemicals that would have significantly impacted the ecology of the wetland.

Copper and zinc concentrations at one location, LOC-8SS, were higher than the limit of tolerance concentrations reported in the NYSDEC Sediment Criteria guidance document (December 1989). The copper and zinc sample concentrations were 156 ug/Kg and 1090 ug/Kg, respectively, and the limit of tolerance values are 114 ug/Kg and 800 ug/Kg, respectively. The NYSDEC Sediment Criteria guidance document states that for metals, if sample concentrations exceed the limit of tolerance in significant portions of the ecosystem, it is highly likely that biota are impaired and remediation should be considered necessary. Considering that only one sample exhibited copper and zinc concentrations that exceeded the limit of tolerance, the presence of these two metals at elevated concentrations in one sample is not considered to have had significant impact on the biota of wetland SW-7.

In summary, based on chemical analysis of the various media from the Site itself and wetland SW-7, the potential for a significant impact to biota is minimal. Current data indicate that a Step II Fish and Wildlife Impact Analysis is not required.



N

LEGEND

P–Palustrine, Wetland Habitat

P1	Open Mineral Soils or Open Peat Soil Wetland Containing Less Than 50% Tree or Shrub Cover
P2	Forested Mineral Soils or Forested Peat Soils Wetland Containing Greater Than 50% Tree or Shrub Cover

T–Terrestrial

TN Terrestrial Natural

TN1	Open Upland and Barrens; Successional Old Field and Successional Shrub Field
TN2D	Forested–Deciduous
TN2C	Forested–Coniferous
TN2M	Forested–Mixed

TC Terrestrial Cultural

TC1	Agricultural
TC2	Residential
TC3	Commercial
TC4	Industrial
TC5	Recreational and Public
TC6	Transitional
TC7	Quarries, Strip Mines, Gravel Pits and Landfills
TC8	Transportation and Utilities
TC9	Cemeteries

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NEW YORK STATE DEPARTMENT OF CONSERVATION
WORK ASSIGNMENT No. D002520–14

LAND USE/LAND COVER MAP
SWEDEN–3 CHAPMAN SITE

TOWN OF SWEDEN MONROE COUNTY, NY

PROJECT NO. 40296 – 00150	DWG. NO. 2M09043
SCALE: Approx. 1"=600' DATE 10/92	FIGURE NO. 11-1

12.0 HEALTH RISK ASSESSMENT STUDY

12.1 INTRODUCTION

12.1.1 Overview and Site Conditions

This qualitative baseline human health evaluation (HHE) has been prepared for the New York State Department of Environmental Conservation (NYSDEC) as part of the Remedial Investigation/Feasibility Study (RI/FS) process at the Sweden-3 Chapman Site, NYS Site Number 8-28-040A (the Site). It includes an evaluation of levels of organic and inorganic chemicals detected in soil, sediment, surface water and groundwater resulting from the disposal of drums and hazardous materials at the Site. As Interim Remedial Measures (IRM) in March 1991, the NYSDEC oversaw the removal and disposal of 2,383 drums, 2,400 tons of hazardous soil and debris, 1,710 tons of non-hazardous soil and debris, and 486 bottles containing laboratory materials. This qualitative baseline HHE is limited to the existing conditions found at the Site. The conditions of the Site prior to the IRM were not considered. Numerous conservative assumptions have been made throughout the HHE. The HHE considers the current commercial/industrial and potential future uses of the property.

Improper waste management activities have resulted in groundwater and soil contamination at the Site. This qualitative baseline HHE evaluates the potential for human exposure and the possibility of effects associated with exposure to chemicals at the Site.

12.1.2 Purpose, Scope and Organization

This qualitative baseline HHE is based on data collected as part of the RI/FS process at the Site. Potential transport pathways are identified, exposure routes assessed and basic toxicological properties of the chemicals identified in the Remedial Investigations (RI) are discussed. Site-specific conditions are evaluated during each of the above steps. In addition, the qualitative baseline HHE considers state and federal applicable or relevant and appropriate requirements (ARARs) for chemicals in environmental media. The following items were addressed within the qualitative baseline HHE's scope of work:

- evaluation of Site history, chemical, hydrologic, hydrogeologic, demographic and other information;
- identification and evaluation of potential exposure pathways through a review of data collection activities, analytical protocols, current and surrounding land use, populations-at-risk and other related data;
- characterization of completed exposure pathways by the evaluation of chemical release sources, fate and transport, human exposure (contact) points and chemical intake routes;
- discussion of chemical-specific carcinogenic and noncarcinogenic properties.
- presentation and discussion of regulatory standards and criteria at both the

Inorganics

- Aluminum
- Antimony
- Arsenic
- Barium
- Beryllium
- Calcium
- Chromium
- Cobalt
- Copper
- Iron
- Lead
- Magnesium
- Manganese
- Nickel
- Potassium
- Silver
- Sodium
- Vanadium
- Zinc
- Chloride
- Fluoride
- Nitrate
- Sulfate

12.2.1.2 Soil

Soil samples were collected by Dunn personnel in June and October 1992 as part of the Phase I and Phase II RI. These subsurface samples were then analyzed for organics and inorganics parameters. These data are presented in Tables 9.7 (soil boring samples) and 9.8 (test pit samples) of the RI report.

Table 12.5 provides a summary of the concentrations and detection frequencies of organic chemicals detected in subsurface soil samples at the Site. Based on the finding that they were detected in less than 5% of the samples collected (i.e., only one sample), the organic chemicals carbon disulfide, 1,1,2,2-tetrachloroethane, 4-chloro-3-methylphenol, 1,2,4-trichlorobenzene, acenaphthylene, 4-nitrophenol, dibenzofuran, 2,4-dinitrotoluene, anthracene, carbazole, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, Aroclor-1254, heptachlor, dieldrin, endrin, 4,4'-DDT and gamma-BHC may be excluded from further qualitative evaluations concerning overall Site hazards. However, since 2,4-dinitrotoluene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, Aroclor-1254, heptachlor, 4,4'-DDT and gamma-BHC are considered by the EPA (HEAST, 1992) to be Group B2 carcinogens they will be retained in the qualitative HHE.

Table 12.6 presents the summary of concentrations and detection frequencies of inorganics in samples collected from Site soils. Since cadmium, selenium, silver and thallium were not detected, they may be excluded from the qualitative HHE. Table 12.6 also presents the background concentrations of a number of inorganics normally found in uncontaminated soils. It can be seen that the maximum detected concentration of aluminum, arsenic, barium, beryllium, chromium, lead, nickel, potassium, sodium and vanadium are below the average concentrations of these elements generally found in uncontaminated soils. In addition, the maximum detected concentrations of antimony, cobalt, copper, iron, manganese, mercury and zinc do not exceed the upper limit range of concentrations normally found in uncontaminated soils. Therefore, the above mentioned inorganics are not considered to be related to past activities at the Site and will not be included in the qualitative HHE.

Based on the above evaluations, the following list of chemicals will be included in the qualitative HHE for determining potential human health risks related to Site soils:

Volatile Organics

Vinyl Chloride
Methylene Chloride
Acetone
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
2-Butanone
1,1,1-Trichloroethane
4-Methyl-2-pentanone
Trichloroethene
Tetrachloroethene
Toluene
Ethylbenzene
Xylenes (total)

Semivolatile Organics

Benzoic acid
Phenol
2-Methylphenol
4-Methylphenol
Naphthalene
2-Methylnaphthalene
Diethylphthalate
N-Nitrosodiphenylamine
Di-n-butylphthalate
Butylbenzylphthalate
Bis(2-ethylhexyl)phthalate
Di-n-octylphthalate
Hexachlorobutadiene
Acenaphthene
2,4-dinitrotoluene
Fluorene
Phenanthrene
Fluoranthene
Pyrene

Chrysene
Benzo(a)anthracene
Chrysene
Benzo(b)fluoranthene
Benzo(k)fluoranthene
Benzo(a)pyrene

Pesticides/PCBs

Aldrin
Aroclor-1254
Heptachlor
4,4'-DDT
gamma-BHC (Lindane)

Inorganics

Calcium
Magnesium
Chloride
Fluoride
Nitrate
Sulfate

12.2.1.3 Air

Two air samples each were collected directly from soil borings and from ambient air by Dunn personnel in October 1992 as part of the Phase II RI. These air samples were then analyzed for volatile organics in attempt to determine whether the Site requires remediation to protect air quality, and to obtain the data necessary to assess and control the ambient air impact of any remedial activities.

Table 12.7 provides the analytical results of air samples collected from ambient air and boring hole air samples at the Site. The volatile organics bromodichloromethane, 1,2-dichloropropane and 2-hexanone were detected in one ambient air sample taken at the Site. Since they were not present in soil samples (refer to Table 12.5) or in boring hole air samples, their presence in the one ambient air samples is not considered to be related to the Site. Therefore, these volatile organics will not be further evaluated in this quantitative HHE.

Based on the above evaluations, the following list of volatile organic chemicals will be included in the qualitative HHE for determining potential human health risks related to the air pathway:

Volatile Organics

Vinyl Chloride
Methylene Chloride
Acetone
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
Chloroform
2-Butanone
1,1,1-Trichloroethane
Trichloroethene
Benzene
4-Methyl-2-pentanone
Tetrachloroethene
1,1,2,2-Tetrachloroethane
Toluene
Chlorobenzene
Ethylbenzene
Total xylenes

12.2.1.4 Surface Water

Surface water samples were collected by Dunn personnel as part of the Phase I and Phase II RI. The surface water samples collected in June 1992 were analyzed for the full CLP analysis of organics and inorganics parameters, while samples collected in October 1992 were analyzed for SSICs, only (refer to RI report). The data were then validated and are presented in Table 9.6 of the RI report.

Table 12.8 presents a summary of the concentrations and detection frequencies for organics detected in surface water samples collected from the Site. Tetrachloroethene and bis(2-ethylhexyl)phthalate were each detected in one sample in June 1992, however, neither was detected in the October 1992 sampling round. Although methylene chloride was detected in six samples in October 1992, it was also detected in similar concentrations in the up-gradient surface water sample. Therefore, the organics detected in surface water samples are not considered to be related to the Site and were not retained for evaluation in the qualitative HHE.

The summary data for the inorganics detected in Site surface water samples are presented in Table 12.9. Beryllium, mercury and thallium were not detected in any of the up-gradient or down-gradient surface water samples. The inorganics antimony, arsenic, chromium, cobalt, nickel, vanadium, and zinc were detected infrequently in only the June 1992 sampling round. Cadmium and silver were each detected in only one sample at very low concentrations. In addition, the detected concentrations of magnesium and sodium are consistent with the up-gradient surface water sample. Although arsenic is considered a Group A oral carcinogen by the EPA (HEAST, 1992), it was not retained in further evaluations due to the low concentration detected. Since chromium, nickel, and cadmium are only considered carcinogenic via inhalation and not by the oral or dermal exposure routes (the potential exposure routes from exposure to surface water), they are not considered to pose a carcinogenic hazard. Therefore, the above mentioned inorganics will not be retained in further evaluations performed in this qualitative HHE.

Based on the above considerations, the following list of chemicals will be retained in the qualitative HHE for evaluating potential human health risks related to Site surface water:

Inorganics

- Aluminum
- Barium
- Calcium
- Copper
- Iron
- Lead
- Manganese
- Potassium

12.2.1.5 Surface Sediment

Surface sediment samples were collected by Dunn personnel in October 1992 as part of the Phase II RI. The data are presented in Table 9.6 of the RI report.

Table 12.10 presents a summary of the concentrations and detection frequencies for organics detected in surface sediment samples at the Site. The volatile organics methylene chloride and acetone were detected in up-gradient and down-gradient surface water samples, as well as laboratory blanks. Since acetone and methylene chloride are common laboratory contaminants, their detection in these samples indicate their presence is due to laboratory contamination. The noncarcinogenic semivolatile organics n-nitrosodiphenylamine and anthracene were detected in only one sample at very low concentrations. Therefore, the above mentioned organics will not be included in further evaluations in this qualitative HHE.

Table 12.11 includes the summary data for levels of inorganics detected in up-gradient and down-gradient surface sediment samples. The inorganics antimony, silver and thallium were not detected in any of the sediment samples. The levels of aluminum, arsenic, barium, beryllium, calcium, cobalt, iron, magnesium, mercury, nickel, potassium and vanadium are consistent with the up-gradient surface sediment sample. Therefore, these inorganics will not be retained in further evaluations performed in this qualitative HHE.

Based on the above considerations, the following list of chemicals will be evaluated in the qualitative HHE for evaluating potential human health risks related to Site surface sediment:

Volatile Organics

- 2-Butanone

Semivolatile Organics

Chrysene
4-Methylphenol
Benzoic acid
Di-n-butylphthalate
Phenanthrene
Fluoranthene
Pyrene
Benzo(a)anthracene
Bis(2-ethylhexyl)phthalate
Benzo(a)pyrene

Inorganics

Cadmium
Copper
Lead
Manganese
Zinc

12.2.2 Procedure for Ranking Chemical Hazards

The procedure utilized in ranking chemical hazards at the Site was performed separately for each environmental media. For the purposes of ranking chemical hazards, two potential adverse health outcomes are evaluated for each chemical based upon their toxicological properties. They are the chemicals potential to cause noncarcinogenic and/or carcinogenic health effects. Noncarcinogenic effects can include either acute or chronic effects. Such toxic endpoints might include impairment of organ(s), system dysfunction, (e.g., respiratory, neurological and immune), reproductive interference (including sterility and birth defects), metabolic changes, etc. These effects can be either reversible or irreversible. Noncarcinogenic effects generally occur only after a "threshold" dose has been exceeded. In order to be health-protective, a reference dose (RfD) is derived from the no-observed adverse effect level (NOAEL) or lowest observed adverse effect level (LOAEL) of the experimental toxicology data. The RfD represents the threshold dose below which noncarcinogenic effects are not expected to occur in exposed populations. Effects in sensitive populations are taken into account by the use of uncertainty factors which are multiplicative adjustments that reduce the allowable dose level 10-fold to account for sensitive or more susceptible members of an exposed population. If necessary, additional uncertainty factors of 10 may also be used to: (1) provide a margin of safety in comparing animal studies to human responses, and (2) in adjusting data obtained in subchronic or acute studies to be relevant in assessing risk associated with chronic exposures. Thus, the RfD values used in the assessment are often 100 to 1,000 times lower than the lowest dose found to be associated with the least severe adverse effect for a given chemical. The RfD for each chemical is used as a benchmark for ranking chemicals based on their potential noncarcinogenic effects.

Carcinogenic effects refer to the demonstrated or suspected capacity of a chemical to induce cancers. A chemical's carcinogenic potential is ranked by the EPA based on a "weight-of-evidence" classification which considers evidence of carcinogenicity in animals and humans (Table 12.12). Cancer potency factors (CPFs) are calculated based upon available scientific evidence of the dose-response relationship between the cancer induced and the level(s) of chemical administered that caused the carcinogenic response. Specifically, the 95% UCL of the dose-response curve is used in multi-stage dose-response models to calculate CPFs. Because the link between cancer and chemicals/physical agents (e.g., radiation) is unknown, federal (EPA, Occupational Safety and Health Administration, and the Consumer Product Safety Commission) and state regulatory agencies have adopted a policy which assumes that no threshold dose exists for carcinogens. Under this policy, the agencies assume that the levels of exposure below which cancer will not appear cannot be defined. These assumptions lead to conservative estimates of carcinogenic risks for some chemicals. The CPFs are used in this section of the qualitative baseline HHE to rank chemicals based on their potential carcinogenic effects.

Evaluation and incorporation of the toxicological data into this report followed the review hierarchy referenced in applicable EPA guidance documents (EPA, 1989a). Unless otherwise indicated, RfDs and CPFs for each chemical were selected from the following references in the order presented:

- Integrated Risk Information System (IRIS, 1992)
- Health Effects Assessment Summary Table (HEAST, 1992)
- EPA Criteria Documents
- Agency for Toxic Substances and Disease Registry (ATSDR) toxicological profiles

The purpose of ranking chemical hazards at the Site is to identify which chemicals in a specific environmental media are more likely to present a hazard to human health and, thereby possess the greatest potential risks to the health of exposed populations. The ranking procedure is performed separately for each environmental media. Carcinogenic and noncarcinogenic hazards in each environmental media are ranked separately as described below. It must be mentioned that the relative rankings described below do not provide any direct indication of potential risks to human health. Rather, these rankings only indicate which chemicals may present the greatest noncarcinogenic and carcinogenic hazards in each environmental media.

12.2.2.1 Groundwater

As discussed previously (Section 12.2.1.1), there were 13 volatile organics, 2 semivolatile organics and 23 inorganics detected in monitoring well groundwater which are considered to be related to Site activities. Table 12.13 provides a relative ranking of these chemicals based on their noncarcinogenic properties (i.e, oral RfD). It can be seen from this relative ranking that nitrate, zinc, 1,2-dichloroethene, toluene and 1,1-dichloroethane are considered to present the greatest noncarcinogenic hazards.

The relative ranking based on the carcinogenic properties of the parameters detected in monitoring well groundwater are presented in Table 12.14. Of the 38 chemicals present in groundwater, 16 are considered by the EPA to be potential or known human carcinogens (i.e., Group A, B or C). It can be seen from this relative ranking that chrysene, beryllium, vinyl chloride, arsenic and 1,1-dichloroethene are considered to present the greatest carcinogenic hazards.

12.2.2.2 Soil

As discussed previously (Section 12.2.1.2), there were 14 volatile organics, 24 semivolatile organics, 5 pesticides/PCBs and 6 inorganics detected in subsurface soils which are considered to be related to Site activities. Table 12.15 provides a relative ranking of these chemicals based on their noncarcinogenic properties (i.e, oral RfD). It can be seen from this relative ranking that benzoic acid, xylenes, nitrate, diethylphthalate and phenol are considered to present the greatest noncarcinogenic hazards.

The relative ranking based on the carcinogenic properties of the parameters detected in subsurface soils are presented in Table 12.16. Of the 49 chemicals present in Site soils, 23 are considered by the EPA to be potential or known human carcinogens (i.e., Group A, B or C). It can be seen from this relative ranking that n-nitrosodiphenylamine, aldrin, Aroclor-1254, benzo(a)anthracene and benzo(a)pyrene are considered to present the greatest carcinogenic hazards.

12.2.2.3 Air

As discussed previously (Section 12.2.1.3), there were 18 volatile organic chemicals detected in ambient air or boring hole air samples collected from the Site which are considered to be related to Site activities. Table 12.17 provides a relative ranking of these chemicals based on their noncarcinogenic properties (i.e, inhalation RfD). It can be seen from this relative ranking that methylene chloride, 1,1-dichloroethane, 1,1,1-trichloroethane, ethylbenzene and 2-butanone are considered to present the greatest noncarcinogenic hazards.

The relative ranking based on the carcinogenic properties of the parameters detected in ambient air or boring hole air samples are presented in Table 12.18. Of the 18 volatile organic chemicals present in Site soils, 8 are considered by the EPA to be potential or known human inhalation carcinogens (i.e., Group A, B or C). It can be seen from this relative ranking that vinyl chloride, 1,1-dichloroethene, chloroform, benzene and trichloroethene are considered to present the greatest carcinogenic hazards.

12.2.2.4 Surface Water

As will be discussed in Section 12.3.2.4, the most likely human exposure pathway to surface water is expected to be via dermal exposures during wading activities. Since only 8 inorganics were detected in surface water were considered to be potentially related to the Site (Section 12.2.1.4) and because the dermal absorption of inorganics is considered to be negligible (EPA, 1989b; NYSDOH, 1992), their presence in surface water is not considered to pose a significant health threat. Therefore, a relative ranking of the inorganics detected in surface water will not be conducted in this qualitative HHE.

12.2.2.5 Surface Sediment

As discussed previously (Section 12.2.1.5), there were 1 volatile organic, 10 semivolatile organics and 5 inorganics detected in surface sediments which are considered to be related to Site activities. Table 12.19 provides a relative ranking of these chemicals based on their noncarcinogenic properties (i.e, oral RfD). It can be seen from this relative ranking that benzoic acid, zinc, 2-butanone, fluoranthene, pyrene and bis(2-ethylhexyl)phthalate are considered to present the greatest noncarcinogenic hazards.

The relative ranking based on the carcinogenic properties of the parameters detected in surface sediment samples are presented in Table 12.20. Of the 16 chemicals present in surface sediments, 7 are considered by the EPA to be potential or known human carcinogens (i.e., Group A, B or C). It can be seen from this relative ranking that benzo(a)anthracene, benzo(a)pyrene and bis(2-ethylhexyl)phthalate are considered to present the greatest carcinogenic hazards.

12.3 EXPOSURE PATHWAY ANALYSIS

12.3.1 Characterization of the Exposure Setting

The purpose of an exposure assessment is to identify pathways through which people can be exposed. The exposure assessment utilizes the current conditions at the Site in determining potential exposure scenarios. The analysis assumes that the concentrations of chemicals in environmental media has stabilized and will not change significantly over time.

The Site is an unused approximately two acre area which was previously utilized as a landfill for disposal of various construction/demolition debris, along with drums and bottles containing hazardous materials. It is located in a predominantly rural area. Private residences are sparsely located to the east, west and south of the Site. There are currently approximately 29 residences within a 0.5 mile radius of the Site. The area immediately to the north-northeast is a wetland area. Based on the general residential uses of surrounding properties, it is foreseeable that future alternative uses of the Site may include residential development. Therefore, future residential uses of the Site were considered.

12.3.2 Potential Human Exposure Pathways

This qualitative baseline HHE compares the locations, sources and types of environmental chemicals with the population locations and activity patterns to determine what, if any, significant pathways of human exposure are viable. As outlined by the EPA (1989a), an exposure pathway generally consists of four elements:

- a source and mechanism of chemical release,
- a retention and transport medium (media),
- a point of potential human contact with the impacted media,

- an exposure route at the contact point.

In order for an exposure pathway to be complete, all four of the above criteria must be met. The source itself (e.g., soil containing chemicals) may be an exposure point, or an impacted media may be a contaminant source for other media (e.g., impacted soil could be a source for groundwater contamination).

Considering the chemical's chemical/physical properties, the adjoining property uses/characteristics and the environmental media impacted, the potential human exposure pathways include:

- groundwater
- soils
- air
- surface water
- sediments

A discussion of the reasons for their selection and an evaluation of each potential pathway follows.

12.3.2.1 Groundwater

There are three distinct groundwater bearing zones beneath the Site: overburden; overburden/bedrock interface; and bedrock. Groundwater beneath the Site has been shown to contain elevated levels of chemicals in all three groundwater bearing zones. The most widespread contamination of chemicals appeared in the overburden/bedrock interface water bearing zone. The bedrock aquifer is of concern since nearby residences use this aquifer as a source for drinking water and household uses due to the absence of a public water supply. Although only one bedrock groundwater sample collected from MW-3D contained low levels of contamination, the potential exists for the bedrock aquifer to be contaminated due to the downward groundwater hydraulic gradient beneath the Site. An upward gradient is present in the northeast portion of the Site. This gradient moves groundwater from the bedrock aquifer into the overburden/bedrock interface zone. The potentiometric contours indicate that the horizontal component of groundwater movement is generally to the north and northeast, and is dependent upon seasonal fluctuations in precipitation. During the wet seasons (e.g., late Spring and Fall) the groundwater appears to shift from the northeast to a more northerly direction.

Sampling of nearby residential wells during the RI revealed the presence of methylene chloride in the October 1992 sampling in one private well, and the presence of several inorganics. However, the sampled wells are up-gradient or cross-gradient from the Site in terms of the horizontal direction of groundwater movement.

Based on the above considerations, it is extremely unlikely that the area drinking water wells are currently affected under existing conditions at the Site. Therefore, the groundwater pathway is considered to be an incomplete exposure pathway under current conditions, since no exposure point can be established with impacted media. However, it is possible that contaminated Site groundwater will continue to migrate off-site in the future and may affect nearby residential drinking water wells. In addition, it is feasible that an individual may place a well on the Site in the future since a viable aquifer is present. For these reasons, future groundwater ingestion and household use is considered a complete exposure pathway.

12.3.2.2 Soils

The sampling program in the RI indicated the presence of a number of analytes in subsurface soils (i.e., >2 feet deep). These included volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and inorganics. The fact that these soils are subsurface soils which are currently covered with clean fill and a clay cap precludes exposures by direct contact with soils. Therefore, according to the EPA guidance (EPA, 1989a), the direct exposure to subsurface soils pathway is incomplete (closed) since an exposure contact point cannot be established. However, these subsurface soils may provide a transport pathway whereby groundwater may be impacted due to leaching. The areas to the east, south and west are sparsely populated residential areas which utilize private wells for drinking water and household use purposes. For this reason the current subsurface soils conditions may impact groundwater and provide a complete exposure pathway. Since much of the surrounding land use is residential, it is possible that the Site may be used for residential purposes in the future. As such, it is foreseeable that significant excavation of the subsurface soils may occur in the future. These subsurface soils could potentially be brought to the surface where human exposures may occur. Therefore, direct human contact with the subsurface soils is a complete exposure pathway under potential future Site use considerations.

12.3.2.3 Air

As part of the RI, an Air Pathway Analysis (APA) was performed in accordance with NYSDEC Division of Air Resources guidance (refer to Section 10.0). The APA involved the analysis of two ambient air samples and two boring hole air samples for VOCs. Since the soils of concern at the Site are greater than 2 feet below grade due to the presence of a clay cap, it is not expected that these subsurface soils will allow significant volatilization of chemicals into the air whereby people may be exposed. However, since twelve VOCs were detected in one of the ambient air samples, this pathway is considered to be open under current conditions. The presence of VOCs in the boring hole air samples indicates that future activities, such as the placement of a building foundation within these impacted soils, may present an pathway whereby individuals may be exposed. Therefore, the direct human contact with these bore hole air concentrations is considered a complete exposure pathway under potential future Site use considerations.

12.3.2.4 Surface Water

The Site is bordered to the north/northeast by a wetland. Since elevated levels of chemicals were detected in monitoring well groundwater and the horizontal direction of groundwater flow is primarily to the northeast, surface water samples were collected during the RI. It is possible that individuals may come into contact with surface water during recreational activities. It is expected that these recreational activities would be limited to wading, only, since the consumption of aquatic life from these surface waters is extremely unlikely (refer to Section 11.0 - Fish and Wildlife Impact Analysis) Analysis of these samples did not reveal the presence of any VOCs or SVOCs which were not detected in the up-gradient sample. However, elevated levels of 8 inorganics were present in the surface water samples. Based on these findings, it is possible that an individual may come into contact with surface water in an extremely limited capacity during these activities. It is expected that the primary human exposure route during wading activities would be via dermal exposures of arms and legs. Since the dermal absorption of inorganics is considered negligible (EPA, 1989b; NYSDOH, 1992), their presence in surface water is not considered to represent a significant threat to human health. Therefore, the direct human contact with Site surface water during wading activities is not considered a pathway of concern under current and future use considerations.

12.3.2.5 Sediments

Due to the presence of a wetland to the northeast of the Site, it is possible that individuals may come into contact with sediments during recreational activities such as wading (refer to Section 12.3.2.4). Sediment samples collected during the RI revealed the presence of organics and inorganics above the up-gradient surface sediment sample. As discussed above, the primary route of human exposure to surface sediments is expected to be during wading activities via dermal exposures of arms and legs. Since the dermal absorption of inorganics is considered negligible (EPA, 1989b; NYSDOH, 1992), their presence in surface sediments is not considered to represent a significant threat to human health. Therefore, direct contact with VOCs and SVOCs in surface sediments during wading activities is considered a complete human exposure pathway under current and future use considerations.

12.3.2.6 Exposure Pathway Summary

In summary, an evaluation of the RI and exposure assessment data indicates that the significant potential exposure points associated with the Site would be: 1) future ingestion and household use of contaminated groundwater by residents; 2) the direct contact with subsurface soils by future residents on the Site; 3) the future transport of subsurface soils contaminants to the groundwater pathway; 4) the direct contact with ambient air by future Site residents; 5) the direct contact with subsurface air by future Site residents; and 6) the direct contact with VOCs and SVOCs in surface sediments by recreational users.

12.4 LIMITED RISK ANALYSIS/HAZARD EVALUATION

The purpose of the final step in the baseline qualitative HHE process is to evaluate the potential hazards associated with the existing levels of chemicals in environmental media.

From these evaluations the chemical hazards can be ranked based on chemical-specific toxicological, carcinogenic and environmental fate considerations. Consideration is given to the current environmental conditions at the Site, potential transport of chemicals in environmental media, and the possibility for human exposures. Direct comparisons to existing health-based ARARs further defines potential chemical hazards. The net result is a limited evaluation of the potential for non-cancer adverse toxic effects and potential cancer risks due to the existing levels of chemicals in environmental media at the Site.

Caution should be exercised in attempting to draw conclusions regarding any actual or perceived risks to individuals which may or may not exist within a potentially exposed population. The qualitative HHE does not provide a quantitative estimate of risk and cannot be interpreted or used to evaluate actual population-based risks. Nonetheless, the baseline qualitative HHE does provide a systematic and consistent basis for identifying the potential risks which may exist and identifying exposure pathways of possible concern. This information can then be factored into the remedial risk management decisions which are protective of public health and the environment.

12.4.1 Chemical Hazards/Ranking

Of major concern at sites with chemicals in environmental media is which of these chemicals are likely to provide the greatest hazards to human health and the environment. The ranking of chemical hazards is carefully accomplished such that they represent the most toxic, mobile, and persistent chemicals at the site, as well as those present in the largest amounts (i.e., the chemicals posing the "highest hazard"). Identifying the most hazardous chemicals at a site allows future studies and activities at the site to focus on the chemicals of greatest concern. This step ensures that future activities and studies at a site do not focus on less hazardous chemicals.

Two important factors for ranking chemical hazards at a site are the measured concentrations in environmental media and the toxicity of the specific chemicals. A concentration-toxicity screen has been developed by the EPA (EPA, 1989a) for use in risk assessments. For the purposes of this qualitative baseline HHE, this screening procedure may be used to indicate which chemicals are likely to pose the greatest relative risk. A chemical in a medium is scored according to its concentration and toxicity in order to obtain a risk factor as follows:

$$R_{ij} = (C_{ij})(T_{ij})$$

Where: R_{ij} = risk factor for each chemical i in medium j

C_{ij} = concentration of chemical i in medium j

T_{ij} = toxicity value for chemical i in medium j (either the CPF or 1/RfD)

This concentration-toxicity screen is conducted separately for each environmental media, and within each media, for noncarcinogenic and carcinogenic effects. The risk factors may then be used to provide an indication of which chemicals in a specific environmental media are likely to pose the greatest hazards at the Site. It is important to keep in mind that the risk factors developed in this screen are not expressions of risk and have no meaning outside the framework of the screen. They are developed only to provide a relative ranking of chemical hazards at the Site.

Of critical importance to any evaluation of potential hazards from a chemical in environmental media is the environmental mobility and persistence. The log K_{ow} (octanol-water partition coefficient) is a measure of how a chemical is distributed at equilibrium between octanol and water. Generally speaking, a low log K_{ow} indicates that a chemical distributes significantly into the water column (i.e., it is water soluble). If a chemical possesses a high log K_{ow}, it is not as soluble in water and may not be transported as significantly as a chemical with a low log K_{ow}. For chemicals in soil, the K_{oc} provides an indication of a chemicals ability to leach out of the soil/sediment and into groundwater and/or surface water. In general, chemicals with high K_{oc} values have correspondingly high bioconcentration factors. In contrast, chemicals with low K_{oc} values tend to readily leach from soils/sediments and are mobile in the water column. Environmental persistence is a measure of how long a chemical will exist in a given medium. The persistence of a chemical is reflected in its overall half-life in a specific medium. Chemicals with long environmental half-lives are more persistent and may pose a greater long-term hazard.

12.4.1.1 Groundwater

Table 12.21 presents the concentration-toxicity screen and relevant environmental properties of the noncarcinogenic analytes detected in monitoring well groundwater samples at the Site. This relative hazard ranking procedure indicates that trichloroethene, 1,2-dichloroethene (total), manganese, tetrachloroethene, antimony, lead, silver and arsenic presented the greatest noncarcinogenic risk factors. These analytes individually account for 61.4%, 28.9%, 2.8%, 2.5%, 1.2%, 1.1%, 1.0% and 0.4% of the noncarcinogenic hazard, and together account for over 99% of the noncarcinogenic hazards from groundwater at the Site. In general, these analytes also have relatively low log K_{ow} values (Table 12.23). Environmental half-lifes for these analytes in groundwater could not be located (EPA, 1986).

The concentration-toxicity screen and relevant environmental properties of the carcinogenic analytes detected in monitoring well groundwater samples at the Site are presented in Table 12.22. This relative hazard ranking procedure indicates that trichloroethene, tetrachloroethene, vinyl chloride, chrysene, 1,1-dichloroethene and arsenic presented the greatest carcinogenic risk factors. These analytes individually account for 61.1%, 15.3%, 10.5%, 5.6%, 4.6% and 2.3% of the carcinogenic hazard, and together account for over 99% of the carcinogenic hazards from groundwater at the Site. Table 12.22 also indicates that, in general, these analytes also have relatively low log K_{ow} values. Environmental half-lifes could not be located for these analytes in groundwater (EPA, 1986).

The concentration-toxicity screen for carcinogenic and noncarcinogenic analytes detected in residential well groundwater samples are presented in Tables 12.23 and 12.24, respectively. It can be seen from these evaluations that antimony, arsenic, lead, manganese, silver and barium presented the greatest noncarcinogenic risk factors and account for 40.3%, 37.9%, 10.8%, 5.4%, 4.2% and 1.0%, respectively, of the noncarcinogenic hazards from residential well groundwater. Arsenic and methylene chloride presented the greatest carcinogenic risk factors and accounted for 99.99% and 0.01%, respectively, of the carcinogenic hazards from residential well groundwater. With the exception of methylene chloride, relevant environmental properties could not be located be located for these analytes in groundwater.

12.4.1.2 Soil

Table 12.25 presents the concentration-toxicity screen and relevant environmental properties of the noncarcinogenic analytes detected in subsurface soils at the Site. This relative hazard ranking procedure indicates that trichloroethene, aldrin, 2-butanone, bis(2-ethylhexyl)phthalate, 1,2-dichloroethene, 4-methyl-2-pentanone, acetone, 4,4'-DDT, gamma-BHC, hexachlorobutadiene, tetrachloroethene, heptachlor, di-n-butylphthalate, vinyl chloride, naphthalene and di-n-octylphthalate presented the greatest noncarcinogenic risk factors. These analytes individually account for 55.9%, 12.3%, 6.5%, 5.6%, 5.3%, 4.3%, 1.9%, 1.6%, 1.3%, 1.2%, 1.0%, 0.7%, 0.7%, 0.4%, 0.2% and 0.2% of the noncarcinogenic hazard, and together account for over 99% of the noncarcinogenic hazards from subsurface soils at the Site. In general, the VOCs and SVOCs have relatively low K_{oc} values indicating that they do not bind appreciably to soil, while the detected pesticides have high K_{oc} values (Table 12.25). Environmental half-lifes for the majority of these analytes in soil could not be located (EPA, 1986). As evidenced by the half-life for 4,4'-DDT, the pesticides are expected to be fairly persistent in soils.

The concentration-toxicity screen and relevant environmental properties of the carcinogenic analytes detected in subsurface soil samples at the Site are presented in Table 12.26. This relative hazard ranking procedure indicates that Aroclor-1254, n-nitrosodiphenylamine, chrysene, benzo(a)anthracene, benzo(b)fluoranthene, benzo(a)pyrene, benzo(k)fluoranthene and aldrin presented the greatest carcinogenic risk factors. These analytes individually account for 83.3%, 11.2%, 1.3%, 1.0%, 0.9%, 0.6%, 0.5% and 0.5% of the carcinogenic hazard, and together account for over 99% of the carcinogenic hazards from subsurface soils at the Site. Table 12.26 also indicates that, in general, these analytes also have relatively high K_{oc} values. With the exception of benzo(a)pyrene, environmental half-lifes could not be located for these analytes in soils (EPA, 1986).

12.4.1.3 Air

Table 12.27 presents the concentration-toxicity screen and relevant environmental properties of the noncarcinogenic VOCs detected in ambient air and bore hole air samples at the Site. This relative hazard ranking procedure indicates that chlorobenzene, 4-methyl-2-pentanone, 2-butanone, xylenes and toluene presented the greatest noncarcinogenic risk factors for ambient air. These analytes individually account for 45.8%, 38.1%, 5.9%, 5.3%, and 4.0% of the noncarcinogenic hazard, and together account for over 99% of the noncarcinogenic hazards from ambient air at the Site. The VOCs chlorobenzene, toluene, 1,1,1-trichloroethane, 4-methyl-2-pentanone, xylenes, ethylbenzene and 1,1-dichloroethane presented the greatest noncarcinogenic risk factors for bore hole air. These analytes individually account for 35.4%, 24.1%, 20.7%, 8.9%, 8.3%, 1.4% and 1.2% of the noncarcinogenic hazard, and together account for over 99% of the noncarcinogenic hazards from bore hole air at the Site. In general, the analytes detected in air samples also have relatively high vapor pressures indicating that they are relatively volatile (Table 12.27). Available environmental half-lifes for these analytes in air indicate that, with the exception of 1,1,1-trichloroethane and 1,1-dichloroethane, these VOCs are not persistent in air.

The concentration-toxicity screen and relevant environmental properties of the carcinogenic VOCs detected in ambient air and bore hole air samples at the Site are presented in Table 12.28. This relative hazard ranking procedure indicates that benzene, chloroform, trichloroethene, tetrachloroethene and methylene chloride presented the greatest carcinogenic risk factors for ambient air. These analytes individually account for 52.9%, 36.9%, 5.4%, 2.5% and 2.3% of the carcinogenic hazard, and together account for approximately 100% of the carcinogenic hazards from ambient air at the Site. The VOCs vinyl chloride, trichloroethene and 1,1-dichloroethene presented the greatest carcinogenic risk factors for bore hole air. These analytes individually account for 96.0%, 2.9% and 0.9% of the carcinogenic hazard, and together account for over 99% of the carcinogenic hazards from bore hole air at the Site. Table 12.28 also indicates that, in general, these analytes in air samples also have relatively high vapor pressures. Available environmental half-lifes for these analytes in air indicate that, with the exception of chloroform, they are not extremely persistent in air.

12.4.1.4 Surface Sediment

Table 12.29 presents the concentration-toxicity screen and relevant environmental properties of the noncarcinogenic VOCs and SVOCs detected in surface sediments at the Site. (Note: the dermal absorption of inorganics is considered to be negligible - refer to Section 12.3.2.5). This relative hazard ranking procedure indicates that bis(2-ethylhexyl)phthalate, pyrene, fluoranthene and 2-butanone presented the greatest noncarcinogenic risk factors. These analytes individually account for 54.0%, 22.0%, 19.5% and 4.4% of the noncarcinogenic hazard, and together account for over 99% of the noncarcinogenic hazards from surface sediments at the Site. In general, these analytes have relatively high K_{oc} values. Environmental half-lifes for these analytes in sediment could not be located (EPA, 1986).

The concentration-toxicity screen and relevant environmental properties of the carcinogenic VOCs and SVOCs detected in surface sediment samples at the Site are presented in Table 12.30. This relative hazard ranking procedure indicates that chrysene, benzo(a)anthracene and benzo(a)pyrene presented the greatest carcinogenic risk factors. These analytes individually account for 46.8%, 38.7% and 14.3% of the carcinogenic hazard, and together account for over 99% of the carcinogenic hazards from surface sediments at the Site. Table 12.30 also indicates that, in general, these analytes also have relatively high K_{oc} values. Environmental half-lifes for all except benzo(a)pyrene (480 days) could not be located for these analytes in sediments (EPA, 1986).

12.4.2 Regulatory Standards and Guidelines

As indicated in Section 9.7 (Applicable or Relevant and Appropriate Requirements) the State of New York has developed health-based standards or guidelines for chemicals in environmental media. A review of these health-based criteria may provide an indication of potential hazards associated with the existing environmental conditions at the Site.

Therefore, this section provides a review of health-based ARARs established by the State. Relevant remediation goals for chemicals identified in environmental media at the Site are presented and are discussed below. For comparative purposes, the maximum detected concentration, 95% UCL of the arithmetic average concentrations, and average concentrations are also presented. It has been stated by the EPA that it is unreasonable to assume any long-term contact with the maximum concentration detected at a site. Therefore, in evaluating potential health risks from chemicals, the EPA (1989) utilizes the upper confidence limit (i.e., 95% UCL) on the arithmetic average concentration for exposure point concentrations. The 95% UCL provides a reasonable maximum concentration likely to be contacted over time (EPA, 1989a). In calculating the arithmetic average values, it was assumed that all non-detected results were equal to zero.

12.4.2.1 Groundwater

The chemical constituents and concentrations detected in Site groundwater are presented in Table 12.31 along with the relevant New York State criteria. A comparison of the detected concentrations to the regulatory criteria may provide an indication of the potential health risks the Site may pose to future residents who consume groundwater at the Site. This comparison indicates that the 95% UCL concentration of the following analytes exceed the New York State groundwater criteria:

Volatile Organics

Vinyl Chloride
Methylene Chloride
1,1-Dichloroethene
1,1-Dichloroethane
1,2-Dichloroethene (total)
Trichloroethene
Tetrachloroethene

Semivolatile Organics

Chrysene

Inorganics

Antimony
Copper
Iron
Magnesium
Manganese
Silver
Sodium
Sulfate

It should also be mentioned that the maximum concentrations of the following analytes (frequency of detection in parentheses) also exceeded the NYSDEC groundwater criteria: acetone (2/34), chloroform (2/35), 1,1,2-trichloroethane (2/35), benzene (5/35), toluene (6/35), lead and chloride. However, as stated previously it is unreasonable to assume any long-term contact with the maximum concentration detected at a site. Therefore, these chemical constituents detected in groundwater are not expected to significantly contribute to the overall health risks the Site may pose in the future to residents.

The chemical constituents and concentrations detected in residential well groundwater are presented in Table 12.32 along with the relevant New York State criteria. Although it is considered unlikely that the area drinking water wells are currently affected by the Site since they are all located up-gradient or cross-gradient from the Site, the detected levels were compared the NYSDEC groundwater criteria. This comparison indicated that the 95% UCL concentrations of the analytes below exceeded the applicable criteria:

Inorganics

Iron
Magnesium
Sodium

In addition the maximum detected concentration of antimony (1/7 detects), arsenic (1/7 detects) and sulfate exceeded the NYSDEC criteria.

12.4.2.2 Soils

The chemical constituents and concentrations detected in subsurface soils at the Site are presented in Table 12.33 along with the relevant New York State criteria. It is unlikely that there are currently any direct exposures to these soils since they are greater than 2 feet below the ground surface. However, since the NYSDEC criteria are designed to provide "safe" levels of chemicals in soil with consideration given to direct contact with soils as well as leaching to groundwater, a comparison of the detected concentrations to the regulatory criteria may provide an indication of the potential health risks the Site soil may pose to potential future site user. This comparison indicates that the 95% UCL concentration of the following analytes exceed the New York State soil criteria:

Volatile Organics

Acetone
2-Butanone
Trichloroethene
4-Methyl-2-pentanone

Semivolatile Organics

Phenol

It should also be mentioned that the maximum concentrations of the following analytes (frequency of detection in parentheses) also exceeded the NYSDEC soil criteria: methylene chloride (3/16), xylenes (5/33) and Aroclor-1254 (1/24). However, as stated previously it is unreasonable to assume any long-term contact with the maximum concentration detected at a site. Therefore, these chemical constituents detected in subsurface soil are not expected to significantly contribute to health risks the Site may pose to future Site residents.

12.4.2.3 Air

The chemical constituents and concentrations detected in air at the Site are presented in Table 12.34 along with the relevant New York State criteria. It is unlikely that there are currently any direct exposures to these vapors since the Site is relatively inaccessible and the soils of concern are 2 feet below grade due to the presence of a clay cap. However, since there were VOCs detected in one of the ambient air samples and in both of the boring hole samples, a comparison of the maximum detected concentrations to the regulatory criteria may provide an indication of the potential health risks the Site air may pose to potential future Site residents. This comparison indicates that the maximum concentration of the following analytes detected in ambient air exceed the New York State air criteria:

Volatile Organics

Trichloroethene
Benzene
Tetrachloroethene
1,1,2,2-Tetrachloroethane

The results of the boring air sampling results are also presented in Table 12.34. A comparison of these levels to the NYSDEC criteria indicates that the maximum concentration of the following analytes detected in bore hole air exceed the New York State air criteria:

Volatile Organics

Vinyl Chloride
1,1-Dichloroethene
Trichloroethene
Benzene
Tetrachloroethene

It should be mentioned that the NYSDEC criteria are designed to protect individuals exposed to chemicals in air 24 hours/day, 7 days/week for extended periods of time.

12.4.2.4 Surface Sediments

The chemical constituents and concentrations detected in surface sediments at the Site are presented in Table 12.35 along with the relevant New York State criteria. The criteria presented are designed for direct contact with surface soil. However, these levels are directly applicable to Site surface sediments since consumption of aquatic wildlife exposed to this environmental media is extremely limited (refer to Section 11.0). As such, the most likely exposure under current and potential future use scenarios would be direct contact via recreational activities such as wading. Therefore, since the NYSDEC criteria are designed to provide "safe" levels of chemicals in surface soil with consideration given to direct contact, a comparison of the detected concentrations to this regulatory criteria may provide an indication of the potential human health risks the surface sediments may pose. This comparison indicates that none of the maximum detected levels or the 95% UCL concentrations of any analytes exceed the New York State surface soil criteria. As such, the surface sediments at the Site are not considered to present a threat to human health.

12.4.3 Limited Risk Analysis

A risk analysis is a qualitative assessment of the toxic properties of a chemical in relation to a populations likelihood of exposure. The ultimate goal is to evaluate the possibility that exposed human populations may be adversely affected and to characterize the nature of the effects they may experience. Risk is broadly defined by the following relationship:

$$\text{Risk} \approx \text{Hazard x Exposure}$$

Of utmost importance in these analyses is the potential for exposure to the media of concern at the Site. For without a potential for exposure, even though a chemical hazard may exist on a site there can be no risk to health. An evaluation of potential human exposures to the chemicals in Site soils indicate that there are a number of exposure pathways of concern including: consumption and use of Site groundwater by future residents; future contact with excavated subsurface soils, as well as leaching of subsurface soils to groundwater; the inhalation of ambient and subsurface air by future residents; and direct contact with surface sediments during wading activities. Over 80 organic and inorganic chemicals were frequently detected in environmental media at the Site. In an effort to evaluate which of these chemicals presents the greatest potential health hazard, a concentration-toxicity screen was performed for each media (Tables 12.21 through 12.30). This screening procedure provided an indication of the chemicals which are expected to present the greatest noncarcinogenic and carcinogenic hazard (i.e., >99%) in each media. A comparison of the detected chemical constituents to relevant and applicable health-based regulatory criteria established by New York State was then conducted to identify which analytes may pose a health risk under current and potential future Site use considerations (refer to Tables 12.31 through 12.35). These two evaluations individually indicated that there are chemical constituents in groundwater, subsurface soils and air which may pose a risk to human health under current and potential future use considerations. By combining these two evaluations it is possible to identify which chemicals exceed regulatory criteria and are expected to account for the majority of the potential risks the Site may pose to human health.

Table 12.36 lists the parameters expected to account for >99% of the chemical hazard in each media and an indication of whether or not the respective regulatory criteria were exceeded.

12.4.3.1 Groundwater

Groundwater beneath the Site has been shown to contain elevated levels of chemicals in all three groundwater bearing zones. The most widespread contamination of chemicals appeared in the overburden/bedrock interface water bearing zone. The bedrock aquifer is of concern since nearby residences use this aquifer as a source for drinking water and household uses due to the absence of a public water supply. The potentiometric contours indicate that the horizontal component of groundwater movement is generally to the north and northeast, and is dependent upon seasonal fluctuations in precipitation. During the wet seasons (e.g., late Spring and Fall) the groundwater appears to shift from the northeast to a more northerly direction. Chemicals at the Site are not expected to be currently impacting the area drinking water supply since existing private wells are either cross- or up-gradient from the Site. However, this HHE evaluated the levels of chemicals detected in residential well groundwater. Analysis of residential well samples revealed a single detection of methylene chloride and 18 naturally occurring inorganics. It has previously been shown that 7 of these analytes account for over 99% of the chemical hazard on the Site. Table 12.36 indicates that none of these 7 chemicals exceeded the New York State groundwater criteria. Based on the above considerations, current Site conditions are not considered to be impacting the residential water supply wells.

As previously discussed, there were 38 chemicals frequently identified in monitoring well groundwater. This list included both noncarcinogenic and carcinogenic chemicals, several of which exceeded relevant New York State groundwater criteria. Previous evaluations also indicated that of these 38 chemicals in groundwater, over 99% of the chemical hazard may be attributed to only 8 analytes. Table 12.36 indicates that of these 8 chemicals of potential concern detected in groundwater, vinyl chloride, 1,1-dichloroethene, 1,2-dichloroethene, trichloroethene, tetrachloroethene, chrysene, antimony, and silver also exceeded the New York State groundwater criteria. Antimony does not appear to be a concern since groundwater in the upgradient monitoring well MW-5D contained 698 pcb. In addition, chrysene does not appear to be a concern since this compound does not appear as a contaminant of concern in the source areas.

Silver was detected in groundwater during the Phase I RI from monitoring wells MW-7S and MW-8S at 872 and 55.7 ppb, respectively. It appears that silver at these concentrations might be cause for a concern. However, silver concentrations have not been detected in other RI and past IRM sampling.

Silver was not detected in any significant concentration in surface sampling conducted during the RI and the previous IRM project. The analytical results of confirmatory soil samples collected from the staged stockpile soils also during the IRM resulted in only two elevated levels of silver at 0.24 and 20.7 ppb. In addition, silver was not detected in groundwater during the most recent sampling event of November 1993 under the operations and maintenance program. It can be concluded that silver does not appear to be a concern since silver concentrations have not been repeated in RI and IRM analytical results.

Chemicals at the Site are not expected to be currently impacting the area drinking water supply wells since existing private wells are either cross- or up-gradient from the Site, as discussed above. However, it is possible that the Site groundwater may continue to migrate off-site in the future and affect nearby residential wells. In addition, the groundwater may be used in the future as a drinking water supply since a viable aquifer exists beneath the Site. Based on the above considerations, future ingestion and use of groundwater may pose a health risk to area residents. The majority of the noncarcinogenic health hazards from these

Based on the above considerations, future ingestion and use of groundwater may pose a health risk to area residents. The majority of the noncarcinogenic health hazards from these chemicals of potential concern are likely to be attributed to trichloroethene, 1,2-dichloroethene, manganese, tetrachloroethene, antimony and silver. The majority of the carcinogenic health hazards from these chemicals of potential concern are expected to be attributed to trichloroethene, tetrachloroethene, vinyl chloride, chrysene, and 1,1-dichloroethene.

12.4.3.2 Soil

Previous evaluations indicated that there were 49 chemicals frequently identified in Site subsurface soils. This list included both noncarcinogenic and carcinogenic chemicals. Previous evaluations also indicated that of these 49 chemicals in soil, over 99% of the chemical hazard may be attributed to only 23 analytes. Table 12.36 indicates that of these 23 chemicals of potential concern detected in subsurface soils, trichloroethene, acetone, 2-butanone, 4-methyl-2-pentanone and the one detection of Aroclor-1254 were the only analytes which also exceeded the New York State soil criteria.

The IRM performed at the Site involved the excavation of significant quantities of contaminated soil and the placement of a clay cap over the landfill portion of the Site, thereby, precluding human exposures via direct contact. However, these subsurface soils may provide a source for future contamination of groundwater. In addition, these subsurface soils may be brought to the surface during excavation activities related to potential future residential uses of the Site. Based on the above considerations, subsurface soils at the Site may pose a health risk to future Site residents. The majority of the noncarcinogenic health hazards from these chemicals of potential concern are likely to be due trichloroethene, 2-butanone, 4-methyl-2-pentanone and acetone. The majority of the carcinogenic health hazards from the chemicals of potential concern are expected to be due to trichloroethene, with the one Aroclor-1254 contaminated area also contributing.

12.4.3.3 Air

As previously discussed, there were 18 VOCs identified in ambient and bore hole air samples collected at the Site. This list included both noncarcinogenic and carcinogenic chemicals. Previous evaluations also indicated that of the 13 VOCs detected in ambient air, over 99% of the chemical hazard may be attributed to 10 analytes. Table 12.36 indicates that of these 10 chemicals of potential concern detected in ambient air, trichloroethene, benzene and tetrachloroethene were the only analytes which also exceeded the New York State ambient air criteria. Of the 14 chemicals detected in bore hole air, over 99% of the chemical hazard may be attributed to 10 VOCs. Table 12.36 indicates that of these 10 chemicals of potential concern detected in bore hole air, vinyl chloride, 1,1-dichloroethene and trichloroethene were the only analytes which also exceeded the New York State ambient air criteria.

Since the IRM performed at the Site involved the excavation of significant quantities of contaminated soil and the placement of a clay cap over the landfill portion of the Site, it is not expected that significant volatilization of chemicals into ambient air will occur under current Site conditions. However, since 13 VOCs were detected in one of the ambient air samples, this pathway is considered to provide a pathway whereby future Site residents may be exposed. In addition, it is foreseeable that future uses of the Site may include residential uses. Therefore, it is possible that the basement of a house may be in contact with contaminated subsurface soils, thereby presenting indoor air levels of the VOCs detected in bore hole air. Based on the above considerations, air present at the Site may pose a health risk to future Site residents. The majority of the health hazards from these chemicals of potential concern in ambient air are likely to be due the carcinogenic potential of benzene, trichloroethene and tetrachloroethene. The majority of the health hazards from these chemicals of potential concern in bore hole air (i.e., household air) are likely to be due the carcinogenic potential of vinyl chloride, trichloroethene and 1,1-dichloroethene.

12.4.3.4 Surface Water

Remedial investigations at the Site indicated that there were 8 inorganics identified it elevated levels (relative to the up-gradient sample) in Site surface water. The Fish and Wildlife Impact Analysis (Section 11.0) indicated that consumption of aquatic life from these surface waters is extremely unlikely. As such, it is expected that the only pathway of human exposure to these surface waters would be dermal contact during wading activities. The EPA and the New York State Department of Health have both stated that the dermal absorption of inorganics is considered to be negligible (EPA, 1989b; NYSDOH, 1992). Based on the above considerations, Site surface water is not considered to pose a pathway of concern under current and potential future use considerations.

12.4.3.5 Surface Sediments

As previously discussed, there were 16 chemicals frequently identified in Site surface sediment samples and at levels above the up-gradient samples. This list included both noncarcinogenic and carcinogenic chemicals. Previous evaluations also indicated that of these 16 chemicals in surface water, over 99% of the chemical hazard may be attributed to only 4 analytes. Table 12.36 indicates that of these 4 chemicals of potential concern detected in surface sediments, none exceeded the New York State surface soil criteria.

It is possible that individuals may come into contact with surface sediments during wading activities. However, since none of the detected levels of chemical constituents exceeded New York State surface soil criteria, the surface sediment levels detected on Site are not expected pose a human health risk.

12.5 SUMMARY AND CONCLUSIONS

This LRA/HE is intended to evaluate current known Site conditions and available environmental analytical results in an effort to qualitatively assess the potential human health and environmental risks posed by the Site. This was accomplished by reviewing the levels of the chemical constituents in soils, evaluating the toxicological and physical/chemical properties of the chemicals of concern, identifying potential exposure pathways and comparing applicable New York State health-based regulatory limits or guidelines to the existing Site conditions.

Based on the evaluations conducted in this qualitative HHE, the existing conditions at the Site are not expected to provide any current exposure pathways which may pose a potential human health concern. There are three future residential use considerations which may pose human health concerns: 1) the future ingestion and use of groundwater by residents; 2) the existing levels of chemicals in subsurface soils since they may contaminate groundwater in the future; and 3) the inhalation of ambient and subsurface air by future Site residents. The noncarcinogenic human health hazards related to future groundwater ingestion and use are expected to be primarily attributed to trichloroethene, 1,2-dichloroethene and tetrachloroethene. The majority of the carcinogenic health hazards related to future groundwater ingestion and use are expected to be primarily attributed to trichloroethene, tetrachloroethene, vinyl chloride, and 1,1-dichloroethene. Potential noncarcinogenic human health hazards associated with the subsurface soil contamination at the Site are expected to be primarily attributed to trichloroethene, 2-butanone, 4-methyl-2-pentanone and acetone. The majority of the carcinogenic health hazards associated with the subsurface soils are expected to be primarily attributed to trichloroethene, with the one Aroclor-1254 contaminated area also contributing. The human health hazards associated with ambient and subsurface air are expected to be primarily attributed to the carcinogenic chemicals vinyl chloride, 1,1-dichloroethene, trichloroethene, benzene and tetrachloroethene.

TABLE 12.1

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Organic Parameters
Detected in Monitoring Well Groundwater Samples (1)

Parameter	Minimum Detected Conc.	Maximum Detected Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
Volatile Organics						
Vinyl Chloride	2.0	79.0	7.6	20.82	13.5	7/35
Methylene Choride	2.0	120.0	5.7	23.12	13.3	7/27
Acetone	21.0	87.0	3.2	15.24	7.5	2/34
1,1-Dichloroethene	2.0	110.0	5.9	19.54	11.5	7/35
1,1-Dichloroethane	10.0	47.0	2.9	9.49	5.6	4/35
2-Butanone	62.0	62.0				1/35
1,2-Dichloroethene(total)	2.0	100,000.0	3,404.5	17,080.16	8,286.6	12/35
Chloroform	9.0	10.0	0.5	2.24	1.2	2/35
1,2-Dichloroethane	5.0	5.0				1/35
Trichloroethene	4.0	78,000.0	2,757.5	13,306.13	6,560.8	10/35
1,1,2-Trichloroethane	4.0	7.0	0.3	1.35	0.7	2/35
Benzene	2.0	4.0	0.4	0.97	0.6	5/35
4-Methyl-2-Pentanone	31.0	31.0				1/35
Tetrachloroethene	2.0	4,300.0	232.1	955.54	505.3	7/35
Toluene	2.0	12.0	0.7	2.17	1.3	6/35
Chlorobenzene	2.0	4.0				1/35
Ethylbenzene	3.0	3.0				1/35
Total Xylenes	10.0	10.0				1/35
Total Volatiles	2.0	178,311.0	6,424.6	30,406.27	15,115.7	24/35
Total Volatile TIC's	6.0	19,000.0	551.3	3,210.23	1,468.9	6/35
Semi-Volatile Organics						
Di-n-butylphthalate	2.0	2.0				1/22
4-Methylphenol	2.0	2.0				1/22
Chrysene	1.0	11.0	1.1	2.74	2.1	5/22
bis(2-Ethylhexyl)phthalate	1.0	11.0	1.4	3.32	2.6	5/22
Phenol	9.0	9.0				1/22
Total Semi-Volatiles	1.0	15.0	2.8	4.56	4.5	11/22
Total Semi-Volatile TIC'S	13.0	489.0	91.2	148.52	145.7	13/22
Pesticides/PCB's						
All Parameters						0/22
Total Pesticides						0/22

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

TABLE 12.2

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Inorganic Parameters Detected in Monitoring Well Groundwater Samples (1)

Parameter	Minimum Detected Conc.	Maximum Detected Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
TAL Metals						
Aluminum	133.0	27,200.0	3,443.8	6,435.09	5,805.0	20/22
Antimony	39.1	80.0**	17.9	28.07	28.2	7/22
Arsenic	6.9	18.8	1.5	4.38	3.1	3/22
Barium	11.5	303.0	67.1	72.40	93.6	20/22
Beryllium	1.1	1.1				1/22
Cadmium						0/22
Calcium	15,400.0	540,000.0	165,568.2	136,376.40	215,607.2	22/22
Chromium	4.8	41.7	7.5	10.05	11.2	13/22
Cobalt	9.7	24.3	2.5	6.03	4.7	4/22
Copper	8.1	102,000.0	4,643.5	21,744.88	12,622.1	8/22
Iron	1,580.0	51,600.0	11,530.0	13,091.91	16,333.7	21/22
Lead	3.0	52.3	5.2	10.70	8.3	15/35
Magnesium	6,140.0	201,000.0	71,041.4	48,235.98	88,740.0	22/22
Manganese	32.9	1140*	265.2	287.00	370.5	22/22
Mercury	0.5	0.5				1/22
Nickel	32.6	45.6	6.8	14.89	12.3	4/22
Potassium	2,040.0	36,500.0	7,696.8	8,677.34	10,880.7	22/22
Selenium						0/22
Silver	3.0	872.0	44.5	185.49	112.6	3/22
Sodium	5,700.0	990,000.0	121,603.2	236,011.43	208,200.1	22/22
Thallium						0/22
Vanadium	5.1	64.2	7.2	14.61	12.6	9/22
Zinc	5.6	147.0	39.4	41.39	54.6	21/22
Misc. Compounds						
Total Cyanide	10.0	10.0				1/22
Chloride (mg/l)	8.0	321.0	90.6	92.12	134.6	13/13
Fluoride (mg/l)	0.2	1.5	0.6	0.42	0.8	13/13
Nitrate (mg/l)	0.1	4.2	0.3	1.17	0.9	3/13
Sulfate (mg/l)	36.0	486.0	214.2	133.61	277.9	13/13

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

* Maximum detected concentration in MW-11I groundwater resampled on 3/93 resulting in 616 ppb.

** Maximum detected concentration in MW-12D; upgradient well MW-5D detected at 69.8 ppb.

TABLE 12.3

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Organic Parameters
Detected in Residential Well Groundwater Samples (1)

Parameter	Minimum Detected Conc.	Maximum Detected Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
Volatile Organics						
Methylene Chloride	0.7	0.7				1/14
All Other Parameters						0/14
Total Volatiles	0.7	0.7				1/14
Total Volatile TIC's						0/14
Semi-Volatile Organics						
All Parameters						0/7
Total Semi-Volatile TIC's	2.0	25.0	13.0	8.54	19.3	7/7
Pesticides/PCB's						
All Parameters						0/7

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

TABLE 12.4

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Inorganic Parameters Detected in Residential Well Groundwater Samples (1)

Parameter	Minimum Detected Conc.	Maximum Detected Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
TAL Metals						
Aluminum	40.2	55.8	13.7	23.85	31.2	2/7
Antimony	38.5	38.5				1/7
Arsenic	5.6	27.2	2.3	7.31	5.8	2/14
Barium	11.7	160.0	72.9	63.61	119.6	7/7
Beryllium						
Cadmium						
Calcium	87,500.0	134,000.0	109,600.0	16,221.28	121,512.7	7/7
Chromium						
Cobalt						
Copper	7.4	69.2	18.4	25.40	37.1	4/7
Iron	43.4	3,020.0	729.1	1,081.98	1,523.6	6/7
Lead	4.0	7.4	1.2	2.54	2.4	3/14
Magnesium	31,300.0	54,100.0	44,885.7	9,053.81	51,534.7	7/7
Manganese	10.7	64.6	26.2	21.11	41.7	6/7
Mercury						
Nickel						
Potassium	2,390.0	7,080.0	3,465.7	2,822.95	5,538.8	5/7
Selenium						
Silver	50.4	50.4				1/7
Sodium	5,100.0	94,300.0	52,757.1	33,905.25	77,656.7	7/7
Thallium						
Vanadium						
Zinc	7.3	246.0	48.0	87.93	112.5	6/7
Anions(mg/l)						
Total Cyanide						
Chloride	5.0	206.0	90.9	66.88	140.0	7/7
Fluoride	0.1	0.9	0.4	0.32	0.6	7/7
Nitrate	0.1	0.4	0.1	0.13	0.2	2/7
Sulfate	48.0	297.0	137.7	86.08	200.9	7/7

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

TABLE 12.5

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Organic Parameters
Detected in Subsurface Soil Samples (1)

Parameter	Minimum Detection Conc.	Maximum Detection Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
Volatile Organics						
Vinyl Chloride	7.0	27.0	1.0	4.82	2.5	2/33
Methylene Chloride	3.0	230.0	16.3	57.31	41.4	3/16
Acetone	9.0	8,900.0	668.1	2,103.51	1,288.0	8/33
Carbon Disulfide	2.0	2.0				1/33
1,1-Dichloroethene	2.0	14.0	0.5	2.45	1.2	2/33
1,1-Dichloroethane	18.0	79.0	2.9	14.01	7.1	2/33
1,2-Dichloroethene (total)	1.0	4,900.0	272.5	948.43	552.1	15/33
2-Butanone	120.0	15,000.0	1,200.6	3,725.66	2,298.6	6/33
1,1,1-Trichloroethane	140.0	600.0	22.4	106.51	53.8	2/33
4-Methyl-2-Pentanone	7.0	10,000.0	576.9	2,161.83	1,214.0	6/33
Trichloroethene	3.0	19,000.0	709.3	3,328.26	1,690.2	10/33
Tetrachloroethene	1.0	450.0	23.7	91.65	50.7	7/33
Toluene	2.0	840.0	45.9	154.65	91.5	9/33
Ethylbenzene	6.0	570.0	22.8	99.94	52.3	5/33
Total Xylenes	28.0	3,900.0	145.3	680.74	345.9	5/33
1,1,2,2-Tetrachloroethane	14.0	14.0				1/33
Total Volatiles	4.0	33,891.0	3,824.1	8,712.79	6,391.9	27/33
Total Volatile TIC's	29.0	7,011.0	444.4	1,531.02	895.6	12/33
Semi-Volatile Organics						
Benzoic Acid	6.0	20.0	0.8	3.60	1.8	2/33
Phenol	150.0	270.0	19.1	62.18	37.4	3/32
2-Methylphenol	13.0	14.0	0.8	3.27	1.8	2/33
4-Methylphenol	15.0	230.0	12.0	43.62	24.8	4/33
Naphthalene	30.0	330.0	24.4	67.22	44.2	7/31
2-Methylnaphthalene	2.0	190.0	12.2	38.11	23.5	3/33
Diethylphthalate	6.0	400.0	33.0	81.67	57.1	6/32
N-Nitrosodiphenylamine	7.0	140.0	5.0	24.35	12.1	2/33
Di-n-butylphthalate	24.0	3,100.0	400.8	779.16	694.1	15/21
Butylbenzylphthalate	16.0	76.0	4.7	16.37	9.8	3/30
bis(2-Ethylhexyl)phthalate	23.0	5,200.0	866.1	1,352.95	1,264.9	18/33
Di-n-octylphthalate	4.0	160.0	6.7	29.17	15.7	6/30
Hexachlorobutadiene	22.0	110.0	5.5	21.04	11.7	3/33
4 Chloro-3-methylphenol	10.0	10.0				1/33
1,2,4-Trichlorobenzene	9.0	9.0				1/33
Acenaphthylene	13.0	13.0				1/33
Acenaphthene	9.0	17.0	0.8	3.30	1.8	2/33
4-Nitrophenol	26.0	26.0				1/33
Dibenzofuran	9.0	9.0				1/33
2,4-Dinitrotoluene	4.0	4.0				1/33
Flourene	31.0	64.0	6.4	18.20	11.8	4/33
Phenanthrene	22.0	420.0	31.6	90.93	58.4	5/33
Anthracene	32.0	32.0				1/32
Carbazole	13.0	13.0				1/32
Flouranthene	13.0	200.0	7.5	34.87	17.8	4/33
Pyrene	5.0	120.0	5.8	21.66	12.2	5/33
Benzo (a) anthracene	85.0	85.0				1/33
Chrysene	8.0	110.0	4.1	19.31	9.8	3/33
Benzo(b)flouranthene	76.0	76.0				1/33
Benzo(k)flouranthene	47.0	47.0				1/33
Benzo(a)pyrene	53.0	53.0				1/33
Total Semi-Volatiles	48.0	25,090.0	2,051.4	4,348.88	3,333.1	31/33
Total Semi-Volatile TIC'S	82.0	29,524.0	9,583.1	9,667.48	12,432.2	31/33
Pesticides & PCBs						
Aldrin	2.4	17.0	0.8	3.48	2.0	2/24
Aroclor-1254	6,900.0	6,900.0				1/24
Heptachlor	16.0	16.0				1/24
Dieldrin	39.0	39.0				1/24
Endrin	41.0	41.0				1/24
4,4'-DDT	37.0	37.0				1/24
gamma-BHC(Lindane)	18.0	18.0				1/24
Total Pesticides/PCBs	2.4	6,900.0	287.6	1,408.44	1,057.1	2/24

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

TABLE 12.6

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Inorganic Parameters Detected in Subsurface Soil Samples (1)

Parameter	Minimum Detected Conc.	Maximum Detected Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection	Avg. Conc. in Uncontam. Soils (2)	Upper Range in Uncontam. Soils (2)
TAL Metals								
Aluminum	1,950.0	14,000.0	4,727.8	3,418.66	6,129.8	18/18	33,000	300,000
Antimony	8.4	26.2	7.7	9.66	11.7	8/18	1	150
Arsenic	1.5	3.0	1.7	0.94	2.1	15/18	5	12
Barium	19.3	127.0	43.9	27.23	55.1	18/18	290	600
Beryllium	0.3	0.6	0.1	0.21	0.2	6/18	1	2
Cadmium						0/18	1	7
Calcium	2,450.0	124,000.0	74,436.1	32,256.31	87,665.1	18/18	3,400	35,000
Chromium	3.3	22.1	8.1	5.21	10.3	18/18	33	40
Cobalt	1.7	13.2	3.5	3.46	4.9	16/18	6	60
Copper	1.7	32.0	8.4	7.55	11.5	16/18	20	100
Iron	5,400.0	25,000.0	10,485.0	5,184.42	12,611.2	18/18	14,000	550,000
Lead	2.6	8.8	5.1	1.90	5.9	18/18	14	61
Magnesium	1,800.0	45,800.0	23,926.1	13,326.67	29,391.7	18/18	6,300	9,000
Manganese	77.6	967.0	349.3	180.96	423.5	18/18	850	4,000
Mercury	0.1	0.1	0.0	0.04	0.0	2/18	0	0
Nickel	8.2	30.4	7.2	9.04	10.9	10/18	40	60
Potassium	331.0	2,900.0	926.7	642.20	1,190.0	18/18	12,000	37,000
Selenium						0/18	0	12
Silver						0/18	-	8
Sodium	102.0	356.0	191.6	81.40	225.0	17/18	6,300	15,000
Thallium						0/18	-	-
Vanadium	6.9	30.6	14.1	6.35	16.8	18/18	100	300
Zinc	11.2	79.2	34.1	18.77	41.8	18/18	50	300
Misc. Compounds								
Cyanide							-	-
Chloride	70.0	137.0	95.9	22.87	111.2	8/8	-	-
Fluoride	0.1	0.1	0.1	0.02	0.1	8/8	-	-
Nitrate	0.2	0.2	0.0	0.08	0.1	1/8	-	-
Sulfate	51.0	206.0	134.8	54.79	171.5	8/8	-	-

(1) Results expressed in mg/l (ppm) unless otherwise noted.

(2) Refer to Table 9.12C.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

TABLE 12.7

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Volatile Organic Parameters Detected in Air Samples (1)

	Ambient Air		Boring Air	
Parameter	**APA-A1**	**APA-A2**	**APA-B6**	**APA-B12**
Volatile Organics				
Vinyl Chloride	ND	ND	260	20
Methylene Chloride	ND	3 J	8 JB	2 J
Acetone	ND	46	ND	ND
1,1-Dichloroethene	ND	ND	4 J	4 J
1,1-Dichloroethane	ND	ND	14	ND
1,2-Dichloroethene (total)	ND	ND	370	47
Chloroform	ND	1 J	ND	ND
2-Butanone	ND	22	ND	ND
1,1,1-Trichloroethane	ND	ND	140	ND
Bromodichloromethane	ND	1 J	ND	ND
1,2-Dichloropropane	ND	3 J	ND	ND
Trichloroethene	ND	2 J	390	31
Benzene	ND	4 J	ND	4 J
4-Methyl-2-Pentanone	ND	10	4 J	ND
2-Hexanone	ND	12	ND	ND
Tetrachloroethene	ND	3 J	ND	40
1,1,2,2-Tetrachloroethane	ND	3 J	ND	ND
Toluene	ND	6	62	4 J
Chlorobenzene	ND	3 J	ND	4 J
Ethylbenzene	ND	3 J	9 J	ND
Total Xylenes	ND	6	16	ND
Total Volatiles	ND	122	1277	156
Total Volatile TIC's	25 J	30 JB	ND	8 J

(1) Results expressed in ppb.
ND = Not detected.

TABLE 12.8

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Organic Parameters Detected in Surface Water Samples (1)

Parameter	Upgradient Conc. (SW-4)	Minimum Detection Conc.	Maximum Detection Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
Volatile Organics							
Tetrachloroethene		21.0	21.0				1/9
Methylene Chloride	4.0	1.0	4.0	2.2	1.92	3.4	6/9
Total Volatiles	4.0	1.0	21.0	4.6	6.41	8.5	7/9
Total Volatile TIC's		8.0	8.0				1/9
Semi-Volatile Organics							
bis(2-Ethylhexyl)phthalate	NA	41.0	41.0				1/3
Total Semi-Volatiles	NA	41.0	41.0				1/3
Total Semi-Volatile TIC'S	NA	2.0	17.0	8.0	7.94	21.4	3/3
Pesticides/PCB's							
All Parameters	NA						0/3

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

NA = Not Analyzed.

TABLE 12.9

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Inorganic Parameters Detected in Surface Water Samples (1)

Parameter	Upgradient Conc. (SW-4)	Minimum Detected Conc.	Maximum Detected Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
TAL Metals							
Aluminum	154.0	45.0	25,700.0	4,916.8	9,590.36	10,862.8	9/9
Antimony		93.5	93.5				1/9
Arsenic		5.6	6.9	1.4	2.78	3.1	2/9
Barium	84.2	42.8	429.0	100.2	125.80	178.2	9/9
Beryllium							0/9
Cadmium							0/9
Calcium	10,600.0	10,200.0	215,000.0	68,611.1	70,128.35	112,090.7	9/9
Chromium		16.6	38.3	6.1	13.26	14.3	2/9
Cobalt		9.1	22.6	3.5	7.76	8.3	2/9
Copper		6.1	31.6	7.2	11.02	14.1	4/9
Iron	380.0	173.0	36,500.0	6,853.7	13,247.66	15,067.2	9/9
Lead		12.3	80.1	11.6	28.03	28.9	2/9
Magnesium	32,100.0	27,200.0	77,400.0	38,355.6	15,038.96	47,679.7	9/9
Manganese	143.0	91.0	5,690.0	1,034.9	1,810.98	2,157.7	9/9
Mercury							0/9
Nickel		33.6	33.6				1/9
Potassium	2540 UJ	2,860.0	10,500.0	6,570.0	3,824.75	8,941.3	3/9
Selenium							0/9
Silver		8.3	8.3				1/9
Sodium	80,000.0	7,730.0	54,700.0	34,847.8	16,247.67	44,921.3	9/9
Thallium							0/9
Vanadium		33.5	54.1	9.7	19.99	22.1	2/9
Zinc		9.6	269.0	45.1	90.28	101.0	4/9
Anions (mg/l)							
Total Cyanide							
Chloride	NA	18.0	72.0	47.3	27.30	93.4	3/3
Fluoride	NA	0.2	0.3	0.2	0.03	0.3	3/3
Nitrate	NA						0/3
Sulfate	NA	82.0	203.0	124.3	68.19	239.3	3/3

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

NA = Not Analyzed.

TABLE 12.10

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Organic Parameters
Detected in Surface Sediment Samples (1)

Parameter	Upgradient Conc. (SS-4)	Minimum Detected Conc.	Maximum Detected Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
Volatile Organics							
Methylene Chloride	18.0	In sample blanks					
Acetone	100.0	64.0	180.0	48.8	78.40	123.6	2/5
2-Butanone		35.0	37.0	8.0	15.88	17.8	2/9
Total Volatiles	118.0	71.0	390.0	233.8	126.47	312.2	9/9
Total Volatile TIC's							0/9
Semi-Volatile Organics							
4-Methylphenol		20.0	230.0	44.4	85.16	97.2	3/9
Benzoic Acid		32.0	38.0	7.8	15.51	17.4	2/9
Di-n-Butylphthalate							
Phenanthrene		21.0	110.0	14.6	36.46	37.2	2/9
N-Nitrosodiphenylamine		41.0	41.0				1/9
Anthracene		21.0	21.0				1/9
Fluoranthene		14.0	130.0	23.3	43.14	50.1	4/9
Pyrene		12.0	110.0	22.3	35.71	44.5	5/9
Chrysene		29.0	75.0	11.6	25.65	27.5	2/9
Benzo(a)Anthracene		62.0	62.0				1/9
bis(2-Ethylhexyl)phthalate	72.0	40.0	180.0	93.9	55.18	128.1	8/9
Benzo(a)Pyrene		23.0	23.0				1/9
Total Semi-Volatiles	72.0	72.0	763.0	234.2	217.07	368.8	10/10
Total Semi-Volatile TIC'S	103,060.0	5,095.0	146,450.0	52,599.4	58,758.17	89,029.5	10/10

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

TABLE 12.11

SWEDEN-3 CHAPMAN SITE
Summary of Concentrations of Inorganic Parameters Detected in Surface Sediment Samples (1)

Parameter	Upgradient Conc. (SS-4)	Minimum Detected Conc.	Maximum Detected Conc.	Average Conc.	Standard Deviation	95% UCL	Frequency of Detection
TAL Metals							
Aluminum	19,600.0	7,650.0	27,700.0	14,840.0	6,175.50	18,722.3	9/9
Antimony							0/9
Arsenic	8.2	2.8	9.3	4.7	2.02	6.0	9/9
Barium	213.0	48.8	226.0	146.5	50.34	178.2	9/9
Beryllium	0.6	0.4	1.4	0.7	0.28	0.9	9/9
Cadmium	1.8	1.8	15.5	2.0	5.13	5.2	2/9
Calcium	11,000.0	1,890.0	33,500.0	14,015.6	9,533.19	20,008.8	9/9
Chromium	20.5	8.9	31.5	19.8	7.20	24.4	9/9
Cobalt	12.5	6.6	14.7	10.0	2.54	11.6	9/9
Copper	11.0	8.0	156.0	38.5	49.09	69.4	9/9
Iron	16,800.0	13,100.0	27,900.0	18,822.2	4,944.39	21,930.6	9/9
Lead	27.2	16.3	108.0	43.4	27.82	60.9	9/9
Magnesium	5,420.0	1,720.0	7,100.0	4,701.1	1,577.53	5,692.9	9/9
Manganese	131.0	131.0	1,480.0	618.1	433.81	890.8	9/9
Mercury	0.4	0.3	1.3	0.4	0.50	0.7	5/9
Nickel	19.7	11.3	24.5	16.9	7.55	21.6	8/9
Potassium	2,630.0	509.0	3,670.0	1,682.2	1,011.15	2,317.9	9/9
Selenium		5.5	5.5				1/9
Silver							0/9
Sodium		88.0	423.0	251.8	139.64	339.6	8/9
Thallium							0/9
Vanadium	30.5	15.9	48.6	30.5	10.81	37.3	9/9
Zinc	148.0	41.5	1,090.0	239.6	325.37	444.2	9/9
Anions							
Total Cyanide							0/9

(1) Results expressed in ug/l (ppb) unless otherwise noted.

Average conc. = Arithmetic average concentration, assuming a value of zero for all non-detected results.

95% UCL = 95 percent upper confidence limit on the arithmetic average concentration.

TABLE 12.12

EPA Weight-of-Evidence Classification System for Carcinogenicity

Group	Description
A	Human carcinogen
B	Probable human carcinogen
B1	indicates that limited human data are available
B2	indicates sufficient evidence in animals and inadequate or no evidence in humans
C	Possible human carcinogen
D	Not classifiable as to human carcinogenicity
E	Evidence of noncarcinogenicity for humans

TABLE 12.13

SWEDEN-3 CHAPMAN SITE
Ranking of Noncarcinogenic Hazards for Analytes Detected in Monitoring Well Groundwater Samples

Parameter	Chronic Reference Dose (mg/kg/day)		
	Inhalation	Oral	Source
Nitrate		1.6E+00	IRIS
Zinc		3.0E-01	IRIS
1,2-Dichloroethane		2.5E-01	ATSDR
Toluene	1.1E-01	2.0E-01	IRIS(2)
1,1-Dichloroethane	5.0E-01	1.0E-01	HEAST
Acetone		1.0E-01	IRIS
Barium	5.0E-04	7.0E-02	HEAST/IRIS
Fluoride		6.0E-02	IRIS
Methylene Choride	3.0E+00	6.0E-02	HEAST/IRIS
1,2-Dichloroethene(total)		2.0E-02	IRIS (1)
Bis(2-ethylhexyl)phthalate		2.0E-02	IRIS
Nickel		2.0E-02	IRIS
Chloroform		1.0E-02	IRIS
Tetrachloroethene		1.0E-02	IRIS
1,1-Dichloroethene		9.0E-03	IRIS
Trichloroethene		7.4E-03	EPA, 1987
Vanadium		7.0E-03	HEAST
Beryllium		5.0E-03	IRIS
Chromium		5.0E-03	IRIS(3)
Manganese	1.1E-04	5.0E-03	IRIS (2)(5)
Silver		5.0E-03	IRIS
1,1,2-Trichloroethane		4.0E-03	IRIS
Vinyl Chloride		1.3E-03	ATSDR
Antimony		4.0E-04	IRIS
Arsenic		3.0E-04	IRIS
Lead		2.9E-04	EPA (4)
Aluminum			
Benzene			
Calcium			
Chloride			
Chrysene			
Cobalt			
Copper			
Iron			
Magnesium			
Potassium			
Sodium			
Sulfate			

(1) Established for trans-1,2-dichloroethene.
(2) Based on an inhalation rate of 20 cu. m/day by a 70 kg individual.
(3) Established for chromium VI.
(4) Lifetime Health Advisory. EPA, 1985.
(5) Oral RfD for manganese in water. The oral RfD for food is 1.4E-01.

TABLE 12.14

SWEDEN-3 CHAPMAN SITE
Ranking of Carcinogenic Hazards for Analytes Detected in Monitoring Well Groundwater Samples

Parameter	CANCER POTENCY FACTOR (mg/kg/day)-1			
	Class	Inhalation	Oral	Source
Chrysene	B2		7.30E+00	IRIS(3)
Beryllium	B2	8.4E+00	4.3E+00	IRIS (1)
Vinyl Chloride	A	3.0E-01	1.9E+00	HEAST
Arsenic	A	1.5E+01	1.8E+00	IRIS (1)
1,1-Dichloroethene	C	1.8E-01	6.0E-01	IRIS
1,2-Dichloroethane	B2	9.1E-02	9.1E-02	IRIS (1)
1,1,2-Trichloroethane	C	5.7E-02	5.7E-02	IRIS (1)
Tetrachloroethene	B2	1.8E-03	5.1E-02	HEAST(1)
Benzene	A	2.9E-02	2.9E-02	IRIS
Bis(2-ethylhexyl)phthalate	B2		1.4E-02	IRIS
Trichloroethene	B2/C	6.0E-03	1.1E-02	EPA, 1992
Methylene Choride	B2	1.7E-03	7.5E-03	IRIS (1)
Chloroform	B2	8.1E-02	6.1E-03	IRIS (1)
Chromium	A	4.2E+01		IRIS (1)(4)
Lead	B2			IRIS
1,1-Dichloroethane	C			IRIS
1,2-Dichloroethene(total)	D			IRIS (2)
Acetone	D			IRIS
Copper	D			IRIS
Manganese	D			IRIS
Silver	D			IRIS
Toluene	D			IRIS
Zinc	D			IRIS
Aluminum				
Antimony				
Barium				
Calcium				
Chloride				
Cobalt				
Fluoride				
Iron				
Magnesium				
Nickel				
Nitrate				
Potassium				
Sodium				
Sulfate				
Vanadium				

(1) Based on an inhalation rate of 20 cu. m/day by a 70 kg individual.
(2) Established for cis-1,2-dichloroethene.
(3) Oral CPF established for benzo(a)pyrene is used as a surrogate.
(4) Classified as a carcinogen by inhalation, only.

TABLE 12.15

SWEDEN-3 CHAPMAN SITE
Ranking of Noncarcinogenic Hazards for Analytes Detected in Subsurface Soil Samples

Parameter	Chronic Reference Dose (mg/kg/day)		
	Inhalation	Oral	Source
Benzoic Acid		4.0E+00	IRIS
Xylenes		2.0E+00	IRIS
Nitrate		1.6E+00	IRIS
Diethylphthalate		8.0E-01	HEAST
Phenol		6.0E-01	IRIS
Butylbenzylphthalate		2.0E-01	IRIS
Toluene	1.1E-01	2.0E-01	IRIS(2)
1,1-Dichloroethane	5.0E-01	1.0E-01	HEAST
Acetone		1.0E-01	IRIS
Di-n-butylphthalate		1.0E-01	IRIS
Ethylbenzene	2.9E-01	1.0E-01	IRIS
1,1,1-Trichloroethane	3.0E-01	9.0E-02	HEAST
Acenaphthene		6.0E-02	IRIS
Fluoride		6.0E-02	IRIS
Methylene Choride	3.0E+00	6.0E-02	HEAST/IRIS
2-Butanone	2.9E-01	5.0E-02	IRIS (2)/HEAST
2-Methylphenol		5.0E-02	IRIS
4-Methyl-2-Pentanone	2.0E-02	5.0E-02	HEAST
Fluoranthene		4.0E-02	IRIS
Fluorene		4.0E-02	IRIS
Naphthalene		4.0E-02	HEAST
Pyrene		3.0E-02	IRIS
1,2-Dichloroethene(total)		2.0E-02	IRIS (1)
Bis(2-ethylhexyl)phthalate		2.0E-02	IRIS
Di-n-Octylphthalate		2.0E-02	HEAST
Tetrachloroethene		1.0E-02	IRIS
1,1-Dichloroethene		9.0E-03	IRIS
Trichloroethene		7.4E-03	EPA, 1987
2,4-Dinitrotoluene		2.0E-03	IRIS
Hexachlorobutadiene		2.0E-03	IRIS
Vinyl Chloride		1.3E-03	ATSDR
4,4'-DDT		5.0E-04	IRIS
Heptachlor		5.0E-04	IRIS
gamma-BHC		3.0E-04	IRIS
Aldrin		3.0E-05	IRIS
2-Methylnaphthalene			
4-Methylphenol			
Aroclor-1254			
Benzo(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthene			
Benzo(k)fluoranthene			
Calcium			
Chloride			
Magnesium			
n-Nitrosodiphenylamine			
Phenanthrene			
Sulfate			

(1) Established for trans-1,2-dichloroethene.

(2) Based on an inhalation rate of 20 cu. m/day by a 70 kg individual.

TABLE 12.16

SWEDEN-3 CHAPMAN SITE
Ranking of Carcinogenic Hazards for Analytes Detected in Subsurface Soil Samples

Parameter	Class	CANCER POTENCY FACTOR (mg/kg/day)-1 Inhalation	Oral	Source
n-Nitrosodiphenylamine	B2	4.9E+01	5.1E+01	IRIS (1)
Aldrin	B2	1.7E+01	1.7E+01	IRIS (1)
Aroclor-1254	B2		7.7E+00	IRIS (4)
Benzo(a)anthracene	B2		7.3E+00	IRIS (3)
Benzo(a)pyrene	B2	6.1E+00	7.3E+00	HEAST/IRIS
Benzo(b)fluoranthene	B2		7.3E+00	IRIS (3)
Benzo(k)fluoranthene	B2		7.3E+00	IRIS (3)
Chrysene	B2		7.3E+00	IRIS (3)
Heptachlor	B2	4.5E+00	4.5E+00	IRIS (1)
Vinyl Chloride	A	3.0E-01	1.9E+00	HEAST
gamma-BHC	B2/C		1.3E+00	HEAST
2,4-Dinitrotoluene	B2		6.8E-01	HEAST
1,1-Dichloroethene	C	1.8E-01	6.0E-01	IRIS
4,4'-DDT	B2	3.4E-01	3.4E-01	IRIS (1)
Hexachlorobutadiene	C	7.8E-02	7.8E-02	IRIS (1)
Tetrachloroethene	B2	1.8E-03	5.1E-02	HEAST(1)
Bis(2-ethylhexyl)phthalate	B2		1.4E-02	IRIS
Trichloroethene	C/B2	6.0E-03	1.1E-02	EPA, 1992
Methylene Choride	B2	1.7E-03	7.5E-03	IRIS (1)
1,1-Dichloroethane	C			IRIS
2-Methylphenol	C			IRIS
4-Methylphenol	C			IRIS
Butylbenzylphthalate	C			IRIS
1,1,1-Trichloroethane	D			IRIS
1,2-Dichloroethene(total)	D			IRIS (2)
2-Butanone	D			IRIS
Acetone	D			IRIS
Benzoic Acid	D			IRIS
Di-n-butylphthalate	D			IRIS
Ethylbenzene	D			IRIS
Fluoranthene	D			IRIS
Fluorene	D			IRIS
Naphthalene	D			IRIS
Phenanthrene	D			IRIS
Phenol	D			IRIS
Pyrene	D			IRIS
Toluene	D			IRIS
Xylenes	D			
2-Methylnaphthalene				
4-Methyl-2-Pentanone				
Acenaphthene				
Calcium				
Chloride				
Di-n-Octylphthalate				
Diethylphthalate				
Fluoride				
Magnesium				
Nitrate				
Sulfate				

(1) Based on an inhalation rate of 20 cu. m/day by a 70 kg individual.
(2) Established for cis-1,2-dichloroethene.
(3) Oral CPF established for benzo(a)pyrene is used as a surrogate.
(4) Established for Aroclor-1260.

TABLE 12.17

SWEDEN-3 CHAPMAN SITE
Ranking of Noncarcinogenic Hazards for Analytes Detected in Air Samples

Parameter	Chronic Reference Dose (mg/kg/day)		
	Inhalation	Oral	Source
Methylene Choride	3.0E+00	6.0E-02	HEAST/IRIS
1,1-Dichloroethane	5.0E-01	1.0E-01	HEAST
1,1,1-Trichloroethane	3.0E-01	9.0E-02	HEAST
Ethylbenzene	2.9E-01	1.0E-01	IRIS
2-Butanone	2.9E-01	5.0E-02	IRIS (2)/HEAST
Toluene	1.1E-01	2.0E-01	IRIS(2)
Xylenes	8.6E-02	2.0E+00	EPA, 1989 (2)/IRIS
4-Methyl-2-Pentanone	2.0E-02	5.0E-02	HEAST
Chlorobenzene	5.0E-03	2.0E-02	HEAST/IRIS
Acetone		1.0E-01	IRIS
1,2-Dichloroethene(total)		2.0E-02	IRIS (1)
Chloroform		1.0E-02	IRIS
Tetrachloroethene		1.0E-02	IRIS
1,1-Dichloroethene		9.0E-03	IRIS
Trichloroethene		7.4E-03	EPA, 1987
Vinyl Chloride		1.3E-03	ATSDR
1,1,2,2-Tetrachloroethane			IRIS
Benzene			

(1) Established for trans-1,2-dichloroethene.

(2) Based on an inhalation rate of 20 cu. m/day by a 70 kg individual.

TABLE 12.18

SWEDEN-3 CHAPMAN SITE
Ranking of Carcinogenic Hazards for Analytes Detected in Air Samples

Parameter	Class	CANCER POTENCY FACTOR (mg/kg/day)-1 Inhalation	Oral	Source
Vinyl Chloride	A	3.0E-01	1.9E+00	HEAST
1,1-Dichloroethene	C	1.8E-01	6.0E-01	IRIS
Chloroform	B2	8.1E-02	6.1E-03	IRIS (1)
Benzene	A	2.9E-02	2.9E-02	IRIS
Trichloroethene	C/B2	6.0E-03	1.1E-02	EPA, 1992
Tetrachloroethene	B2	1.8E-03	5.1E-02	HEAST(1)
Methylene Choride	B2	1.7E-03	7.5E-03	IRIS (1)
1,1-Dichloroethane	C			IRIS
1,1,1-Trichloroethane	D			IRIS
1,2-Dichloroethene(total)	D			IRIS (2)
2-Butanone	D			IRIS
Acetone	D			IRIS
Ethylbenzene	D			IRIS
Toluene	D			IRIS
Xylenes	D			
1,1,2,2-Tetrachloroethane				IRIS
4-Methyl-2-Pentanone				
Chlorobenzene				

(1) Based on an inhalation rate of 20 cu. m/day by a 70 kg individual.
(2) Established for cis-1,2-dichloroethene.

TABLE 12.19

SWEDEN-3 CHAPMAN SITE
Ranking of Noncarcinogenic Hazards for Analytes Detected in Surface Sediment Samples

Parameter	Chronic Reference Dose (mg/kg/day) Inhalation	Oral	Source
Benzoic Acid		4.0E+00	IRIS
Zinc		3.0E-01	IRIS
2-Butanone	2.9E-01	5.0E-02	IRIS (1)/HEAST
Fluoranthene		4.0E-02	IRIS
Pyrene		3.0E-02	IRIS
Bis(2-ethylhexyl)phthalate		2.0E-02	IRIS
Manganese	1.1E-04	5.0E-03	IRIS (1)(4)
Cadmium		1.0E-03	IRIS (2)
Lead		2.9E-04	EPA (3)
4-Methylphenol			
Benzo(a)anthracene			
Chrysene			
Benzo(a)pyrene			
Copper			
Phenanthrene			

(1) Based on an inhalation rate of 20 cu. m/day by a 70 kg individual.
(2) Oral RfD for cadmium in food. The oral RfD for water is 5.0E-04.
(3) Lifetime Health Advisory. EPA, 1985.
(4) Oral RfD for manganese in water. The oral RfD for food is 1.4E-01.

TABLE 12.20

SWEDEN-3 CHAPMAN SITE
Ranking of Carcinogenic Hazards for Analytes Detected Surface Sediment Samples

Parameter	Class	CANCER POTENCY FACTOR (mg/kg/day)-1 Inhalation	Oral	Source
Benzo(a)anthracene	B2		7.3E+00	IRIS (1)
Benzo(a)pyrene	B2	6.1E+00	7.3E+00	HEAST/IRIS
Chrysene	B2		7.3E+00	IRIS (1)
Bis(2-ethylhexyl)phthalate	B2		1.4E-02	IRIS
Cadmium	B2	6.1E+00		IRIS (2)
Lead	B2			IRIS
4-Methylphenol	C			IRIS
2-Butanone	D			IRIS
Benzoic Acid	D			IRIS
Copper	D			IRIS
Fluoranthene	D			IRIS
Manganese	D			IRIS
Phenanthrene	D			IRIS
Pyrene	D			IRIS
Zinc	D			IRIS

(1) Oral CPF established for benzo(a)pyrene is used as a surrogate.
(2) Classified as a carcinogen by inhalation, only.

TABLE 12.21

SWEDEN-3 CHAPMAN SITE
Concentration-Noncarcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected In Monitoring Well Groundwater Samples

Parameter	Maximum Concentration (ug/l-ppb)	Oral RfD (mg/kg/day)	Noncarcinogenic Risk Factor	% Total Noncarc. Risk Factor	Cumulative % Total Noncarc. Risk Factor	Log Kow	Groundwater Half-Life (days)
Trichloroethene	78,000.0	7.4E-03	10,612,244.90	61.4051%	61.4051%	2.38	NA
1,2-Dichloroethene(total)	100,000.0	2.0E-02	5,000,000.00	28.9313%	90.3364%	0.48	NA
Manganese	2,440.0	5.0E-03	488,000.00	2.8237%	93.1601%	NA	NA
Tetrachloroethene	4,300.0	1.0E-02	430,000.00	2.4881%	95.6482%	31	NA
Antimony	80.0	4.0E-04	200,000.00	1.1573%	96.8054%	NA	NA
Lead	52.3	2.9E-04	182,867.13	1.0581%	97.8635%	NA	NA
Silver	872.0	5.0E-03	174,400.00	1.0091%	98.8726%	NA	NA
Arsenic	18.8	3.0E-04	62,666.67	0.3626%	99.2353%	NA	NA
Vinyl Chloride	79.0	1.3E-03	60,769.23	0.3516%	99.2243%	1.38	NA
Fluoride	1,500.0	6.0E-02	25,000.00	0.1447%	99.3689%	NA	NA
1,1-Dichloroethene	110.0	9.0E-03	12,222.22	0.0707%	99.4396%	1.84	NA
Vanadium	64.2	7.0E-03	9,171.43	0.0531%	99.4927%	NA	NA
Chromium	41.7	5.0E-03	8,340.00	0.0483%	99.5410%	NA	NA
Barium	303.0	7.0E-02	4,328.57	0.0250%	99.5660%	NA	NA
Nitrate	4,200.0	1.6E+00	2,625.00	0.0152%	99.5812%	NA	NA
Nickel	45.6	2.0E-02	2,280.00	0.0132%	99.5944%	NA	NA
Methylene Choride	120.0	6.0E-02	2,000.00	0.0116%	99.6060%	1.3	NA
1,1,2-Trichloroethane	7.0	4.0E-03	1,750.00	0.0101%	99.6161%	2.47	NA
Chloroform	10.0	1.0E-02	1,000.00	0.0058%	99.6219%	1.97	NA
Acetone	87.0	1.0E-01	870.00	0.0050%	99.6269%	-0.24	NA
Bis(2-ethylhexyl)phthalate	11.0	2.0E-02	550.00	0.0032%	99.6301%	NA	NA
Zinc	147.0	3.0E-01	490.00	0.0028%	99.6329%	NA	NA
1,1-Dichloroethane	47.0	1.0E-01	470.00	0.0027%	99.6357%	1.79	NA
Beryllium	1.1	5.0E-03	220.00	0.0013%	99.6369%	NA	NA
Toluene	12.0	2.0E-01	60.00	0.0003%	99.6373%	2.73	NA
1,2-Dichloroethane	5.0	2.5E-01	20.00	0.0001%	99.6374%	1.48	NA
Aluminum	27,200.0					NA	NA
Benzene	4.0					2.12	NA
Calcium	540,000.0					NA	NA
Chloride	321,000.0					NA	NA
Chrysene	11.0					5.61	NA
Cobalt	24.3					NA	NA
Copper	102,000.0					NA	NA
Iron	51,600.0					NA	NA
Magnesium	201,000.0					NA	NA
Potassium	36,500.0					NA	NA
Sodium	990,000.0					NA	NA
Sulfate	486,000.0					NA	NA
TOTAL			17,282,345.15				

TABLE 12.22

SWEDEN-3 CHAPMAN SITE
Concentration-Carcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Monitoring Well Groundwater Samples

Parameter	Maximum Concentration (ug/l-ppb)	Cancer Class	Oral CPF (mg/kg/day)-1	Carcinogenic Risk Factor	% Total Carc. Risk Factor	Cumulative % Total Carc. Risk Factor	Log Kow	Groundwater Half-Life (days)
Trichloroethene	78,000.0	C/B2	1.1E-02	873.60	61.1330%	61.1330%	2.38	NA
Tetrachloroethene	4,300.0	B2	5.1E-02	219.30	15.3462%	76.4793%	31	NA
Vinyl Chloride	79 0	A	1.9E+00	150.10	10.5037%	86.9830%	1.38	NA
Chrysene	11.0	B2	7.3E+00	80.30	5.6193%	92.6022%	5.61	NA
1,1-Dichloroethene	110.0	C	6.0E-01	66.00	4.6186%	97.2208%	1.84	NA
Arsenic	18.8	A	1.8E+00	32.90	2.3023%	99.5231%	NA	NA
Beryllium	1.1	B2	4.3E+00	4.73	0.3310%	99.8541%	NA	NA
Methylene Choride	120.0	B2	7.5E-03	0.90	0.0630%	99.9171%	1.3	NA
1,2-Dichloroethane	5.0	B2	9.1E-02	0.46	0.0318%	99.9489%	1.48	NA
1,1,2-Trichloroethane	7.0	C	5.7E-02	0.40	0.0279%	99.9768%	2.47	NA
Bis(2-ethylhexyl)phthalate	11.0	B2	1.4E-02	0.15	0.0108%	99.9876%	NA	NA
Benzene	4.0	A	2.9E-02	0.12	0.0081%	99.9957%	2.12	NA
Chloroform	10.0	B2	6.1E-03	0.06	0.0043%	100.0000%	1.97	NA
Chromium	41.7	A					NA	NA
Lead	52.3	B2					NA	NA
1,1-Dichloroethane	47.0	C					1.79	NA
1,2-Dichloroethene(total)	100,000.0	D					0.48	NA
Acetone	87.0	D					-0.24	NA
Copper	102,000.0	D					NA	NA
Manganese	2,440.0	D					NA	NA
Silver	872.0	D					NA	NA
Toluene	12.0	D					2.73	NA
Zinc	147.0	D					NA	NA
Aluminum	27,200.0						NA	NA
Antimony	80.0						NA	NA
Barium	303 0						NA	NA
Calcium	540.000.0						NA	NA
Chloride	321,000 0						NA	NA
Cobalt	24 3						NA	NA
Fluoride	1,500 0						NA	NA
Iron	51,600 0						NA	NA
Magnesium	201.000.0						NA	NA
Nickel	45.6						NA	NA
Nitrate	4,200.0						NA	NA
Potassium	36,500.0						NA	NA
Sodium	990,000 0						NA	NA
Sulfate	486,000 0						NA	NA
Vanadium	64 2						NA	NA
TOTAL				1,429.02				

TABLE 12.23

SWEDEN-3 CHAPMAN SITE
Concentration-Noncarcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Residential Well Groundwater Samples

Parameter	Maximum Concentration (ug/l-ppb)	Oral RfD (mg/kg/day)	Noncarcinogenic Risk Factor	% Total Noncarc. Risk Factor	Cumulative % Total Noncarc. Risk Factor	Log Kow	Groundwater Half-Life (days)
Antimony	38.5	4.0E-04	96,250.00	40.2848%	40.2848%	NA	NA
Arsenic	27.2	3.0E-04	90,666.67	37.9480%	78.2328%	NA	NA
Lead	7.4	2.9E-04	25,874.13	10.8295%	89.0622%	NA	NA
Manganese	64.6	5.0E-03	12,920.00	5.4076%	94.4698%	NA	NA
Silver	50.4	5.0E-03	10,080.00	4.2189%	98.6887%	NA	NA
Barium	160.0	7.0E-02	2,285.71	0.9567%	99.6454%	NA	NA
Zinc	246.0	3.0E-01	820.00	0.3432%	99.9886%	NA	NA
Fluoride	0.9	6.0E-02	15.33	0.0064%	99.9950%	NA	NA
Methylene Choride	0.7	6.0E-02	11.67	0.0049%	99.9999%	1.3	NA
Nitrate	0.4	1.6E+00	0.22	0.0001%	100.0000%	NA	NA
Aluminum	55.8					NA	NA
Calcium	134,000.0					NA	NA
Chloride	206.0					NA	NA
Copper	69.2					NA	NA
Iron	3,020.0					NA	NA
Magnesium	54,100.0					NA	NA
Potassium	7,080.0					NA	NA
Sodium	94,300.0					NA	NA
Sulfate	297.0					NA	NA
TOTAL			238,923.73				

TABLE 12.24

SWEDEN-3 CHAPMAN SITE
Concentration-Carcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Residential Well Groundwater Samples

Parameter	Maximum Concentration (ug/l-ppb)	Cancer Class	Oral CPF (mg/kg/day)-1	Carcinogenic Risk Factor	% Total Carc. Risk Factor	Cumulative % Total Carc. Risk Factor	Log Kow	Groundwater Half-Life (days)
Arsenic	27.2	A	1.8E+00	47.60	99.9890%	99.9890%	NA	NA
Methylene Choride	0.7	B2	7.5E-03	0.01	0.0110%	100.0000%	1.3	NA
Lead	7.4	B2					NA	NA
Copper	69.2	D					NA	NA
Manganese	64.6	D					NA	NA
Silver	50.4	D					NA	NA
Zinc	246.0	D					NA	NA
Aluminum	55.8						NA	NA
Antimony	38.5						NA	NA
Barium	160.0						NA	NA
Calcium	134,000.0						NA	NA
Chloride	206.0						NA	NA
Fluoride	0.9						NA	NA
Iron	3,020.0						NA	NA
Magnesium	54,100.0						NA	NA
Nitrate	0.4						NA	NA
Potassium	7,080.0						NA	NA
Sodium	94,300.0						NA	NA
Sulfate	297.0						NA	NA
TOTAL				47.61				

TABLE 12.25

SWEDEN-3 CHAPMAN SITE
Concentration-Noncarcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected In Subsurface Soil Samples

Parameter	Maximum Concentration (ppb)	Oral RfD (mg/kg/day)	Noncarcinogenic Risk Factor	% Total Noncarc. Risk Factor	Cumulative % Total Noncarc. Risk Factor	Koc (ml/g)	Soil Half-Life (days)
Trichloroethene	19,000.0	7.4E-03	2,585,034.01	55.9446%	55.9446%	126	NA
Aldrin	17.0	3.0E-05	566,666.67	12.2636%	68.2082%	96000	NA
2-Butanone	15,000.0	5.0E-02	300,000.00	6.4925%	74.7007%	4.5	NA
Bis(2-ethylhexyl)phthalate	5,200.0	2.0E-02	260,000.00	5.6268%	80.3276%	NA	NA
1,2-Dichloroethene(total)	4,900.0	2.0E-02	245,000.00	5.3022%	85.6298%	59	NA
4-Methyl-2-Pentanone	10,000.0	5.0E-02	200,000.00	4.3283%	89.9581%	19	NA
Acetone	8,900.0	1.0E-01	89,000.00	1.9261%	91.8843%	2.2	NA
4,4'-DDT	37.0	5.0E-04	74,000.00	1.6015%	93.4857%	243000	5500
gamma-BHC	18.0	3.0E-04	60,000.00	1.2985%	94.7842%	6600	NA
Hexachlorobutadiene	110.0	2.0E-03	55,000.00	1.1903%	95.9745%	29000	NA
Tetrachloroethene	450.0	1.0E-02	45,000.00	0.9739%	96.9484%	277	NA
Heptachlor	16.0	5.0E-04	32,000.00	0.6925%	97.6409%	12000	NA
Di-n-butylphthalate	3,100.0	1.0E-01	31,000.00	0.6709%	98.3118%	170000	NA
Vinyl Chloride	27.0	1.3E-03	20,769.23	0.4495%	98.7613%	57	NA
Naphthalene	330.0	4.0E-02	8,250.00	0.1785%	98.9399%	NA	NA
Di-n-Octylphthalate	160.0	2.0E-02	8,000.00	0.1731%	99.1130%	NA	NA
1,1,1-Trichloroethane	600.0	9.0E-02	6,666.67	0.1443%	99.2573%	152	NA
Ethylbenzene	570.0	1.0E-01	5,700.00	0.1234%	99.3806%	1100	NA
Fluoranthene	200.0	4.0E-02	5,000.00	0.1082%	99.4888%	38000	NA
Toluene	840.0	2.0E-01	4,200.00	0.0909%	99.5797%	300	NA
Pyrene	120.0	3.0E-02	4,000.00	0.0866%	99.6663%	38000	NA
Methylene Choride	230.0	6.0E-02	3,833.33	0.0830%	99.7493%	8.8	NA
2,4-Dinitrotoluene	4.0	2.0E-03	2,000.00	0.0433%	99.7926%	45	NA
Xylenes	3,900.0	2.0E+00	1,950.00	0.0422%	99.8348%	240	NA
Fluoride	100.0	6.0E-02	1,666.67	0.0361%	99.8708%	NA	NA
Fluorene	64.0	4.0E-02	1,600.00	0.0346%	99.9054%	7300	NA
1,1-Dichloroethene	14.0	9.0E-03	1,555.56	0.0337%	99.9391%	65	NA
1,1-Dichloroethane	79.0	1.0E-01	790.00	0.0171%	99.9562%	30	NA
Diethylphthalate	400.0	8.0E-01	500.00	0.0108%	99.9670%	142	NA
Phenol	270.0	6.0E-01	450.00	0.0097%	99.9768%	14.2	NA
Butylbenzylphthalte	76.0	2.0E-01	380.00	0.0082%	99.9850%	NA	NA
Acenaphthene	17.0	6.0E-02	283.33	0.0061%	99.9911%	4600	NA
2-Methylphenol	14.0	5.0E-02	280.00	0.0061%	99.9972%	NA	NA
Nitrate	200.0	1.6E+00	125.00	0.0027%	99.9999%	NA	NA
Benzoic Acid	20.0	4.0E+00	5.00	0.0001%	100.0000%	NA	NA
2-Methylnaphthalene	190.0					NA	NA
4-Methylphenol	230.0					NA	NA
Aroclor-1254	6,900.0					530000	NA
Benzo(a)anthracene	85.0					1380000	NA
Benzo(a)pyrene	53.0					5500000	480
Benzo(b)fluoranthene	76.0					550000	NA
Benzo(k)fluoranthene	47.0					550000	NA
Calcium	124,000,000.0					NA	NA
Chloride	137,000.0					NA	NA
Chrysene	110.0					200000	NA
Magnesium	45,800,000.0					NA	NA
n-Nitrosodiphenylamine	140.0					NA	NA
Phenanthrene	420.0					14000	NA
Sulfate	206,000.0					NA	NA
TOTAL			4,620,705.47				

TABLE 12.26

SWEDEN-3 CHAPMAN SITE
Concentration-Carcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Subsurface Soil Samples

Parameter	Maximum Concentration (ppb)	Cancer Class	Oral CPF (mg/kg/day)-1	Carcinogenic Risk Factor	% Total Carc. Risk Factor	Cumulative % Total Carc. Risk Factor	Koc (ml/g)	Soil Half-Life (days)
Arochlor-1254	6,900.0	B2	7.7E+00	53,130.00	83.3326%	83.3326%	530000	NA
n-Nitrosodiphenylamine	140.0	B2	5.1E+01	7,140.00	11.1988%	94.5315%	NA	NA
Chrysene	110.0	B2	7.3E+00	803.00	1.2595%	95.7909%	200000	NA
Benzo(a)anthracene	85.0	B2	7.3E+00	620.50	0.9732%	96.7642%	1380000	NA
Benzo(b)fluoranthene	76.0	B2	7.3E+00	554.80	0.8702%	97.6344%	550000	NA
Benzo(a)pyrene	53.0	B2	7.3E+00	386.90	0.6068%	98.2412%	5500000	480
Benzo(k)fluoranthene	47.0	B2	7.3E+00	343.10	0.5381%	98.7793%	550000	NA
Aldrin	17.0	B2	1.7E+01	289.00	0.4533%	99.2326%	96000	NA
Trichloroethene	19,000.0	C/B2	1.1E-02	212.80	0.3338%	99.5664%	126	NA
Bis(2-ethylhexyl)phthalate	5,200.0	B2	1.4E-02	72.80	0.1142%	99.6806%	NA	NA
Heptachlor	16.0	B2	4.5E+00	72.00	0.1129%	99.7935%	12000	NA
Vinyl Chloride	27.0	A	1.9E+00	51.30	0.0805%	99.8740%	57	NA
gamma-BHC	18.0	B2/C	1.3E+00	23.40	0.0367%	99.9107%	6600	NA
Tetrachloroethene	450.0	B2	5.1E-02	22.95	0.0360%	99.9467%	277	NA
4,4'-DDT	37.0	B2	3.4E-01	12.58	0.0197%	99.9664%	243000	5500
Hexachlorobutadiene	110.0	C	7.8E-02	8.58	0.0135%	99.9799%	29000	NA
1,1-Dichloroethene	14.0	C	6.0E-01	8.40	0.0132%	99.9930%	65	NA
2,4-Dinitrotoluene	4.0	B2	6.8E-01	2.72	0.0043%	99.9973%	45	NA
Methylene Choride	230.0	B2	7.5E-03	1.73	0.0027%	100.0000%	8.8	NA
1,1-Dichloroethane	79.0	C					30	NA
2-Methylphenol	14.0	C					NA	NA
4-Methylphenol	230.0	C					NA	NA
Butylbenzylphthalate	76.0	C					NA	NA
1,1,1-Trichloroethane	600.0	D					152	NA
1,2-Dichloroethene(total)	4,900.0	D					59	NA
2-Butanone	15,000.0	D					4.5	NA
Acetone	8,900.0	D					2.2	NA
Benzoic Acid	20.0	D					NA	NA
Di-n-butylphthalate	3,100.0	D					170000	NA
Ethylbenzene	570.0	D					1100	NA
Fluoranthene	200.0	D					38000	NA
Fluorene	64.0	D					7300	NA
Naphthalene	330.0	D					NA	NA
Phenanthrene	420.0	D					14000	NA
Phenol	270.0	D					14.2	NA
Pyrene	120.0	D					38000	NA
Toluene	840.0	D					300	NA
Xylenes	3,900.0	D					240	NA
2-Methylnaphthalene	190.0						NA	NA
4-Methyl-2-Pentanone	10,000.0						19	NA
Acenaphthene	17.0						4600	NA
Calcium	124,000,000.0						NA	NA
Chloride	137,000.0						NA	NA
Di-n-Octylphthalate	160.0						NA	NA
Diethylphthalate	400.0						142	NA
Fluoride	100.0						NA	NA
Magnesium	45,800,000.0						NA	NA
Nitrate	200.0						NA	NA
Sulfate	206,000.0						NA	NA
TOTAL				63,756.56				

TABLE 12.27
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SWEDEN-3 CHAPMAN SITE
Concentration-Noncarcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Ambient Air Samples

Parameter	Ambient Air Maximum Concentration (ppb)	Inhalation RfD (mg/kg/day)	Noncarcinogenic Risk Factor	% Total Noncarc. Risk Factor	Cumulative % Total Noncarc. Risk Factor	Vapor Pressure (mm Hg)	Air Half-Life (days)
Chlorobenzene	3.0	5.0E-03	600.00	45.7697%	45.7697%	1.17E+01	3.5
4-Methyl-2-Pentanone	10.0	2.0E-02	500.00	38.1414%	83.9111%	NA	NA
2-Butanone	22.0	2.9E-01	76.92	5.8679%	89.7790%	7.75E+01	0.58
Xylenes	6.0	8.6E-02	70.01	5.3407%	95.1197%	1.00E+01	0.5
Toluene	6.0	1.1E-01	52.63	4.0149%	99.1346%	2.81E+01	1.3
Ethylbenzene	3.0	2.9E-01	10.34	0.7891%	99.9237%	7.00E+00	1.46
Methylene Choride	3.0	3.0E+00	1.00	0.0763%	100.0000%	3.62E+02	53.2
1,1,1-Trichloroethane		3.0E-01				1.23E+02	1752
1,1,2,2-Tetrachloroethane	3.0					5.00E+00	47
1,1-Dichloroethane		5.0E-01				1.82E+02	45
1,1-Dichloroethene						6.00E+02	2
1,2-Dichloroethene(total)						3.24E+02	2.1
Acetone	46.0					2.70E+02	NA
Benzene	4.0					9.52E+01	6
Chloroform	1.0					1.51E+02	80
Tetrachloroethene	3.0					1.78E+01	47
Trichloroethene	2.0					5.79E+01	3.7
Vinyl Chloride						2.66E+03	1.2
TOTAL			1,310.91				

TABLE 12.27
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SWEDEN-3 CHAPMAN SITE
Concentration-Noncarcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Boring Hole Air Samples

Parameter	Boring Air Maximum Concentration (ppb)	Inhalation RfD (mg/kg/day)	Noncarcinogenic Risk Factor	% Total Noncarc. Risk Factor	Cumulative % Total Noncarc. Risk Factor	Vapor Pressure (mm Hg)	Air Half-Life (days)
Chlorobenzene	4.0	5.0E-03	800.00	35.4412%	35.4412%	1.17E+01	3.5
Toluene	62.0	1.1E-01	543.86	24.0938%	59.5350%	2.81E+01	1.3
1,1,1-Trichloroethane	140.0	3.0E-01	466.67	20.6740%	80.2091%	1.23E+02	1752
4-Methyl-2-Pentanone	4.0	2.0E-02	200.00	8.8603%	89.0694%	NA	NA
Xylenes	16.0	8.6E-02	186.70	8.2710%	97.3404%	1.00E+01	0.5
Ethylbenzene	9.0	2.9E-01	31.03	1.3749%	98.7153%	7.00E+00	1.46
1,1-Dichloroethane	14.0	5.0E-01	28.00	1.2404%	99.9557%	1.82E+02	45
Methylene Choride	3.0	3.0E+00	1.00	0.0443%	100.0000%	3.62E+02	53.2
1,1,2,2-Tetrachloroethane						5.00E+00	47
1,1-Dichloroethene	4.0					6.00E+02	2
1,2-Dichloroethene(total)	370.0					3.24E+02	2.1
2-Butanone		2.9E-01				7.75E+01	0.58
Acetone						2.70E+02	NA
Benzene	4.0					9.52E+01	6
Chloroform						1.51E+02	80
Tetrachloroethene	40.0					1.78E+01	47
Trichloroethene	390.0					5.79E+01	3.7
Vinyl Chloride	260.0					2.66E+03	1.2
TOTAL			2,257.26				

TABLE 12.28
Page 1 of 2

SWEDEN-3 CHAPMAN SITE
Concentration-Carcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Ambient Air Samples

Parameter	Ambient Air Maximum Concentration (ppb)	Cancer Class	Inhalation CPF (mg/kg/day)-1	Carcinogenic Risk Factor	% Total Carc. Risk Factor	Cumulative % Total Carc. Risk Factor	Vapor Pressure (mm Hg)	Air Half-Life (days)
Benzene	4.0	A	2.9E-02	0.12	52.8932%	52.8932%	9.52E+01	6
Chloroform	1.0	B2	8.1E-02	0.08	36.9340%	89.8272%	1.51E+02	80
Trichloroethene	2.0	C/B2	6.0E-03	0.01	5.4261%	95.2533%	5.79E+01	3.7
Tetrachloroethene	3.0	B2	1.8E-03	0.01	2.4896%	97.7429%	1.78E+01	47
Methylene Choride	3.0	B2	1.7E-03	0.00	2.2571%	100.0000%	3.62E+02	53.2
Vinyl Chloride		A	3.0E-01				2.66E+03	1.2
1,1-Dichloroethane		C					1.82E+02	45
1,1-Dichloroethene		C	1.8E-01				6.00E+02	2
1,1,1-Trichloroethane		D					1.23E+02	1752
1,2-Dichloroethene(total)		D					3.24E+02	2.1
2-Butanone	22.0	D					7.75E+01	0.58
Acetone	46.0	D					2.70E+02	NA
Ethylbenzene	3.0	D					7.00E+00	1.46
Toluene	6.0	D					2.81E+01	1.3
Xylenes	6.0	D					1.00E+01	0.5
1,1,2,2-Tetrachloroethane	3.0						5.00E+00	47
4-Methyl-2-Pentanone	10.0						NA	NA
Chlorobenzene	3.0						1.17E+01	3.5
TOTAL				0.22				

TABLE 12.28
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SWEDEN-3 CHAPMAN SITE
Concentration-Carcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Bore Hole Air Samples

Parameter	Boring Air Maximum Concentration (ppb)	Cancer Class	Inhalation CPF (mg/kg/day)-1	Carcinogenic Risk Factor	% Total Carc. Risk Factor	Cumulative % Total Carc. Risk Factor	Vapor Pressure (mm Hg)	Air Half-Life (days)
Vinyl Chloride	260.0	A	3.0E-01	76.70	95.9799%	95.9799%	2.66E+03	1.2
Trichloroethene	390.0	C/B2	6.0E-03	2.32	2.9038%	98.8837%	5.79E+01	3.7
1,1-Dichloroethene	4.0	C	1.8E-01	0.70	0.8760%	99.7596%	6.00E+02	2
Benzene	4.0	A	2.9E-02	0.12	0.1452%	99.9048%	9.52E+01	6
Tetrachloroethene	40.0	B2	1.8E-03	0.07	0.0911%	99.9959%	1.78E+01	47
Methylene Choride	2.0	B2	1.7E-03	0.00	0.0041%	100.0000%	3.62E+02	53.2
Chloroform		B2	8.1E-02				1.51E+02	80
1,1-Dichloroethane	14.0	C					1.82E+02	45
1,1,1-Trichloroethane	140.0	D					1.23E+02	1752
1,2-Dichloroethene(total)	370.0	D					3.24E+02	2.1
2-Butanone		D					7.75E+01	0.58
Acetone		D					2.70E+02	NA
Ethylbenzene	9.0	D					7.00E+00	1.46
Toluene	62.0	D					2.81E+01	1.3
Xylenes	16.0	D					1.00E+01	0.5
1,1,2,2-Tetrachloroethane							5.00E+00	47
4-Methyl-2-Pentanone	4.0						NA	NA
Chlorobenzene	4.0						1.17E+01	3.5
TOTAL				79.91				

TABLE 12.29

SWEDEN-3 CHAPMAN SITE
Concentration-Noncarcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected In Surface Sediment Samples

Parameter	Maximum Concentration (ppb)	Oral RfD (mg/kg/day)	Noncarcinogenic Risk Factor	% Total Noncarc. Risk Factor	Cumulative % Total Noncarc. Risk Factor	Koc (ml/g)	Soil Half-Life (days)
Bis(2-ethylhexyl)phthalate	180.0	2.0E-02	9,000.00	54.0016%	54.0016%	NA	NA
Pyrene	110.0	3.0E-02	3,666.67	22.0007%	76.0023%	38000	NA
Fluoranthene	130.0	4.0E-02	3,250.00	19.5006%	95.5029%	38000	NA
2-Butanone	37.0	5.0E-02	740.00	4.4401%	99.9430%	4.5	NA
Benzoic Acid	38.0	4.0E+00	9.50	0.0570%	100.0000%	NA	NA
4-Methylphenol	230.0					NA	NA
Benzo(a)anthracene	62.0					1380000	NA
Benzo(a)pyrene	23.0					5500000	480
Chrysene	75.0					200000	NA
Phenanthrene	110.0					14000	NA
TOTAL			16,666.17				

TABLE 12.30

SWEDEN-3 CHAPMAN SITE
Concentration-Carcinogenic Toxicity Screen and Environmental Properties Of Chemical Constituents Detected in Surface Sediment Samples

Parameter	Maximum Concentration (ppb)	Cancer Class	Oral CPF (mg/kg/day)-1	Carcinogenic Risk Factor	% Total Carc. Risk Factor	Cumulative % Total Carc. Risk Factor	Koc (ml/g)	Soil Half-Life (days)
Chrysene	75.0	B2	7.3E+00	547.50	46.7741%	46.7741%	200000	NA
Benzo(a)anthracene	62.0	B2	7.3E+00	452.60	38.6666%	85.4407%	1380000	NA
Benzo(a)pyrene	23.0	B2	7.3E+00	167.90	14.3441%	99.7847%	5500000	480
Bis(2-ethylhexyl)phthalate	180.0	B2	1.4E-02	2.52	0.2153%	100.0000%	NA	NA
4-Methylphenol	230.0	C					NA	NA
2-Butanone	37.0	D					4.5	NA
Benzoic Acid	38.0	D					NA	NA
Fluoranthene	130.0	D					38000	NA
Phenanthrene	110.0	D					14000	NA
Pyrene	110.0	D					38000	NA
TOTAL				1,170.52				

TABLE 12.31

SWEDEN-3 CHAPMAN SITE
New York State Regulatory Standards and Guidelines Of Chemical Constituents Detected in Monitoring Well Groundwater Samples

Parameter	Maximum Concentration	95% UCL	Average Concentration	NYSDEC Groundwater Criteria (1)
Vinyl Chloride	***79.0***	***13.5***	***7.6***	2.000
Methylene Choride	***120.0***	***13.3***	***5.7***	5.000
Acetone	***87.0***	7.5	3.2	50.000
1,1-Dichloroethene	***110.0***	***11.5***	***5.9***	5.000
1,1-Dichloroethane	***47.0***	***5.6***	2.9	5.000
1,2-Dichloroethene(total)	***100,000.0***	***8,286.6***	***3,404.5***	5.000
Chloroform	***10.0***	1.2	0.5	7.000
1,2-Dichloroethane	5.0			5.000
Trichloroethene	***78,000.0***	***6,560.8***	***2,757.5***	5.000
1,1,2-Trichloroethane	***7.0***	0.7	0.3	5.000
Benzene	***4.0***	0.6	0.4	0.700
Tetrachloroethene	***4,300.0***	***505.3***	***232.1***	5.000
Toluene	***12.0***	1.3	0.7	5.000
bis(2-Ethylhexyl)phthalate	11.0	2.6	1.4	50.000
Chrysene	***11.0***	***2.1***	***1.1***	0.002
Aluminum	27,200.0	5,805.0	3,443.8	
Antimony	***80.0***	***28.2***	***17.9***	3.000
Arsenic	18.8	3.1	1.5	25.000
Barium	303.0	93.6	67.1	1,000.000
Beryllium	1.1			3.000
Calcium	540,000.0	215,607.2	165,568.2	
Chromium	41.7	11.2	7.5	50.000
Cobalt	24.3	4.7	2.5	
Copper	***102,000.0***	***12,622.1***	***4,643.5***	200.000
Iron	***51,600.0***	***16,333.7***	***11,530.0***	300.000
Lead	***52.3***	8.3	5.2	25.000
Magnesium	***201,000.0***	***88,740.0***	***71,041.4***	35,000.000
Manganese	***1,140.0***	***370.5***	***265.2***	300.000
Nickel	45.6	12.3	6.8	
Potassium	36,500.0	10,880.7	7,696.8	
Silver	***872.0***	***112.6***	44.5	50.000
Sodium	***990,000.0***	***208,200.1***	***121,603.2***	20,000.000
Vanadium	64.2	12.6	7.2	
Zinc	147.0	54.6	39.4	300.000
Chloride	***321,000.0***	134,588.2	90,615.4	250,000.000
Fluoride	1,480.0	797.7	599.2	1,500.000
Nitrate	4,230.0	896.8	338.5	10,000.000
Sulfate	***486,000.0***	***277,927.9***	214,153.8	250,000.000

All concentrations expressed in ppb.

Concentrations in bold and italics indicate excedence of regulatory criteria.

(1) NYSDEC, 1992. Concentrations expressed in ppb.

TABLE 12.32

SWEDEN-3 CHAPMAN SITE
New York State Regulatory Standards and Guidelines Of Chemical Constituents Detected in Residential Well Groundwater Samples

Parameter	Maximum Concentration	95% UCL	Average Concentration	NYSDEC Groundwater Criteria (1)
Methylene Chloride	0.7			5.000
Aluminum	55.8	31.2	13.7	
Antimony	***38.5***			3.000
Arsenic	***27.2***	5.8	2.3	25.000
Barium	160.0	119.6	72.9	1,000.000
Calcium	134,000.0	121,512.7	109,600.0	
Copper	69.2	37.1	18.4	200.000
Iron	***3,020.0***	***1,523.6***	***729.1***	300.000
Lead	7.4	2.4	1.2	25.000
Magnesium	***54,100.0***	***51,534.7***	***44,885.7***	35,000.000
Manganese	64.6	41.7	26.2	300.000
Potassium	7,080.0	5,538.8	3,465.7	
Silver	***50.4***			50.000
Sodium	***94,300.0***	***77,656.7***	***52,757.1***	20,000.000
Zinc	246.0	112.5	48.0	300.000
Chloride	206,000.0	139,970.3	857.1	250,000.000
Fluoride	920.0	605.5	371.4	1,500.000
Nitrate	350.0	159.1	62.9	10,000.000
Sulfate	***297,000.0***	200,929.3	137,714.3	250,000.000

All concentrations expressed in ppb.

Concentrations in bold and italics indicate excedence of regulatory criteria.

(1) NYSDEC, 1992. Concentrations expressed in ppb.

TABLE 12.33

SWEDEN-3 CHAPMAN SITE
New York State Regulatory Standards and Guidelines Of Chemical Constituents Detected in Subsurface Soil Samples

Parameter	Maximum Concentration	95% UCL	Average Concentration	NYSDEC Soil Criteria (1)
Vinyl Chloride	27.0	2.5	1.0	200.000
Methylene Chloride	***230.0***	41.4	16.3	100.000
Acetone	***8,900.0***	***1,288.0***	***668.1***	200.000
1,1-Dichloroethene	14.0	1.2	0.5	400.000
1,1-Dichloroethane	79.0	7.1	2.9	200.000
1,2-Dichloroethene (total)	***4,900.0***	***552.1***	***272.5***	300.000
2-Butanone	***15,000.0***	***2,298.6***	***1,200.6***	300.000
1,1,1-Trichloroethane	600.0	53.8	22.4	800.000
4-Methyl-2-Pentanone	***10,000.0***	***1,214.0***	576.9	1,000.000
Trichloroethene	***19,000.0***	***1,690.2***	***709.3***	700.000
Tetrachloroethene (2)	***450.0***	50.7	23.7	1,400.000
Toluene	840.0	91.5	45.9	1,500.000
Ethylbenzene	570.0	52.3	22.8	5,500.000
Total Xylenes	***3,900.0***	345.9	145.3	1,200.000
Benzoic Acid	20.0	1.8	0.8	2,700.000
Phenol	***270.0***	***37.4***	19.1	30.000
2-Methylphenol	14.0	1.8	0.8	100.000
4-Methylphenol	230.0	24.8	12.0	900.000
Naphthalene	330.0	44.2	24.4	13,000.000
2-Methylnaphthalene	190.0	23.5	12.2	36,400.000
Diethylphthalate	400.0	57.1	33.0	7,100.000
N-Nitrosodiphenylamine	140.0	12.1	5.0	
Di-n-butylphthalate	3,100.0	694.1	400.8	8,100.000
Butylbenzylphthalate	76.0	9.8	4.7	50,000.000
bis(2-Ethylhexyl)phthalate	5,200.0	1,264.9	866.1	50,000.000
Di-n-octylphthalate	160.0	15.7	6.7	50,000.000
Hexachlorobutadiene	110.0	11.7	5.5	
Acenaphthene	17.0	1.8	0.8	50,000.000
2,4-Dinitrotoluene	4.0			
Flourene	64.0	11.8	6.4	50,000.000
Phenanthrene	420.0	58.4	31.6	50,000.000
Flouranthene	200.0	17.8	7.5	50,000.000
Pyrene	120.0	12.2	5.8	50,000.000
Benzo (a) anthracene	85.0			220.000
Chrysene	110.0	9.8	4.1	400.000
Benzo(b)flouranthene	76.0			1,100.000
Benzo(k)flouranthene	47.0			1,100.000
Benzo(a)pyrene	53.0			61.000
Aldrin	17.0	2.0	0.8	41.000
Aroclor-1254	***6,900.0***			1.0 (surface) 10.0 (subsurface)
Heptachlor	16.0			100.000
4,4'-DDT	37.0			2,100.000
gamma-BHC(Lindane)	18.0			60.000
Calcium	124,000.0	87,665.1	74,436.1	SB
Magnesium	45,800.0	29,391.7	23,926.1	SB
Chloride	137,000.0	111,200.0	95,900.0	
Fluoride	100.0	100.0	100.0	
Nitrate	200.0			
Sulfate	206,000.0	171,500.0	134,800.0	

All concentrations expressed in ppb.

Concentrations in bold and italics indicate excedence of regulatory criteria.

(1) NYSDEC, 1992. Concentrations expressed in ppb.

(2) PCE concentration is suspected to exceed NYS Guidelines due to a sampling protocol problem.

TABLE 12.34

SWEDEN-3 CHAPMAN SITE
New York State Regulatory Standards and Guidelines Of Chemical Constituents Detected in Air Samples

Parameter	Boring Air Maximum Concentration	Ambient Air Maximum Concentration	NYSDEC Air Criteria (1)
Vinyl Chloride	***260***		0.008
Methylene Chloride	2	3	7.773
Acetone		46	5893.595
1,1-Dichloroethene	***4***		0.005
1,1-Dichloroethane	14		123.522
1,2-Dichloroethene (total)	370		479.165
Chloroform		1	4.710
2-Butanone		22	101.734
1,1,1-Trichloroethane	140		183.256
Trichloroethene	***390***	***2***	0.084
Benzene	***4***	***4***	0.038
4-Methyl-2-Pentanone	4	10	117.173
Tetrachloroethene	***40***	***3***	0.011
1,1,2,2-Tetrachloroethane		***3***	0.003
Toluene	62	6	530.772
Chlorobenzene	4	3	4.344
Ethylbenzene	9	3	230.313
Total Xylenes	16	6	69.094

All concentrations expressed in ppb.

Concentrations in bold and italics indicate excedence of regulatory criteria.

(1) NYSDEC, 1991. Annual GuidelineConcentration (AGC) expressed in ppb.

TABLE 12.35

SWEDEN-3 CHAPMAN SITE
New York State Regulatory Standards and Guidelines Of Chemical Constituents Detected in Surface Sediment Samples

Parameter	Maximum Concentration	95% UCL	Average Concentration	NYSDEC Surface Soil Criteria (1)
2-Butanone	37.0	17.8	8.0	4,000,000.000
4-Methylphenol	230.0	97.2	44.4	4,000,000.000
Benzoic Acid	38.0	17.4	7.8	300,000,000.000
Phenanthrene	110.0	37.2	14.6	
Fluoranthene	130.0	50.1	23.3	3,000,000.000
Pyrene	110.0	44.5	22.3	2,000,000.000
Benzo(a)Anthracene	62.0			220.000
Chrysene	75.0	27.5	11.6	
bis(2-Ethylhexyl)phthalate	180.0	128.1	93.9	50,000.000
Benzo(a)Pyrene	23.0			61.000

All concentrations expressed in ppb.

Concentrations in bold and italics indicate excedence of regulatory criteria.

(1) Human direct ingestion soil concentrations (NYSDEC, 1991).

TABLE 12.36

SWEDEN-3 CHAPMAN SITE
Summary of the Primary Chemical Hazards in Environmental Media and Exceedences of New York State Criteria

	Groundwater			Air		
Parameter (1)	**Monitoring Wells**	**Residential Wells**	**Subsurface Soil**	**Ambient**	**Bore Hole**	**Surface Sediment**
Vinyl Chloride	***Yes***		No		***Yes***	
Methylene Choride		No		No		
1,1-Dichloroethene	***Yes***				***Yes***	
1,1-Dichloroethane					No	
1,2-Dichloroethene(total)	***Yes***		***Yes***			
Chloroform				No		
Trichloroethene	***Yes***		***Yes***	***Yes***	***Yes***	
Benzene				***Yes***		
Tetrachloroethene	***Yes***		***Yes***	***Yes***		
Toluene				No	No	
Acetone			***Yes***			
2-Butanone			***Yes***	No		No
Chlorobenzene				No	No	
1,1,1-Trichloroethane					No	
4-Methyl-2-Pentanone			***Yes***	No	No	
Ethylbenzene					No	
Xylenes				No	No	
Naphthalene			No			
n-Nitrosodiphenylamine			No			
Di-n-butylphthalate			No			
Bis(2-ethylhexyl)phthalate			No			No
Di-n-Octylphthalate			No			
Hexachlorobutadiene			No			
Benzo(a)anthracene			No			
Fluroanthene						No
Chrysene	***Yes***		No			
Pyrene						No
Benzo(b)fluoranthene			No			
Benzo(k)fluoranthene			No			
Benzo(a)pyrene			No			
Aldrin			No			
Aroclor-1254			***Max.***			
Heptachlor			No			
4,4'-DDT			No			
gamma-BHC			No			
Antimony	***Yes***	No				
Arsenic	No	No				
Barium		No				
Lead	No	No				
Manganese	No	No				
Silver	***Yes***	No				

(1) Chemical constituents which accounted for >99% of chemical hazard in a given media.
"Yes" indicates that the 95% UCL concentration exceeded the relevant New York State criteria.
"No" indicates that the 95% UCL concentration did not exceed the relevant New York State criteria.
Blank indicates that the parameter was not included in chemicals accounting for >99% of hazard.

13.0 SUMMARY AND CONCLUSIONS

The Phase I, II and III RI confirms that contamination exists in the soils and groundwater at the Sweden-3 Chapman Site as a result of improper disposal of hazardous waste in the landfill. Furthermore, the Phase I, II, and III RI studies have provided an understanding of the nature and extent of contamination at the Site.

13.1 Nature and Extent of Contamination

13.1.1 Satellite Sites

As part of the Phase I RI, surface soils, test pit soils and drum samples were collected from Satellite Sites 1, 2, 3 and 4 for chemical analysis. In addition, geophysical magnetic surveys were conducted on Satellite Site 2 and 3. Satellite Site 5 was investigated through residential interviews that confirmed no hazardous wastes present on the Site.

The contents of two drums that were overpacked, sampled and analyzed from Satellite Site 1 did not exceed RCRA Waste Characteristics. The drum wastes can be characterized as non-hazardous materials that can be disposed of at a sanitary landfill. In addition, the Satellite Site 1-IRM conducted during the Phase II RI removed minor amounts of PCB contaminated soil which were placed in five new 55-gallon drums. All drums were staged on the existing decontamination pad at the Sweden-3 Chapman Site. Disposal of these drums will take place during Site remediation.

Other than the staged drums from Satellite Site 1, all Satellite Site investigations did not find any evidence of any hazardous waste and indicated no environmental health or public threat. The investigation of Satellite Site 3 further collaborated the NYSDEC decision of delisting this site. No further action is proposed for Satellite Sites 1, 2, 3, 4 and 5.

13.1.2 Source Areas of Contamination

Three source areas of heavily contaminated soils have been identified at the Site (refer to Figures 9.1 through 9.4). These contamination sources are primarily located in areas where drums were removed during IRM operations. During the IRM, numerous leaking, partially filled drums were removed along with visually contaminated soils, however, test trenching during the IRM revealed soil contamination remained beneath the landfill. The extent of contamination was unknown and the material was left in place for future study under the RI/FS.

The northwestern source area depicted in Figures 9.1 through 9.4 contains elevated concentrations of volatile organic compounds at levels exceeding NYS Guidance Values. The majority of the contamination is located within the lacustrine and upper till units as evidenced by both field observations and analytical results. Contamination appears to have migrated from this source area both horizontally (to the northeast) and vertically (downward).

Contaminants migrating from this source were identified by the presence of volatile and semi-volatile organic compounds in soil samples collected from soil borings B-2, 4, 5, 6, 7, 9, 10 11, 12 and 13. The primary chemical compounds present were TCE and associated compounds, PCE and associated compounds, Acetone, MEK, Toluene and total Xylenes. In addition, analytical results of groundwater samples collected from monitoring wells MW-6S, MW-6I and MW-2I further documented the presence of volatile organics in groundwater. These monitoring wells are located northeast of the source area. This is consistent with the direction of groundwater movement within the Overburden unit and Interface Zone. Contaminated soils cover an area of approximately 31,000 square feet as defined by the soil borings mentioned above. The approximate bottom elevation of suspected contaminated soil ranges between 610 to 613 feet MSL (refer to PID Reading Summary Table 8.7), which transposes to approximately 11 feet of contaminated soil. The volume of contaminated soil in the northwestern source area is approximately 12,800 cubic yards.

The northeastern source area located in the vicinity of test pits TP-4 and TP-9 and as depicted in Figures 9.1 through 9.4 is considerably smaller than the previously discussed northwestern source area. The area defined by test pits TP-4 and TP-9 and associated sample analytical results represents a small, localized "hot spot" of contamination. The area dimensions are approximately 20 feet by 20 feet, which was defined by test trenching around the "hot spot". The thickness of the contaminated soils, which consists primarily of TCE, toluene, ethybenzene, and total xylene, ranges from 2 to 10 feet. The estimated volume of this contaminated zone is approximately 120 cubic yards.

The third source area is also located northeast of the Site as depicted in Figures 9.1 through 9.4 and is also considerably smaller than the northwestern source area. The estimated volume of contaminated soil within the source area was calculated utilizing the field data generated during the test pit and groundwater sampling program. The area defined by analytical results from samples from test pit TP-6 and monitoring well MW-31 represents a small, localized "hot spot" of soils primarily contaminated with PCE and associated compounds. The lateral limits and depth of contaminates were defined by background PID readings from test pits (TP-7, TP-11) and soil borings (B-15, B-16). The lateral dimensions of this area are approximately 25 feet by 25 feet with the thickness of contaminated soils ranging from 2 to 10 feet. The estimated volume of this contaminated zone is approximately 185 cubic yards.

13.1.3 Soil Contamination

A review of the Test Boring Logs and headspace screening results indicates that the contaminants detected in soil borings B-2, 4, 5, 6 and 7 are located primarily within the lacustrine unit. The contaminants detected in B-9, 10, 11 were located primarily in the upper till unit. Contaminants detected in soil samples from borings B-12 and B-13 were located primarily in the lower-till unit; as was the case with test pit TP-13, which was located off the toe of the landfill adjacent to soil borings B-12 and B-13. Table 13.1 summarizes the location of contaminated soils within the respective borings and test pits as determined by headspace screening.

Table 13.1

SWEDEN 3-CHAPMAN SITE

Location of Contaminated Soil Determined By Headspace Screening Results

Boring/Test Pit Location	Approx. Elevation of Contaminated Soil Zone(ft.)	Stratigraphic Unit
B-2	620.2 - 614.2	Lacustrine/Upper Till
B-4	620.9 - 614.9	Lacustrine
B-5	622.5 - 614.5	Lacustine/Upper Till
B-6	620.6 - 614.6	Lacustrine
B-7	617.5 - 611.5	Lacustrine
B-9	618.1 - 608.1	Lacustrine/Upper Till
B-10	617.0 - 607.0	Upper Till
B-11	619.9 - 611.9	Upper Till
B-12	615.8 - 605.8	Upper Till/Lower Till
B-13	613.9 - 607.9	Upper Till/Lower Till
TP-13	612.8 - 606.8	Lower Till

Based upon the results of the boring and test pit programs, it is apparent that the lacustrine unit is discontinuous across the Site. The location and thickness of the lacustrine deposit is presented on Figure 6.5. The thickest deposit of the lacustrine unit is located in the western portion of the landfill and pinches out to the north and east. The pinching out of the lacustrine deposit is apparent in Cross-Section D-D, (refer to Figure 6.9D) which traverses the western portion of the Site from soil boring B-1 to monitoring well MW-2I. The lateral pinch out of the lacustrine unit correlates well with the old stream channel as discussed in Section 4.4 and presented on Figure 4.1.

The field data generated and observations made during the boring program suggest that a significant concentration of contaminants exist in the silty sand lenses contained within the lacustrine deposit. However, as previously discussed in Section 6.2.1.2, the lenses are not continuous throughout the lacustrine deposit. It appears that the vertical mobility and to a lesser extent the horizontal mobility of contaminants within the lacustrine unit, is limited due to the low permeability of the silty clay which encompasses the lenses. In the soil borings where the contaminants were located primarily in the lacustrine deposit (B-2, 4, 5, 6 & 7) the elevation of the contaminated soil zone was relatively consistent (622.5′ to 611.5′). This indicates limited downward migration of contaminants into the upper till unit. In addition, contaminants were not detected in the lacustrine deposit in either soil boring B-8 or test pit TP-14, located east and west of the contaminated zone, respectively. This which indicates limited lateral migration of contaminants within the lacustrine unit.

The field data indicates that limited horizontal migration of contaminants from the lacustrine deposits has occurred in a northeast direction, which corresponds to groundwater flow direction within the Overburden unit. A review of the Cross-Section D-D (refer to Figure 6.9D), which trends in a southwest-northeast line, reveals that as the lacustrine unit pinches out, it is replaced by the upper till unit at a similar elevation. Therefore, lateral migration of contaminants from the lacustrine unit to the upper till unit will occur. This is supported by the above table, which indicates that the soil borings in which the contaminants were located are primarily within the upper till unit (B-9, 10 & 11) and the elevation of the contaminated zone ranges from 619.9′ to 607.0′. Borings B-9, 10 & 11 are located hydraulically downgradient of the contaminated lacustrine unit.

It is anticipated that once the contaminants reach the upper till unit from the lacustrine unit, their mobility both vertically and horizontally will greatly increase due to the increased permeability of the upper till unit, which consists primarily of gravelly silt. This is supported by the data obtained from soil borings B-12, B-13 and test pit TP-13, which are located hydraulically downgradient of B-9, 10 & 11. The contaminants at these locations were primarily within the lower till unit and at lower elevations (615.8′ to 605.8′). The lower till unit is located a few feet above the highly permeable Interface Zone. This would explain the presence of groundwater contaminants within monitoring wells MW-2I, MW-6I and MW-101 which are located hydraulically downgradient of contaminated zone.

The presence of volatile organics within overburden soil samples from monitoring wells SWE-B6S and SWE-B6I located hydraulically downgradient from the northwestern source area, is indication that both lateral and downward migration of contaminants have occurred. It can be concluded from observations made during the test pitting operations that the soil contamination within the lower till unit is migrating predominately in a northeasterly direction towards test pit TP-13. This corresponds to groundwater flow direction within the overburden and soil analytical data from monitoring well boring samples SWE-B6S and SWE-B6I. The total Volatile Organic Concentration Map of Subsurface Soils is presented in Figure 9.10.

13.1.4 Groundwater Contamination

The primary contaminant migration pathway appears to be in a northeasterly direction along the Interface Zone. The groundwater contaminant plume has been delineated and presented on Figure 9.3. As stated in Section 7.0 Site Hydrogeology, there are three distinct groundwater bearing zones (Overburden unit, the Interface Zone and the Bedrock Aquifer) associated with the geologic units found at the Site.

Analytical results from groundwater samples collected from all three zones have indicated Site contaminants in groundwater. The groundwater samples collected from the Overburden unit at monitoring well MW-6S have the highest level of contaminants in groundwater sampled on Site. Groundwater contamination found at monitoring well MW-6S is directly related to the northwestern source area.

In addition, overburden groundwater contamination has been detected in monitoring well MW-10S. It appears that this contamination has entered overburden soils by means of upward hydraulic gradients that exist in the area.

Analytical results of groundwater samples collected from the Interface Zone indicate that this zone has the most widespread groundwater contamination at the Site. Contamination was detected in groundwater samples collected from monitoring wells MW-2I, MW-3I, MW-6I, MW-9I and MW-10I (refer to Figures 9.2 through 9.4). The primary contaminants have been identified in the analytical summary Tables 9.9A and B that include: VC; PCE; TCE and associated compounds.

The most northerly extent of the Interface Zone contaminant plume lies between monitoring wells MW-10I and MW-13I. Retardation modeling estimates that the plume extends north of monitoring well MW-10I by approximately 50 to 75 feet (refer to Figure 9.3). The potential for further contaminant migration is relatively high, since the Interface Zone groundwater flow velocity is 49 feet/year beneath and downgradient of the source area and 8 feet/year in the wetlands region of the Site.

Groundwater contamination in the Interface Zone can be separated in two distinct plumes. The most widespread plume has migrated from the northwestern source area as TCE and associated compounds and identified in groundwater at monitoring wells MW-6I, MW-2I, MW-1I and MW-10I. PCE and associated compounds were found in groundwater at monitoring well MW-3I and to a much lesser degree in MW-2I. The PCE plume is not as widespread as the westerly located TCE plume due to a smaller source area and differing chemical solubility rates.

The installation of the Phase III monitoring well MW-14I was placed hydraulically downgradient and between the PCE and TCE plumes. Groundwater analytical results from monitoring well MW-14I detected only an estimated value of TCE that was below detection limits. These results further define and assist in delineating the two plumes.

During Phase III RI, groundwater contaminant levels could be compared with existing Phase I and II data. A significant decrease in total volatiles is present in Phase II and III sampled monitoring wells, MW-2I, MW-6S and MW-6I. The conclusion that can be drawn to explain this volatile decrease is directly related to the northwestern source area and the removal of drums under the IRM conducted in 1991. Decreased levels of volatiles in groundwater at close proximity to the IRM drum removal show groundwater that has passed through this area has and is improving in quality.

The potential for the bedrock aquifer to be contaminated from the Interface Zone only exists beneath the landfill due to the downward hydraulic gradient in this area. To date, only two groundwater sample collected from bedrock monitoring wells (MW-2D, MW-3D) haveindicated low levels of volatile organic contamination. Based on the Hydraulic Head Difference Maps (refer to Appendix I-4) and Hydraulic Head Difference Table 7.3, the groundwater over a majority of the Site is shown to have a downward hydraulic gradient, indicating that groundwater flows from the Overburden and Interface water-bearing zones to the Bedrock Aquifer. However, a region showing temporally consistent positive head differentials is identified northeast and east of the landfill. This is represented on Hydraulic Head Difference Maps (refer to Appendix I-4) by the shaded area. In this region the positive head differentials indicate an upward hydraulic gradient with groundwater flow from the Bedrock Aquifer to the Interface Zone. The region characterized by the positive head differentials corresponds directly with the bedrock high located northeast of the landfill (refer to the Top-of-Bedrock Contour Map Figure 6.7). The hydraulic relationship between the Interface Zone and the Bedrock Aquifer in this region indicates that the contaminated Overburden or Interface groundwater will not infiltrate into the Bedrock Aquifer in this region of the Site. The upward hydraulic gradients in this area create a hydraulic barrier to the downward movement of groundwater.

During the Phase III RI, monitoring wells MW-10S and MW-13S were installed to further delineate the vertical upward hydraulic gradient between the Overburden unit and the Interface Zone. Based on the Hydraulic Head Difference Maps and Tables (refer to Appendix I-4 and Table 7.3), the groundwater flows from the Interface Zone to the Overburden unit in a region identified by the shaded area northeast and east of the landfill. The upward hydraulic gradients in this area create a hydraulic barrier to the downward movement of groundwater into the Bedrock Aquifier. The upward hydraulic gradient, however, does not create a hydraulic barrier in the Interface Zone and only possibly retards , to some limited extent, the horizontal flow of groundwater. Horizontal groundwater flow velocity is much greater than the vertical aspect of groundwater movement. Interface Zone groundwater will follow least resistance areas which abound in horizontal top of rock fracture zones.

13.2 Conclusions and Recommendations

Based upon the nature and extent of contamination discussed in Section 13.1, a number of conclusions are presented herein.

- The primary northwestern source areas will require remediation, and remedial alternatives will be investigated during the Feasibility Study. It should be noted that containment (slurry wall, etc.) and capping of this area does not appear to be a feasible remedial alternative due to the potential flushing action of the seasonal vertical groundwater fluctuations. This source area is underlain by the lacustrine silty clay unit which is not considered an impervious clay or confining layer. The lacustrine unit pinches out laterally to the northeast and hydraulically downgradient of the source and also consists of a variety of discontinuous silt and sand lenses. A containment wall around this source area, even if tied into bedrock, may not prevent contamination from moving vertically downward through the lacustrine unit to the bedrock.

  The density of the main contaminant of concern (TCE) from this source area is heavier than water, commonly referred to as a Dense Non-Aqueous Phase Liquid (DNAPL), the possibility exists that downward DNAPL movement is presently occurring. If DNAPL concentrations are allowed to penetrate overburden soils to top of rock, then residential well water and Interface Zone groundwater are subject to possible contamination.

- The two smaller northeastern source areas present the same concerns regarding vertical migration of contaminates during seasonal fluctuation in the water table. The Feasibility Study will also address removal and/or in situ remediation of these areas.

- Since there is a good possibility that the final remediation of the Site will require the excavation of additional contaminated soils, it is recommended that the remediation of the existing staged contaminated soils pile be included with the Feasibility Study of the remediation of the entire Site.

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